NEW INFORMATION TECHNOLOGY
IN EDUCATION

SPAIN

Cataloguing data can be found at the end of this publication.

Printed in Luxembourg

Commission of the European Communities

New information technology in education

in Spain

Prepared for the Commission - TFHR

**New Information and Telecommunication Technology Programme
Ministry of Education and Science**

February 1993

Document

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1. Context

1.1 Framework and organisation of the Spanish education system

The 1978 Spanish Constitution contains the basic guidelines for all legislation on education. Three essential aspects are involved. First, recognition of the right to education as one of the basic rights the Government must protect. Second, other basic rights related to education. Finally, responsibility for education, which is divided between central Government and the self-governing communities.

Under the Constitution and in accordance with the terms laid down by their respective Statutes, the self-governing communities of Andalusia, the Canaries, Catalonia, Galicia, the Basque Provinces, Valencia and Navarre have assumed full responsibility for the regulation and administration of education at all levels and grades, types and special forms with no limits other than education which is the sole responsibility of the State. The remaining ten communities may assume responsibility when appropriate. Communities which have already taken full responsibility for education exercised it fully as soon as the resources required -which were previously the responsibility of the State - were transferred to them by Royal Decree.

There are four principal levels of authorities responsible for education in Spain:

-   The State, represented by the Government (the Ministry of Education and Science - MEC).

-   Regional governments, represented by the education departments of the governments of the self-governing communities of Andalusia, the Canaries, Catalonia, Galicia, the Basque Provinces, Valencia and Navarre, to which responsibility for education has been transferred. The remaining self-governing communities constitute the so-called "territory managed by the MEC", which is made up of the communities in which education is still primarily the responsibility of the Ministry of Education and Science, i.e. Aragon, Asturias, the Balearic Isles, Cantabria, Castille-La Mancha, Castille and Leon, Ceuta and Melilla, Extremadura, La Rioja, Madrid and Murcia.

-   Provincial, where education is the responsibility of the MEC provincial offices (except in the communities with full responsibility for education where the responsibility not transferred lies with the Education and

Science Offices).

- Finally, local or municipal, where some operations relating to education are the responsibility of the councils in these areas.

1.2 The education system structure

The structure and organisation of the Spanish education system today is mainly that laid down by the 1970 General Education Law. In spite of the fact that at the time it was said to be one of the most important reforms of the Spanish education system, this Law is now somewhat out of date in respect of today's educational requirements. The basic inadequacies of the Law and problems of adapting it to the requirements of a complex democratic society involved in integration in Europe, faced with increasingly rapid changes in technology and requiring increasingly richer and varied forms of culture have become apparent over the last two decades.

In order to adapt the system to these changes, the Ministry of Education and Science introduced a reform under which the curriculum will be amended in the next ten years following approval of the Ley Orgánica de Ordenación General de Sistema Educativa (LOGSE) (Organic Law for the General Organisation of the Education System) in October 1990.

1.3 Forms of education

Some of the principal objectives of the new Law relate to aspects as important as extending compulsory education to 16 years, reorganising the education system by establishing nursery education, primary education, secondary education and vocational training stages. In order to consolidate this reorganisation, the Ministry of Education has also taken measures relating to the permanent training of teachers, a proposal for a basic curriculum, setting up Departments of Educational and Vocational Guidance at schools and colleges, etc.

Nursery education

Nursery education, which includes the six year-olds, will not be compulsory. However, it will be available free from the age of 3 for those who require it.

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The object of nursery education is to provide the youngest children with suitable experience in various areas to assist their physical and personal development. It will be provided by specialised teachers with the collaboration of the children's parents.

Primary education

Primary education, which is compulsory for children from six to twelve, consists of three cycles of two years each. Its aim is to promote socialisation and facilitate the children's incorporation into the country's culture.

Primary education covers the following subjects: Language and Literature, Mathematics, Environmental Studies (natural and social), Arts (Music and Three-Dimensional Art), Physical Education, Foreign Language (from 8 years) and Religion (which must be provided by schools but is voluntary for pupils).

Teaching will be delivered by teachers, each of whom will teach a group of pupils throughout each cycle. There may however be specialist teachers for Physical Education, Foreign Language and Music.

Compulsory secondary education

This level of education, which is for children from 12 to 16, is divided into two cycles of two years each. In the second cycle pupils may choose each year's subjects. In the first years options will take up approximately 10% of the school timetable, which will increase to 30-35% in the final year.

The aim of compulsory secondary education is to ensure that pupils learn the essential elements of modern culture and are trained to be citizens who can fulfil their duties and exercise their rights in a democratic, pluralist and technologically advanced society.

Secondary school teachers will be university graduates trained to teach at this level. However, established main grade teachers may continue to teach during the first cycle of this stage (from 12 to 14 years).

The 12 to 16 stage will be provided at secondary schools which, when possible, will also provide teaching at baccalaureate and specialised vocational level.

The following subjects will be taught at this stage: Natural Science; Physical Education; Painting and Sculpture; Geography, History and Social Sciences;

Foreign Languages; Language and Literature; Mathematics; Music; Technology; Religion (compulsory for schools and optional for pupils). Each subject area will have a teacher and each group of pupils will have a tutor.

Pupils who have achieved the general objectives on completion of compulsory secondary education will receive the corresponding qualification, which will give them access to the baccalaureate course or vocational education.

The necessary resources will be provided to enable all pupils to achieve these objectives.

Education authorities will also promote training programmes to enable pupils who have failed to obtain the necessary vocational training qualification to enter the world of work.

Baccalaureate

The object of the baccalaureate is twofold. First, to provide pupils with specialised teaching (according to the type of baccalaureate) and, second, to prepare them for university or advanced vocational education/courses.

There are three different types of baccalaureate:

- Humanities and Social Sciences,
- Natural Sciences and Health,
- Technology.

Baccalaureate teachers are university graduates trained to teach at this level. There is also a baccalaureate in Art provided in association with the respective academies or colleges.

Baccalaureate courses are now being reduced to two years (16-18) since secondary education starts at 12 and includes many subjects which at present are taught during the baccalaureate stage. The present Pre-University Course is being discontinued and guidance for all types of education is being provided by the schools and colleges' guidance departments.

In order to enter university it will be necessary to have completed the baccalaureate course and passed an examination which assesses general abilities. Success in any baccalaureate makes a student eligible for a university place. Priority however depends on the type taken, examination results and

qualifications obtained during the course.

Vocational Training

The aim of reforming vocational training is to provide training to produce a worker with vocational skills, thus forming a true link between the education system and the world of work.

Vocational training has two components: basic, which must be provided in secondary education, and specialised, which is provided in courses which are modular in nature and form a bridge between schools and employment.

These vocational modules, which are taken on completion of compulsory secondary education, are designed to provide the European Community grade 2 qualification. Modules taken after the baccalaureate are at Grade 3 level.

Vocational modules provide qualifications and certificates which are recognised in the academic world and on the employment market. These modules must also however be a form of continuing education to provide qualifications for workers, and generally young adults as well. Access to them will therefore be not only from the education system but from the world of work (via a maturity test) as well.

Other forms of education

The reform of education also covers other forms of education which may be concurrent with or subsequent to compulsory education, or which may be integrated with it. These forms include:

- Musical and artistic education
- Special education for children with special needs, provided as far as possible in ordinary schools.
- Adult education

1.4 Division between State and private education sectors

Infant and primary education in Spain is mostly provided by the State, while secondary education (baccalaureate and vocational training) is provided equally by both the State and private sectors.

The following table shows the numbers of teachers at the different levels in 1990.

	Total	State Education	Private Education
Nursery and Primary Schools	20 847	15 268	5 606
Secondary Schools offering Baccalaureate and Pre-University Courses	3 004	1 627	1 377
Technical Colleges	2 287	1 143	1 144
Total	26 138	18 038	8 127

1.5 Teaching staff

In 1988 there were 414 131 teachers at the principal education system levels, nursery, primary, secondary, technical and university, giving a total of over 435 000 teachers in the whole system, including teachers in special education, remedial education, continuing education for adults, distance learning and education abroad. It will be seen that the proportion of women to men at the different levels is far higher in nursery education (93.5%) and in the first two primary cycles (81.4% and 67.7% respectively). In recent years there has been a significant increase in the number of female baccalaureate teachers, which now exceeds the number of men. There are more men at the remaining levels, the difference being particularly significant in universities where only 28% are women.

The following table shows the numbers for teachers in the State and private sectors but does not include universities (1991 figures).

	Total	State Education	Private Education
Nursery and Primary Schools	287 312	207 477	79 835
Secondary Schools offering Baccalaureate and Pre-University Courses	95 621	70 237	25 384
Technical Colleges	59 398	44 716	14 682
Total	442 331	322 430	119 901

1.6 Students

There were 9 433 556 students in Spain in 1991, including students attending State and private schools and universities.

The following table shows student numbers and percentages according to types of education.

	Total	State Education	%	Private Education	%
Nursery	973 704	636 003	65.4	337 701	34.6
Primary	4 929 161	3 250 976	66.0	1 672 185	34.0
Schools offering Baccalaureate and Pre-University Courses	1 571 937	1 134 572	72.2	437 365	27.8
Technical Colleges	859 105	592 738	69.0	266 367	31.0
University	1 105 649	1 068 624	96.7	37 025	3.3
Total	9 433 556	6 682 913		2 750 643	

2. Developments in the introduction of information technology to educational institutions

2.1 National information technology projects

There are at present 7 different projects in the education system in Spain for introducing the teaching of information and communication technology at non-university level. These are self-governing community projects, for which the communities are fully responsible, and the Ministry of Education project under which the Ministry is responsible for the remainder of the communities (MEC area).

These projects have been planned as a result of experiments and pilot projects realised during the 1980s. The education authorities in the self-governing communities saw the need for a general framework to channel and coordinate these initiatives and identify the general objectives, methodology to be followed, type of teacher training to be given and any topics which might arise as the technology develops. The following projects have therefore been set up:

MEC Territory:	Atenea and Mercurio Projects
Andalusia:	Zahara Project
The Canaries:	Abaco Plan
Catalonia:	Computer-assisted Education Programme
Galicia:	Abrente and Estrela Projects
Basque Provinces:	Basque Computer-assisted Education Project
Valencia:	Computer-assisted Education Programme

In 1991 the self-governing community of Navarre assumed full responsibility for education and set up a new project which is a continuation of the Atenea and Mercurio Projects in which it had participated until then.

Although there are several different projects, some aspects are common to all.

All projects primarily involve the introduction of new resources for teaching in the different areas of present curriculum since Computing is the only subject which is an option in the baccalaureate. It is compulsory in some special types of vocational training. Under the current education reform, some forms of the new baccalaureate courses may include specific technologies.

The projects apply to non-university education. Apart from the Abrente Project, which applies chiefly to primary education, the others now include

primary and secondary schools, baccalaureate courses and vocational training. Some communities, such as Catalonia and the Basque Provinces, have now included all State teaching centres for students of 14 years and over. All projects provide for the gradual extension of IT to other teaching centres during the next few years. This will lead to the general use of IT in education in the future.

Special education is included specifically in the Ministry of Education and Science Atenea Project and in the Andalusia, Catalonia and Galicia Projects.

The Andalusian Project and the Ministry of Education and Science Atenea Project also include continuing education for adults.

Special programmes include projects for creating telematic networks. These have already been started in communities such as Andalusia, the Canaries, Catalonia and the Ministry of Education and Science territory. These networks enable project offices to be connected to schools and colleges, making it possible to provide video conferencing services, access to data bases, the transmission of data and electronic mail.

Other areas being given special attention are the development of control equipment, robotics and computer-assisted experiments, computer graphics and the use of computers for teaching music.

The projects have made provision for procedures for the support, monitoring and assessment of activities, principally by holding meetings of teachers with specialists, seminars, visits to schools and colleges, investigation, etc. These initiatives make it possible to ascertain the progress of projects and introduce modifications which can be used for all projects. In some cases, such as the Ministry of Education and Science, the Canaries and the Basque Provinces Projects, assessment is carried out by agents outside the programme. In addition, the Atenea project has been assessed internationally by the O.E.C.D in Paris.

2.2. Objectives

The objectives of the projects may be summarised as follows:

For students

- To improve cognitive development and learning (innovative apprenticeship) through a new environment which favours the development of abilities, skills and the acquisition of knowledge.

- To encourage the rational and critical use of IT and train students to understand and express themselves through it.

- To develop the ability to access, organise and process information by using computers.

For teachers

- To provide technical support and suitable training in the use of computers as a teaching resource and a means of improving education methodology to improve the quality of teaching.

- To provide teachers with the theoretical and practical means of analysing and selecting the computer resources most suited to their environment and their specific task.

- To improve the academic and administrative management of schools and colleges.

For the curriculum

- To define the ways of including IT in the various curriculum areas.

- To make it possible to include data processing as a science and technology in the curriculum of all types of general and specialised education.

2.3 Teacher training

The training of teachers warrants special attention in all projects as a means of achieving their objectives.

Teacher training establishments play an important part in training. These establishments, which have different names (CEP, COP, etc), are to be found in most communities. Their purpose is to provide training and further training in technology and pedagogy for teachers in the locality in all areas of the

curriculum. Most teacher training establishments have one or more persons responsible for IT.

All projects for the introduction of IT into education have their own training programmes for teachers; they are normally at two levels:

Intensive training

A full time course for teachers released from their teaching duties. Training is of a specialised nature and teachers subsequently teach and advise other teachers. They are then known as "advisors" in the Atenea Project, "coordinators" in the Canaries and Andalusia Projects and "teacher trainers" in other projects.

This training is given intensively on one or more academic courses and is later complemented by updating training. Teachers are given thorough knowledge of technology, language and teaching and are then qualified to work in the different subject areas and to assess and monitor educational projects.

General training

Other teachers wishing to use IT when teaching are given general training. Courses are generally held outside teaching hours and teachers who attend still have their own class work. In the Canary Isles teachers are released from their teaching duties for training which takes place during working hours.

Training is given by specialist staff at the same educational centres or at teacher training establishments.

There are several types of general training course:

-       Introductory courses, to provide a general idea of the possibilities of IT in education.

-       Specialised courses, for the in-depth study of the various computer programs and resources for the different areas or specialities.

-       Seminars, updating courses, etc, for the continuing training of teachers which promote the exchange of experience and ideas relating to their work with students.

Most projects make provision for the preparation of their own material.

2.4 Resources

Equipment

Hardware used in the projects follows market trends as far as funds allow. In most cases for economic reasons decisions on resources to be purchased are made centrally. In many State schools and colleges there are other procedures for the provision of hardware, which generally depend on parents' associations, local enterprises or the budgets of colleges or departments which see the need for computers and provide their own finance.

Project managers normally purchase the requirements of teaching centres annually. Before making a purchase, the equipment available on the market is carefully assessed. This helps hardware manufacturers to standardise their products and provides a guide for other associations or individuals in the education world.

There is also a policy of producing or aiding the production of hardware for education. This is for peripherals for special education or for developments relating to the technology.

The basic equipment for all projects consists of IBM compatible computers (about 10 per school), generally with 80286 (prior to 1991), 80386 (1991 and 1992) and 80486 (1993) microprocessors, a hard disc of between 40 and 200 Mb, 5¼" and/or 3½" disc drives, 2 to 4 Mb RAM memory, colour monitor and printer and, depending on the school or college, plotters, digitizers, modems, etc. The Abrente project has different equipment since IBM compatible computers were not available initially.

The equipment for audiovisual projects includes 26" TV sets, video recorders with editing and Euroconnection facilities, sound and camcorder equipment. Teacher training establishments also have mixing desks, editing and lighting equipment.

Software

When the projects were started in 1985, there was hardly anything which could be called educational software available on the Spanish market. It was therefore necessary to purchase general purpose software and use it for education. Integrated packages performed (and still perform) this function; word-processing and data base packages were adapted for many teaching purposes. Owing to

their initial difficulty and complexity spread sheets were little used.

In the early days computer-assisted drawing and design packages also played an important part.

Various computer languages were employed, depending on whether or not they were included in the project curriculum. In the first place Logo, Basic and Pascal were included for training teachers and were supplied to teaching centres. The Atenea Project, which did not include teaching of programming or supporting specific subjects with a data processing content, was however an exception. In this case, since the object was inclusion in the curriculum, only Logo was provided as it was considered a system or environment rather than a language.

There is now a considerable amount of specialised educational software which falls into the categories of:

- Computer-assisted lesson operators
- Test packages
- Simulations
- Teacher support programs
- Dictionaries
- Special needs programs
- Educational data bases
- Data acquisition and control software
- Problem-solving programs
- Authoring programs
- etc.

Education software has appeared on the market in Spain as a result of different initiatives.

In 1988 an agreement was signed by the Ministry of Industry, the Ministry of Education and Science and the Centro para el Desarrollo Tecnológico e Industrial (CDTI) (Centre for Technological and Industrial Development). The object of the agreement, of which there have been four subsequent versions, was to subsidise Spanish companies to develop educational software. Although about 100 different educational programs of varying quality have been produced, the agreement ensured that companies in the sector have included the education market among its projects.

Programs produced as a result of the agreement are sold on the market and some have been translated into different languages and exported.

Apart from the agreement, under the projects companies have also been commissioned to produce software which has already been written. Little use has so far been made of this measure.

In some cases software has been produced through other agreements or as a result of scholarships. The Catalonia Computer-assisted Education Programme (PIE) has a software production department which has supplied software to all the other projects.

Educational software has also been produced as a result of public competition for which prizes are awarded. Some of the projects, including the Andalusian, Galician and the New Information and Communication Technology Programme, have used, or normally use, this means of obtaining their software.

Programs produced in this way vary in quality and cover a wide range of subjects. In view of the precise nature of the procedure, the programs produced are not normally of a general or generic nature but are for specialised use. However, since a large number is produced in this way, it is a good source.

In many cases successful programs have been revised professionally by a company in the sector and marketed by a commercial company.

Some foreign programs have also been translated into Spanish for sale in Spain. In view of the difficulties of adapting programs to the cultures of different countries, this is not an important source. It is usual for a company with foreign capital or agreements with a foreign software producer to set up a department to produce Spanish software, but it is always much more than a translation of the original product, except when the content is of a neutral nature, e.g. mathematics or physics. The obvious example is software produced in Israel and France.

All projects provide teaching centres with general purpose computer programs (MS-DOS, word processors, data bases, spreadsheets, DP packages, integrated packages, utility programs, etc), programing languages (Logo, Pascal, Basic) and curriculum programs and applications for the various areas or specialisations.

The audiovisual market is much more stable; the principal activities have been

the direct purchase of recordings, joint production with companies in the sector and the translation and adaptation of material from abroad. Projects have also produced a considerable amount of their own material.

2.5 Coordination between projects

In 1987 the Spanish Ministry of Education and Science, through the Dirección General de Coordinación y Alta Inspección ("Coordination and Senior Inspection Office"), set up a coordinating committee for the various projects for introducing IT into education in Spain. This committee, made up of a representative from each project, is responsible for studying technological standards for education and procedures for the implementation of the various projects.

Its role in relationships with the European Community is to publicise and coordinate the actions sponsored by the European Community Programme "New Information Technology in Education Systems".

3. The current situation

After an experimental period, there was a tendency for many projects to retain some responsibility for the provision and assessment of software and towards a reduction in activities in general.

In some, such as the Catalonia Project or MEC New Information and Communication Technology Programme, experiments have continued in other fields of IT such as networks, telematics, flexible distance learning, multi-media integration, etc.

Details will now be given of the projects mentioned. The activities described, figures and specifications were those available when this report was prepared and relate to the period between 1991 and 1993.

3.1 Territory for which the MEC is responsible - Atenea and Mercurio Projects

In 1985 the Ministry of Education and Science set up the Atenea Project, incorporating the activities of various sections of the Ministry. When this experimental project was started, the aim was the gradual rational integration of equipment and computer programs to permit experimentation with these technologies in the different curriculum and subject areas.

In 1987 it was decided to include the Atenea Project in a new administration unit known as the New Information and Communication Technology Project (PNTIC). It also became part of the Mercurio Experimental Project Programme, the aim of which was to incorporate audiovisual resources, especially video, using similar lines of action.

General objectives and principal guidelines

The PNTIC area of action includes the educational levels prior to university of the 11 self-governing communities for whose education the Ministry of Education and Science is responsible.

The principal objectives of PNTIC are:

- To respond to the requirements of the gradual introduction of new information and communication technology.

- To act as a permanent body to aid the creation, development and assessment of the application of information and communication information technology.

- To provide advice and support for the departments of the Ministry of Education and Science in respect of these subjects.

- To define the technical specifications of the software and computer equipment with which the educational centres are provided as technology evolves.

- To propose lines of cooperation with both State and private organisations and institutions and with the industrial and service sectors for the promotion of potential new areas of learning, the preparation of educational software and the design of peripherals and other data processing devices.

- To unify the lines of action of the Atenea and Mercurio experimental Projects.

- To advise and coordinate the participation of the Ministry of Education and Science in the various national and international fields in all aspects related to IT and primary and secondary education.

During the experimental stage of the Atenea Project material and staffing infrastructures were created to make it possible to create new equipment, provide continuing training for teachers and consider the primary and secondary education curricula from the point of view of IT. Studies have been carried out to define ways of integrating IT into curriculum areas.

Action has also been taken to investigate the possibilities offered by IT for special education.

The aim of this stage of the Atenea Project was also to examine the effect of incorporating IT in the organisation of teaching centres and the managing of teaching and learning situations, including architectural and ergonomic aspects.

Schedule

Experimental stage (1985-1990)

The standard MS-DOS operating system was chosen for computers. The production of educational software was encouraged and guidance was given. Tenders were invited for the selection of experimental centres to service the primary, baccalaureate, vocational training, special education, art education and continuing adult education sectors.

In 1989 there were 697 selected teaching schools and colleges. Resources for training and classroom use were created and publicised. During this period 248 teacher trainers were selected and trained in information technology. A plan was established for monitoring the experiment and assessing the objectives of this stage.

Assessment of the experimental stage (1990)

In addition to monitoring during the experimental stage, in 1990 three specific ways were introduced for the overall assessment of this stage. The first was through an agreement with the University of Murcia Institute of Education and Science. The second was carried out for the OECD by a team of international specialists formed specifically for the purpose. The third was carried out directly by PNTIC from information from the teams of those who participated in the Atenea Project.

Extension stage (1990 onwards)

A start was made on planning this stage at the same time as the experimental stage was assessed. It was to be carried out during the 1990-1991 and 1991-1992 academic years, taking into consideration the results of the assessment. The aim is to make significant progress in implementing experiments in the use of computers in the various curriculum areas and to generalise the use of IT in the various subjects, areas and cycles.

During this stage teaching centres were incorporated until the current numbers of 1 609 in the Atenea Project and 1 087 in the Mercurio Project were reached. Staffing is being increased by appointing provincial New Technology Programme coordinators. This stage is no longer experimental and the aim is to introduce data processing fully in various subject and curriculum areas through projects which affect each of them.

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In 1992 a start was made on planning the generalisation stage which takes place at the same time as the extension stage. There are three basic aims of this stage:

- To publicise among teaching centres the achievements made during the process;

- To provide teaching centres with up-to-date continuous support in implementing teaching based on IT within the framework laid down by the new Law for the General Planning of the Education System;

- To provide support for the creation, development and assessment of the application of information and communication technology to education, in accordance with technological evolution and changes in the education world.

Organisation

The New Information and Communication Technology Programme is organised as follows:

Management
                      Technical Council

<u>Services</u>:   Audiovisual
               Computer

                      Management
                      Curriculum integration
                      Training
<u>Offices</u>   Distance learning
                      Computing specialist
                      Audiovisual specialist
                      Media and publications

Teacher training

Teachers are given general training at the 109 teacher training establishments participating in the Atenea Project and teacher advisors are trained in the

Projects' new data processing and audiovisual technologies.

A training model is used initially to provide teachers with a profile which, by focusing upon their attitudes and methods, encourages them to modify their teaching style, the teacher being the basic figure for any process of innovation in a school.

The training plan is divided into two stages: an introductory stage and the stage during which the teaching aspects of the actual subject are dealt with in depth.

In the first stage teachers attend a course for the introduction to new information technology in education. This provides a general view of the various possibilities of using computers in the different subjects and in an inter-disciplinary manner. Specialised courses are also held on the use of specific computer equipment applicable to teaching. Both courses are highly practical and based on the use of teaching application software.

The second stage complements the first. Aspects relating to each of the areas are tackled and new resources suitable for the level and subject concerned are included. Aspects relating to experiments in the classroom, the analysis of actual practice and the introduction of new lesson plans are also dealt with. Permanent seminars are also set up based on areas or of an inter-disciplinary nature within the scope of each teacher training establishment.

Five teacher/supervisor posts have been created at the PNTIC Servicios Centrales (Central Departments) for the training described above. Training includes technical and teaching aspects and aspects relating to the training of teachers. Training is thus complemented by subjects relating to the assessment, publicising and monitoring of experiments and to aid innovation processes.

Specific projects

Several specific projects influenced by the Atenea Project have been planned and implemented while the Atenea project is in progress.

Telematic teaching and learning project (PLATEA)

This project is based on the use of an education mailbox using the Red Telefónica Conmutada (RTC) ("Telephone Exchange System") and a Videotext Service Centre which has been in operation since it was set up January 1991.

Information is provided on educational software and videos, education experiments (EXPER), activities and courses at the CEPs, news of interest to the education community, curriculum activities, etc. There are also applications of electronic mail, video conferencing and question and answer forums.

Specific telematic tutorial and computer-assisted educational programs suitable for distance learning are being produced.

Activities using the RTC are all local because of the cost of telephone calls. Activities based on videotext are of a national nature and accessible to the whole community, not only schools and colleges taking part in the Atenea Project. Their low cost makes them ideal for introducing telematics to teachers, students and other educational practitioners.

Special education

The Project makes provision for students with special educational needs, which is provided in association with the National Resource Centre for Special Education. 90 experimental schools and colleges selected by competition take part in this Project and since 1991 any school or college which takes students with special needs may take part in various ways. Special equipment has been acquired and specialised programs have been produced. Mention should be made here of the agreement between the ONCE Foundation and the association APANDA to provide computer programs for students with hearing defects.

Art education

Under the Project IT is introduced into art colleges, taking into consideration the special features of these institutions. All art colleges take part and have been provided with special equipment and software.

Continuing adult education (EPA)

The object of this experimental project is to introduce IT into continuing education for adults. The intention is to cover aspects such as the introduction of IT into areas of the curriculum, entry into the world of work, further training and the updating of knowledge and skills and access to culture and leisure.

Selective experiments

Special experiments have been planned at the new Technology Programme

Central Departments covering a number of aspects. These experiments are conducted at a few schools and colleges only. Among the experiments are those relating to Mathematics, Language, Social Science and Languages (French and English).

Computer-assisted music teaching

A project has been implemented to introduce a number of programs and suitable hardware (MIDI board, music keyboard, loud speakers, etc) into schools and colleges so that music can be taught at these schools and art colleges using this technology.

Computer-assisted laboratory

There is a specific project for physics, chemistry and biology for which schools and colleges are provided with a computer with a data collection board, printer and dedicated software for the experiment. Schools and colleges which participate in this project have publicity days and the results of their experiments are published; these publications are particularly useful for the centres involved in the project.

The PNTIC media library

A media library has been formed at the PNTIC Central Departments so that educational programs can be assessed. The library is open to the public and educational videos and publications (magazines and books) on subjects related to IT in education can be consulted here.

Flexible and distance learning using information technology. The Mentor Project

The new telematics equipment has now been introduced into IT. It has wide application for flexible and distance learning.

There are two areas in which this technology is required to play a central role in projects for introducing IT, i.e. the training of adults (regulated or otherwise) and the training of teachers in both specific IT topics and in updating the scientific and methodological aspects of teaching the subjects in the curriculum.

The training of teachers is now based largely on practical work in the classroom. The demand for training in this field and that anticipated in all

other curriculum areas is such that experiments are being conducted with distance learning programs which require less personal attendance. This tendency is in line with EEC recommendations and it is anticipated that it will be used to a great extent in future.

In the case of flexible and distance learning, the Ministry of Education and Science has the Mentor Project, the New Information and Communication Technology Programme initiative, the aim of which is to encourage **distance education and learning** in the less favoured regions, especially in rural areas where accessibility to information and information resources is still a considerable problem. The overall object is to promote local development. The project is partially funded by the FEDER European Plan.

Telematic tutorials and the development of resource packages for training carried out under this project will be used to train teachers and to make this facility available to other areas in the country.

The Mentor Project is therefore in line with the great interest in Europe in encouraging distance education and training and with the certainty that one of the basic factors to encourage the development of the more backward regions is the provision of information and training procedures adapted to the characteristics of the area in question. Distance learning is conceived as a means of overcoming geographical and time barriers which make it difficult for adults to participate in training in person.

The most significant aspect of the Mentor Project is the fact that distance learning will basically be supported by the **Information and Communication Technologies**.

In order to implement the Project, a telematics infrastructure has been created with the following objectives:

- To extend the possibilities of distance learning to areas of difficult access.

- To exploit the forms of distance learning based on information and communication technologies.

- To assist in the rapid transfer of knowledge and training resources.

A Mentor Project classroom is designed to be a centre for training and self-

training, providing resources for training and information for adults who wish to avail themselves of the Project, either for basic education for motives of personal development, or for job training.

Before starting the Project's experimental stage, several classrooms were fitted out, initially with a telephone line, fax, four computers (one with a modem), a printer and audiovisual equipment, consisting of a television set, video recorder and a multimedia work station. One person, the Systems Manager, will be responsible for operating IT equipment and making the technological and teaching resources for training available to adults. Mentor classroom managers have received 150 hours training given at the New Technology Programme premises in Madrid.

The project also provided for personal training directed at two complementary areas in the training of adults, general education and personal development. It is designed for adult students and enterprise managers involved in the development of their enterprises. It is intended to include assistance with adults' personal development, in addition to overcoming the problems of illiteracy. The first courses were held in 1992.

There are two types of distance learning, namely general training and training for a specific job. Apart from overcoming the problems of illiteracy, general training through distance learning is at present chiefly for adults planning personal development activities, in other words, for students who for some reason cannot attend courses in person. It provides an alternative form of self-learning for this section of the young or adult population. Training for a job is for young persons or adults of over 14 with no specific job qualification and for enterprise managers who wish to update their management skills and/or working methods and cannot attend training in person. These people must be able to establish their own learning speed and in accordance with this be available to attend the Mentor classes regularly.

Self-study packages consisting of written, audiovisual and computer material which have been produced and are still being developed for distance learning. To follow up this up there is also an telematic tutorial to enable students to form a personal relationship with their tutor who will be at the PNTIC Central Department. The telematic tutorial is provided through a special mailbox program. Under this scheme each individual is responsible for his/her own progress, while the tutor is responsible for guiding the learning process.

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Production of materials

Several procedures have been implemented with the object of gathering ideas and products from teachers conversant with the potentials of computers and of encouraging companies to produce educational software.

In 1987 the Ministry of Education and Science, the Ministry of Industry and Energy and the Centre for Technological and Industrial Development signed an agreement to finance the production of educational software.

Under this agreement four tenders for the selection of development projects were put out; over 20 enterprises and universities took part. During their development prototypes are monitored by members of the PNTIC Central Departments. About 200 programs have been produced so far.

Since 1988 a national competition has been held annually for educational software in association with the Centro de Investigación, Documentación y Evaluación (Investigation, Documentation and Assessment Centre). The object is to award prizes for quality programs, which are generally produced by teachers. Programs awarded prizes are edited and distributed to the Project schools and colleges.

Products of an experimental nature have also been produced at the New Technology Programme Central Departments. On occasions prototypes have also been written and enterprises have then been requested to produce the software.

There are also videos to assist training and publicity.

Monitoring and assessment

Being innovatory, the Atenea and Mercurio Projects require feedback about the problems of methodology, content, administration, organisation, coordination, etc. Constant monitoring and support based on a suitably flexible infrastructure is required during the operation of projects to enable the Projects in progress to be assessed and suggestions made for changes and improvement where necessary. It is also necessary to be able to report on results achieved in practice from the use of IT.

The monitoring and assessment of innovations involves a number of actions

designed to:

- Analyse the processes and results obtained throughout the experiment at all stages involved in it.

- Propose procedures to aid in implementing the projects.

- Carry out an overall assessment to enable information to be obtained on the effect of these resources on the learning processes and arrive at procedures for general use.

Assessment, in which teachers take part, is carried out so that information can be obtained on the state of the Atenea and Mercurio Projects at any time. Assessment is of a cyclical, continuous nature and is a form of permanent monitoring and self-regulation of the projects. It combines quantitative and qualitative methodologies.

However, the resources required, i.e. questionnaires, observation techniques, etc, are designed with the aid of a team of university assessors to enable a large amount of information to be collected and processed so that the resources can be adapted to the actual experiment.

In order to check and adjust to actual situations the aspects outlined in the design, i.e. objectives, lines of action, procedures, etc, the new technology advisors must be trained to detect if the design is suitable for the various teaching situations and be able to propose modifications.

A report on the process of assessment was prepared and published by the University of Murcia in December 1990.

Mention should be made of the international assessment of the Atenea Project for the OECD in Paris by a team of assessors from the United States, Belgium, Great Britain and France. The report was completed in March 1991 and the results were published.

Since 1991 telematics have been available as a new means of monitoring and publicising experiments. The data bases containing the teaching centres' experiments are freely accessible through videotext. Mailboxes have been set up and meetings have been arranged to make contact and exchange experiences and interest groups etc have also been formed.

Information is periodically collected to improve the data bases.

Resources

Equipment

- Computer room with MS-DOS IBM compatibles (colour monitor, super VGA graphics, 4 Mb RAM, 120 Mb hard disc, mouse)
- Printers
- Modem
- CD-ROM reader
- Computer-assisted laboratory equipment
- Special education keyboard
- Speech board for special education
- Robotics and technology equipment
- Card reader for primary education
- Musical keyboards and MIDI interface
- Design rooms for art education (plotters, digitizers, etc).

Software

- Integrated packages
- Document editors
- Language: LOGO
- Self-editing programs
- Graphic design programs
- Computer-assisted teaching programs
- Simulations

3.2 Andalusia - Zahara XXI Project

Until the Project started and was being fully implemented, there were two aspects to IT activities.

Under the Alhambra Project, which was introduced in 1986 by the Consejería de Educación y Ciencia (Education and Science Council), numerous experiments have been conducted on the use of computers in education and many schools and colleges in the community have been provided with the necessary equipment. At the same time computer departments of teacher

training establishments trained teachers in the use of this equipment by holding courses, organising working parties and other activities.

The annual competitions held by the Proyectos de Experimentación e Inovación Pedagógica (Teaching Experiment and Innovation Projects) have made it possible to conduct audiovisual experiments and to start projects for linking computers. At the same time, as the result of the creation of the fully equipped Resources Departments, many teachers have been trained in the use and incorporation of audiovisual equipment in teaching.

General objectives and principal guidelines

The objectives of the Zahara XXI project are as follows:

- To extend the use and knowledge of IT to facilitate and improve the achievement of teaching/learning objectives.

- To develop and conduct experiments in the use of IT in teaching/learning.

- To create new independent learning areas (individual and group) and develop creativity.

- To introduce into the curriculum the necessary theoretical and practical elements relating to the use of IT to enable messages to be received and information to be properly decoded and to use these means of expression and communication creatively.

- To facilitate the integration of students with special education requirements into all levels of the education system and into working and social life.

- To encourage the review and revision of subjects in the curriculum from the perspective of IT.

- To define ways of integrating IT into the different areas of the curriculum and educational levels, increasing opportunities of cross-curricular initiatives.

- To increase the capacity for and improve the quality of management,

administration, documentation and information at schools and colleges.

- To facilitate and improve assessment procedures.

- To favour the role of educational centres as agents for community development.

- To link investigation, experiment and educational innovation programmes and the training of teachers with the project objectives.

Schedule

The IT project will be implemented in three stages:

The introductory stage, which begins with approval of the Alhambra Project and the tenders put out since 1986-87 for selecting State and approved teaching establishments at non-university level (primary and secondary education, vocational training, special education, continuing education for adults, arts and crafts colleges, academies and language schools).

Through the schools and colleges under the Project it is planned to:

- Provide advice and assistance to teachers through the computer departments which operate on a district basis within teacher training establishments.

- Establish coordination procedures required between the schools and colleges which carry out experiments.

- Provide the schools and colleges with computer equipment.

The teaching staff of the teaching centres selected must in turn carry out the work necessary to achieve the Project's objectives as far as possible, attend training and further training and submit themselves to the monitoring and assessment procedures established by the Education and Science Council.

Experiments are carried out under a project prepared at the teaching centre itself, with one or more teachers as coordinators. Under the project a specific pre-established experimental model is not essential, but centres participating in

the experiment must be prepared to conform with the project's objectives. The computer departments ensure that progress is consistent with the general framework planned.

It has also been possible to carry out experiments in the audiovisual field through the experimental teaching and innovation projects approved every year.

The development stage commences with the joint participation of audiovisual resources integrated with data processing and telecommunications. This results in integration between the Computing and Audiovisual Resource Departments.

48 IT departments have carried out their activities during this period. Up to now they have held 1 030 courses attended by over 19 000 teachers. This does not include the teachers who take part in the 42 permanent seminars and 93 working parties whose work is directly related to IT.

According to the reports provided during assessment, it is estimated that the progressive generalisation stage may begin in 1994. The Project will then be considered part of the education system. Its structures will have the function of facilitating and enabling IT to be gradually incorporated into the teaching centres through procedures which will be worked out for the purpose.

The Project is coordinated and guided in four different areas, namely the teaching centres, teacher training establishments, the provincial offices and the Education and Science Council Andalusian Institute for the Training and Further Training of Teachers central departments.

Organisation

NTIC Project Coordination

Provincial Coordinators

Working Parties (Special Education, Curriculum Planning)

Monitoring and Assessment Committees

NTIC Departments

Resource Development Team

Investigation & Innovation Projects

Teacher training

In spite of developing extensively in its own right, this important aspect of the Project must be understood in the general context of the reform, particularly in the framework of the Continuing Teacher Training Andalusian Project.

There are two types of training:

-        Training of the CEP NTIC departments staff. The object is to enable teachers to work with sufficient competence as assessors, coordinators and trainers. Since the departments must perform tasks some of which are common and others specific, the training plan is in two modules:

a) A common module with the following content: Organisational Psychology, Learning and the Curriculum, Educational Investigation and Assessment, Continuing Teacher Training and Information and Communication Theory.

b) Specific modules: Audiovisual Resources, Data Processing, Telecommunications.

- Training of teachers at schools and colleges.

This is carried out in two stages:

- An attendance stage. The modules related to the experiment conducted at the teaching centre are delivered. The length of this stage depends largely on the experimental projects involved; this is determined by the CEP NTIC departments.

- A practical stage. In the schools. This involves simulated practice to complement the project. Practice is supervised by staff of the NTIC departments.

Special projects

Computerised system for the management of teaching centres

The experimental stage of this programme commenced in May 1990. The object is to improve the quality of administration of teaching centres by computerising management and recording the results of assessment at the centres.

Special education

A Regional Special Education Committee has been set up so that under the Project preference may be given to the use of IT for students with special needs. Since 1988-1989 the work of the Committee, which is formed of teachers from NTIC centres and departments, has included the study of "intervention models" and the analysis, development and assessment of IT resources. One example is the keyboard simulator which obtained the INSERSO prize in 1989 and is used by students with serious motor deficiencies.

Telecommunications

As a result of the need to share resources and interact between schools and colleges and the CEPs, under the Project efforts have been intensified to prepare a telecommunications project. The object of this project, which

commenced in 1990, is to enable teaching centres to have access to data bases.

Data processing as a subject

Since 1986-87 an experimental project has been in operation in 26 institutes in which data processing has been taught as an optional subject for three hours per week. For baccalaureate courses the reform programme offers Science, Humanities, Technology and Business Administration.

The experiment is being assessed at two levels:

- Provincially, through the Comisiones Técnicas de Seguimento y Evaluación de Proyectos Experimentales (Experimental Projects Monitoring and Assessment Committees).

- Regionally, by university entrance examinations in association with the Andalusian universities to give access to universities.

Production of materials

Most teaching materials for the Project are prepared in the teacher training establishments. They include a wide range of written material produced during the further training for teachers. The task of the Resource Development Team, which was created in 1990, is to create programs and resources on a regional basis for use in education.

However, since 1989-1990 the Council has been holding competitions and awarding prizes for the creation of computer education resources and software. The object is to encourage initiatives by teachers and students in the self-governing community to prepare material to facilitate and promote teaching support activities to assist the integration of data processing into the curriculum.

Monitoring and assessment

Monitoring and assessment are carried out in conjunction with the other further training activities, i.e. educational experiment and innovation projects, working parties, permanent seminars, specialist courses for primary school teachers and education reform experiments.

Monitoring is carried out provincially by a technical committee and regionally or locally by a monitoring committee at each of the CEPs. The respective

committees make use of the following:

-    Written reports in which each of the sectors involved gives its opinion on the IT programme with which it is involved.

-    Interviews and discussion with all classes of the education community involved.

-    General observation, not to judge the work of participants but to define to what extent the Project has implications for the practice of education in order to achieve the ultimate aim, i.e. the transformation and improvement of the quality of teaching.

Resources

Equipment

The equipment described is used in complementary modules; an equipment module may be constructed to suit a specific experiment, however extensive and varied it may be.

Audiovisual and telecommunications equipment:

> Video I module, video II module, sound module, lighting module, basic photographic module, photograph laboratory module, projection module, school radio module, TV 1 module, TV 2 module (amplification) and telecommunications module.

Computing equipment:

> Classroom computer module, design module, authoring module, experimentation and control technology module, special education module, nursery education module, communications systems module, local systems module, telematic systems module and interactive CD-ROM video module.

The basic configuration consists of IBM compatible computers.

Software

The resources with which schools and colleges are provided consist of educational programs and programs of a general nature. These are not the same for all schools and colleges in the Project and, depending on the type of institution, may include:

- Integrated packages
- Data bases
- Word processors
- Languages
- Graphic design programs
- Authoring programs.

3.3 The Canary Isles - The Abaco Project

In view of the importance of IT in society today, the Canary Isles authorities have been working since 1984-85 towards introducing this technology into teaching centres.

The ABACO-CANARIES Project was set up for this purpose. It is the responsibility of the Consejería de Educación, Cultura y Deportes (Council of Education, Culture and Sport) and is coordinated by the Dirección General de Promoción Educativa (Educational Promotion Directorate-General). The project covers four years (1988-92) and affects all the non-university centres in the Islands. Its work consists chiefly of the training of teachers, providing schools and colleges with equipment, coordinating operations from teacher training colleges and experiments in class.

The project began in 1984-85 (the Abaco-85 Project). A three year experiment was conducted with 19 primary schools (6 - 14 years) to study the effect of the introduction of computers into classrooms on the learning process.

When planning the current Abaco-Canarias Project, the results of this experiment were taken into consideration and its area of application was extended to cover secondary schools and Applied Arts and Crafts Colleges.

The monitoring team analyses the results at the end of each year and modifies any aspects where improvement is possible. It is anticipated that the Project will be completed during the 1991-92 year.

Objectives and principal guidelines

- To encourage the rational and logical use of computers in schools and colleges.

- To determine the possibilities of using IT in teaching, in particular encouraging investigation in the classroom.

- To define the ways of integrating IT into the various curriculum areas.

- To promote the creation of new learning environments which will assist in the development of abilities and skills and the acquisition of knowledge.

- To develop in students and teachers the ability to access, organise and process information using the new techniques made available by computers.

- To provide teaching staff with the resources necessary to guide students. To analyse and select the resources and, if necessary, create their own applications.

Schedule

The project may be considered to have two stages:

Initial experimental stage (1985-87)

This stage was only implemented in 19 primary schools by providing equipment, training teachers and through classroom activities. Five teachers from each school were trained; their experience was gained with a small number of pupils. On completion of the stage, it was assessed and the assessment published by the Education Council. These results have been used as a basis for planning the present Abaco-Canarias Project.

Experimental stage at non-university education centres (1988-1992)

During this stage the Project was extended to primary and secondary schools

and the equipping of some of the primary schools which commenced in the previous stage was completed. The training of teachers was brought up to date.

Schools had to tender in order to be able participate in the Project. These new schools were equipped, the teachers were trained and they worked in class with pupils. 32 new primary schools and 82 secondary schools (33 baccalaureate and 49 vocational training modules) were included. The latter were provided with equipment to suit the type of vocational training.

Some teachers from these schools have received this training and most of them are now teaching.

At this stage the equipment amounted to a total of 1 170 computers of various configurations, 200 printers, plotters and digitizers. There were also various computer programs, i.e. integrated packages, document data bases, authoring packages and other packages for specific use for the various types of vocational training.

The process was completed by the training of 920 teachers from different levels, about 70% of whom were from secondary schools. About 10 teachers from each school participating were trained.

The equipping of all the secondary schools and 60 new primary schools will be completed during 1991-92, while in 1990-92 450 teachers from the latter were trained.

Organisation

The Education Council of the Canary Isles Government is responsible for the Community's new technology project, which is coordinated by the Dirección General de Promoción Educativa (Education Promotion Directorate-General) which has its office in Las Palmas, Grand Canary.

During this period the Project has 24 teachers/coordinators responsible for training teachers, preparing computer programs, planning teaching applications and assessing and monitoring the Project.

In addition, 128 teachers coordinate each of the teams at the work centres.

Teacher training

Since the training of teachers is one of the key factors in any situation involving a change in teaching methods, it receives special attention. Under the ABACO Project training is at two levels: the training of trainers and the training of teachers from each of the schools involved.

Trainers, who are teachers from different levels of education participating in the Project, are given extensive training in:

- Aspects of the new IT and its application in education.

- Technology, with the prospect of using a preferred language for education and using programs which are particularly useful in this field.

- The principles of planning teaching applications.

- Aspects of project monitoring and assessment.

In the last stage of this period training is alternated with the development of environments and models for use in the classroom for different subjects. These teachers are responsible for the direct training of the remainder of the teaching staff involved in the Project. In this way the process of training teachers is simplified, so avoiding any weakness in the training chain.

The aim of the general training plan is for teachers to be capable of using new methods of IT-aided teaching. The aim of this type of training is not to have teachers specialising in computing but teachers who can make sensible use of computers in their subjects. At the same time new ways of operating and teaching are suggested.

At least 10 teachers from each teaching centre attend the courses, which involve a number of seminars.

Courses are of three types:

- Introductory, (approximately 100 hours) for all teachers.

- Specialist, covering each of the subjects and specialities of teachers in depth. A vocational training teacher will therefore attend special courses using management programs and applications in the world of work.

- Further training, for the continuing training of teachers. New teaching programs will periodically be shown and at the same time instruction will be given in the use of new programs produced by the Project coordination team.

After the courses seminars are formed at the teacher training establishment to examine and discuss the activities carried out in schools, prepare classroom work, develop learning environments, assess computer programs, etc. Subject teachers or teachers of related specialities take part in each seminar.

Specialist Projects

Use of communications

During 1989-91 the Project used a communications system consisting of a central unit in the principal office and 45 terminals at the teacher training establishments on the different islands and at each of the schools and colleges taking part in the Project. Each terminal is provided with a modem and suitable communications software. The result is that a number of services are available, i.e. electronic mail, information on methodology, a bulletin board, simulation in certain areas, video conferencing, etc.

Work in multimedia environments

During 1989-90 experiments were conducted using interactive data processing systems. Some members of the coordination team were trained in the handling and programming of interactive video discs and at present they are experimenting with their potential for education. A disc has been produced which deals with different aspects relating to the Canary Isles.

Production of materials

The following materials are produced or acquired:

- Printed matter. Under the Project the training material, manuals and guidelines for the use of the software and teaching applications are produced.

- Applications and open learning environments to be used for teaching

different subjects are developed.

-   Packages for the different vocational training modules are acquired and specially produced for the Project.

-   Applications of packages acquired on the market, integrated packages, document data bases, etc., are developed.

Monitoring and assessment

At the end of 1990-91 in order to carry out the improvements identified during assessment, a review of the results and recommendations emanating from the monitoring and assessment of the training process and of teaching centres' activities was implemented.

After preparing the questionnaires, a team of outside specialists contracted for the Project carried out the monitoring and assessment taking the objectives into account.

Teachers' seminars and meetings with the Project coordination team play an important part in monitoring classroom activities and in their application.

Assessment takes into account aspects outside the Project, including comparison between learning methods and the performance of students involved in the experiment.

Resources

Equipment provided for the schools depends on the level of teaching and, if applicable, the specialist subjects taught.

Equipment

- IBM compatible computers
- VGA graphic adapter
- VGA colour monitor
- Mouse
- 80 and 132 column dot matrix printers
- PC expansion bus
- PC E/S expansion board
- 8052 AH-BASIC microcontroller board
- Programmable robot
- Modems
- Special peripherals
- Plotter
- Digitizer
- Interface for science laboratory experiments.

Software

General purpose

MS-DOS operating system. Programing languages: Logo, Quick-Basic, DBase III. Document data base. Authoring program.

Curriculum

Specific application programs for specific subjects, e.g. problem-solving, simulations, computer-assisted education, preparing models, etc. Specific applications for other programs. Programs specially written for vocational training in the field of business administration (accountancy, payrolls, etc).

3.4 Catalonia - Programa de Informática Educativa (Computer-assisted Education Programme)

In 1983 a number of experiments on the use of computers in teaching at non-university establishments was initiated in Catalonia. Among them were pilot schemes relating to vocational training and baccalaureate courses, computer-assisted education experiments in arithmetic and pilot projects to introduce the Logo language into primary education. These experiments showed the obvious advantage of teaching the use of computers at teaching centres and producing materials for the use of IT in education. As a result, in 1986 the Catalonia Generalitat Department d'Ensenyament (Government Education Department) started the Computer-assisted Education Programme (PIE), which assumed responsibility for existing experiments and initiated general activities, particularly in secondary education.

General objectives and principal guidelines

The general objectives of the Catalonia Computer-assisted Education Programme are:

- To improve the learning process and develop the ability to raise and resolve problems, intuition and creativity.

- To promote the use of the computer as a teaching aid and a means of reorganising educational methods.

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- To facilitate the inclusion of data processing as a science and a technology in general and specialist teaching.

- To coordinate experiments carried out at the various non-university educational centres on the use of data processing in education.

Under the programme the Education Department aims to integrate IT fully into all its educational activities to enable:

- Teaching centres to use data processing, integrating it with their education and administrative activities.

- Students to become familiar with information and communications technology so that it can be integrated rationally into today's technically oriented changing society.

By introducing the Computer-assisted Education Programme, the Education Department is now addressing the educational aspects of the present technological revolution.

Since the Computer-assisted Education Programme was introduced in 1986, its work has been related to secondary education and particular attention has been paid to attempts to reform teaching at this level.

Another important area of its work has been the Teaching Resource Centres' network. These centres cover the whole of Catalonia and provide services chiefly for primary schools (6 - 14 years).

In 1989 a start was made to prepare and introduce a plan of action into primary schools. It is planned to use IT in all these schools under a four year plan commencing in 1990.

From the beginning, particular attention has been paid to the Special Education Centres and to rural areas, the equipping of which commenced during 1990-91.

Apart from the traditional use of computers, PIE has carried out activities for teaching music and introducing CD-ROM and telematics in the classroom.

Schedule

The stages were:

1986-1987. Activities commenced in March 1986 with the equipping of secondary schools with computers (about 1 000) and printers (over 500) and general purpose software. Extensive courses were held for secondary school teachers, while intensive courses were held for vocational training and primary school teachers.

1987-1988. Activities were extended with the second equipment phase: 1 107 computers, 100 more printers, multiplexors and communications modems. The first computer teaching package, "MOSTRARI-I", was distributed. Teacher training became general (with over 20 different courses). A network of permanent seminars was created, with representatives from all secondary school computer coordinators, and computer literacy was adopted as a subject.

1988-1989. The Catalonia telematic education system (XTEC) was set up and the third equipment phase was accomplished, with 1 500 computers, over 500 printers, the second computer teaching package "SOFTWARE EDUCATIU-2" and document, statistics and drawing programs. Courses for teachers were extended (Mathematics, Language, Robotics). The post of computer room head was created and permanent seminars for providing support and monitoring were set up.

1989-1992. Experiments and activities for the inclusion of data processing in the curriculum were introduced into a selected group of teaching centres. These related to drawing and design, authoring, robotics, laboratory experiments, computer-assisted production, music teaching, telecommunications, English teaching.

New equipment (mice and special keyboards) and computer programs for management, art drawing and telematics applications were provided. Primary schools began to participate in the Project and the Computer-assisted Education Plan for primary education was prepared and introduced.

Organisation

PIE is an organisation responsible to the Education Department Dirección General de Ordenación e Inovación Educativa (Education Planning and

Innovation Directorate-General).

PROGRAMME MANAGEMENT

Computer Education Office	Computer Education Resource Centre
Experiment area	Telematics network
Training area	Software development
Documentation area	Software homologation

Organisations involved in the PIE

The Computer-Assisted Education Programme assists all State non-university teaching centres in Catalonia.

The 67 teaching resource centres also are part of the network of centres which PIE provides with material and to which it offers training, assistance and advice.

The PIE has links with numerous organisations and institutions with which it collaborates, particularly in respect of training and the production of material. Among them are the departments and programmes of the Education Planning and Innovation Directorate-General itself, the Institutes of Education Science of the Catalan universities, some university departments, training colleges and teachers' associations.

Teacher training

There are several courses for training teachers, one of which is for trainers and the others for teachers in general.

Most trainers working today were trained on the intensive courses held during 1983-84 and 1986-87. These are one year courses for which trainers are

exempted from training. There were also seminars varying in length from 8 and 50 hours for the further training of trainers and preparing specific courses.

Teachers receive general training in the use of computers in teaching on extended courses, the object of which is to impart the skills to enable them to work with computing equipment with confidence and encourage others to use it for teaching purposes.

The courses last from 40 hours to 90 hours in weekly sessions of three hours each, depending on their specification. Each course has support materials to enable students to work individually and in some cases self-study is included.

"Presentations" are open sessions for which no prior enrolment is necessary. They last between 4 and 8 hours and focus on developments in IT and in the various specialist subjects with the object of assisting more thorough learning in the future, either by attending courses or through self-study.

The course content was planned previously by experts supervised by the PIE training area office. The materials consist of a detailed programme including objectives, a list of topics, resources, recommendations on the methodology to be used and teaching cards.

Specialist projects

The principal projects promoted and coordinated by PIE are as follows:

Implementation of the educational telematic network (XTEC)

Since teaching centres are located throughout Catalonia and telematic techniques have now been well tested, in addition to providing teaching centres with computers, the Computer-assisted Education Programme has introduced the XTEC (Xarxa Telemàtica Educativa de Catalunya) project, the first stage of which links all State secondary schools, teaching resource centres and some primary schools.

The network has a central unit, a DPS8 Honeywell-Bull mainframe computer, at the Computer-assisted Education Programme premises. It is specially equipped to satisfy the communication requirements of the terminals. In its present configuration it can cope with 32 calls simultaneously.

The following services are provided:

- Videotext:

    * Consultation via the SINERA document data base of learning resources by means of a videotext interface.
    * News bulletin. A summary of all PIE activities and general news relating to education.
    * Mailbox. Electronic mail of two types, the open approach (questions and answers) and the private approach.

- Full duplex:

    * Document data bases. In vocational consultation format using the telecommunications software Mistral. This includes several preparatory bases: SINERA (educational resources), English language games, MILENARIO (history of Catalonia) and others.
    * Video discussions and conferencing. Permits the exchange (in real or recorded time) of information and opinions on previously agreed subjects between many users.
    * Transmission of information files (documents, programs, etc) on magnetic media.

The object of the network is to play an active part in making the education system more responsive, to provide the community with wider educational opportunities and bring students face to face with the real computerised, technically oriented world.

Computer literacy as a subject

The PIE has prepared curriculum and teaching guidelines for a subject which introduces IT or computer literacy in the second baccalaureate course and the first vocational training course.

Development of control, robotics and computer-assisted experimentation equipment (EXAO)

This includes not only the development of computer equipment and software but also the definition of objectives, integration into the curriculum and work methodology. Training courses are now being held and 50 schools and colleges have been equipped to test the systems and integrate them into the curriculum.

Computerisation of district teaching resource centres

The aim is to make these centres into media libraries by introducing documents and a suitable document program. The project also includes institute libraries where multimedia materials are kept.

Special education

A study seminar has been set up to assess products on the market and promote the design of a word processor for students with motor deficiencies. At the same time experiments have been started at primary schools.

Graphic computing

The project includes linear and art drawing, authoring and CAD/CAM for specific subjects in both general and vocational areas. 60 schools and colleges are taking part and have been provided with specialised software and peripherals for graphics.

Teaching music by computer

25 centres are taking part and have specialised software and peripherals.

The production of materials

Materials are produced in different ways:

They are produced when there is a special need for the system (such as a Catalan spelling checker) or a functional advantage for PIE projects (such as applications for the telematics network, particularly document data bases) or the EPICUR educational material programming environment.

There are also documents of general interest, for publicising materials or software and for activities and experiments. These are kept in the "document file".

Tendering for materials already produced, i.e. equipment, software, documents, or projects to be realised. The three volumes of computer-assisted educational programs produced by PIE were the result of these tenders.

Groups of teachers, universities (by special agreements) or enterprises may be asked to produce materials for special projects. Materials produced includes those for training courses (detailed programing, theoretical documents and activities on magnetic media) and materials for teaching computer literacy.

The direct acquisition of materials suitable for the requirements of the education system and already produced, whether they have been marketed or not.

The production of certain commercial products in Catalan, following the purchase of language rights.

Monitoring and assessment

Monitoring, which may be of training or of the activities and experiments at teaching centres, varies according to the numbers of these centres involved in the experiment.

Training is monitored through periodic meetings of trainers and questioning the teachers and the trainers themselves.

The monitoring of experiments limited to a few schools and colleges is also carried out by periodic meetings with the teachers involved and the respective class teachers.

The monitoring of experiments and activities of a more general nature, such as subjects or computer credits, or their use in the curriculum, is conducted in permanent seminars. These seminars enable teachers from all the secondary schools in an area to meet every month. In addition to reporting new developments and advising on the correct use of the equipment and software in use at the centres, the seminars are used for discussing different applications and ways of publicising them among teachers and the optimum use of the centres' computer resources.

PIE has a number of specialist teachers for monitoring and providing assistance for primary schools. They work locally in the seven areas to provide schools with technical and teaching assistance and ensure that the various initiatives coming from teachers complement each other.

The centres are visited and direct contact made with the teachers to assess how much has been achieved and identify the most dynamic establishments or those

with unusual features.

Resources

Equipment

At present 437 schools and colleges are equipped with computers, 356 of which have a fully equipped computer room. Computer rooms, which have an average capacity for eight computers, have the following equipment:

- IBM compatible computers, 8 or 132 column printers. Full duplex 1200 modems with different types of emulation and 1200/75 videotext.

Software

- General purpose:
  * MS-DOS, version 3.2
  * Framework III: Integrated package consisting of word processor, spread sheet and data base.
  * Autosketch: Technical drawing.
  * Deluxe Paint: Art drawing.
  * Micro-Questel: Document data base manager.
  * Statgraphics: Statistics and calculation.
  * Password: Business management package (accountancy, invoicing, stocks and VAT).
  * Logo: Programing language especially suitable for teaching.
  * Turbo Pascal: Programing language.
  * GW-Basic: High level programing language.

- Curriculum
  * Educational software, own production:
    Mostrari I: A set of 14 teaching programs
    Software Educatiu 2: A set of 500 teaching programs.
    The object of these programs is to use data processing resources for the curriculum.

  * Resources of own creation:
    Schools and colleges also receive all the programs and resources produced under the Project.

3.5 Galicia - The Abrente and Estrela Projects

At present the Galicia Xunta (Government) Consellería de Educación (Education Department) has two computer education projects, the Abrente Project, for which the EGB Directorate-General is responsible, and the Estrela Project, for which the Dirección General de Enseñanzas Medias (Intermediate Education Directorate-General) is responsible. They are coordinated by the Consejería de Educación y Ordenación Universitaria (University Education and Planning Council) Computer Department.

The Gabinete de Estudio para la Reforma Educativa (Education Reform Study Office) formed the Area de Nuevos Medios Didáticas (New Teaching Resources Area), the task of which is to test the new resources (audiovisual and data processing) in the context of the new General Education Law.

The University Education and Planning Council plans to combine these three lines of action into one new technology programme containing the manpower and resources of the previous projects and is defining objectives, equipment to be provided and training plans to satisfy the requirements of the education system.

General objectives and principal guidelines

The Abrente Project uses pre-computing exercises and interaction between students and the Logo computer language to assist in the development of their abilities to analyse and structure reality. It is responsible for equipping the teaching centres and training teachers from areas which use computers for teaching.

The objectives of the Project are:

- To develop students' capacities for analysis, criticism and structuring from the earliest days.

- To train students to interact with computers through the Logo language.

Two complementary aspects are considered when achieving these two objectives, namely, pre-computing exercises and interaction with the computer.

Pre-computing exercises are introduced to improve the students' ability to reason. They use an approach based on discovery and student participation in the learning process.

The aim of interaction with the computer is to create learning environments in which there is true participation by the student, giving him/her the opportunity of freedom of creation and avoiding a stereotyped approach to computing.

There are four levels of action in the Abrente Project:

- Equipping with computers
- Training teachers
- Teaching primary school pupils
- Supporting experiments

The aims of the Estrela Project, which is directed at baccalaureate courses and training colleges, are as follows:

- Administrative:

  * Computerisation of the centres' administrative offices.
  * Training of administrative staff.

- Education:

  * To instruct teachers in the use of computers for the preparation of material for their specialist subjects.
  * To provide further training and guide teachers in:
    + Teleprograming-assisted education
    + Adapting computer systems for use in the management of schools in accordance with the reform of the education system
    + Integrating information technology into the different curriculum areas by making computing a cross-curricular subject such as teleprograming.

The Project is also involved in providing the centres' administrative offices with computers and advising them on the purchase of equipment.

The Reform New Teaching Resources Area has designed a project based on teaching requirements under the education system reform and its revised curriculum.

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Schedule

In February 1984 the Galicia Education and Culture Council implemented the Abrente Project to introduce computing into primary education. This was the first computer plan implemented by a national education office.

As a result of three tenders, by 1987 37 schools had been selected. In 1988 a programme was introduced for replacing equipment; so far only 20 of the existing schools have been involved.

The Primary Education Directorate-General will extend the project to include all primary schools with more than eight teaching units and provide them with the necessary computer equipment, intensify the teacher training programme and give the support groups more authority.

The Estrela Project, which was set up in 1988, is coordinated by the Education Council Computer Department, which is responsible to the Dirección General de Enseñanzas Medias (Intermediate Education Directorate-General). It was divided into several one year stages during which the number of teaching centres with computers and support for the baccalaureate and training centres was increased.
Some of the Seminario Permanente de Informática Educativa (Computerised Education Permanent Seminar) teachers provide the coordination for the Estrela Project.

Teacher training

The Abrente Project

By 1987 2 500 primary school teachers had been trained on 65 courses. From 1988 505 more teachers were trained; their training included applications of IBM compatible computers.

Courses are at two levels:

- An introduction to computers course (30 hours), with the following content: introduction to structured programing, programing methodology, pre-computing exercises, introduction to Basic and Logo applications programs.

- Computer-assisted further training course (40 - 60 hours), for teachers who had attended the previous course. The course consists of: the treatment of errors and creation of error messages, monitor instructions, memory maps, three dimensional graphics, word processing, electronic "pages", and data bases, introduction to interactive video.

There are other courses on special subjects, series of conferences and day workshops and support for experiments.

The Estrela Project

Between 1983 and 1987 40 courses were held at which 1 300 training college and baccalaureate teachers were trained.

Between 1988 and 1990 24 courses were held and attended by 691 teachers.

Courses are held annually for teachers at schools and colleges which teach teleprograming as a subject for the first time. These courses are generally held at the same centres, provided they have suitable equipment.

The courses are based on the training programs used by these teachers since the teleprograming approach gives them a considerable degree of freedom.

Courses are at the following levels:

- Introductory (operating system, integrated packages).

- Specialisation for the "Unified General" Baccalaureate and vocational training (programing languages, related data bases, multi-user operating systems).

- Specialist courses for teachers in vocational training colleges, e.g. computer assisted design, robotics, process automation, Unix operating system, networks, etc, according to their special requirements, of which the Departamento de Renovación Pedagógica (Teaching Reform Department) must be informed.

The Reform New Teaching Resources Area

An experimental programme with the following three stages has been planned for the training of teachers:

- Preparation of teaching material.

- Incorporation of new teaching resources into teaching units.

- Modification of existing and design of new teaching resources and methods.

Specialist projects

By using an experimental approach the Abrente Project has also included children affected physically and mentally by afflictions such as Down's Syndrome and cerebral paralysis.

The production of materials

The production of materials required for the various training courses and for use by students. There is also an annual computer programing competition for teams of students led by a teacher.

Monitoring and assessment

The Abrente Project has been monitored by meetings with the teachers involved. A permanent regional seminar was created to assess the achievement of objectives and for the continual revision of the technical and teaching aspects of the Project.

In 1986 four district seminars were initiated in order to coordinate and advise teachers carrying out experiments. A comparison was made of students who use computers and those who have not used computers and reports were compiled of the results of the experiments.

Resources

<u>Abrente Project</u>

Equipment
12 64 + 128 Kb Apple IIe computers, 40 200 E Dragon computers, 3 PC2

Corona computers, 15 MSX2 VG 8235 Philips computers, 3 Apple IIc computers, 204 computers (20 XT), 57 dot matrix printers of different types, 200 mice.

Software
MS-DOS operating system, Logo, general purpose software, integrated packages, graphic environment applications, teaching applications programs, bibliographical and pre-computer exercise teaching material.

Estrela Project

Equipment
IBM compatible computers.

Software
Basic and Pascal languages, word processor, relational data base, document data base, spreadsheet.

3.6 The Basque Provinces - The Basque Computer-assisted Education Project

In 1984 the Basque Government Education Department introduced the Plan Vasco de Informática Educativa (PVIE) (Basque Computer-assisted Education Plan) into both State teaching centres such as "ikastolas" and into private primary and secondary schools using the results of experiments carried out previously at primary and secondary schools.

The object of the Project, which was initially defined as an educational innovation project, is to conduct experiments in the classroom at different academic levels to investigate the effect of introducing computers and IT into teaching/learning. The education authorities could not ignore the changes being brought about by IT in all areas of society. Young people in schools today therefore have to be prepared for its use.

Consequently, under the PVIE the most effective and significant uses of data processing for education had to be found. To achieve this, it was necessary to create a flexible framework for experiments in which teachers, students and teaching centres were given suitable resources to test the various ways of using and including IT in the curriculum, starting with general objectives and recommended basic methodologies. In addition, under the Project procedures

were created for monitoring and assessing the experiment to enable the most interesting contributions, methods and procedures to be recorded.

General objectives and principal guidelines

The objectives of the PVIE at that time were:

- The introduction of data processing into the curriculum in order to:

  * Improve the cognitive development of students and the acquisition of new methods.

  * Reinforce the teaching style of teachers and improve teaching methodology.

  * Provide basic training in computing and its social and cultural applications.

  * Familiarise students with IT by teaching them to understand and express themselves through new languages and forms of communication.

- Data processing as a management resource to:

  * Improve academic management.

  * Assist administration.

In order to achieve these objectives the PVIE has paid special attention to the following four aspects:

- The training of teachers

- The equipping of teaching centres with computers and peripherals.

- The distribution of software and educational resources.

- The creation of structures and bodies for coordinating and supporting experiments.

Organisation

The Basque Government Department of Education Dirección de Renovación Pedagógica (Teaching Reorganisation Office) is responsible for the PVIE, the organisation of which is shown below.

Council

Education Council

Teaching Reorganisation Office

Teaching Innovation

Technology and Education

After several changes to its initial organisation, in 1990 it was made up as follows:

-       The Teaching Resources Centre CERED-HEGAKA, at the Erandio Vocational Training Institute, which has a computer section and section for audiovisual resources. Its has the task of assisting in the coordination of the PVIE (which works directly with the teaching centres). Its work relating to data processing consists of:

*   Preparing materials (programs, guidelines, procedures and teaching guides for the use of the various computing resources) to exploit fully resources made available to teachers and students at centres for educational purposes.

*   Studying the potential for teaching purposes of the equipment and education-oriented software available.

*   Finding and compiling bibliographical and documental information which facilitates the achievement of the PVIE objectives.

*   Planning and supervising courses and other undertakings to complement the further training of teachers.

* Monitoring and assessing experiments relating to the use of computer resources at the teaching centres.

- Provincial specialists with experience in education whose duties, which basically involve administration and the management of material, include:

* Attending to the centres' administrative aspects concerning the provision of resources, tendering for courses, etc.

* Managing the centres' equipment maintenance department.

* Collecting sundry statistics when requested to do so by other education authorities.

* Identifying requirements for equipment and training indicated by the centres.

- Technology resource specialists from the Teaching Guidance Centres (COP-PAT) whose duty is to service teachers in their areas. This may be summarised as:

* Assuming responsibility for documentation, the distribution and loaning of resources, equipment and teaching, data processing and audiovisual material for the centres in their area.

* Coordinating seminars or working parties on data processing and audio visual resources with primary and secondary school teachers.

* Supporting and monitoring centres provided with computers or audiovisual equipment.

* Organising the collection, distribution and exchange of teaching materials to ensure that data processing and audiovisual equipment in schools is properly used.

* Providing further training and qualification training for teachers responsible for activities using IT at their centres.

* Guiding and providing basic training for tutors to ensure that computer and audiovisual resources are properly exploited for teaching purposes.

*   Taking an interest in and supporting innovatory experiments approved by the Department of Education on the use of computing and audiovisual resources.

Teacher training

Implementation of the PVIE involved the organisation of a number of initiatives aimed at giving teachers in the Basque Self-governing Community qualification in IT. As a result, over 8 000 teachers in the Basque non-university education sector have received some training in the use of computers in education. The work of the education authorities and the enthusiasm of teachers over these years deserves praise. Training, organised in modules and given by specialist teachers with experience in the use of computers for education, begins with basic and initial stages, then continues with modules integrating the different computer resources in the various curriculum areas and is completed by the organisation of specialised short courses for specialist vocational training teachers.

Training may be summarised as follows:

-   Extended introductory courses for secondary school teachers. These were held during the first three years and involved a 150 hour training module in weekly sessions of four hours each. These courses, providing basic training for those in charge of computer rooms, were attended by approximately 1 000 teachers.

-   Intensive introductory courses for primary school teachers responsible for computing at their respective schools. They were held during the first four academic years of the PVIE in daily sessions of five hours each during July and September and amounted to 100 to 120 hours in all. Some 300 teachers attended these courses.

-   Single-subject courses held on a seasonal basis. These sessions, which were held every quarter, consisted of courses designed to extend the initial training received by all the above teachers and were also for other teachers interested in specific parts of the courses. They averaged 32 hours.

-   Other activities. While the PVIE was in progress, day and other meetings were held so that teachers already using IT in their teaching could exchange experience and meet other teachers who were interested in becoming

involved in IT.

In February 1989 the Continuing Training Plan for Teachers was discussed in the Regional Government. Following approval of the Plan, all training is now regulated by the directives issued under it. Under the Plan teaching centres must propose training programs to suit their requirements, after they have been assessed systematically by the teacher training establishments (COPs) in association with the area inspectorate. These requirements will be satisfied as far as possible by the Annual Training Plan.

Specialist projects

During the courses being given under the PVIE many different types of experiments have been conducted to find new applications for the use of computers at teaching centres. These experiments cover almost all the areas of the curriculum. As an illustration of their diversity, in the 1989-90 academic year some 50 teams of teachers conducted experiments with IT approved in the tenders for experiments by the Department of Education.

The production of materials

One of the most important tasks under the PVIE carried out by organisations responsible for implementing the project and by teachers was the production of materials, both written and on magnetic media. This material, not all of which was successful, was of a pioneering nature at the time and was welcomed not only by the teachers in our Community but also by teachers in the rest of the country. Written material published up to that time was sent to all teaching centres, as was educational software. These publications and programs are listed in the "Publications" section of this report. There is also a Department of Education programme, the EIMA programme, the object of which is to subsidise the production of material on computer or audiovisual disc/cassette wholly in Euskera (the Basque language) and purchase the publication rights.

Monitoring and assessment

Like any process of educational innovation, in recent years the PVIE has created various support and monitoring structures, some of which are no longer in existence, while the function of others has been modified.

CERED/HEGAKA plans training procedures, assesses equipment and programs, produces resources and acts as a central document centre.

Teacher training colleges provide support, advice and training at area level through permanent seminars and have been collecting information on direct classroom experiments throughout these courses, publicising it among the teachers in their areas.

In addition, other work, surveys and interviews have been carried out by teaching and psychology specialists from outside the Department of Education to assess certain aspects of the experiment, such as the attitude of teachers and students to the introduction of computers and their opinion on the different resources.

Resources

Equipment

All State secondary schools and rather more than a third of the primary schools have at least one computer room. These rooms have:

- 10 IBM compatible computers with 512 or 640 Kb RAM, colour monitor and 2 disc drives.
- Three printers.
- Suitable furniture and security measures.

About 4 500 computers with these basic characteristics have been sent out over the years, including to "ikastolas", private schools and establishments which have received equipment from the PVIE.

In addition to these basic computers, since 1986 other configurations known as "business microcomputers" and microcomputers for computer-assisted design, both of which are for specialist vocational training in management, drawing or design, have been specified. Both configurations have 640 Kb RAM, a 20 Mb hard disc, 2 serial ports and an EGA or VGA monitor. Design equipment also includes a digitizer and a plotter for every two computers.

Software

Teaching centres were initially provided with:

- Applications packages: A set of programs with wordprocessing, data base, drawing and graphic plotting programs and a spread sheet.

- Languages: Logo, Pilot (primary schools) and Pascal (secondary schools).

Later, during the 1987-88 academic year all Caja de Recursos (Resource Office) schools and colleges were provided with "Softkuxta". This included practically all the educational software on the market in Spain at that time, commercial software produced by private companies and that produced by teachers and based on different teaching procedures, i.e. simulation, tutorials, exercises and practice programs, etc.

3.7 Valencia - Programa Informática a L'Ensenyament (Computer-assisted education programme)

The Valencia Self-governing Community Conselleria de Cultura, Educació i Ciència (Culture, Education and Science Council) has been experimenting with the introduction of computers into non-university education through this programme.

General objectives and principal guidelines

The basic objectives of the programme are:

- To include data processing in the curriculum in order to:

  * Provide the citizens of the future with a critical view of the use of computers in a wide range of activities such as production or investigation.

  * Improve the quality of teaching by updating content and methodology.

  * Enrich the individual work of students and teachers through computing.

- To prepare students attending specialist courses related directly to professional activities for their entry into a computerised world of work.

- To provide teachers with technical support and suitable training so that they can carry out their specialist teaching duties against a background of continuous improvement in their teaching performance.

Schedule

Computing was introduced into the Community of Valencia as follows:

1985

A study was made of the situation in the Community of Valencia and in other localities. As a result, the "White Book on Computing in Secondary Education" was published in which the basic directives for the procedure to be followed were laid down. The practical side was inaugurated by equipping 3 schools with 5 computers and a printer, the proceeds of a private gift.

1985-86 and 1986-87

Over this period 47 secondary schools (15 to 18 years) were included in the Project and were provided with a minimum of 5 computers and a printer. Each school was also given a batch of software consisting of Logo, Writing Assistant, Lotus and Turbo Pascal. During the second year the schools were provided with Framework, which was established as the standard integrated package.

413 teachers were trained in 49 courses totalling 14 027 hours.

1987-88 and 1988-89

17 secondary schools were included in the Project during this period. The 22 courses were attended by 296 teachers and amounted to 10 146 hours.

1989-90

The number of secondary schools was increased to 112 and the number of primary schools in the experiment was increased to 37.

The 47 courses held were attended by 531 teachers and totalled 24 453 hours.

The basic equipment for schools' computer rooms was redefined.

Organisation

The programme is currently organised as follows:

Generalitat Valenciana
(Valencia Government)

Consellería de Cultura, Educació i Ciència
(Culture, Education and Science Council)

Direcció General d'Ordenació i Innovació Educativa
(Education Planning & Innovation Board)

Programa d'Informàtica d l'Ensenyament
(Computer-assisted Education Programme)

Teacher training

Three types of course are offered:

- Basic training.
- Single subject.
- Users.

Basic training courses are for teachers at teaching centres which are equipped with computers for the first time. The schools must select at least three teachers. The criteria suggested for selection are employment stability at the school, involvement of teachers in various areas, etc.

Single-subject courses are for teachers who have the requirements specified in the respective competition. The object of these courses is to improve the competence of a school's teaching staff in the teaching of computing as a distinct subject and the use of computers in the teaching process.

Courses held at teaching training establishments, which are classified according to area, average 6 hours per week in two sessions and are given outside

ordinary teaching hours. The trainers belong to centres at the same level of education and therefore continue to carry out their normal teaching duties.

Courses for users are for teachers at schools which have computers and for those who initially only wish to use computers in their own work or in their classes. In principle these courses are held at the schools of teachers who request them and the centre's own computer teaching staff are used.

However, it has been found from experience that training should not be restricted to the courses. In some cases it is complemented by a system of tutorials to enable teachers attending a course to carry out practical work. This will be supervised by the course teacher.

The necessary material for these courses (manuals, discs, etc) has been produced with the object of standardising the levels of training and improving the results from the courses.

Specialist projects

Centro de Asistencia Técnica (CAT) (Technical Assistance Centre)

This is located at a training college with a computer section. Its object is to provide technical support to centres in the Programme and to repair equipment.

The aim of teaching is to improve the vocational qualifications of students in this specialised subject. Students repair the equipment under supervision.

Production of materials

The following were produced during the experiment:

- Logolem: a Logo package.
- Gescen: a schools' management package.
- Manuals for the training courses.
- The "White book on the use of computers in non-university education"

Monitoring and assessment

Monitoring and assessment are carried out principally by periodic visits to the schools involved in the programme.

Resources

Under the programme schools have the following:

Equipment

143 computers with 8086/88 microprocessors, 640 Kb RAM, two disc drives (360 and 720 Kb) and CGA/MCGA monochrome monitors.

300 computers of the above type with one disc drive and a 20 Mb hard disc instead of the two disc drives.

431 computers with 80286 microprocessors, 1 Mb RAM, 20 Mb hard disc and a 1.44 Mb disc drive, VGA colour monitors and mouse.

162 9-pin and 181 24-pin dot matrix printers, 80% of which have wide carriages.

All schools have a computer with 5.25" and 3.5" drives or an external disc drive to enable data to be transferred between the two formats. They also have one or two multiplexors for connecting several computers to a printer.

Centres with special features, such as draughtsmanship/technical drawing, graphic art, etc, are provided with appropriate peripherals, i.e digitizers, plotters, etc.

Software

The software with which these schools and colleges have been equipped consists of:

- MS-DOS operating system.
- Framework III integrated package.
- Autosketch graphics package.
- DeLuxe Paint graphics package.

-   Logo programing language.

As in the previous case, schools and colleges with special features, such as line draughtsmanship/technical drawing, graphic art, business administration, etc, have appropriate software suitable for their use, e.g. Autocad, PageMaker, commercial accountancy and management packages, etc.

3.8 Project addresses

Ministry of Education and Science

Programa de Nuevas Tecnologías de la Información y de la Comunicación (Proyectos Atenea y Mercurio)

Calle Torrelaguna, 58.28027 Madrid
Tel: (34) 1 4082008
Fax: (34) 1 4088376

Government of Andalusia

Plan Zahara XXI

Consejería de Educación
Avda. República Argentina, 24.41071 Seville
Tel: (34) 5 4278258
Fax: (34) 5 4278369

The Canaries Isles Government

Projecto Abaco

Consejería de Educación, Cultura y Deportes
Dirección General de Promoción Educativa
Calle León y Castillo, 57.35003 Las Palmas
Tel: (34) 28 381162
Fax: (34) 28 373155

Government of Catalonia

Programa de Informática Educativa

Departament de l'Ensenyament
Carrer de les Jonqueres, 2.08003 Barcelona
Tel: (34) 3 2680500
Fax: (34) 3 2683636

Government of Galicia

Proyects Abrente y Estrela

Consejería de Educación y Ordenación de Universidades
Gabinete de Reforma Educativa
Edificio San Caetano, 15700 Santiago de Compostela (La Coruña)
Tel: (34) 81 531160
Fax: (34) 81 564426

The Basque Government

Plan Vasco de Informática Educativa

Consejería de Educación, Universidades e Investigación
Calle Duque de Wellington, 2.01011 Vitoria
Tel: (34) 45 247200
Fax: (34) 45 247644

Valencia Government

Programa de Informática Educativa

Consellería de Cultura, Educació i Ciència
Casa de la Misericordia, 34.46014 Valencia
Tel: (34) 6 3701005
Fax: (34) 6 3795761

Navarre

Programa de Informática Educativa

Departamento de Educación y Cultura
Arcadio María Larroche, 1
31008 Pamplona
Navarra

4. The future

4.1 Considerations

IT has a place in education for two reasons, namely, because of its potential to help improve teachers' performance, and because its key role in society is now firmly established everywhere.

A student's basic training must now include IT-related skills. In any type of intellectual activity equipment such as word processors or data base managers is now invariably employed. The opportunity to work with equipment which can extend human intellectual horizons is lost if schools do not use it in their teaching programmes.

The situation however is not static and is still open. New tools (programs or devices) are continually being added to the list of essential, or highly desirable, educational, items. Examples are computer-assisted drawing and design programs, CD-ROM readers with their vast data storage capacity, made accessible to the world by telematics. The use of these valuable tools in education must be considered since they make possible objectives which could never otherwise be contemplated, or which can be achieved by this highly efficient means much more efficiently, simply and reliably than by any other method.

The general trend in prices of both IT hardware and software is one of continual reduction, contrary to the situation in most manufacturing and commercial sectors. Consequently, schools, an area where funds are traditionally limited, can acquire easy access to the latest technology, which is demonstrating its potential for education. Continual investment in equipment and software is therefore necessary and - much more important - in the training of staff who use this technology.

Continuing training acquires special significance in this respect. Teachers must maintain their skills as users of IT and teachers of specialist subjects. Methodology, schemes of study and proposals for school organisation change and teachers must be aware of these changes. Some are brought about by the use of IT and the opportunities it provides.

In view of the above, in the near future the training of teachers will evolve towards self-training and distance learning. The contribution made by teacher training establishments described earlier will not be able to satisfy the demand

for training. Training in groups, which is essential in some cases, will have to be restricted as far as possible and distance learning and self-study training packages now being developed to meet this demand will become more common.

4.2 The inclusion of information technology in the curriculum

Two levels at which IT may be included in primary and secondary education may be distinguished.

The essential level

There are some activities in which IT has without doubt shown its effectiveness and it would be difficult to consider them without it.

One is **Special Education**, in which IT acts as an artificial means of extending faculties, facilitating actions or even acting as exclusive channels for a capacity which otherwise does not exist.

Another is in the field of **drawing and design**. Work in this field has changed to such an extent that it is now based almost entirely on IT, possibly with the important - and partial - exception of art. The situation is the same with teaching. When a curriculum is planned, even at basic level, it must include the use of computer-assisted design and drawing programs. The basic skills involving paper, pencil and ink, are not neglected, but there is a net gain of the whole vast field of testing, development and learning opened up by IT, even for those not very clever with their hands.

The situation is similar with **automated process technology**. Side by side with craft technology is the technology of more advanced resources. In the latter IT is the basis of all development and is now part and parcel of the general technological and technical culture.

Finally, owing to its interdisciplinary nature and educational value one item of great interest to schools and colleges which is normally found in their projects and for which IT is particularly suitable is the **school/college magazine**. The variety of the content which can be covered, e.g. social, literary and artistic issues, collaborative ventures, vocational guidance features, the encouragement of critical, linguistic and cultural talents, etc, makes it an asset for the centres. IT not only makes production easier but makes continuity possible since results can be obtained immediately. Furthermore, it includes specific undertakings

(authoring, data processing, telematics) which are of great interest.

The desirable level

Many activities at teaching centres which use or are based on IT are highly desirable and will be essential in the near future.

These are aspects such as **telematics,** with its enormous potential to link remote locations and to simplify access to information. The present difficulties of access to telephone lines and the cost of using them will gradually be overcome so that these resources will naturally be used as a matter of course and exploited in teaching.

Another area in which computers have an unquestionable place is in physics, chemistry or biology laboratories. With a data access board, a collective projection system and a printer, the computer becomes a resource which can facilitate activities and be used to compare hypothesis, extrapolate results, repeat experiments, recover data, carry out continual measurements of very slow experiments, etc. It plays the very desirable role of increasing the possibilities of experimental science.

It is also important to have resources for studying **computer-assisted music.** IT undoubtedly has a place in the analysis, practice, creation and - even the enjoyment - of music and it will play an important part in teaching this subject in the future.

New standards

New uses are continually being found for IT. Once they are established, they are naturally included in various fields, including education. In the near future we will see large numbers of local networks, CD-ROM readers, multimedia applications and programs incorporating artificial intelligence techniques for use at teaching centres.

Frequent use will also be made of portable computers, electronic books and telematic links using RDSI. Future plans include the use of products with an education potential which are standardised and are easily obtainable on the IT market.

Information technology in curriculum projects

The Organic Law for the General Planning of the Education System which lays down the procedure for the reform of the Spanish education system also considers the introduction of IT into the curriculum. The new curricula contain computering and audiovisual techniques as discrete subjects, as well as cases where these are applied to other subject areas such as drawing, sculpture and art, science laboratories etc. In mathematics computers are used in very different ways in subjects such as statistics or geometry.

Under the new Law teaching centres will have some freedom over their curricula. Many will certainly include activities made possible by IT or activities where IT is an indispensable element. This applies to all levels of education from primary to post-compulsory secondary.

This freedom for centres in respect of curricula will lead to changes at all levels, e.g. timetables being planned to make the best use of computer rooms, equipment for computer-assisted design, audiovisual rooms, etc. Classrooms will be altered to accommodate these new resources; school and college funds will be allocated to activities related to IT (telephone accounts, subscriptions to respective magazines, consumables) etc.

Reform of the teaching system affects several curriculum decision making levels. The highest is that of the compulsory minima, which is common to all, the self-governing community and provincial level, where local authorities take some of the curriculum decisions, and the school or college curriculum plan, the last level, for decisions reserved for the centres themselves. Two aspects relating to the extent and way that schools are involved in the introduction of IT into the curriculum will be distinguished:

- The introduction of activities previously classified as essential to ensure that IT is given a significant amount of time and considered a significant subject for all students.

- The implementation of a curriculum project introducing IT as essential for organisation, communication and for improving the quality of teaching, including both essential and important activities in the curriculum.

4.3 Plans for the future

Incorporation of new schools and colleges

The number of teaching centres taking part in the Information and Communication Technology Projects will gradually and continually increase. At the same time consideration will be given to the training of teachers so that the number of teachers using IT will increase, not only overall but also in each school/college. The aim is for the amount of equipment to be increased and its quality to be improved so that all State schools in Spain are well equipped.

In private schools, social pressure and the example of the progress of the various independent State authorities' projects are making them follow a similar line, although at a very different rate, which varies according to the type of private school. Prestigious private schools have already funded the provision of hardware, or are doing so in parallel with State schools - in some cases more quickly. However, progress made by the majority of private schools is slower owing to the considerable amount of investment required in the three main areas to introduce IT, i.e. the training of teachers and the purchase of hardware and software.

In the Atenea and Mercurio Projects no distinction has been made between primary and secondary schools where incorporation is concerned. In other self-governing authorities' projects, such as the Catalonia Computer-assisted Education Project (PIE), secondary schools have been equipped first and an experiment is now in progress to equip primary schools. In the remaining schemes, the situation varies between the two extremes, as in private education.

Activities

The path chosen in most State school projects has been integration into the curriculum, without paying particular attention to the study of computer hardware or programing. These aspects have been covered individually in secondary schools which have therefore included it in the free time which is part of the school timetable in Spain. In some projects provision has been made for studying programming but IT is more often a cross-curricular activity. In the Atenea Project programming has not been taught in the initial training of teachers, as in most national schemes. A possible exception is Logo, which has never been taught as a language as such, but as an "open micro environment with instructions".

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Programing, principally of the Basic language has more often been taught in private schools but this trend is now disappearing.

Modern trends in software (authoring languages, hypertexts, etc) are leading to an even greater lack of interest in programing languages; they will be restricted to special subjects in vocational training and optional baccalaureates. Most educational authorities will adopt the cross-curricular approach.

Equality of opportunity

One aspect which has been of particular concern in some national projects (principally the Atenea Project) has been equality of opportunity. Special courses have been held for teachers to encourage and promote projects led by women with the object of counteracting the tendency for technology to be used largely by male teachers and students. Since the problem has been observed more among teachers than students, action has been taken to increase opportunities for women teachers. Statistics on students do not indicate any bias towards greater use of IT by male students but more specific studies are being carried out to determine whether the present medium term tendency of males towards technology can be extended to IT.

There are also other activities aimed at equality of opportunity for students who have special requirements or who come from neglected communities. The new technology has been shown to have a great potential for integrating these communities and the trend will be to widen the scope of activities in this field (special courses for teachers, the production of materials, the provision of equipment).

Trends in the provision of equipment

The recently approved Organic Law of the General Planning of the Education System (LOGSE) lays down the minimum amount of IT equipment that teaching centres in Spain should have and asserts that there must be space for using it. As a result, in the very near future (the Law will come into force gradually between 1992 and 1996) there will be an increase in hardware in schools and colleges The minima are more specific for secondary schools, namely a computer room for every 8 computers or fraction thereof with suitable equipment is specified. In addition, there will have to be physics, chemistry and biology laboratories with suitable equipment, which probably includes computers.

The model teaching centre of the future as specified in some national projects also includes computers in the library, administrative office, staff room, etc.

The plans for the latest schools and colleges being built also include cables which link up with the local area network, with terminals in all classrooms and appropriate departments. Local networks suitable for current installations will be introduced as their educational applications are identified and the major problem, i.e. that of training teachers to administer the system, is resolved.

The power and capacity of equipment at schools and colleges will increase. Hardware for projects is purchased centrally, which in practice results in the standardisation of equipment, an essential for the centres. Producers of software follow suit so that their programs exploit the educational possibilities of the hardware. This creates a situation which other schools and colleges must follow in order to keep up with the general trend.

In this respect CD-ROM readers and multimedia equipment are being incorporated. In addition, modems are being routinely included and many plans envisage local networks. All computers are IBM compatible, with the most up-to-date performance possible at the time of purchase.

The speed of development of the microelectronics sector is indicated by the fact that every year there is an improvement in the specifications of microcomputers purchased for education.

Software

Most educational software is produced by small companies which take advantage of grants. They generally use these grants to acquire the technology to produce the software. Teachers are usually responsible for writing the programs and ensuring that they are suitable for the curriculum in the projects being implemented. The large publishing companies in Spain have generally shown little interest in the production of software for education although they sell imported translated software. They are more interested in the large home education market and less in software to be used in schools. There is no indication of a change in this trend in the next few years.

At present programs of a general nature not written specially for education are used more than specifically educational programs. The most common are word processors, data bases, either for documents or otherwise, spreadsheets, design and drawing packages. The principal characteristics of this software, which

generally comes from the United States, is its professional nature and flexibility. The characteristics of specific software are that it is produced in Spain, is appropriate to the curriculum and practically orientated.

There are two trends in educational software. One is that programs are written to cover a specific aspect of the curriculum either by means of a number of exercises or introducing concepts (the closed approach) or by simulation or games which enable a particular subject to be investigated (the open approach).

The second is that some sets of programs are designed to cover most of the topics in one or more courses within a subject area. There are no examples of this type being produced in Spain but some well established companies are adopting this policy. This type of software is very popular for subjects such as Physics, Mathematics and English and, in view of the increased storage capacity of computers, it is considered to be a trend for the future.

The increase in the quality of software and its potential as a multimedia resource may result in this situation changing in favour of specific software.

Teacher training

The training of teachers has been described earlier in this report. The training scheme using teacher training establishments within provincial training plans appears to be correct and is able to tackle the problem of training on a large scale. In future training will include more distance learning, using various telematic techniques and the editing of self-training packages, with a tendency for fewer teachers to be trained in groups, with the result that more will ultimately be trained.

One important question however still needs to be resolved. Training takes place basically during the time a teacher is not teaching, i.e. it is on a voluntary basis. At the moment at least, the problems of pay and the fact that training may not actually be done appear to be insuperable.

Teacher training establishments are open to teachers from both State and private schools, therefore in principle the scheme is valid for all teachers. However, it may be anticipated that there will be supplementary training to enable training to keep up with the development of technology as far as possible.

Clearly, IT in future must be incorporated in the study programmes for teachers

at teacher training establishments. Continuing training is more expensive than initial training and the chances of success are less. Teachers in future will use IT frequently and effectively if they used it while they were initially being trained.

One disadvantage in Spain is that, in view of the very large numbers entering the teaching profession on completion of training in the last 10 years, the average age of teachers is very low, therefore the effect of this measure is difficult to judge. Most teachers who will be working in the first decade of the next century are at present now teaching.

The information and communication technology programmes in education

Programmes for the introduction of IT will gradually lose their importance as an innovation in the medium term since the use of IT will become routine. However, a long adaptation period may be expected in which some centralisation of training and activity will still be necessary, i.e. the purchase of materials, the assessment and homologation of software, the planning of initial training, etc.

There are 8 Education Information Technology Programmes in Spain, 7 relating to 7 self-governing communities with responsibility for education and the eighth, which is involved in the PNTIC, relating to the other communities. The tendency is that in future the remaining self-governing communities will gradually take over responsibility for education as the transfer to autonomy takes place.

Since there are 17 self-governing communities in Spain, it is expected that there will be 17 schemes for introducing IT into education, possibly with links between some of them to increase their effectiveness.

In fact, as has already been mentioned at the beginning of this report, the 8 in existence at present have an agreement to meet to exchange views and compare policies. This is proving to be an excellent means of standardisation. The result is a certain unity of action and the implementation of common projects, such as telematics schemes, the design of multimedia projects, etc, with the result that to a certain extent there is a policy in Spain for the introduction of IT into classroom teaching.

This situation is assisted by the European Task Force programme "New Information Technology in Education Systems". The periodic meetings originated from meetings between self-governing communities to report on and give details of all activities in which this European working party is involved.

It is hoped that in future the tendency for the number of independent programmes to increase will not have an adverse affect on the convergence of criteria occurring at present. As was mentioned earlier, there are no organisations of comparable size in private schools and the standards in these schools resulting from the official policies of the various programmes continue to show the same trends.

Future problems and answers

One of the problems of using IT in teaching which slows down its introduction is that, compared with other school equipment, the hardware is expensive, The solution in the State sector in Spain is still centralisation of the provision of equipment. With the fall in price of the technology and the extensive use of computers and peripherals in all fields, other local institutions will be used to an increasing extent for supplying equipment, while the normal funds of schools and colleges will be used more for technology, with no exception as at present. In the private sector hardware will be funded under normal private schemes according to schedules imposed by LOGSE and State schools.

Technology is now being used to aid education in three ways. First, it is a curriculum subject, for which there is an increasing amount of specialised software of better quality and higher power (multimedia, networks, etc). Certain subjects and concepts are taught by using IT, which has proved to be more effective than the traditional means.

Second, IT will be used as a means of gaining access to areas of knowledge resulting from it. These topics e.g. computer-assisted design, robotics, graphics laboratories, microelectronics, etc., could not be considered without computers and their peripherals. This area includes the study of program languages, which is now of decreasing importance.

Third, computers will be used as a means of generating data, i.e. for processing texts, data bases, CD-ROM readers, for access to routine information and the management of both teaching and learning processes.

The approach to teaching via teacher training institutions, which has been introduced into all self-governing communities in Spain, appears to be satisfactory for teachers from either the State or private sectors who have problems with or are interested in IT. However, the fact that the time spent training in a teacher training establishment is not counted as part of a teacher's workload is a disadvantage for the vast amount of training which will have to be considered in the future. The most promising answer for the medium-term will be that quoted earlier, i.e. including IT training in training prior to teacher training. In the meanwhile, the tendency will be for telematics and distance learning to be used for training teachers to a greater extent, as is provided for in the plans now being implemented in some of the independent projects and in the New Information and Communication Technology Programme.

New developments, such as linking up classrooms with local networks or the use of multimedia, are at a very early stage in Spain. Very little real experience has been obtained, although there are specific plans at least in the New Information and Communication Technology Programme and in the Catalonia Computer Assisted Education Programme.

4.4 Conclusion

Looking back at the topics dealt with here and the prospects for the future, it should be noted that the achievements have been relative. As a result of the introduction of IT in Spain, new projects will never have to start from scratch but those which are already under way will be able to grow organically.

The aim for the future is for all schools and colleges to join the present scheme, which is sufficiently flexible and dynamic to tolerate changes introduced at the various levels.

The key to planning the future direction of IT in education is the recognition that information is an important raw material which must be managed through investment in hardware, software and human training resources.

Publications issued within the New Information Technology in Education framework

1993

Member States reports on New Information Technologies in Education, produced for the Commission of the European Communities - Task Force Human Resources (TFHR) and published by the Office for Official Publications of the European Communities, Luxembourg :

*New Information Technologies in Education in :

Belgium :	co-ordinated by E. Platteeuw, Centrum voor Onderwijsmedia-Euryclee, for the Flemish Community and by M.A. Martegani, OSE Network-Euryclee, for the French Community. (FR/NL-EN)
the United Kingdom :	by Jenny Brown, Jon Coupland and Martin Davies, National Council for Educational Technology. (EN-FR)
Ireland :	by Michael Brady, Marino Institute of Education. (EN-FR)
Greece :	by Christina Metaxaki-Kossionides, University of Athens. (GR-EN)
Italy :	co-ordinated by C. Della Toffola, Ministry of Education. (IT-FR)
Spain :	coordinated by Elena Veiguela, Ministry of Education and Sciences (ES-EN) .
Portugal :	by Tomás Patrocínio, Ministry of Education[1] .

*New Information Technologies in Education, Synthesis report with policy recommendations based on the Member States Reports on New Information Technologies in Education. By Dr W.J Pelgrum, University of Twente, The Netherlands[1] .

Out of a series of reports on **Macro-Economic and Sectoral Analysis of Future Employment and Training Perspectives in the New Information Technologies in the European Community** produced for the Commission of the European Communities (DG V, DG XIII and TFHR) the following reports are published by the Task Force Human Resources, Brussels :

*Synthesis Report, by Chris Freeman and Luc Soete (MERIT), April 1991. (EN-FR)

*Skills Implications of Information Technologies for the European Community (Chapter 10), by Patrick Bowen, Jacqueline Senker and Peter Senker, January 1991. (EN)

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[1]   In preparation

Equal opportunities and New Information Technologies, Evaluation Report on the Projects 1987-1989, a review co-ordinated by Ms Sylvie Osterrieth, Service de Technologie de l'Education, Université de Liège (Dir. Professeur Dieudonné Leclercq). Office for Official Publications of the European Communities, Luxembourg, 1991. ISBN 92-826-0576-0 . (EN)

Using Computers in Mathematics Teaching. A collection of case studies by João Pedro Ponte, Fernando Nunes and Eduardo Veloso funded by the Commission of the European Communities - Task Force Human Resources. Edited by Projecto Minerva, University of Lisbon, 1991. ISBN 972-9348-00-6. (EN)

The use of Computers in Education Worldwide. Results from the IEA "Computers in Education". Survey in 19 Educational systems. Willem J. Pelgrum and Tjeerd Plomp, Pergamon Press, Oxford 1991. ISBN 0-08-041382-X. (EN)

Portability of Educational Software in relation to the Creation of a Viable European Market (Document + Annex). Scottish Council for Educational Technology. Office for Official Publications of the European Communities, Luxembourg, 1991, ISBN 92-826-2806-X (Annex) and 92-826-3459-0 (Document). (EN)

Prolog and Knowledge Bases in Schools. The creation and analysis of three pieces of software in order to investigate the suitability of prolog in building knowledge-based software for use in schools. A project involving Ireland, Portugal and Spain, co-ordinated by the Marino Institute of Education and funded by the Task Force Human Resources. Dublin, August 1991. (EN)

1990

Teacher Education in Logo-Based Environments; Outcome of a co-operative project by the CEC, edited by G. Schuyten and M. Valke EDIF-State University, Gent, 1990. (EN)

Europe in the classroom, by Cineca (Italy), Universidade de Coimbra (Portugal) and Ministerio de Educación y Ciencia (Spain). Project A 103 funded by CEC-Task Force Human Resources, Education, Training and Youth, 1990. (EN)

1989

L'Informatique tranquille. Usages d'ordinateurs dans trois écoles primaires de la Communauté Européenne. A review co-ordinated by Ms Sylvie Osterrieth of the University of Liège. Commission of the European Communities / Communauté française, direction générale des études. Bruxelles, 1989. (FR)

*Skills Implications of Information Technologies for the European Community (Chapter 10), by Patrick Bowen, Jacqueline Senker and Peter Senker, January 1991. (EN)

*New Information Technologies and Vocational Education and Training in the European Community (Chapter 12), by Gareth Rees, January 1991. (EN)

1 9 9 2

Member States reports on New Information Technologies in Education, produced for the Commission of the European Communities - Task Force Human Resources (TFHR) and published by the Office for Official Publications of the European Communities, Luxembourg :
New Information Technologies in Education in :

France :	by Serge Pouts-Lajus with Eric Barchechath and Noëlle Barre, . Observatoire des Technologies pour l'Education en Europe, Paris. (FR-EN). ISBN 92-826-4772-2.
the Netherlands :	co-ordinated by prof. Dr. Plomp, University of Twente. (NL-EN)
Denmark :	by Lise Dalgaard (FSA) and Vagn Laursen (GYM), The Danish Ministry of Education and Research. (DA-EN)
Germany :	by Dr Hans-Georg Rommel, Euryclee-D. (DE-EN)
Luxembourg :	by Alexis Werne. (FR-EN)

Skill Shortages, Women and New Information Technologies. A report by Teresa Rees of the Social Research Unit of the University of Wales, College of Cardiff. Brussels, 1992. Published by the Office for Official Publications of the European Communities, Luxembourg. ISBN 92-826-4617-3. (EN-FR-DE)

New Information Technologies in Education, The added value of Community measures, Report of the Task Force Human Resources of the Commission of the European Communities, Brussels. (EN)

Le développement des banques de données sur la formation et l'éducation en Europe, report by Dominique Vignaud, Centre INFFO, Paris, October 1991. Published by the Office for Official Publications of the European Communities, Luxembourg. ISBN 92-826-4669-6. (FR-EN)

1 9 9 1

Las Tecnologías de la Información en Los Currículos de Los Diferentes Países de la C.E., report in Spanish, English and French, Ministerio de Educación y Ciencia, Madrid, July 1991.

Memorandum on Open Distance Learning in the European Community, COM (91) 388 final, Brussels, 12 November 1991. (9 official languages)

Eastern Europe and the USSR

THE CHALLENGE OF FREEDOM

GILES MERRITT

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28/05/93

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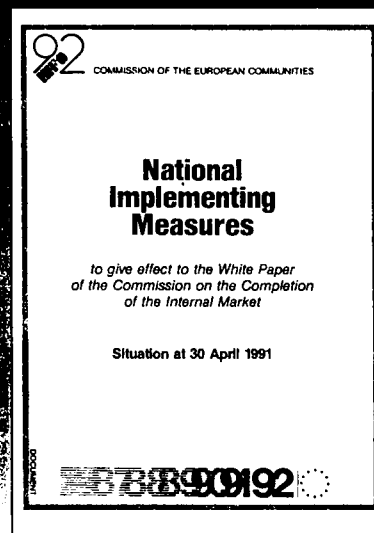
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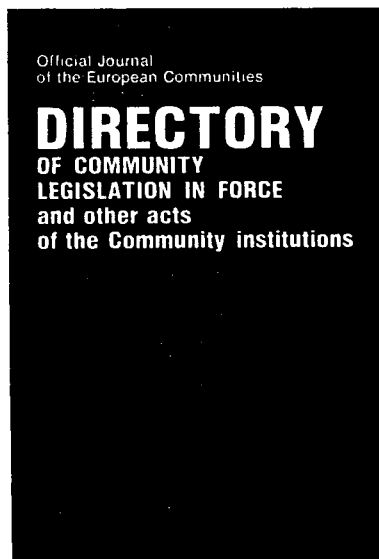
EUROPEAN
ECONOMY

European Economy appears four times a year, in March, May, July and November. It contains important reports and communications from the Commission to the Council and to Parliament on the economic situation and developments, as well as on the borrowing and lending activities of the Community. In addition, *European Economy* presents reports and studies on problems concerning economic policy.

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Unless otherwise indicated, the texts are published under the responsibility of the Directorate-General for Economic and Financial Affairs of the Commission of the European Communities, 200 rue de la Loi, B-1049 Brussels, to which enquiries other than those related to sales and subscriptions should be addressed.

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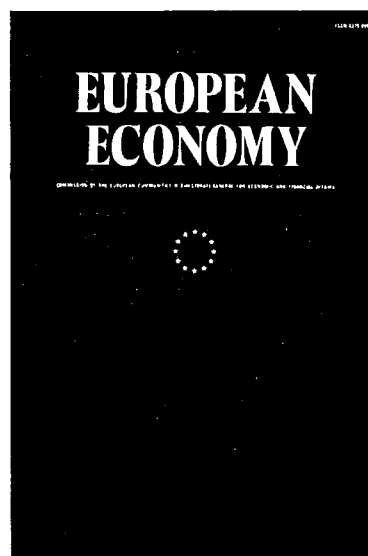
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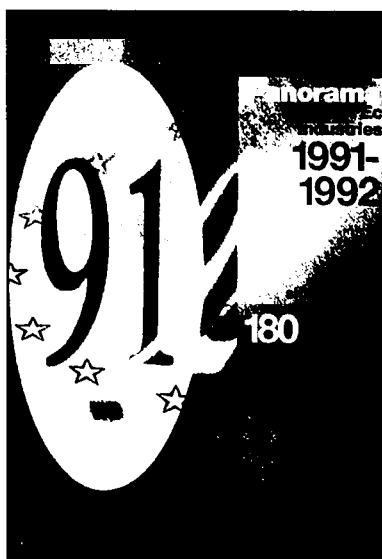
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28/05/93
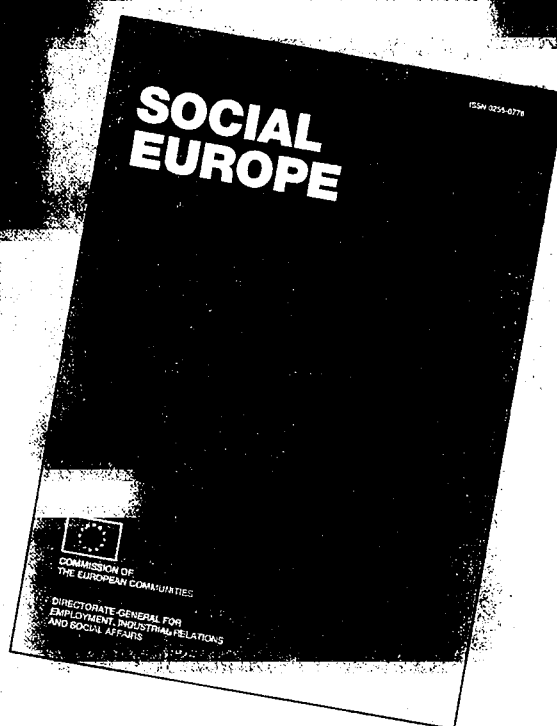
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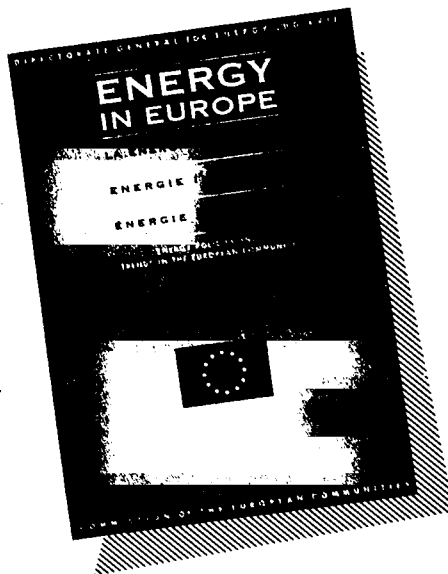
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1993 — 90 pp. — 21.0 × 29.7 cm

ISBN 92-826-4770-6

Price (excluding VAT) in Luxembourg: ECU 14