SOCIAL EUROPE

Supplement on EDUCATION, VOCATIONAL TRAINING AND YOUTH POLICY

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INFORMATICS AND EDUCATION

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This report has been prepared by Ms Virginia MAKINS, journalist at the Times Educational Supplement. It gives an impression of the discussions which took place in December 1983 in Marseille during the Seminar on Informatics and Education organised by the French Authorities in close cooperation with the Commission of the European Communities. This seminar is the first one of a series of meetings to be organised pursuant to the Resolution concerning the introduction of New Information Technology in education adopted by the Council on 19 September 1983 (OJ C 256, 24 September 1983).

INTRODUCTION

In many ways, new information technology is an ideal focus for productive European co-operation in the education field. The group of educationists and experts from EEC Member Countries who met for three days in Marseille in December 1983 to discuss "Informatics and Education" had very diverse views about how new telecommunications and computer technologies could and should be introduced to schools and teaching. But they also had a lot in common.

First, and most important, there was a feeling of urgency. Out there in the world, new technologies were beginning to change almost every aspect of working lives, and many aspects of social and cultural life. It was an economic and social necessity to bring up the whole of the next generation - not just a small select elite - knowledgeable and comfortable and critical about the uses of new technologies.

Second, there was the knowledge that teaching, of all professions, could be transformed by new technologies. As one participant said, teachers are first and foremost sorters and dispensers of information. Making use of powerful new tools to do it would be fundamental to the job.

Third, there was the undoubted fact that the cost of equipping schools and teachers to make the most of the new possibilities was very high. If there was agreement about anything, it was that a massive teacher training effort was needed to open teachers' minds and practice to new technologies. One speaker put the "critical mass" of specially trained and enthusiastic teachers needed to make something of new technology in any one school at ten per cent.

Quite apart from the cost of retraining teachers, there was the cost of providing hardware on big enough scale to make an impact on all pupils, and - perhaps even more important - software to make something of the hardware. However powerful the potential of new technologies in education, they are still in a pretty expensive and primitive state when it comes to applications in schools. If ever there was a field where practical exchanges of knowledge and experience and materials between European countries made sense, it was this one.

Predictably, perhaps, one of the main outcomes of the discussion was the call for such exchanges, particularly on the teacher training and software fronts. But these demands were not simply based on the usual ritual politeness of international discussion, when everyone believes really that their situation is so different from the other's that exchange and cooperation has little to offer. Here there was a genuine and urgent demand simply to see, and assess, what other countries were doing.

The representatives of the ten countries came to the seminar from different starting points. All of them had introduced computer studies in various ways into upper secondary vocational education and training. In three countries - Greece, Ireland and Italy - there was as yet no national initiative to introduce general awareness courses in lower secondary education, although of course individual schools in all countries were experimenting for themselves with new technology.

Most of the rest were introducing schemes to make some kind of computer awareness and familiarisation course part of every pupil's lower secondary education. But only two countries, France and the United Kingdom, had launched major national initiatives that were resulting in computers and new microelectronic devices going into all schools, at both primary and secondary levels, in the hope that they would both encourage computer literacy for all children, and improve the quality of teaching and learning.

The seminar met in a well-defined framework. Its origins had been in 1982, when the EEC Ministers of Education had discussed new technology and education. The German minister had suggested the meeting, and the French government took the idea up and offered to be hosts. By the time it took place, a further meeting had been scheduled for the summer of 1984 in the UK, and later meetings in Germany and Italy would follow. So the Marseille seminar was the first of a series.

In September 1983 the Council and Ministers for Education had passed a resolution (1) that helped to set the seminar's agenda, and went a great deal further than the existing emphasis on vocational education and training for new technology within the EEC. The resolution said that <u>all</u> pupils should be introduced to new information technologies, and become aware of their applications and limitations. They must not simply learn to use new technology as a tool, but they must be taught to judge its effects on everyday life, and its social significance.

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(1) Resolution of the Council and Ministers for Education, meeting within the Council of 19 September 1983, on measures relating to the introduction of new information technology in education (O.J. 256 - 24 September 1983, pp 1-2).

The resolution outlined action that should be taken within the EEC by 1987. There would be a series of meetings to pool the experience of member countries. They should focus on:

- appropriate objectives and methods for awareness and familiarisation of courses;

- the applications of new technologies in different subjects taught in schools;

- the potential contribution of new technology to the education of children with special needs; and

- the strategies needed to ensure that girls took part.

There should be exchanges, particularly of teacher trainers, to share and broaden experience. Action should be taken to promote the transferability of software and teaching materials between different countries and different systems, and there should be studies into the educational value of different hardware systems. Finally, networks for the exchange of information and experience should be set up.

An interesting longer report (1), that had paved the way for the resolution, filled out this agenda for the Marseille seminar. Its starting point was that "the entire education system should respond to the growing and accelerating diffusion of new information technologies". The real task is to determine how and where the educational systems can help to establish a cultural influence on these new instruments", it said, and it discussed the uses of new technologies in broad and non-instrumental ways, mentioning, for example, their possible use "to improve the creative abilities of pupils".

The report divided the territory into four main areas:

- teacher training;

- the content and place of new technologies in education;

- their social and cultural impact; and

- hardware and software.

A major aim of the Marseille meeting was to identify practical ideas and projects to back the EEC initiatives in those four areas. But first, a lot of ground had to be cleared.

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(1) "Education and the new information technologies - The situation in the Member States" (note from the Commission's services).

CLEARING THE GROUND

On the first day of the seminar - a mixture of speeches, panel discussions, and general plenary discussions - a number of themes were raised which, explicitly or covertly, were to run through the rest of the proceedings. Both the representative of the Commission and Mr. R.G. Schwartzenberg (1), opening the conference, talked of the high economic stakes involved.

The idea that economic survival depended on mastery of new technologies, that education had a crucial part to play, and that co-operation was needed if European countries were not to slip even further behind the United States and Japan, was to run through several contributions to the debate.

Mr. Schwartzenberg reflected concerns of many participants when he talked of the danger that unequal access to mastery of new technologies could widen social gaps, and described French initiatives to introduce disadvantaged groups to computers and their uses.

And the French minister was the first person to suggest that the new technology had the potential to "renovate" educational systems. This notion - that computers and new information networks were a lever that could shift teachers from inappropriate, and failing, traditional methods - was to ripple through the proceedings without ever clearly coming to the surface.

Professor M. Nivat (2) warned that informatics is a hard science, with its own concepts and body of knowledge that cannot begin to be taught on a short course. Several delegates clearly agreed with his contention that some of its basic concepts - such as algorithms (3) and data structures - could and should be taught from an early age, alongside the basic concepts of mathematics and grammar.

But it was Professor Nivat's warning about the speed of progress in information science - already, he said, specialists trained five years ago were completely out of date - that was taken up in subsequent discussion. If the science was changing so fast, some people argued, should the education world not wait, rather than make an expensive effort to give teachers knowledge and equipment that would be useless in five years time?

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(1) Mr. R.G. SCHWARTZENBERG, Minister of State at the French Education Ministry.

(2) Mr. M. NIVAT, Professor of Informatics at the University of Paris VII.

(3) "ALGORITHM" is one of the words bandied about by computer people that puzzles laymen. It used to mean a systematic procedure for solving a mathematical problem, and has come to be used for a step by step, logical branching procedure for solving any problem, or making a decision. Whatever the exact definition, many people consider that the logical thinking, progressively excluding all irrelevant factors, needed to make an algorithm is not only essential for new technologies, but also intrinsically useful intellectual training.

The seductive notion that the whole business might safely be put off for a couple of years got very short shrift. As one expert said, the decision to wait and see was itself a policy, and one that could have serious consequences.

Besides, several computer and information scientists in the group rapidly put paid to the notion that there was anything particularly new about new technology. Although the science was advancing at high speed, they said, its basic concepts were clear, unlikely to change dramatically, and could be introduced to both teachers and children.

The seminar did not go any distance towards defining exactly which basic concepts might be taught to children, or how and when to teach them. But it seemed likely that teachers and information scientists, working together, could reach some agreement on which concepts would be valuable intellectual tools in their own right, fundamental to the intelligent use of new technologies, and within the grasp of children.

In the afternoon of the first day of the seminar, the chairman attempted to focus the attention of the delegates on five questions. First, should informatics be introduced as a separate subject, such as computer studies, or should they come into all subjects, across the curriculum? Second, at what level of schooling should they be introduced? Third, what should be the content of computer literacy or awareness courses? Fourth, how fast should you go: should you have a massive programme or a cautious experimental one? Fifth, what is the place of evaluation?

There was some agreement that, where resources were limited, the upper secondary level was the logical place to start. There, you had manageable numbers of schools and teachers, and it was important to give at least some of the students about to leave school some grounding in the new technologies.

But, as a Danish delegate said, the ultimate aim should be that every child was introduced to aspects of the new technology from an early age. For one thing it was important to catch girls, and others who might be put off by social and cultural conditioning, as young as possible.

There was much less agreement on whether you should put your money on computer studies as a specialist option, or introduce new technology across the curriculum. Several people believed that new technology should not be confined to a specialist subject. After all there were plenty of academic disciplines, such as law and medicine, that were not taught to secondary pupils.

But a great number of participants wanted to concentrate on computer studies. A delegate from Luxembourg said that research into the needs of employers and industry had shown that what was required was young people with a good grounding in computing and new office technology. Delegates argued that, if you tried to introduce computing across the curriculum at this stage, you could well end up with something trivial and of low quality.

"We would find ourselves doing things that we can do better with traditional methods, and producing useless software", said an Irish delegate, and argued that the first step should be to concentrate resources on high quality specialist courses, which could then act as a catalyst for serious uses across the curriculum.

Against that others maintained that, once the computer studies were dug in as a separate subject, the subject would monopolise all available equipment and teachers in other subjects would feel they could safely ignore new technology. "The mentality of secondary teachers is such that, if it is a specialism, they won't bother about it", said a Belgian delegate, and he suggested that computer awareness course for pupils in lower secondary schools should be designed by teams of teachers from different subject disciplines.

Discussion of when and how to introduce informatics into schools led on the chairman's fourth question: should you go cautiously, or have a massive initiative? A French delegate described how the French government had changed gear, moving from a carefully controlled limited experiment to a massive initiative, with 100,000 microcomputers in schools by 1988, distance learning courses for adults, and informatics in elementary schools. The need, he argued, was to "introduce informatics as an element of basic culture, and try to democratise it".

A representative of teacher trade unions argued that it was impossible to have a massive initiative unless it was backed by massive and well-planned in-service training programmes. But both British and French delegates said that, given the present state of knowledge, the shortage of qualified trainers and the urgency of the demand, it was impossible to start with neat and tidy training programmes. "We can't start by changing the curriculum and teacher training. We have to start with the available hardware and software, use it to train teachers, and then go round the cycle a few times".

Others had more fundamental worries about the support for a massive push. A Greek delegate suggested that no-one was facing up to the impossibility of introducing teachers to the science and practice of informatics by short courses lasting a few days. Nor did it make sense to introduce pupils and teachers to informatics on the basis of the present, very limited, generation of home computers. "Instead, we should be looking at more fundamental questions of what computer and information science can contribute to education".

By this time there was considerable restiveness in parts of the group. Did no-one realise what was happening out there in the world, with new technology invading almost every aspect of people's lives, booming sales of home computers, and a generation of computer-wise kids (admittedly mostly boys) growing up with a feeling that schooling was irrelevant to the modern world?

The day ended with some people being impatient with all the talk about introducing new technology into schools in carefully controlled ways. One asked: "If the steam engine had recently been invented, would it make sense to discuss at what stage you should begin to teach children about it, or whether the course should take two or three hours a week? Informatics is important because it's transforming economic and social life".

Another demanded: "Are we talking about the kids' informatics, or ours? You can't pass the stuff from the top down, children can learn with and about informatics in a way that we never could". Another raised the sinister spectre of "para-educationists" - people in the game to make money - taking over, if educators did not take a strong line. "Computer manufacturers are imposing stuff, mainly of bad quality, on pupils. The schools must show students what quality is, and what are the good uses of new technology."

But the most critical intervention came from a French delegate. The whole education system was in crisis, he said. Large numbers of students were rejecting what the school had to offer. The knowledge explosion meant that traditional schooling, designed to give pupils a baggage of knowledge to last a lifetime, no longer made sense.

New technology provided an answer to the crisis. Computers increased motivation, and attracted children who were failing. They changed the role of teachers in ways that would transform teacher pupil relations. Teachers no longer had to pretend to be infallible pedagogues: instead they could become companions in learning. New technology made for integration across outdated subject barriers. It should not be introduced as another specialism, or as a tool in the traditional curriculum. It should be used to transform compulsory schooling, and to reach alienated students.

This kind of dissatisfaction with traditional schooling was another undercurrent that surfaced from time to time at the seminar. Several people seemed to believe that new technology had the power to break down subject barriers, and allow students to be active and independent about learning, and to use knowledge to tackle worthwhile problems.

But the discussion only strayed very briefly beyond the closed world of traditional schooling and teaching. "We've got to rethink the school", said a Belgian delegate, referring to the absurdity of putting costly and powerful technology into schools that were only open for a few hours a day to a limited age-group. "The whole context in which the school exists is going to be modified", said a British delegate, and he asked for an experiment to see what "une école informatisée", giving pupils, teachers and the local community access to new technology on a large scale, might achieve.

Not surprisingly perhaps these larger and more intractible themes were not much pursued in the rest of the seminar, which was mainly directed to the nuts and bolts of European co-operation in introducing new technology into conventional schools and into teacher training. But they may be important markers for future discussions and initiatives.

Two almost identical answers were given to Mr. Cerych's third question: what should be the content of computer literacy courses for all pupils? Children should know and have some experience of the various uses of computers: gaming and simulations, uses in business and industry, control technology,data-bases and information handling, text handling, computer assisted learning. They should learn about the essential nature of information technology - the storage and retrieval of data, communication networks, basic ideas about programming. They should discuss social consequences,even though they were not yet definite. There was no disagreement with the list, and one piece of ground seemed to have been satisfactorily cleared.

NUTS AND BOLTS

On the second day of the seminar, delegates divided into four working groups to tackle the four areas identified in the Commission's paper: teacher training, the content and place of new information technologies in education, their social and cultural impact, and hardware, software and teachware. Their task was to identify specific projects that the European Community might undertake.

One reporter cannot hope to give a systematic account of four simultaneous meetings : what follows is the result of dropping in and out of the groups, picking up some of the subject matter and flavour of the arguments.

Perhaps inevitably, there was a great deal of overlap between the groups. Most spent time discussing the variety of uses of new technologies in education, and the fundamental impact they could have on traditional teaching styles and methods. All of them tackled the difficult questions of how dug-in systems - of hardware and programming languages - could be improved and made more compatible.

Most agreed that the EEC initiatives should focus on those who were most disadvantaged when it came to access to new technologies - girls, the young unemployed, children with special education needs. All the groups spent some time discussing how exchanges of information, experience, training strategies and teaching materials could best be set up. All groups concentrated on the introduction of informatics across the curriculum , rather than informatics as a specialist discipline.

People agreed that computers could and should be used in schools as they were used in the real world, as number crunchers, data processors and work processors. They could be used to model complex processes, and to demonstrate changes and effects over timescales that were too long for conventional experiments. Simulations were valuable in many subject areas - science, social science and humanities. Children should be taught how to control other devices through microcomputers, and should experiment with microelectronics and computer control, and be able to access data-bases.

Finally, the special capacity of computers to produce animated visual effects, and graphically to demonstrate things that had been abstract and hard to grasp, such as mathematical functions and scientific phenomena, was extremely powerful. In one working group a Belgian delegate described how, using the visual and graphic capabilities of computers, children in secondary schools were successfully learning mathematical concepts that had previously been thought suitable only for undergraduates.

There was general agreement that the only way to demonstrate these possibilities to teachers was to provide them with a wide range of good software: if their introduction to computers in education came from trivial and poor quality software, they would rapidly become disillusioned. Then was much discussion about ways in which the EEC Member Countries could exchange software, and co-operate in its development.

For many delegates the most exciting characteristic of new technology in education went far beyond any particular or specialist uses. It was that, for the first time, it could genuinely give students control over their own learning, allow them to follow their own interests and progress at their own pace, and promote active learning, problem-solving and investigation.

More than one group discussed how teachers could be helped to undertake the fundamental rethinking of teaching style and methods needed to realise this potential. There were warnings from delegates who had lived through educationists' earlier honeymoon with audio-visual gadgetry. That, too, was supposed to shift emphasis from teaching to learning, and to individualise learning. It had failed. Teachers had either rejected the audio-visual aids, or used them to reinforce traditional methods.

There were, of course, significant differences between the new technologies and the earlier educational technology. Language laboratories and programmed teaching machines were limited educational tools - not part of a versatile technology that was invading every home, office and factory. But, some delegates cautioned, teachers were being approached in very similar ways, and with similar rhetoric, to the earlier attempts to sell them audio-visual technology. Research was needed into the difficulties teachers faced when trying to introduce new technology, its impact on their teaching methods and the best way they could be helped to adapt their practice. Since problems would be similar for teachers throughout Europe, this would be an appropriate area for a Community initiative.

How to help teachers to overcome their initial fear of, and even hostility to , the new technologies and use them to increase the effectiveness of their teaching, was a major focus for discussion. Most of the debate concerned in-service training for practising teachers. The group unanimously agreed that both the uses of new technologies across the curriculum and the discussion of its effects on the role of the teacher should be an integral part of all initial training.

It was more difficult to determine what the content and approach of in-service courses should be. Should teachers simply be encouraged to become competent users of new technology, able to hook up leads, run programmes, use teletext systems and data-bases? Should they be taught to write computer programmes? Should training encourage them to rethink their practice in more fundamental ways? Was it more effective to

concentrate on a small cadre of well-trained teachers, and hope for a multiplier effect through the system, or to give large numbers of teachers a basic introduction, perhaps using techniques of distance learning?

There was agreement on only one of these questions: most people believed that it was a waste of time for teachers to learn to be programmers. The essential thing was that they should know enough to design programmes for professionals to encode.

The thorny problems of standardisation of hardware and computer languages were firmly on the EEC agenda, and were discussed by more than one group. Some of the benefits of standardisation were clearly seen in the French system, which was standardised on one programming language and four compatible microcomputers. Most people recognised that it was too late for standardisation across Eurpean countries. But interfaces should be developed to make systems more compatible.

But there was also considerable opposition to standardisation as a principle. Standardisation meant settling on a primitive stage of a technology that was rapidly changing and improving: "We're still at the stone age, and mustn't hold back the move to the iron age", as a Danish delegate put it. This argument also applied to the notion of standardising computer languages. What was required was investigation of the uses of different languages for different purposes, and discussion of how languages shaped different styles of thought. LOGO, MICROPROLOG and SMALLTALK were all suggested as having particular merits.

Several groups discussed how far educational needs could hope to influence the computer industry - particularly if pressure was strengthened by agreement on standards and requirements across the EEC countries: "Can we impose an education dimension or must we let the home computer market set the standards and ride along with the commercial trend?". There seemed to be a pessimistic feeling that the educational market was not big enough for the powerful hardware manufacturers to take much notice of it - though, for the sake of teachers and children, it was important to try to set standards.

One vital task was to bring up the next generation to be critical and demanding consumers of the products of the informatics industry: "the role of education is not to adapt children to an evolution controlled by others, but to give them some control over the evolution". Schools must realise that new technology would become "part of a child's perception of the world", just as television had done, and help them to be discriminating about it. But one delegate was not very hopeful: "We've done very badly on teaching children to be discriminating about television and the media".

All four working groups ended by discussing what kind of exchanges or information, materials and strategies would be most useful to disseminate good practice and pool and develop experience. The day ended on a hopeful note, with the idea of using new technology to facilitate co-operative development at many levels in the education system.

PROPOSALS AND PROSPECTS

The third day began with talks and visits which demonstrated very well the complex range of issues that the seminar had to deal with: the need to bring new technologies to the more disadvantaged members of society, developments in computer languages, the importance of informatics in technical and vocational education, its applications in general education, teacher training. Tantalisingly brief visits to Marseille's Centre Mondial, which was experimenting with ways of bringing informatics to one socio-economically disadvantaged neighbourhood, to a technical lycee and a lower secondary college, and to the regional teacher training centre, showed possibilities for the long working exchanges proposed by more than one of the seminar's working parties.

In the afternoon, the seminar heard the reports from the four working groups and their proposals for action. Mr. Pair (1) not only summed up the seminar's discussions in an elegant synthesis, but explored fascinating ground that the seminar had hardly touched on in his analysis of what might be involved in bringing up children to make the most of informatics as a powerful tool for thinking.

Finally, Mr. Hughes, Chef de Cabinet, to Mr. Ivor Richard, Member of the Commission of the European Communities, Mr. Papathemelis Kaklamanis, the Greek Minister of Education and Religious Affairs, and Mr. Alain Savary, the French Minister for Education, reiterated the importance of mastery of informatics to European economic and social development, the strength of the EEC commitment to action and development in the education and training fields, and the value Member Countries could gain from co-operation.

The working groups' proposals divided into two distinct categories: proposals for exchanges and joint development work, and proposals for more fundamental research. One clear recommendation stood out: that each Member Country should have a designated national centre equipped to exchange information and materials with the others, and linked by new technology - including a telesoftware network.

Working exchanges for teachers and teacher trainers was another clear proposal. The exchanges should be of varying length, but some at least should be long, and they would be of most value if they were accompanied by exchanges of software and teaching materials. Both Mr. Savary and Mr. Pair suggested that EEC-sponsored summer schools would be valuable. Another suggestion was for workshops where teachers and programmers could create and develop educational software.

The "twinning" of both teacher training institutions and individual schools was seen as a fruitful prospect by more than one working group. "Twinning" should lead to visits and exchanges of staff, but it was most important that it should be based on links through new technologies, that would allow for day-to-day co-operation and development work by larger numbers of staff and students. The first aim would be to encourage

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(1) Mr. C. PAIR, Professor of Informatics at the University of Nancy.

systematic development work across national boundaries. But those who proposed the idea also hoped that, while working together in this way, staff and students would come to a better understanding of each other's outlooks and cultures.

There were calls for research on several fronts. Some people wanted fundamental research into the impact of new technology on learning and on children's development. This idea did not receive unanimous support, not because such research would not be valuable, but because some people thought it was too soon for serious assessment of the effects of new technology, when new uses and applications were developing at rapid pace. Although the whole question of evaluation was more or less shelved at the Marseille seminar, it will be an important one for future discussion.

Research into the pedagogic uses of new technology in different subjects and disciplines across the curriculum, was seen as a good basis for European co-operation. It seemed logical to link such research with the development of software and other materials. An essential first step would be to choose a limited focus for research and development, and to have a preliminary survey of existing work and materials in the area. A more specific proposal was that research should be started on the educational uses of videodiscs and interactive audio-visual systems.

Research into the social impact of new technologies and action to minimise the gap between haves and have-nots in computer and information skills, was seen as a highly appropriate target for EEC initiatives. Many of the groups identified as in danger of losing out in the new informatics culture were already identified as priorities for Community programmes - girls, the young unemployed, children with special educational needs. Some delegates wanted Community action to concentrate on the students who were most likely to fail at school and to reject what schools have to offer; they believed that new technology had a unique capacity both to motivate these students and to change schools in ways that would meet their needs.

Research into the impact of new technologies on the work of teachers and on the infrastructure of support systems and materials needed to help teachers make the most of new technologies, was seen as important. People emphasised that the challenges of new technology, and rethinking of established teaching methods it demanded, were extremely threatening to teachers. Far from making the job of teaching easier, new technology would make it much more difficult - at least in the short and medium term. Many of the problems it posed would be common to teachers in all European countries, and could be the subject of joint investigation.

The content of courses for all pupils at lower secondary level to make them aware of the uses and consequences of informatics, and generally computer literate, was seen as another area for co-operative research and development. Here, Mr. Pair (and before him Professor Nivat) brought in an important dimension: the importance of children growing up able to use informatics as auxiliary tools for thinking. As Mr. Pair said, this task would not be at all easy for a generation of teachers and academics who had not themselves come to use informatics in this way, as prosthetic devices to take the drudge work out of thinking.

Furthermore, the mastery of the concepts behind informatics would be good for general intellectual development, promoting logical thought and skill at problem-solving. Bringing teachers and information scientists together to identify the concepts that could be taught at different stages, and work on methods and materials that would help children to acquire them, seemed a rich field for research and development. More specialised applications of informatics in the different subject disciplines should also take account of the need to get pupils using informatics for investigations and problem-solving, and not just experiencing computers as interactive machines for programmed learning.

This emphasis on the creative uses of the new technology was considered to be very important. For many years, educationists in all European countries had been trying to "renew" the curriculum and teaching methods of schools, to break down outdated barriers between subjects, to tailor teaching to individual differences between students, to switch the emphasis from the passive memorising and recapitulation of facts to the active mastery of concepts, and the use of them to solve problems. They had not had much success.

Now, people believed, informatics could provide the technology necessary to effect the change. But it could also be used to shore up traditional methods, and deliver drill and practice routines in traditional subject matter. The in-service training and development work needed if the creative uses were to be preferred to the narrow predagogic uses were formidable.

In what was effectively two days of discussion, covering an enourmous number of topics, it was not surprising that various interesting possibilities were raised, only to be left hanging in mid-air. One was the use of new technology in the creative and aesthetic field, in art, music and design. Another was the need to make microelectronics and control technology part of every child's education in the informatics age.

On a wider sweep, several people at the seminar believed that it was essential to stop talking about the closed confines of the schools, and think about the impact of informatics on education in the Community at large. As a first step, schools should use new technology to dissolve their walls, reach out into the Community, and link with other informal education networks - both learning from them and feeding into them.

The impact of the home computer boom was often mentioned but hardly discussed (apart from the recognition of the schools' job to make sure that the gaps between those growing up surrounded by new technology at home and those without were as narrow as possible). As the seminar met, pre-Christmas advertising and sales of home computers was booming in most Member Countries, and many delegates were well aware that the monopoly that schools and teachers had held on many aspects of academic education was about to be broken.

Apart from the proposal from the working group on social and cultural impact that informal educational agencies such as clubs, libraries and museums should be included in any exchange networks that were set up, these concerns were not encapsulated in specific recommendations at the seminar. But there was a strong feeling among some delegates that new technology should provide a strong impetus to remove some of the barriers between schools and the outside world, that the breaking down of the education monopoly should be welcomed, and that the sea-change that could take place in the role of schools and teachers should begin to be investigated.

No doubt, as Mr. Pair said, several delegates left Marseille somewhat frustrated that the discussion had not progressed further and become more specific. But, in a discussion which ranged from the narrower aspects of computer-assisted learning to the future possibilities of fifth generation computers and sophisticated expert systems, from specialist vocational courses for upper secondary students to possibilities for introducing infants to the basic idea of an algorithm, from the use of informatics greatly to expand people's intellectual capacities, some degree of frustration was inevitable.

The Marseille seminar was only intended as a first step, which would speedily be followed by a series of other meetings. The encouraging thing was that, with all the contradictions and disagreements, and in spite of the fact that Member Countries had very different approaches to the introduction of informatics into education and were at different stages in implementing their policies, there was a great deal of agreement.

There was the knowledge that European countries must keep up with the informatics revolution for economic survival, that education had a vital role to play, that resources for the necessary investment in hardware, software and teacher training were very short, and that the European Community had a lot to offer in facilitating exchanges and co-operative research and development, and in helping to avoid expensive duplication of effort. There was the awareness of the danger of informatics becoming the preserve of a privileged elite, and the consensus that the informatics revolution could help to make schooling more effective.

Furthermore, the problems posed by introducing the new technologies into highly traditional school systems and the difficulties faced by teachers were similar in all countries, whatever the historical and cultural differences between their education systems. It seemed probable that, in trying to meet the challenge of the new culture of informatics, teachers in EEC Member Countries would find they had a lot in common.

The first step identified at Marseille was to set up a network for exchanges at many levels - between experts in national centres, teacher trainers, and teachers, students and children in schools and colleges. The next step will be to move as quickly as possible from general, wide-ranging debate to practical workshops on specific aspects of informatics and education.

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NOTE:

The participants' dossier for the Marseille seminar is available from the services of the Commission. It contains the following:

- the Council Resolution of 2 June 1983 concerning vocational training measures relating to new information technologies (O.J. C 166 - 25 June 1983, pp 1-3);

- the Resolution of the Council and the Ministers for Education, meeting within the Council, of 19 September 1983 on measures relating to the introduction of new information technology in education (O.J. C 256 - 24 September 1983, pp 1-2);

- a monograph prepared by the Commission's services (entitled "Education and the new information technologies - The situation in the Member States", Ref.: V/890/83), brought up to date by Member States;

- an introductory note to the working groups, together with the speech of Prof. Nivat and the Conference Synthesis made by Mr. C. Pair;

- a bibliography.

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