DEPARTMENT OF EDUCATION AND SCIENCE

REPORT BY HM INSPECTORS

on

ASPECTS OF THE WORK OF THE MICROELECTRONICS EDUCATION PROGRAMME

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CONTENTS

CHAPTER 1: INTRODUCTION

1.1 This report is concerned with aspects of the work undertaken by the Microelectronics Education Programme (MEP), which was established by the Department of Education and Science (DES) in 1980. The Programme initially had a budget of £12 million spread over four years, but the Programme was later extended by two years and spent over £23 million in the course of its life. The report is based on the evidence obtained during the period 1983 to 1986. In this period HMI sought to identify the extent to which schools were able to respond to the opportunities and challenges of working with new information technology (IT), and to assess the influence of the MEP. In the course of the survey visits were made to over 350 educational institutions in England. This report also draws on information from over 200 others where computing work had been observed in the course of normal visiting. In addition a variety of MEP committees and in-service training sessions was attended and numerous MEP-funded materials were reviewed. The work of pupils with special needs and of the Special Education aspects of the MEP is commented on only briefly, in view of the more limited evidence available during the main part of the survey.

The Structure of the MEP

1.2 The structure agreed by the DES for the MEP was for a small national Directorate to initiate the development of regional centres and coordinate their activities. In addition there were to be particular initiatives and agencies. The national Director of the MEP was to report to an Advisory Committee appointed by the DES. This consisted of five external nominees, three of whom were involved in directing national projects on information technology, and a numerically strong representation from government departments and associated bodies (Council for Educational Technology (CET), National Computing Centre (NCC), Department of Trade and Industry (DTI), DES (3), HMI (4 - 2 of them English, 1 Welsh, 1 from Northern Ireland) and an observer from the Scottish Education Department). The committee was to be chaired by an Under Secretary from the DES. The financial control of the project was vested within the DES and exercised through the Council for Educational Technology (CET).

1.3 The programme commenced with the appointment from November 1980 of its National Director. It was decided, following a request from the newly appointed Director, that the Programme be based at Newcastle on Tyne, although it was recognised that this would mean longer communication links between the Programme base and the DES. This had implications for the management and working procedures involved in the day-to-day operation of the Programme.

1.4 The first task of the Director was to produce a strategy paper. He based it on the original proposal produced by the Department. It emphasised and made explicit the regional strategy for development and identified the support to be given to established national development centres. The final proposal is described in greater detail in part 1 of Chapter 2.

1.5 The central directorate of the MEP was established in late 1980 and 1981, consisting of the director, two deputy directors who were appointed at senior executive officer grade, a technical officer and one secretary. This was later expanded by the addition of an information officer and further technical support. The Directorate was to direct national activities and promote the MEP strategy, working within its own resources and co-operating with established development or training centres and industrial contacts.

1.6 Much credit must go to the Director for the success he had in working with chief education officers and other local education authority (LEA) staff to achieve acceptable regional groupings and establish new and fruitful patterns of co-operation between many local education authorities. A model was adopted for each of the 14 Regional Information Centres (RICs) set up in England, Wales and Northern Ireland. In each region a regional steering committee was formed, usually chaired by the chief education officer of one of the region's LEAs, or his deputy, and attended by advisers from participating LEAs and the regional director appointed to the RIC. Some of the staff working to the director were attached to the RIC for part of their time and employed by one of the LEAs for the rest of their working week. This model of regional co-operation proved to be very effective in the initial stages of the Programme.

The Context of the MEP

1.7 A considerable amount of work on computing and technology had already been undertaken in many schools and curriculum development centres prior to the launch of the MEP. Much of this work stemmed from individual or local initiatives and had gathered a momentum of its own. The growth in the availability of home computers and the commercial recognition of this market provided a further impetus to a growing computer awareness in the population at large, particularly among young people. This growth was also reflected in the increasing coverage of IT provided by the media.

1.8 In addition to the general growth of IT awareness there were educational initiatives other than the MEP which affected schools. In 1981 the Department of Trade and Industry offered part funding for computers to secondary schools and then, in 1982, to primary schools. This and subsequent Government subsidies for peripheral equipment had the effect of encouraging virtually every secondary school and the overwhelming majority of primary schools to acquire microcomputers. The value of the equipment actually obtained by schools far exceeded the considerable subsidy provided by central government. A further stimulus was the Technical and Vocational Education Initiative (TVEI), launched by the Manpower Services Commission (MSC) in 1983. This too was funded on a scale which made it inherently more "visible" than the MEP and generated a climate and an availability of resources in some schools which enabled them to undertake IT-related work which had not been possible before.

1.9 The MEP was thus but one of a number of educational initiatives operating against a background of IT awareness and support. Its function was to work as far as possible through LEAs and other development agencies and its success would be measured by the extent to which it "pump primed" others to develop microelectronics activities in schools. The variety of external factors at play in the period under review made it difficult directly to attribute very many effects solely to the MEP.

1.10 The picture is further blurred by the MEP's diffuse mode of operation, through its links with staff of LEAs, DTI-funded projects, industry and overseas promotions of British educational computing. It was difficult but not impossible to identify some items of information, of software, of hardware, and of in-service training support which were purely "MEP products" although many developments carried out by others had clearly been inspired by MEP and its personnel.

1.11 This report seeks to address the following issues:-

a) what MEP set out to do;
b) how effectively it seems to have done it;
c) what is happening in schools visited;
d) what needs to be done.

CHAPTER 2: THE AIMS AND ORGANISATION OF THE MEP

2.1 THE AIMS AND STRATEGY

2.1.1 In April 1981 the aims of the MEP were set out in a document called "MEP - The Strategy" which identified the role of the MEP as follows:

> "The aim of the Programme is to help schools to prepare children for life in a society in which devices and systems based on microelectronics are commonplace and pervasive....."
>
> "In developing a strategy for the Programme it has been assumed that:
>
> i. schools should be encouraged to respond to these changes by amending the content and approach of individual subjects in the curriculum and, in some cases, by developing new topics;
>
> ii. with the dual aim of enriching the study of individual subjects and of familiarising pupils with the use of the microcomputer itself, methods of teaching and learning should make use of the microcomputer and other equipment using microprocessors. This may be expected to add new and rewarding dimensions to the relationship between teacher and class or teacher and pupil;
>
> iii. use should be made of the microcomputer to develop the individual pupil's capacity for independent learning and information retrieval;
>
> iv. for those children with physical handicaps, new devices should be used to help them to adjust to their environment while those with mental handicaps should be encouraged and supported by computer programs and other learning systems which make use of new technologies."

2.1.2 The Programme was to cover the application of microelectronics in schools and non-vocational courses for 16-19 year-olds in further education (FE); in practice its main focus was to be on secondary schools, and on fostering links between schools, FE and industry. Priority was to be given to applications in mathematics, the sciences, craft design and technology, geography and courses related to business or commercial occupations. Some attention was also to be given to careers education, languages and the humanities and to the needs of pupils with learning difficulties in remedial and special education. Some new areas of study were also identified as themes to be addressed within school/college subjects.

2.1.3 To attain its aims the Programme identified three main groups of activities which it needed to promote:

> a. **curriculum development**: this would involve the commissioning and, where necessary, production of teaching and learning materials for both existing subjects and courses as well as new disciplines. Some curriculum development projects would be promoted by the MEP in conjunction with existing national software development groups while others would be run by the MEP's new regional organisations referred to in paragraph 1.6 above and still others would be funded to take place in individual schools and IT user groups;

b. **teacher training**: this would involve building on existing course provision after the identification of teachers' training needs. It was acknowledged that the role of the LEAs was crucial in this activity and that MEP would act mainly as a catalyst and facilitator, working in partnership with them. It was proposed that a function of the Regional Centres would be to evaluate teaching materials and methods and to promote the in-service training of both teachers and trainers. Some courses designed for 'self-tuition would also be produced, as well as materials that trainers could use in their work. The delivery of these courses would be in partnership with LEAs. The content and format of initial teacher education courses were not addressed by the Strategy to the same extent as in-service education which was seen as the priority. Nevertheless, close contact was to be sought between the MEP-funded regional centres and local institutions of initial teacher education;

c. **resource organisation and support**: here again the Programme sought to work with existing organisations, like LEA advisory services, Science and Technology Regional Organisations (SATROs), and bodies which already provided information for teachers on materials and equipment for classroom use. The Regional Information Centres were to be the major vehicle for the dissemination of information to schools and LEAs. They were to provide a network whose users could obtain information on materials, software and equipment and where these might be seen, and on developments in teaching materials. These services were to be linked to the RIC's in-service work. Facilities for those interested in creating, testing and correcting computer software were also to be provided.

2.1.4 Once the outline strategy had been published in April 1981, some flexibility was called for in its interpretation. New priorities were introduced. For example, when the DTI's offer of computers to primary schools was made in 1982 it involved an obligation upon LEAs to provide basic in-service training for two teachers in each primary school. MEP became the central agency to support this in-service training and, in addition, they were asked to produce a 'starter pack' of materials. Valuable though this was, it had the effect of diverting the MEP from other activities. Similarly, new opportunities and extra expectations resulted from the emergence of new microelectronic hardware and the realisation that IT could be of value to teachers of subjects other than those which had been originally identified in the MEP strategy document.

2.1.5 In recognition of the pace of technological change and the fact that the Programme had not had enough time to go sufficiently far along the road towards achieving its aims, a two-year extension of the Programme until March 1986 was agreed by Ministers a year before it had been due to terminate.

2.2 ORGANISATION AND MANAGEMENT

Directorate

2.2.1 For most of the life of the Programme the Director was supported by two Deputy Directors. A useful overlap existed in their funtions; one of them was mainly concerned with issues relating to the in-service training of teachers while the other was responsible for the development of curricula and materials. The Director retained responsibility for liaison with the directors of the fourteen Regional Information Centres, with the MEP's national co-ordinator for Special Education and with the business community.

Regional Information Centres

2.2.2 The RICs' principal function was to make information available to teachers and trainers as to how developments in microtechnology and computing might contribute to different subject studies in schools. The centres also provided in-service training courses at various sites in the regions for teachers, advisory teachers and teacher trainers. Limited funds were provided by MEP for small scale projects at the RICs.

2.2.3 Apart from the director of a RIC there was a deputy director, an administrative/clerical officer and four co-ordinators of in-service training. These were responsible for major domains in the secondary school work - Computer-Based Learning in various curriculum areas (CBL), Communications and Information Systems (CAIS), Electronic and Control Technology (ECT) and Computer Studies (CS). From mid 1983 a fifth co-ordinator was added to each RIC, who was a specialist in primary school work and organised training in the application of IT to the primary school years.

National "Domain" Co-ordinators

2.2.4 National Co-ordinators of in-service training were appointed in 1981 in each of the four domains. This was to ensure that regionally based in-service co-ordinators worked as teams and were sufficiently informed about national and international developments in their respective domains. Each of the National Co-ordinators was responsible to one of the deputy directors at Newcastle for developing a national strategy for in-service training in a domain and for ensuring that regional staff were able to implement it if given the resources.

In-Service Training Strategy

2.2.5 The in-service training strategy adopted by the MEP and its National Domain Co-ordinators was known as the "Cascade" model. The idea was that the training given by regional co-ordinators in each domain would be directed at teacher leaders and advisory teachers in the LEAs. The materials and approaches used on these courses would be such as to enable these leaders to train others in their LEAs or their schools. It was hoped that, with the awareness of IT and its uses "cascading" down in this fashion, many teachers would be reached in a relatively short time. Chapter 5 comments on how far this strategy proved successful.

Development Units

2.2.6 To undertake specific development tasks MEP either worked through existing curriculum development organisations or set up its own, often in partnership with industry, the DTI or a university department. Each of these was responsible to the appropriate deputy director, and in time was given its own advisory/steering committee and developed its own objectives and style.

2.2.7 In September 1983 a National Primary Project (NPP) was established by the MEP at King Alfred's College, Winchester. Its purpose was to build on the great interest shown in computers by primary schools and to prepare primary advisers and others in LEAs to assimilate some of the promising ideas which had been generated, and to identify less successful forms of software use. The Director of the National Primary Project was not a National Co-ordinator in name, but reported to a deputy director and played a similar role in her relationship to the primary co-ordinators of INSET who were appointed to the RICs.

Special Education Microelectronics Resource Centres (SEMERCS)

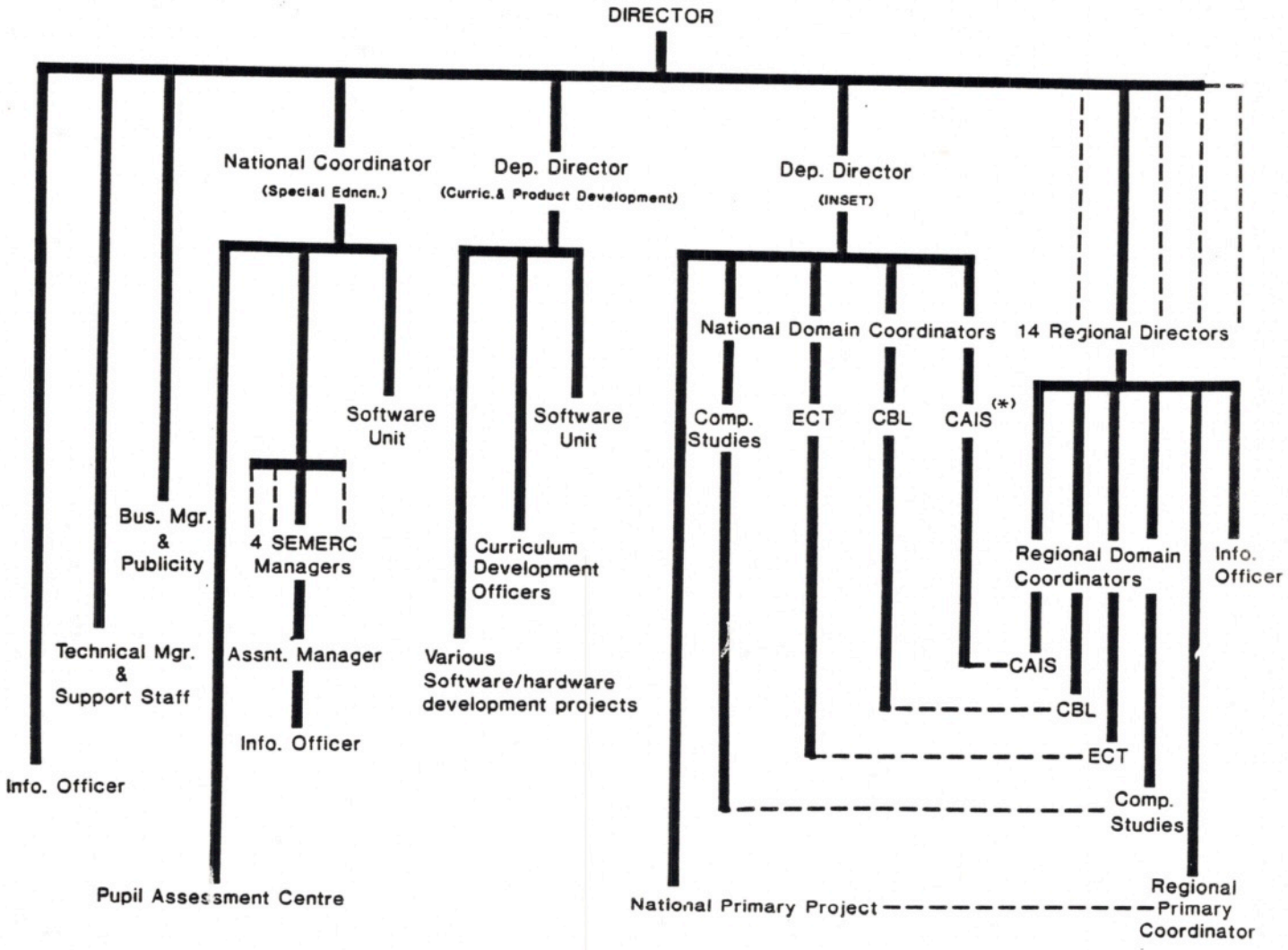
2.2.8 MEP had a co-ordinator for work with pupils with special educational needs based at CET and responsible directly to MEP's Director. To provide information, in-service training and materials for teachers of these pupils four centres were set up in 1982. These Special Education Microelectronics Resource Centres (SEMERCS) were located in Newcastle on Tyne, Manchester, Bristol and Redbridge and fulfilled a function akin to that of the RICs, but each served a far larger number of LEAs and catered for a more specialised range of teacher interests. The SEMERCS were modestly staffed; initially they employed a manager and clerical helper only. In 1983 assistant managers were established and some technical assistance was made available. A software development centre for this SEMERC network and an assessment and equipment centre for physically handicapped pupils were established in 1984. Initial links between SEMERCs and LEAs were not as easy to establish as they were for the RICs, but some progress was made against a background of much lower initial involvement in IT by staff at special schools.

MEP Advisory Committee (MEAC)

2.2.9 The advisory committee met with decreasing frequency, its chairman and membership changing several times in the course of the life of the Programme. For a variety of reasons its influence on the direction and work of MEP was not great. The Director had thus a fairly free hand to develop his activities, though he was subject to the financial control of the DES, which considered his proposals and draft agreements and authorised the Council for Educational Technology (CET) to make payments and contracts. Although in practice this line of financial control rarely prevented MEP staff from deploying resources as they wished, the procedure sometimes led to delays, and the distance of the MEP's headquarters from London also tended to hinder co-operation between MEP and the DES.

2.2.10 The diagram overleaf describes MEP's organisation from 1983.

ORGANISATION OF MEP



(*) shared post during 1981-84

Leadership Style

2.2.11 A co-operative rather than a strongly directive approach characterised the Directorate's style of leadership. The aim was to allow grass roots developments to take place in the regions and in the various development centres and to encourage flair and initiative. There was less emphasis upon providing a central thrust or specific direction for corporate action; more a desire to build on local interests, opportunities and expertise wherever possible. To this end many of MEP's staff were employed for only part of their time on work directly paid for by MEP.

2.2.12 In the initial stages of the Programme this was a constructive way of getting people, who had not been used to so doing, to work together and to address common needs and problems. However, conflicting priorities and expectations occurred, which affected both part-time and full-time MEP staff as well as those outside MEP who were funded for limited periods.

2.2.13 Many people with flair and capacity for hard work had been attracted to work for the MEP or were being partly funded by it. The style allowed such individuals to react creatively to needs of the moment in materials development, information distribution and teacher training, but it proved difficult to manage and direct this multi-faceted and multi-targeted force corporately. For example several of MEP's collaborators, who were not directly employed by MEP but received funds from it for specific development or training work, considered themselves entrepreneurs in their own right. They felt as competent to judge the outcomes of their own developmental and training activities as those who funded them at the MEP.

Complexity of MEP's Network

2.2.14 The complex network of development and training provision required a central administrative machine which could disseminate information quickly and had good links with commercial organisations, the media and publishers. In the final 15 months or so of the Programme, MEP obtained the services of a press and publicity officer. It was his role to ensure that MEP's activities and the large volume of materials produced nationally came to people's attention. The need for this work had not been sufficiently recognised in earlier years.

2.2.15 The network of people needed good means of communication. The MEP was able to use the technology of electronic mail. By this means widely dispersed staff, often away from their base, could stay in touch with one another and communicate easily with several colleagues simultaneously. The availability of these mail facilities contributed greatly to MEP staff's ability to respond, often at very short notice, to requests for advice and information on complex or difficult issues.

Staff Commitments and Pace of Development

2.2.16 MEP's developmental and in-service training work involved a great many committees and meetings. These were frequently attended by its senior officers. The pace of development was sometimes too fast, and the range and intensity of demands upon the Directorate and other staff excessive.

2.2.17 Additional demands were made by overseas governments and other international bodies. The efforts invested by the staff and Directorate in events such as international conferences were sometimes outstanding. These were, however, not always central to the work that MEP had been set up to do and they diverted staff energies away from it.

2.2.18 This intense, entrepreneurial activity, which reflected rapidly expanding industrial and commercial activity in computing and microelectronics, became part of the life-style of some members of the MEP: new courses for teachers and trainers had to be mounted in various parts of the country; software for the DTI's Microprimer pack had to be completed; "one-off" presentations had to be made to visitors from abroad; and deadlines had to be met for joint launches of new materials. Unfortunately, there was a belief in some sections of the MEP that a lot of materials had to be produced quickly. This allowed too little time for reflection and for considered development or concentration on important objectives. Moreover, the administrative infrastructure provided in MEP was not always able to respond adequately to the demands placed on it in such a context.

2.2.19 The fact that MEP's funding was on an annual basis, and that some funds would be entirely lost if they were not allocated to projects or personnel before the end of a financial year, sometimes increased the need for speed. This was not always helpful to the planning of sound educational programmes.

Development of Consultative Procedures

2.2.20 As the Programme matured its consultative and monitoring procedures also improved. In its final two years it was successful in involving interested and knowledgeable people in particular applications of IT; in curriculum development and INSET. These developments led to a proliferation of advisory committees, project management committees, and various working parties. For the most part these provided valuable advice.

CHAPTER 3: THE WORK OF MEP: CURRICULUM DEVELOPMENT

3.1 SCOPE OF DEVELOPMENTS SUPPORTED BY MEP

Range and Characteristics of MEP's Products

3.1.1 The range of materials for teacher training and classroom use sponsored or produced by MEP was impressive. The examples given below illustrate the types of items developed.

3.1.2 The MEP supported the production of computer software for a wide range of educational uses. The software ran on one or more of the main types of microcomputer found in British schools, though very few items were 'versioned' for all the makes of micro which were supported by DTI. In the early days of educational computing many programs were produced which sought to teach specific content or provide practice in particular skills. Partly because of the lessons learnt with these early materials, whose application was useful but limited, most producers of software turned to producing items which were not specific in terms of subject content. These programs allowed the same item of software to be used in several contexts and by pupils with different needs. They also became easier to use: more "user friendly".

3.1.3 In its later years MEP spent an increasing proportion of its resources on new peripherals and software which were designed for use in microelectronics, science, CDT and computer studies, and by pupils with special educational needs. Among the peripherals pioneered was the 'touch screen'[1] and the 'bar-code reader'.[2] These and other ideas, such as floor turtles[3] with their own sensors, were developed to illustrate to pupils the variety of ways in which one can communicate with a computer, even without using a conventional keyboard. As a result of this work, not only the range of peripherals increased, but lessons were clearly learnt by producers. One of the more important of these was how guidance might be given about the use of materials. Aside from the value of any finished products, the creation of some of the materials provided opportunities for curriculum innovation by, and the professional development of, the teams involved in this work.

Collaboration with Outside Bodies

3.1.4 In developing this software, hardware and supporting materials the MEP collaborated with a number of educational publishers; the broadcasting authorities; manufacturers of computers and peripherals; and industrial sponsors. Although such collaboration presented a few problems of co-ordination in the phasing of contributions from partners in an enterprise, it was a wise and helpful policy. It not only multiplied the available resources, but identified the MEP as representing the community of educational computing users, and an organisation capable of presenting British goods overseas.

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1 'Touch Screen' - a visual display unit which allows the user to point by finger to areas on the screen and thus to activate a chosen process or exercise a displayed option.

2 'Bar code reader' - a program-controlled scanning device which reads visible marks of various widths from paper or any light background, and converts these symbols into characters and figures. It can, for instance, read coded price labels and display them as meaningful information.

3 'Floor turtle' - a small domed vehicle fitted with a pen, controlled by a computer and used to explore movement, length, angle, and shape.

Rapidity, Scale and Quality of Production

3.1.5 A policy of rapid and large scale production of software materials was adopted by the MEP early in its history. It was thought at the time that there had to be available a "critical mass" of IT-based teaching materials so that the hardware could be seen to be a useful investment. A high number of units of software was considered by MEP to be an important target, and occasionally quality suffered as a result. An "item" or unit was defined as a program for learning and teaching or a piece of equipment. A program was usually accompanied by some printed suggestions for the teacher on how to guide pupils in its use. Guidance for the teacher became recognised more and more as a crucial part of educational software. What was needed was not merely operational instruction on the use of the keyboard and other features, but suggestions to help the teacher put the software to good use in particular teaching situations.

3.1.6 When an MEP package had been developed, the documentation was often more difficult, or costly, to produce and distribute than the software to which it related. A large number of items was produced which did not find much favour with those concerned with teaching; some of the Microprimer (primary school) software was criticised by a subject association for presenting some incorrect implicit messages in some of the programs. Nevertheless, many schools found that most of MEP's software, which was often freely available through the LEA, was usually error free and provided useful starting points for pupils in primary and secondary schools.

3.1.7 Many items of software produced as part of MEP funded projects were not published for general use. These were useful for some teachers but often proved unsuitable for most others. There were several cases of duplication of effort, when similar ideas were developed by separate teams into IT-related teaching materials. Not all such duplication was necessary or desirable.

3.2 MEP'S SUPPORT FOR CURRICULUM DEVELOPMENT INITIATIVES

Identifying a Variety of Needs and Developments

3.2.1 Although it supported a wide variety of curriculum development, it was not easy for the Directorate to decide which proposal was worth supporting. Decisions on major projects were often made with the best of intentions, based on the credibility of the proposer and plausibility of the project, rather than on clearly defined criteria. Bids for development funds were rarely invited by the MEP in respect of a project it identified as worthy of development.

Developments at the National Centres

3.2.2 A number of curriculum development centres with a strong interest in computing and microelectronics existed before the advent of MEP. MEP's financial support for curriculum and materials development at these centres was substantial. Typically it ranged between £75,000 and £300,000 a year for some centres like Computers In The Curriculum (CIC); The ITMA Collaboration (Investigations on Teaching with Microcomputers as an Aid); and Fiveways Software. A total of between £600,000 and £800,000 was thus spent annually at these centres. In addition MEP funded major projects at the Open University; set up new national development and software units; and gave Regional Information Centres (RICs) opportunities to finance some curriculum development.

3.2.3 All these centres were at very different stages of development, and adopted different approaches to the design and implementation of curricular materials. Some responded to MEP's commission to produce materials quickly but had poor systems for the trial of these in class or workshop. Others were concerned to observe, with various degrees of rigour, the impact of their materials in class and tutorial room, and to write detailed reports, guidance notes and suggestions for the teacher or student using the products. All recognised that close links ought to exist between curriculum development and related in-service training of teachers. Some developers, however, felt under pressure from the MEP to produce all materials quickly. This proved irritating to them; they felt that their professional and technical competence was being unfairly judged whenever they failed to meet deadlines to which they had agreed under pressure but considered unrealistic.

3.2.4 A major difficulty for some of the centres was obtaining financial approval from various partners and sponsors in good time for development proposals to be implemented. It often took too long for a project to gain approval. One effect of this was that it was difficult to find staff willing to join a project if the funding was uncertain, especially since there were many other jobs available for those with expertise in IT where these irritations did not apply.

National Primary Project

3.2.5 The setting up of MEP's National Primary Project (NPP) team was appropriate and timely. Its task was to prepare and introduce in-service training packs for local authority use and for lecturers engaged in in-service teacher training. The Project team consisted of a director and two assistant directors. Initially there was secretarial support but no technical assistance. The team worked under great difficulties to service their own needs by programming, writing and distributing materials, and by organising courses for the trainers.

3.2.6 By the end of the first year, part-time programming and technical support was added. Changes in the original team of two assistant directors presented problems of continuity of approach and planning. Nevertheless, a great deal was achieved in a very short time, and this was due entirely to the tenacity and professional approach of the Director and staff.

3.2.7 It was not intended that the team should deal directly with teachers unless they had been designated by their LEAs as teacher trainers. The materials produced by the project were addressed in the first place to advisers and trainers, whose commitment to the use of IT was uncertain. Much of the material was expected to "cascade" down into class use through LEAs' use of the training packs. Training packs for language, mathematics, topic work, problem solving, teacher training and for work with infants were sent to all LEAs and teacher training establishments. In addition, a series of courses took place as preparation for using the packs. Each pack contained examples of programs (many of which could be copied freely), overhead projector transparencies, relevant reading matter and notes on its use. Three videotapes were also produced which could be used for discussion and which illustrated good practice. Both the packs and the courses introducing them to advisory teachers were of good quality and well received.

3.2.8 The message from the NPP was a clear one: the computer should to be seen as a resource like any other. Its use must be integrated into good primary practice. This message reached many primary teachers, even when they had not seen MEP's materials or heard of the NPP.

Other Major Development Projects

3.2.9 The Electronics and Control Technology Domain (ECT) promoted new thinking about aspects of school technology. After an impressive exhibition of school work held in Birmingham in 1984 MEP established two technology centres, one at Salford University and one jointly funded by MEP and Sunderland LEA. Both centres built upon successful curriculum development activities undertaken earlier in the Programme. The two centres rapidly established themselves as expert at developing materials for microelectronics. A network of teachers and advisers was involved in the early trials of materials in each of the two regions, and this was then extended to national trials. Curriculum development and in-service training were thus intertwined.

3.2.10 The two centres produced a number of highly original packages for microelectronics control and the collection of scientific data via sensors. Some of the packages were aimed at extending the capabilities of existing hardware, such as the Versatile Electronic Laboratory Aid (VELA), an early MEP funded piece of laboratory equipment, which initially had been offered to schools at a subsidised rate in a DTI initiative but with little supporting material.

3.2.11 The Technology Unit of the Music Education Centre at Reading University was established in 1984, funded by MEP. This was active nationally in producing documentation, providing INSET and linking numerous organisations. Two packs of software, one for primary and one for secondary schools were completed and, from the limited evidence available at the end of the Programme, these showed promise. In the primary pack, efforts were made to create exercises which demanded a musical response from pupils, but the limitations of the sound produced by the micro on its own were clearly exposed. The secondary pack offered a much wider scope of activity and gave pupils the opportunity to explore other sound sources with which to create music. The unit helped schools to realise the educational potential of the new technology, and in particular to explore the compositional characteristics of the various systems.

Small Regional Curriculum Development Projects

3.2.12 Individuals or groups of teachers were encouraged to submit ideas for development to their local MEP regional centres. Fairly small, low-cost projects (up to £1000) could be funded directly from regional centre funds. This provided enthusiasts with opportunities to put ideas into effect quickly, to make these available to like-minded colleagues, and sometimes to provide a starting point for larger and more significant projects for the region.

Larger Regional Curriculum Development Projects

3.2.13 More substantial regional curriculum and materials development proposals were considered by a national "Curriculum Development Committee". This committee was usually chaired by a deputy director, and its membership included the head of MEP's software unit, the technical manager, a curriculum development officer, a curriculum development officer seconded from the Schools Curriculum Development Council (SCDC) and an HMI observer. During the final two years of the Programme two regional directors joined the committee as observers. RICs sent in bids for development projects to the chairman. He would seek the opinion of external referees and consult committee members at a monthly meeting. The

quality and presentation of bids varied greatly. Some regional centres were thorough in vetting and refining proposals; others were less so. As the Programme ran into its fourth and subsequent years and the proposers of projects gained experience, there was a marked improvement in the presentation and general thoughtfulness of many development proposals and the committee gained experience in discriminating between bids. In 1984 the chairman issued guidance on the submission of such regional project proposals.

3.2.14 Much time and effort were given to considering regional proposals. Where necessary extensive consultation with and visits to proposers were undertaken by members of the Curriculum Development Committee. These visits were aimed at clarifying objectives and improving the quality of likely outcomes and avoiding excessive overlap with other projects. Initially there had been considerable criticism of the workings of the committee from some quarters, particularly from those RICs which had a number of their proposals rejected. With the introduction of published criteria and the representation of RIC directors on the Curriculum Development Committee most of the criticisms abated.

Regional Project Management and Monitoring

3.2.15 Until the last year of the Programme, the Curriculum Development Committee had no formal mechanism for monitoring the progress and assessing the quality of a project - or even ascertaining if the work paid for had been carried out to specification. Many early projects did not have a local management committee. A number of projects experienced difficulties - sometimes because of unforeseen problems which arose in program coding, non-availability of the appropriate hardware or the low acceptability of materials in trial schools. It was not unusual for estimated completion times to be exceeded, as enthusiastic teachers attempted to fit more and increasingly complex materials into their projects. Late approval granted to some projects resulted in late starts, when staff who had been expected to be available to work on a project became unavailable.

3.2.16 In consequence, while many useful projects were completed in the regions, a number failed to produce any useable product. Various efforts were made at both regional and national level to salvage items of worth, with the MEP's software unit providing help with some of the programming problems. Fortunately, the need for closer monitoring of projects was recognised and a group with this function was established in 1985. This, together with useful documentation from MEP's Software Unit on project management, helped in the establishment of realistic targets and project management guidelines. This support and monitoring should have been available much earlier.

A Case Study of the Regional Project

3.2.17 The aim of one particular project was to consider the solving of problems and investigations in primary schools, using microcomputers as a resource. Much of the support came through the work of the project's steering committee. Apart from MEP staff the steering committee included representatives from LEAs, local teacher education establishments and a professor whose particular interest was in children's ability to solve problems. HMI assessors attended sessions, when teachers were observed using some of the programs with a selected group of pupils.

3.2.18 Much time was spent in steering committee meetings discussing the content and the problems which the project team themselves had to solve in translating their ideas into software and supporting documentation. The outlet through which the materials would be distributed on completion also exercised the minds of those involved. Publishing for the home market through a commercial company was planned. The project team felt under obligation to produce the software and documentation to deadlines and this precluded adequate trials. It was thus difficult for the team, and HMI, to assess the value of the programs and associated materials in the classroom. Although some of the software was self-explanatory, much of it was sophisicated and broke new ground in the type of problem set. As evidenced by the assessment session, much careful in-service training was needed if the new materials were to be used effectively.

3.2.19 The project represented work at a high academic level and showed the commitment of a small, talented team to producing materials of quality, using new technology and new approaches to learning. Unfortunately, there was a lack of time and resources for the team to complete all tasks originally planned and to carry out a full analysis of the effects on teachers and pupils of this approach to problem solving. Until six months before the end of the project those concerned worked on a part-time basis. No doubt many teachers might place the materials produced low in their priorities for class use, but some of this work eventually formed a useful part of a pack on problem solving issued by the National Primary Project.

Curriculum Development by SEMERCs

3.2.20 Schools for pupils with special educational needs (SEN) generally took up IT as a tool for learning later than other schools. Use of IT as an aid to those with physical or communication handicaps was also patchy. To counter this the SEMERCs spent time organising exhibitions; running a large number of introductory and awareness courses; and giving talks in teachers' centres and individual schools. This early training was most useful but led subsequently to demands which outstripped each SEMERC's capacity for quick and sustained response. Responding to this demand also slowed down the development of new courseware and the adaptation of materials which had been developed for mainstream schools but which might also have been suitable for some pupils with special educational needs. A co-ordinated development programme for pupils with special educationsl needs was not easy to formulate and sustain. In addition, LEAs varied in their ability to utilise the information and the range of ideas, resources and technical support provided by the centres. In several LEAs the only take up of IT for pupils with special educational needs was by individual teachers and specific schools, supported largely by whatever informal help the local SEMERC was able to sustain. Other LEAs had enthusiasts they could call on for INSET help who had expertise in the field of SEN and IT, and could integrate some use of IT into mainstream schools too. Given this pattern, and the wide geographical coverage expected of each SEMERC, the quality of curriculum development promoted was understandably uneven, despite impressive enthusiasm and hard work from SEMERC personnel.

Conclusion

3.2.21 The MEP played a crucial role in facilitating curriculum development. It funded major national bodies to undertake projects and co-operated with a variety of firms and agencies to develop a vast and varied range of materials for teachers, learners and teacher trainers. Furthermore, by reacting positively to local initiatives in the 14 regions, and encouraging individuals with

interesting ideas on learning through handling information and practical application of microelectronics and computers it helped to spread the processes of curriculum development and to promote serious discussion about the place of information technology in schools.

3.2.22 As the Programme drew to a close it became evident that a large range of helpful materials for teachers and learners had been produced in the UK. Many of the items produced were of excellent quality. They included not only software, hardware and teaching materials, but also written case studies of good classroom practice, and videofilms showing helpful teaching environments and approaches. Support materials had been produced with MEP's funds for specific items of software, not necessarily originated by the MEP. Hardware and specific subject information packs and videos were also developed with the help of MEP personnel or by individuals employed as a result of direct financial sponsorship.

3.2.23 Many proposals from individuals and groups were supported by the MEP and funded as regional or national projects. The resulting materials were usually put to the test in schools or colleges before being offered to publishers and hardware suppliers, though not all such tests were as thoroughly conducted and evaluated as they might have been. Alongside some products of outstanding quality, there was also much that was indifferent, wasteful and which duplicated other development effort. Many funded developments were never satisfactorily completed; nor were all those which were of value to teachers and trainers. Management of the development projects and monitoring of their progress proved a formidable problem both for some of those commissioned to undertake development work and those who were funding it. Procedures for monitoring and evaluating educational product development were not well developed.

3.2.24 The early policy of allowing many people, especially enthusiastic teachers, to produce a lot of hardware and software items of relatively modest quality succeeded in overcoming a short-term need for materials. It also provided useful in-service training for those involved in the development. However, it may have prevented concentration of effort on better products in the early and intermediate stages of the Programme, which did not have an effective strategy for developing materials in response to thorough analyses of the needs of many curricular areas. Exceptions to this were the National Primary Project and, to a lesser extent, the ECT Domain's Technology Centres. The enthusiastic response of MEP staff to developmental opportunities and ideas encouraged much fruitful, if sometimes undirected, experimentation and contributed to the increased confidence and competence of many teachers with the new technology.

3.3 DISSEMINATING INFORMATION AND MATERIALS

Scale of the Task of Dissemination

3.3.1 In the Programme's five years of operation a rapidly growing volume of materials and training activities needed to be brought to the notice of a busy and hard-pressed teaching and teacher training profession. The principal, though by no means sole, vehicles for disseminating information and materials were to be the RICs and the SEMERCs with their associated training staff. General awareness of information technology and its impact on teaching and the school curriculum was in fact greatly enhanced through MEP's activities. The quality and penetration of MEP's information have, however, been uneven in the various domains and the various regions in the country.

Nature of the Regional Information Centres

3.3.2 Most teachers and advisers who made contact with MEP did so via the RICs and their regional co-ordinators of teacher training or via the SEMERCs. Where a centre was well-integrated into a regional setting it brought together regional expertise, spreading it around the region and contributing to in-service training, as well as to the dissemination of teaching materials and ideas. It was particularly helpful to RICs and SEMERCs to share premises with an establishment of higher or further education, whose technical or educational expertise could be made available informally. Some RICs were hives of activity for many hours of the day and often until late at night. They or their outposts were centres to which teachers came to browse through well displayed and catalogued resource materials; to run unfamiliar software; and to acquaint themselves with new hardware and curriculum trends.

3.3.3 Other RICs were less well found and not always responsive to local needs. Some were geographically badly sited and some were uninviting in appearance. A few were not always open after 5.00pm, so reducing their value to teachers who had to travel to get there, usually after school ended. The use made of the RIC by teachers, lecturers and casual visitors largely depended on the character of its director and staff. Those RICs which inspired confidence by the quality of service they gave; were entrepreneurial in the way they produced and disseminated materials; and attracted teachers, librarians and lecturers. These centres had comprehensive displays of resources, attractive meeting rooms and helpful staff. The good display of catalogued hardware and software at the four SEMERCs and the friendly written tone of their information leaflets also attracted browsers.

RICs Complementing LEA Support for IT

3.3.4 Some RICs fulfilled a useful role in those LEAs which felt it necessary to standardise on just one type of microcomputer for their schools. The RICs had staff from different LEAs in the region who often possessed expertise related to more than one type of computer and its associated software. Schools which had acquired micros which were different from those supported by their local authority were sometimes able to draw on this wider expertise at the RICs. For schools in at least one LEA the only source of mandatory training in the use of a DTI-subsidised computer, which was not recommended by that LEA, was the nearby RIC. Some schools reported organising special visits for one or more members of staff to a SEMERC to compensate for the lack of information on IT in special education within their LEA. Again, where access to a RIC proved to be difficult and more schools needed to be reached, a RIC director might decide to tour the region with equipment and materials mounted in a bus. Some RICs' courses were thus delivered to schools as a "Roadshow".

Means of Distributing Information

3.3.5 Various means were used to make information available to teachers and LEA advisers. RICs published general newsletters and information sheets on particular items of hardware and software. They also published course leaflets and catalogues of available materials. Video tapes, as a basis for in-service training and staff discussion, were available on loan from RICs. In the final eighteen months of the Programme some RICs experimented with the distribution of information using electronic means, but most schools did not possess the hardware required to make full use of such systems, and telephone costs associated with this form of access were considered by many to be too high. Two RICs found that the rate of access was only two or three calls per day.

3.3.6 Concern about possible infringements of copyright militated against the distribution "on approval" of some items of unprotected software to schools. Unlike their practice of sending teachers inspection copies of books, some publishers were unwilling to let software leave their stores until it had been paid for. The RICs along with many LEA teachers' centres often negotiated the acquisition of inspection copies of software. There it was possible to browse through software and even to borrow items for trial, or for use in in-service training courses. In one case borrowing had to be curtailed because unauthorised copying and infringement of copyright had taken place.

Software Reviews

3.3.7 In one RIC a project was started to undertake a systematic review of available software and to provide a catalogue with details and prices for each item in addition to comments provided by the teachers who had used them. This proved a useful if also a somewhat ambitious and costly exercise. While "review" information was clearly necessary for teachers to select items which suited them, much care was needed to ensure that such reviews were fair and balanced in judgement. The catalogues produced were not in fact widely distributed, although another RIC's reviews were available on electronic mail. This project, and others like it in various LEAs' educational computing centres, may have been useful to those who participated in the review process itself. It also underlined the importance and difficulty of keeping software reviews up-to-date. In the final analysis, the advice most often sought, which reviews alone could not provide, was that which was, and needed to be tailored to the requirements of a particular teacher and class.

Reaching the Schools

3.3.8 Unfortunately, information from the RICs did not always reach all the schools in a region. The expense of circulating information directly to schools was considerable. Even if it reached a school, there was little that could be done to ensure that the various components of an information pack would actually reach appropriate members of staff. Often RICs did not send mail to schools directly on a regular basis but instead sent the information to LEA advisers for distribution. It was not uncommon for there to be a delay before schools obtained such information, particularly when the LEA adviser was too busy to distribute it. In the case of teaching materials, the advisers sometimes believed that schools should obtain them only after appropriate in-service training, or that the LEA's own materials or courses were superior to those distributed or advertised by the MEP. Thus some items did not reach schools. Some RICs and LEAs, however, worked well together and ensured the speedy distribution of materials and information. Several RICs could take justifiable

pride in the professionalism with which their information was displayed, produced and disseminated. The standard of presentation and content of the MEP's and LEAs' educational computing centres' output improved greatly in the course of the Programme's lifetime. It was unfortunate, therefore, that some of MEP's publications, which could have been particularly helpful to teachers, curriculum developers and trainers, were priced far too highly. Examples of pamphlets containing under 100 pages of good sense costing £6.50 or more were not uncommon and meant that they were almost never seen in schools, and only rarely in colleges.

Duplication of Publishing Effort

3.3.9 There were unfortunately instances of unnecessary duplication of effort in producing literature and support materials. Many RIC newsletters contained similar articles and software catalogues. Some showed evidence that they had been processed again and again in various regional centres. With hindsight it might have been better to have produced one national newsletter with articles that would be of interest to a wider readership than that of one single region. The one page publicity that appeared each week in the Times Educational Supplement during the last year of the Programme partially met this need for dissemination of information and experience on a national scale.

Conclusion

3.3.10 A stronger central information gathering and distribution function could have spared the RICs much duplication of effort. Greater and earlier use of established channels of communication, such as newspapers and professional journals, instead of the policy of developing new channels and publications might have better served the Programme and enhanced its "visibility".

3.3.11 The quality of information and ideas provided by the MEP improved during the life of the Programme. An attractive catalogue of MEP-subsidised software and hardware was finally published in 1984. In 1985 a stream of welcome and much needed secondary school software catalogues appeared, related to various curriculum subjects. These were of variable quality and provided bald information on the programs available and their characteristics but embodied little wisdom on how to use them effectively. In 1985 there was a further attempt to publicise good classroom practice in the form of a series of "Reports from the Classroom". This series attempted, late in the day, to address a major need: to see the role of the new technology through the eyes of the uncommitted classroom teacher and assess the likely contribution which IT was observed to be making to learning in ordinary lessons.

CHAPTER 4: THE WORK OF MEP: EFFECTS IN SCHOOLS

4.1 RESOURCES IN PRIMARY AND SECONDARY EDUCATION

Range of Resources

4.1.1 By the end of the MEP there was some equipment and software of relevance to the work of most age groups and in most subjects, though not perhaps for all abilities. Some of MEP's products were published commercially, but many more were designated as 'blue files', which indicated that they could be copied free of charge. These usually had limited documentation.

4.1.2 An advantage of MEP's commercially published products was that they were slightly cheaper than some other published products which were not so funded. A disadvantage was that some of these were copy-protected and often, once purchased, were not easily transferable to upgraded equipment, for instance to networked microcomputers which used a central filing system. Not all MEP's products were available for every make of micro purchased by schools with the DTI's help.

4.1.3 The most frequently used and valuable items in primary schools were content free programs, which allowed teachers and pupils to enter and manipulate data in the form of text, codes or numbers. Packages which provided word processing combined with colour graphics and data handling applications were popular and easy to master.

4.1.4 Some packs of materials, developed by MEP's domains, the NPP and the SEMERCs or RICs as part of the INSET programme for teachers were often appropriate or adaptable for classroom use with children. Indeed, the multi-media packs were generally well received by teachers for that very reason, and were adopted for use more readily than other more scantily documented software programs.

Teacher Awareness of MEP Products

4.1.5 For most of the life of the Programme teachers in secondary schools were not usually aware of the range of materials available to them from the MEP. The situation improved considerably in the last six months of the Programme.

However, where teachers did know of the materials they usually commented favourably on them. There was much duplication of effort, with teachers attempting to write programs and prepare courses when good teaching materials already existed. This was in contrast to the situation in most primary schools, where at least the MICROPRIMER pack was well known, even through other MEP primary materials were not.

4.1.6 Some schools which participated in trial and evaluation of materials were helped by the loan or gift of hardware. This incentive was sometimes instrumental in a school becoming much more involved in IT-related activity. One such school, for instance, was equipped by the MEP so that it could be used as a centre for regional training. There were anxieties in the school when it seemed likely that the MEP would have to withdraw items for use elsewhere. On that occasion the LEA stepped in and made good the loss. Only very few schools were fortunate enough to become foci for MEP's regional developmental and training activities.

4.1.7 In secondary schools, subject departments were usually looking for software with specific subject application. The number of software titles relevant to or affordable by a subject department, was not usually large. This, together with the small number of computers in schools and the problems encountered in gaining easy access to those that had been acquired, tended to make teachers reluctant to use the new technologies in their class teaching. Some teachers had experienced difficulties with early software and hardware which did not function well or fulfil their expectations. This sometimes discouraged them from using IT materials on subsequent occasions.

Resource Inequalities Between Schools

4.1.8 The advent of TVEI, with its considerable expenditure on IT resources, resulted in the increased incidence and use of MEP resources in some schools. In other (sometimes adjacent) schools, financial constraints, or the identification of other priorities for spending limited the schools' ability to purchase IT materials. There were many examples of teachers writing and developing their own materials in their own time because the school could not afford to purchase an equivalent item at commercial rates. Even when the cost of teacher-time and the reduced quality of product were taken into account, many staff felt they had little alternative but to reprogram certain commercial materials from scratch in schools and LEA centres to avoid expenditure of hard cash on obtaining multiple copies. The documentation produced was often inferior to that of the original product, although sometimes it was more closely tailored to local needs. In some cases, suppliers countered this trend by offering imaginative licensing arrangements, whereby LEAs purchased the right to reproduce copyright materials.

Examples of particular applications

4.1.9 The Microelectronics For All (MFA) equipment was generally highly regarded. Teachers and schools who had seen and used it often indicated that units of the equipment would have been purchased if sufficient funds had been available. The comprehensive support documentation was invaluable and enabled those teachers with little previous relevant experience to become involved and teach the course successfully. Similarly, the EDWORD package which was developed to support the teaching of word processing, was well supported and documented and enthusiastically received by pupils and teachers. Some local viewdata and text/graphics packages were also used successfully. A number of projects aimed at developing materials to introduce primary school children to computer control. These helped pupils to extend their practical designing-and-making activities. In one primary school pupils followed a BBC/MEP course on electronics and then used their new knowledge and skills to design and build a highly successful working model of a 'robot-room' for a bedridden person.

4.1.10 Unfortunately, and in marked contrast to the above, the output from some large material-development projects appeared to have had inadequate trials in schools. The quality of such products was often indifferent and did not stimulate good use.

Conclusions

4.1.11 Despite considerable development and marketing activity the overwhelming impression is of a lack of awareness in the teaching profession of the wide range of resources available through the MEP. In some cases this was because of poor information flow from the MEP, publishers and LEAs. In others the mechanisms used for distribution did not function well. Sometimes LEAs

had taken MEP materials and distributed them to schools, occasionally with minor changes, the recipients being unaware of the original source. Indeed it was often extremely difficult to determine from schools and teachers the source of some software in use. There is no doubt, however, that where MEP materials were known and used their impact on primary and secondary schools was beneficial.

4.2 WORK SEEN

The following sections describe the work of pupils seen in schools. The effects of the MEP activity on learning style, development of pupil skills and knowledge gained are considered. Since IT activities were introduced into secondary schools before primary schools they are dealt with first. The work in special education forms the third section.

LEARNING STYLES - SECONDARY SCHOOLS

4.2.1 There was evidence that, with experience, the use of microelectronic devices in the classroom changed teaching and learning styles. There were many examples where computer programs were used as an electronic blackboard calling for only passive involvement by pupils, or of pupils using programs that required only repetitious practice of simple techniques. At the same time there was some evidence that, with greater familiarity with computer based learning, teachers tended to abandon these types of program in favour of more open-ended materials which encouraged pupils to speculate and to explore ideas. By the end of the survey there was a greater incidence of this of use of software. MEP staff and LEA advisers felt that the time taken for these newer approaches to be accepted in schools was often underestimated. For example, in mathematics, 'drill and practice' programs were often seen in use during the early stages of the survey. The novelty of initial computer use meant that pupils clearly enjoyed the repetitive exercises with immediate feedback from the program, allowing the activity to continue with minimum teacher intervention. Experience with IT and clearly targeted in-service courses were needed before many teachers moved to more challenging programs. In home economics the most successful IT-related work was seen in departments which were already engaged in active curriculum development and where exploratory work and planning in the context of home making were already commonplace in lessons. Where the MFA materials were used it was usual to see teachers adopt an approach that encouraged pupils to explore problems for themselves.

4.2.2 While some of the changes noted in learning styles can be attributed to the use of MEP products on their own, where INSET was closely involved with the introduction of new materials there was a greater likelihood of change. There were examples of pupils teaching themselves to use programs, particularly where independent learning styles were already adopted. Packages like NEWSROOM encouraged the development of many worthwhile skills, requiring co-operative group work and the evaluation of evidence, for example. (This is a package which allows the computer and printer to simulate a teleprinter using 'newsflashes' created by the teacher in the context of an imaginary or real incident. Pupils have to assess and combine the various items into a news story, for newspaper, radio, teletext or television.) Where computers were used in music it became possible for pupils to experiment with composition and to listen to the outcomes of their efforts even though they had very limited skills of musical performance.

Classroom and Resource Management

4.2.3 In the early months of the MEP there were few microcomputers in schools

and this constraint, in itself, imposed a particular style of working. The increased provision of machines gave much more flexibility, with individual, group and whole class use becoming possible. Imaginative teachers in various subjects could clearly turn even limited software to good use. There were also examples of good software and other materials being poorly used because of poor management of time or equipment. Some teachers tried to provide practical work for a whole class by seating the entire class at a limited number of computers. In one case pupils were set to work in groups of six to a machine and this proved unsatisfactory, as many were clearly reduced to the role of observers. In another case, however, the limitation on the number of computers caused a teacher to organise a whole-class discussion around a single micro linked to a large monitor. The pupils were involved in discussing among themselves and with the teacher the information which was being entered into and requested from the micro. The pupils took turns in keying in the class decisions and requests. This was a difficult teaching situation but one which turned out to be successful in these particular circumstances.

4.2.4 In secondary schools, the acquisition of more computers did not necessarily lead to better use. Where, as so often was the case, all new equipment went into a computer room it was mainly used to support computer familiarisation and computer studies courses. Its influence in the school as a whole was then very slight. MEP identified this as a problem and attempted, by means of its INSET packages, courses and conferences, to encourage the use of IT in as many subject studies as possible. Despite this, many children came from primary schools with a reasonable degree of familiarity with computers, but had little opportunity to use this expertise and to develop the learning styles with IT which they had met in their primary schools.

4.2.5 In schools with pupils with special needs the more easily accessible the micro was within the classroom the more frequently it was used and the quicker was the teacher's appreciation of broader usage. It was significant that those schools which had several micros appeared to be more advanced in appraising their strategies of deployment than schools which had few machines. In schools with limited hardware the teachers often only used basic software which could be easily run and monitored. In both mainstream and special education even good materials could be misused. This happened where leadership and INSET in the use of IT were lacking. It also happened where teachers regarded work with computers as a reward for good behaviour, say, or as a discrete, unrelated time-filler in lessons rather than an integral part of planned learning and teaching.

Successful examples

4.2.6 The Microelectronics For All (MFA) course for secondary pupils was seen in a number of schools (by the end of the Programme one fifth of secondary schools in the country had a class set of this equipment). Pupils were frequently seen enthusiatically discussing the set tasks in small groups, suggesting and trying various solutions - they delighted in making things work. In one school it was noted that all the pupils involved were motivated to work hard for well over an hour. They displayed a sound understanding of the principles involved; could offer extended responses to questions; demonstrate a range of solutions, discuss their relative merits; and compare results. Similar skills were also noted with other microelectronics control technology equipment in a girls' school. However, although the associated teacher INSET materials stressed the importance of this problem solving approach and of applying the concepts to relevant industrial and domestic examples, a number of classes were observed to work through the material in a pedestrian way, preoccupied with routine writing tasks rather than the exploration of control techniques.

4.2.7 One MEP mathematics project was designed to develop short computer programs which could be written by pupils to support their own learning of mathematics. For instance, at one secondary school a fourth year mixed ability class was working in a computer base with two or three pupils to a terminal. They typed in a 10 line program that had been designed by the teacher which, when run, produced a geometrical pattern. By altering the various parameters pupils had to establish the connection with the changed geometrical shapes. Pupils of all abilities worked hard and profitably for the whole of a double period during which they were engaged in useful dialogue and investigation. At another school a similar strategy was adopted with a group of sixth form mathematicians who were engaged on a study of differential equations. Although the programming expertise of the pupils was limited they soon grasped the elementary coding and benefited greatly from new insights into the mathematics which this process and its results provided. Moreover, motivated by the computing facility and the teaching approach, these pupils were soon experimenting with ideas well beyond the starting points suggested by the teacher.

4.2.8 EDWORD, SMILE, LOGO support materials, the BUGGY and other MEP funded products were specifically designed to support the teacher in developing problem solving and other exploratory skills based on first hand experience and investigatory learning styles. These products were usually seen being well used and were popular.

LEARNING STYLES - PRIMARY SCHOOLS

The importance of experience

4.2.9 A relatively small number of the schools visited were 'experienced' users of computers, and the majority were within 12 to 18 months of receiving their machines. In numerous cases pupils were further advanced than their teachers in using the computer because of the growth in sales on the home market. Most of the examples of teachers' early attempts to use IT within their lessons followed a pattern of pupil familiarisation with the operation of the equipment and with individuals or small groups working through a program which the whole class would eventually complete. The software was often not relevant to other class work, though drill and practice programs related to mathematics or language activities were frequently popular and considered by staff as 'safe activities'.

4.2.10 The management of the computer, not only within the classroom but in the school as a whole, still had to be considered seriously by many schools. The MEP had an influence indirectly through its involvement at different levels of INSET and there was a number of publications in which the Programme gave advice through case studies. There was a clear indication that MEP's National Primary Project was firmly committed to encouraging the use of the computer as a support for good primary practice throughout the school, rather than as an object of study in itself.

IT and teaching style

4.2.11 Where teachers were confident in using both hardware and software, encouraging and exciting uses were identified. There was increasing evidence of change in traditional styles of teaching and learning. For example, by using word-processors some children became more confident in their writing; similarly the gathering and sorting of complicated information was found to be within the

scope of young primary age pupils. Both EDWORD and FACTFILE are examples of such MEP funded programs which were successfully used. Reference is made elsewhere in this report to these examples. When 6 or 7 year old children were seen using the MICROWRITER (or QUINKEY)*, as part of a MEP supported project, they typically perserved for over an hour on a writing task; were motivated to work in groups; began to use more punctuation than previously and showed some improvement in spelling. Likewise, when children were using computer adventure games there were many examples of good co-operative activity; extended concentration; and a greater willingness to explore ideas than might normally be expected. This good practice was usually seen where the class teacher was already an exponent of co-operative group work. There was also some evidence that good programs supported by good INSET encouraged teachers to venture into, what was for them, a new style of working.

SKILLS - SECONDARY SCHOOLS

Communication skills

4.2.12 Communication skills - both literary and oral - were often increased as a result of discussion and small group work fostered by some CBL programs. The best of these required pupils to work in groups, often referring to other information sources. Adventure games were useful in this context and some database problems were seen being thoughtfully discussed by less able pupils. However, this sort of activity was less frequently noted in secondary than in primary schools. Where schools were beginning to use word-processing there was evidence of children writing more - one boy who had previously never written more than 40 words constructed a 400 word story - and, more importantly, to a higher standard than previously. The program NEWSROOM (paragraph 4.2.2) encouraged a whole range of communication skills. During one lesson, organised for a year group of 11 year olds, the community policeman and another non-teacher adult were involved to provide reality and interviewing experience. The pupils discussed the newsflashes as they appeared; assessed the validity of the source before deciding on head-lines; and composed the 'story'. They were highly motivated, most showed sustained concentration and much of the language work was of good quality.

Observational skills

4.2.13 Observational, deductive and predictive skills were often improved where pupils were using database programs to record and analyse observations - in environmental studies and some science lessons for example. In one school the information gained from a field study trip was classified and entered as a file in a database program. Pupils then searched for patterns and relationships using the program to test hypotheses.

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* The MICROWRITER is a small hand-held text generator with only six keys, used in place of the QWERTY keyboard. A subsequent and much cheaper development for educational use has been the QUINKEY keyboard, which can only be used with a computer and VDU. It is sold in sets of four which are linked to a single micro. Typically, children work in groups of four at a time using one keyboard each.

Study skills

4.2.14 Few teachers realised the extent to which pupils could improve their study skills through using the computer. Material for handling information was produced by the CAIS domain for use by both teachers and pupils. The MEP and others claimed that the power of the microcomputer could be used to help children acquire facility in manipulating and interpreting information. There was limited evidence to support this contention, although there was an increasing awareness among teachers of what might be possible given suitable resources and experience in various subject studies and school libraries. If pupils could call up information services and gather knowledge and information for themselves, this could, it was suggested, change pupils' and teachers' outlooks on these resources. The paucity and high cost of telephone links and the lack of access to suitable databases together with inexperience on the part of teachers, were all obstacles to development. It should also be remembered that the proper use of IT in this context represented a radical change in traditional practices of information handling in schools. Where good examples of organising and interpreting information were observed, they provided pupils with insights which transcended a particular area or subject of study.

Problem solving skills

4.2.15 Many MEP products could encourage problem solving skills in areas of the curriculum such as mathematics, science, computer studies, electronics and technology. Except in some mathematics classrooms, few secondary subject classes aimed at developing these abilities with the help of MEP's CBL materials. In computer studies, however, the increase in the number of machines available resulted in more programming and some excellent problem solving tasks being undertaken by pupils. These skills were also fostered by courses, such as MFA, where pupils were encouraged to use a 'systems approach' to solving technological control problems. This involved consideration being given to the function of a complete unit, rather than the detailed examination of its components and construction. This approach seemed to increase the level of interest of girls who appeared to find a 'component approach' uninteresting.

Creativity and imagination

4.2.16 Creativity and imagination were encouraged through the use of MEP LOGO materials and a number of other MEP products. For example, in one special school pupils worked in groups on a demanding task in which they created an animated cartoon set to music. This generated great interest and stimulated enthusiasm and sustained effort. In other schools, computer materials encouraged speculative skills in mathematics. Although there were examples of creative uses of the new technology in art, design and music, these were rare and generally at an embryonic stage. Some teachers felt that new technology equipment in these fields allowed pupils to compose and experiment with ideas, uninhibited by their own lack of drawing, painting or musical performance skills. EDFAX and similar programs that allowed pupils to generate teletext-type graphics motivated some pupils who had seldom shown interest in art. Using music packages, groups of pupils worked for long periods of time composing pieces and devising sequential patterns.

Personal and social skills

4.2.17 For some pupils personal and social skills developed and self-esteem was improved as a result of success in using the new technology. Where pupils were using IT they were often more readily able to discuss issues with adults. In

many cases teachers saw their classroom roles changing and appeared to be moving with their pupils towards a situation where expertise and problem solving were shared. Group work was more evident in such situations, although examples of pupils becoming isolated with computers were mentioned by teachers. Boys often tended to dominate girls when groups were using computers unless the teacher took care to guard against this. A number of schools had instituted 'girls only' days for their computer clubs as a strategy to overcome the problem. These and other 'equal opportunities' strategies were encouraged by the EOC project based in one LEA.

4.2.18 In nearly every case pupils handled expensive equipment with care and respect. There was only one case of deliberate misuse noted during the survey, although there were several examples of theft.

SKILLS - PRIMARY SCHOOLS

Communication skills

4.2.19 Many of the points raised in the above section on secondary schools also applied to the primary sector. Teachers suggested that the whole range of communication skills - talking, listening, reading and writing - were extended through using computers and there was some evidence to support these claims. Discussion was an essential part of many programs where decision making was required, for example in simulations, or when using LOGO. Although the level of discussion varied, it was often the case that normally quiet or reticent children contributed on equal terms with their more vocal peers. There were other examples of improved performance in writing and in reading, when sustained effort produced work of improved quantity and quality. Children using MICROWRITERs (paragraph 4.2.11) to checked and corrected their own and each other's work and pupils' hand written work was also said to have improved. Unfortunately not all schools with computers possessed printers. This limited the value of word processing programs since pupils were unable to obtain a paper copy of what they had produced. To counter this some RICs encouraged some schools by loaning them printers. In one school two 9-year old boys were using EDWORD to revise a piece of writing which they had done jointly the previous day. The passage, which was about 600 words long, was intended for inclusion in a class newspaper. The quality of the discussion; the critical consideration of word choice; and the facility with which they used the word processor to try different arrangements were all high.

Problem solving skills

4.2.20 Although in the best practice primary school children have long been involved with problem solving as a learning strategy, the use of computers and the related technology offered opportunities for more specific problem solving skills to be used. Prediction, deciding on a strategy, and reflecting on and discussing results, were some of the skills noted. Projects which encouraged a logical approach to solving problems had the support of MEP. This support came not only through the in-service packs but also through the production of related materials and software including simulations, LOGO and, the use of a computer to control models. In one school a group of infants were using a floor turtle (see 3.1.3) so that each had a different job. They worked as a team and then changed jobs. Their tasks introduced them to the mathematical concepts of estimation and measurement. In another school, a class of 4th year pupils demonstrated programs they had produced in LOGO to illustrate their own written stories about a chase across a roof. They used concepts of distance and time in order to program sprites (small symbols made to move around the computer screen).

Creativity

4.2.21 Certain MEP packages promoted a range of creative abilities when well implemented by the teacher. They encouraged pupils to be creative and imaginative in their use of language in written work, and also in mathematics. Many schools had yet to move away from practising basic skills, but the NPP tried to encourage a more open approach.

Personal and Social Skills

4.2.22 Many children seemed to acquire more confidence through using the computer. Teachers frequently quoted examples of those who had lacked confidence socially or who had previously found it difficult to write, read and take part in activities on equal terms with their peers, becoming more confident as a result of using IT in their learning. In one school a boy became the recognised expert on the making and control of a vehicle and, at the same time, had become interested in recording his work using a word-processor. Although of below average attainment, his written work had increased from two or three badly written lines, to a sustained piece of writing which, when printed, compared favourably with that of more able class-mates.

4.2.23 Although the MEP cannot claim sole responsibility for such positive aspects, a contribution has nevertheless, been made through the enthusiastic approach of those involved and the high quality of some of the materials produced.

KNOWLEDGE AND UNDERSTANDING - SECONDARY SCHOOLS

4.2.24 There was evidence that the use of some computer programs, many of them not necessarily funded by MEP, helped pupils to gain knowledge and understand ideas more easily. Pupils' learning was enhanced because they were able to manipulate data and text at first hand; teach themselves from handbooks; or present their solutions to problems in novel ways. There were good, but rare, examples seen in several subjects in the curriculum. In some home economics for example, pupils were able to apply newly gained knowledge about diet to planning specific meals, and in physics simulation programs made concepts such as wave motion more comprehensible. In control technology, a systems approach enabled pupils to visualise situations more clearly and to apply technological concepts to solving real problems. In mathematics, programs were observed which had been designed to enable pupils to understand ideas and concepts which would normally be very difficult, for most pupils without a computer. However, lessons were also seen where pupils might have gained a better understanding of concepts without the use of a computer.

KNOWLEDGE AND UNDERSTANDING - PRIMARY SCHOOLS

4.2.25 By combining the use of the computer with first hand experiences and other resources as recommended by NPP, many schools had added a new dimension to their work through recording data, retrieving information and presenting results. Likewise the use of LOGO and the developments in control technology motivated children to tackle problems in new ways and often to set themselves the next task when one was finished. Teachers receptive to the INSET and curriculum initiatives emanating from the NPP used the computer to find ways of presenting work so that pupils acquired knowledge and understanding. A commercial program which simulated the finding and raising of a Tudor warship, the Mary Rose, was selected by the MEP Primary Project team as an example of a

simulation program that could be used to enhance topic work. This was observed being used in an INSET course and later followed-up in schools. The results were encouraging. In one class children had plotted their finds on three-dimensional grids; had gained a sound knowledge of the problems of working under the sea; and had researched the period in great detail. Their written work was lively and often established for the reader the excitement of diving or finding treasure, reflecting the computer simulation. Art work and model making added to the displays and illustrated the depth of study undertaken. In another school, in another region, work in mathematics, based on the same program, had included compass bearings, shape, co-ordinates and angles, these topics being reinforced by the computer work. Some children (having carefully researched the background) had recorded interviews pretending to be members of the crew. Although they were unable to visit the real Mary Rose, a visit was to be made to a ship built in the 1860s at Hartlepool; the teacher felt they knew so much about the Tudor ship that they would be able to make comparisons. In both schools the teachers and pupils were enthusiastic and deeply involved in the work.

WORK SEEN IN SPECIAL EDUCATION

Learning Styles

4.2.26 Much of the work seen in special education early in this survey indicated that microelectronic devices were used mainly as separate resources within the classroom, primarily in one to one teaching arrangements or small group work. Later observation revealed the tremendous strides made in the use of IT in special education over the most recent 18 months. Computers were being used much more and, in general, the range and content of programs was far better matched to pupils' need and abilities than in earlier years. The use of wordprocessing, adventure programs, information-processing programs and open-ended music programs was resulting in much better integration of IT work with normal teaching styles and syllabuses. This newer work provided a starting point for more significant overall curriculum usage, but much of the development rested on the expertise and enthusiasm of knowledgeable staff. For most teachers the major use of the micro remained that of skill and drill emphasis - using software of very variable quality. There is a need for sustained INSET at local level if more teachers are to follow the good lead set by the few.

Skills

4.2.27 In most schools visited the range of programs was not extensive and most that were available concentrated upon the development of English and mathematics skills. Most programs used animated visual aids and auditory reinforcement to engage the child in practising basic counting, sight words, the use of the four basic rules in mathematics, sentence construction, spelling, picture recognition and motor control. Several programs contained an authoring facility so that the actual words, numbers, or other items used could be changed by the teacher to suit better the needs and capabilities of a specific group of pupils. In only a few schools were such adaptations made but this appeared to be in part a consequence of the teachers' industrial action, and in part a lack of confidence in the teachers because of limited familiarity with the program facilities. Several schools expressed an intention to use such facilities as circumstances and developing expertise allowed.

4.2.28 The context in which such programs were used varied but in the majority of cases was unconnected with that which preceded or followed it. In some instances games were used to occupy children rather than to fulfil educational objectives.

4.2.29 In approximately one-fifth of the schools visited the teachers were making genuine attempts to evaluate the skills programs they were using. Several of these schools employed the software review forms provided by the SEMERCs, and the completed forms were catalogued for use by all members of the school staff. In one or two instances, the catalogue was available to teachers in other schools. This work appeared to be more prevalent in schools where there was already a continuing review of curriculum plans and implementation. The more advanced schools in curriculum and IT terms were using a disc-based system for program cataloguing and appraisal. Teachers made regular and successful use of such data where the program library and a viewing facility were readily available.

4.2.30 In some schools for the physically handicapped, and in a few schools catering for children with profound and multiple learning difficulties, experimental programs had been devised aimed at encouraging increased attention and the use of specific physical responses. The programs often motivated children with gross learning difficulties and allowed them to complete pictures, patterns or writing which they were not able to achieve if restricted to conventional learning materials and resources. Often teachers went to considerable lengths to ensure that work stations and input devices allowed the children to use these programs, but in very few instances was the child's response systematically recorded. Material of diagnostic significance was all too often ignored.

IT Awareness

4.2.31 In only one school of all those visited was there an attempt to teach the children about computers as well as to engage the pupils in computer assisted learning. The awareness program included looking into people's likes and dislikes of computers; the role of IT in the world of work and leisure; and construction using simple electronic kits aimed at helping the pupils to understand concepts related to the use of microelectronics and information technology.

Successful Work

4.2.32 Several areas of special education are absorbing the new technology at a rapid rate and showing considerable interest in the microcomputer as a tool enabling access to the curriculum of ordinary schools, and material wider than that which would be available to the pupil if IT were not used. In one school for the physically handicapped some pupils attended lessons in an ordinary school taking notes by using the Microwriter. These notes were later transcribed and edited on the main microcomputer and printed for future reference. In another situation instructional programs in biology and history were used to help the pupils prepare in advance for work to be encountered in ordinary classes. With some severely disabled youngsters Blissapple and Blissboard were used to enable them to create various kinds of message. MacApple and Micromike were also effectively to enhance communication.

4.2.33 Sophisticated software and hardware were used successfully with children with severe learning difficulties. For example, Micromate helped teachers to relay concepts of shape and size, colour match and early number discrimination. The COMPACT system appeared to help teachers effectively to stimulate early language development.

4.2.34 In schools for children with moderate learning difficulties, and in some remedial departments in secondary schools, programs from the Microspecial

pack, produced by the Scottish Microelectronics Education Development Programme, were effectively used to support theme or topic work from schemes of social education and health education.

CONCLUSION

4.2.35 During the period of this survey a clear, encouraging and accelerating improvement in both the quality and quantity of IT-related work in all types of schools was observed. Teacher awareness of MEP and other products and courses also increased. However, this needs to be seen against a background where the majority of pupils and teachers, particularly in secondary and special schools, rarely used microcomputers. Nevertheless, where teachers were using good software and appropriate support materials, especially if relevant in-service training had preceded this, there was evidence that pupils' skills and other learning were enhanced by the use of IT and that motivation and interest were often greatly improved as a result of using IT. The MEP has made an important and timely contribution in this respect, and in the latter part of the survey appeared to be having a useful impact also in special education.

CHAPTER 5: THE WORK OF MEP: IN-SERVICE TRAINING

5.1 OBSERVED MEP INSET

Courses visited

5.1.1 More than 30 INSET courses were visited. These were either organised by the MEP or staffed by them. The majority were of short duration lasting from 1 to 3 days. Week-long courses devoted to the dissemination of training packs and run by the National Primary Project (NPP) were also seen. Those observed of longest duration - about 150 hours - were RSA certificate courses staffed by MEP personnel and one MEP mathematics course. The courses visited provided a small but representative sample of those offered within the Programme.

Course Membership

5.1.2 Participants gave various reasons for applying to attend MEP courses. Sometimes it was for general professional development, sometimes because of the intention to introduce new equipment or new curriculum content into their school. On the longer term INSET it was common to find that most participants were holding positions of responsibility for the development of IT approaches but had lacked any significant training in IT. Some of these teachers had been strongly supported by their heads or LEA advisers in their application. In some of the longer courses there were pairs of participants from individual schools or LEAs, which gave hope of a useful collaborative strength in future.

5.1.3 There were some teachers who said that because their school funding was not of a level to permit the acquisition of the necessary equipment they would not be in a position to introduce the microelectronics approaches into their own school curriculum. There were also teachers attending courses whose own expertise already exceeded that which the course aimed to develop.

5.1.4 On occasions it was apparent that closer consultation between the MEP and LEAs about the aims of specific INSET was needed. Greater collaboration between the MEP and LEA advisers and heads about who should be released and what the outcome of course attendance should be, would also have ensured a better match between the provision and need.

5.1.5 The courses had been prepared with care and were in general appropriate to the needs of schools. Courses on the use of new equipment and software, however, were usually short and sufficient only for basic familiarisation. Follow-up to courses rarely received sufficient attention; it was not considered to be an appropriate use of MEP coordinators' time and LEAs often did not have adequate advisory teacher support to provide such follow-up.

Staffing

5.1.6 The knowledge and technical expertise of those involved in the delivery of the in-service courses - MEP personnel college lecturers, advisers and teachers -was often of a high order. In some cases lecturers and seminar leaders lacked first-hand classroom experience of IT. However, in other instances the need for this had been realised and appropriate expertise recruited for relevant parts of a course. Staff were able communicators. Many regional co-ordinators and INSET lecturers found it too time-consuming to visit schools in the early and intermediate years of the Programme, and this showed in the lack of sufficient critical evaluation of what pupils were likely to learn from some of the new materials.

5.1.7 Towards the end of the Programme a number of MEP personnel who had been active in MEP INSET obtained posts in colleges of education, thereby bringing to those institutions a valuable IT strength that could be used as they developed their own IT units within both initial teacher training and INSET.

Accommodation and resources

5.1.8 The quality of accommodation for courses varied. Some centres had the advantage of access to a range of RIC or college software, library and technical support facilities and provided good models for emulation by secondary schools. Others, however, were unattractive surplus rooms in schools or teachers' centres with poor furniture, inadequate storage space or make-shift electrical services.

5.1.9 For all the courses the availability of computers (sometimes linked in a network) and other hardware encouraged course members to work both individually and in small groups. Teething problems with computer networks, errors in new software and the lack of relevant commercially published MEP material sometimes detracted from what was otherwise valuable INSET. Large monitors and OHPs were generally available and supported good lecture presentations. Documentation was thorough and helpful, but there were instances - more so with short courses - where preliminary reading would have been beneficial. In only a minority of instances was illustrative classroom material - pupils' work, video tapes, slides and audiotapes - sufficiently available and well used. The Primary Project courses generally provided the better examples.

Mode of Attendance

5.1.10 The MEP short courses were usually based on a block release of participants for a period ranging from one to three days. This was acceptable for purposes of familiarisation. The provision of supply cover for absent teachers undergoing INSET varied from authority to authority but became an increasing problem towards the end of the Programme. Longer courses were based on one day a week secondment which permitted work -such as the evaluation of pupils' responses to software - to be done by course members in their own schools between sessions. This was a useful strategy which could have been used more frequently to good effect.

5.1.11 Not all MEP courses were based upon attendance through day-release. Many RICs ran evening workshops based on a series of related or discrete topics. At one such seminar/workshop over 20 teachers from three or four LEAs attended to hear about the latest developments in 16-bit microcomputers. The schools had not acquired any such micros but the teachers, most of whom taught computing in secondary schools, wanted to be briefed about the new machines and what they could do and the various facilities available. Four micros were presented in rotation to groups of four or five teachers and a summary discussion was then held with all four groups together. One LEA's criteria for purchasing 16-bit micros were revealed, but not discussed in depth. The evening was highly informative for the teachers, who had given two hours of their time on an unpleasant, snowy winter's evening.

Course Content and style

5.1.12 Courses usually, but by no means always, provided a variety of experiences that included lectures, demonstrations, practical work, small group and plenary discussions. Sometimes too much time was spent viewing software at the expense of analysing its use in the classroom. In most cases the active

participation of teachers was encouraged. On a few courses, however, particularly those of limited duration, there was excessive didactic presentation with associated passivity on the part of course members. Where the demonstrations were illustrated by pupils' work or accounts given of first hand classroom experience there were obvious benefits. Too often, however, these course ingredients were lacking.

5.1.13 Practical opportunities were invariably a strong and important feature of the INSET, enabling teachers to experience the use of, for example, various forms of software, electronic information handling, new technological devices, the use of computers in control and word processing. Such activity was vital if teachers were to transer any of their newly gained knowledge to their own teaching. Where these practical experiences were provided in a learning environment similar to that which teachers could themselves create for their own pupils, there was added benefit.

5.1.14 On one MEP/RSA course the participants were introduced to word processing by providing them with manuals, with access to a tutor to help with difficulties, and then requiring them to produce their INSET course work using this facility. This produced high motivation which contributed to a rapid rate of learning. In another course a word processor was used with a large monitor to record the points made in a plenary discussion.

5.1.15 Discussions in small groups often gave an opportunity for teachers to consider the curricular aspects of the new technologies and the new styles of learning introduced through the courses. A useful consolidation of principles was possible when important points were stressed, or difficulties re-analysed, with the help of the lecturer in subsequent plenary session. Too often, however, insufficient consideration was given to the ways in which the new ideas could be introduced in classrooms.

5.1.16 In some courses insufficient use was made of the strengths and experiences of participants, while in other instances insufficient allowance was made for their range of knowledge and background. On the longer courses teachers were given school based assignments as part of their in-service training which included, for example, the evaluation of pupils' responses to the use of particular pieces of software.

5.1.17 In the shorter courses it was perhaps unrealistic to incorporate any significant consideration of the ways in which teachers' attitudes and curricular vision could be changed. But on the longer courses too, where participants tended to hold positions of responsibility for the development of computer use in their schools, this feature was not often given sufficient prominence. Although teachers on these long courses sometimes provided school-based INSET for their school colleagues relating to their newly acquired knowledge, these broader curricular issues tended to be under-emphasised and under-exploited. On one MEP course visited, an interesting use of role play was seen within which teachers took the parts of heads of various subject departments at a simulated school meeting to discuss the use of capitation and parental funds. In this way participants were enabled to develop a greater awareness of the problems associated with school based curriculum change and the determination of priorities within a school.

Course evaluation

5.1.18 A number of courses included procedures for course evaluation. Both formal and informal evaluations by course teams were regular features and such measures appear to have contributed to improvements in organisation and content. On some courses participants completed standard MEP evaluation forms for analysis by the course teams and, in the case of regional courses, also by the RIC director.

5.1.19 Participants' reactions to their INSET opportunities and experience were favourable. Some requested long-term INSET and the formation of groups of teachers to provide mutual support. Industrial action by teachers in 1984-6 considerably hampered in-service training activities. Attendances fell, courses were cancelled for lack of applicants and the application of new ideas to school teaching seemed to lose momentum.

5.1.20 In some subjects, and in some parts of the country, subject and IT advisers in the LEAs were enthusiastic about MEP's INSET provision, and sometimes were prepared to offer support to teachers as a follow-up to MEP's courses. In other places they were less enthusiastic. Several LEAs were critical of the quality of MEP courses, their relevance to school experience and the knowledge of MEP staff. Some educational technology advisers, for instance, felt that MEP's courses encouraged too narrow and separatist a view of educational computing and microelectronics, and that MEP's course provision created an unnecessary intermediate structure for LEAs, which sometimes merely replicated what LEAs themselves already offered.

5.2 THE SCOPE OF MEP'S INSET ACTIVITIES

Overview of the Range of MEP Inset

5.2.1 The structure of MEP used to plan, coordinate and deliver courses and training materials is described earlier in this report. In each of the four domains a national INSET coordinator had contact with, but had no management responsibility for, the day-to-day work of regional domain coordinators in most of the 14 regions. By September 1983 primary specialists had also been appointed to coordinate in-service training for primary teachers in each region. The SEMERCS provided courses and INSET materials but for much larger geographical areas.

5.2.2 The INSET provided included basic computer awareness and courses on the use of IT and microelectronics in various subjects, aspects and phases of the curriculum. Much INSET was specifically related to curriculum development projects or to the teaching of specialist skills in microelectronics and computer studies.

5.2.3 MEP rightly identified a need to keep its own staff up-to-date with new materials and other developments. Regular series of 'Update conferences' were instituted, mainly in single domain groups, to keep regional training staff informed and to encourage the sharing of experiences. Participants generally found these courses to be valuable, though some of the early ones did not identify clearly enough what was expected of the regional coordinators. Indeed, these early Updates tended to highlight differences in the conditions under which regional coordinators were operating and thereby created some dissatisfaction, without indicating the way the MEP's management could correct these inequalities. The Updates were very useful, however, in enabling technical expertise and training strategy to be shared rapidly across the country.

Regional and local arrangements for INSET

5.2.4 Mainly through the RIC steering commitees, INSET programmes in each of the regions were devised to meet regional needs. There were varying degrees of involvement in this decision made by LEA advisers, regional coordinators, National Domain Coordinators and local institutions of teacher training. Overall there was an impressive range of courses. Where there was strong collaboration between advisers and co-ordinators, good planning enabled regional needs to be identified and courses to be mounted which attracted a substantial number of participants. There were, however, regions where courses had to be cancelled because of the lack of applicants. In many LEAs there were good channels of communication between the regional INSET coordinators and teachers, via LEA advisers. In a number of cases, however, the system of communication was indirect and inefficient. In extreme instances, teachers were informed of courses after they had taken place - much to their annoyance. Some courses were so popular, however, that teachers found it difficult to obtain a place on them even when the courses were repeated several times.

5.2.5 Each RIC was required by MEP and DES to report its INSET course provision in terms of a statistic - the Teacher Course Day Unit (TCDU). One unit represented a full day's course provided for a single teacher. Clearly, a RIC identified one of its major objectives as providing enough courses which would be likely to attract large numbers of teachers. This was unfortunate since smaller meetings and workshops which focused on specific issues, and which did not deliver so many TCDUs, were often found to be more valuable to teachers than large meetings.

5.2.6 Some MEP personnel had difficulty in ascertaining what kinds of courses would be most useful to LEAs in their region. They had the problem of the need to meet often conflicting requirements of LEAs, some of which had different INSET priorities and some with different types of computers. While the links between the MEP and LEA specialist computer advisers, where they existed, were usually good, the links with subject, primary and special education advisers were not always well established. Such were the pressures on LEA advisers however that, in a number of instances, despite the potential benefit, good links between LEAs and RICs proved difficult to maintain. There were extreme cases where MEP's views on the nature of required INSET were said by advisers to be in conflict with their own. Towards the end of the Programme, however, more emphasis was placed by MEP on providing support to LEA subject advisers and this was generally welcomed.

5.2.7 For example, in one LEA the CAIS domain coordinator worked together with a newly appointed advisory teacher in business studies on a series of workshop sessions. The participants were mainly business studies teachers who were studying existing computer software related to information handling. The group used these workshops to produce curriculum materials for their classes based on software items available to their LEA. They needed to agree what it was reasonable to expect of pupils in their secondary schools and how to produce interestingly presented modules of practical work for their classrooms. Local viewdata packages, simple databases, word processing facilities and electronic mail were explored by individuals and then discussed together. The advisory teacher was one of the participants and the workshops provided teachers with useful ideas for development.

5.2.8 Some small LEAs turned to MEP personnel for direct help in running their INSET courses for their own teachers, and this contribution from the MEP was essential and much valued in that context. In time, the computing and IT support centres developed by some LEAs had facilities that matched or exceeded those provided by their MEP regional centre. SEMERCs, however, continued to offer specialist support and advice that LEAs were in many cases not well placed to provide.

Longer courses

5.2.9 As the Programme progressed, financial stringencies resulted in a number of authorities being reluctant to second teachers, and recruitment for courses became increasingly difficult. At this stage the MEP realised the need for longer term courses for serving teachers, particularly those having responsibilities for computer developments. These two issues prompted MEP to explore the possibility of encouraging colleges to offer "poolable" courses whose costs could be largely re-couped from the special LEA pool for funding certain types of INSET. These courses by their nature were longer and sometimes enabled an LEA to employ a supply teacher to replace the seconded participant.

5.2.10 During the latter half of the Programme's life the MEP and the Royal Society of the Arts (RSA) collaborated to enable institutions of HFE to extend their offerings of certificate and diploma courses for teachers. MEP helped to staff some of these diploma courses, which addressed the use of computers in general education and the teaching of computer studies. The MEP also provided teaching materials. Many institutions, however, offered these longer courses with little help from, or indeed awareness of the MEP.

INSET related to curriculum development projects

5.2.11 Some MEP INSET was instigated as a means of disseminating specific IT materials or encouraging the use of software and teaching approaches developed within curriculum projects. The pressure to have materials, software, hardware, support literature etc produced quickly, described in chapter 3, often resulted in the related INSET being started prior to the adequate trial of the new materials in schools. In such cases materials were insufficiently supported by illustration from the classroom. Furthermore, such INSET often took the form of fairly short courses which could only provide a fleeting acquaintance with materials and the need for continued support and follow-up was often insufficiently recognised.

5.2.12 There was one MEP curriculum development project whose prime aim was to help a group of participating mathematics teachers to capitalise on computer programming by pupils to support their own mathematical learning. The project officer was able to spend much of his time during the first year of the project working with teachers in their own schools while in the second year teachers had the advantage of a total of 20 days INSET to help develop their ideas. It was intended that a project report should be produced containing guidelines on these new methods of teaching to which not only the project officer but also the participants themselves would contribute. The visits to one of the INSET workshops, and also to the schools of participants, pointed to the considerable benefit of the active involvement of teachers in classroom research.

'Cascade' Model in Practice

5.2.13 The MEP's policy of addressing as much in-service activity as possible to people who could pass on the training to others - the 'cascade' model - was

described earlier. Many of MEP's INSET sessions did have a useful catalytic effect on trainers and some of the training materials produced in the final two years of the Programme were making a positive contribution to the work of college lecturers and LEA staff who had access to them. On the other hand some of the LEA and college in-service sessions were not as well resourced with MEP's training packs, nor as well informed of national developments as they might have been. Unfortunately some teacher leaders, who had been seconded to develop their own local INSET, were unable to obtain sufficient time on their return to school to continue the 'cascade'. In some cases such trained staff were attracted to posts in other LEAs or to TVEI projects.

5.2.14 For some of these trainers the length of courses was too short to deal with issues in sufficient depth. Computer awareness had been gained but ideas for developing curriculum and children's work in various contexts had not.

Preparation of INSET materials

5.2.15 The preparation of INSET materials that could be used by teachers themselves or by the trainers has been one of the major national initiatives of the MEP. The MEP Mathematics CBL Group, which had wide professional representation, produced a major INSET pack for use by secondary school mathematics departments. It had a wide range of good quality support materials and was disseminated through regional meetings for LEA advisers and college of education lecturers. A number of local authorities indicated that they intended to acquire the packs for dissemination to all their secondary schools and also to provide local INSET support.

5.2.16 The wide range of training materials produced by the National Primary Project were received favourably by trainers and many of their ideas and software items were in evidence in schools towards the end of the Programme.

5.2.17 One major MEP funded project, designed to foster awareness of computer based learning, was undertaken by the Open University. Several packs were developed but the majority became available late in the Programme and were rarely seen in use. Some advisers felt them to be expensive, or believed that their LEA-produced materials could more readily meet the needs of their local teachers.

5.2.18 During the latter stages of the project a number of MEP resource packs, of varying quality, were produced aimed at specific subjects. Although these packs contained many useful references and lists of materials they offered little pedagogical guidance on the use of IT in various curriculum contexts and at the time of writing this report there was no evidence from schools of their effectiveness.

5.3 IMPACT OF INSET ON THE WORK OF SCHOOLS

5.3.1 It is never easy to establish direct causal relationships between provision of INSET and observed work of schools. In the case of the use of IT and teaching of microelectronics and computing, judgements are even more uncertain as the variables involved are far from easy to disentangle. The 'cascade' process of training used by the MEP with various degrees of co-operation from LEAs served to introduce a mixture of locally and nationally inspired activities, whose results cannot be attributed solely to the MEP or to an LEA or to the personalities of those involved.

5.3.2 Specific visits were made during the latter part of the Programme to schools whose teachers had attended various MEP courses. During any school visit it was found that, where teachers were using or teaching about new technology, their initial training had in only rare instances provided a foundation in IT work. To help assess the impact of INSET teachers were asked about the opportunities they had taken up in relation to IT; the head was also asked about the courses attended by staff which had a bearing on microelectronics or computing in the curriculum.

Follow-up of Participants in MEP INSET

5.3.3 Teachers graduating from the one year part-time courses in IT had clearly gained new expertise as well as a new qualification; some had subsequently been promoted to posts in other schools. Many participants had responsibility in their school for aspects of computing, or the application of computers as a resource for learning. They had frequently used their INSET opportunities to clarify their roles and had applied newly gained knowledge of IT to develop their school or departmental curriculum, often making increased use of MEP project material. In the majority of these schools, participants were reported as having provided useful school-based INSET for their colleagues. In some instances within both primary and secondary schools, it had not proved to be any easy task to convince other teachers of the value of the new IT approaches. In secondary schools there was the added problem that access to IT facilities was not always easy to obtain, so that a teacher's initial post-course enthusiasm could be dissipated through inadequate opportunities to put into practice what had been learnt. Some of the work seen indicated that during the courses greater consideration should have been given to teaching methods and the process of implementing change.

Evidence from general visits

5.3.4 Since many of the general visits were made to schools which had been suggested by the MEP as of potential interest, it was not surprising that in a number there was a particular person - teacher, deputy-head or head - who had contributed to MEP projects. This active participation understandably helped the person's own professional development. In many of the primary schools, where heads or deputy-heads had been working with the MEP, they had run courses for teachers in their own schools (sometimes for parents as well) and for their LEA. They had become the focal point for help and advice; in this way the 'cascade' process was reasonably successful. In many schools their involvement had contributed to a general teacher awareness of IT developments, of MEP INSET opportunities and other services. In some primary schools, however, there was an over-reliance on these senior teachers. They in turn could have done more to encourage other teachers - in particular subject coordinators - to take on more responsibility for IT developments and to ensure that they took greater advantage of RIC or LEA centre facilities. Occasionally, the work of a school had suffered because of an overcommitment of such a head or deputy to activities in the training of outsiders in the use of IT.

5.3.5 A number of schools were visited which were in the process of conducting a trial of MEP curriculum development courses and materials. The twin purpose of such a trial was to ascertain how appropriate such materials and courses were and how easy it would be for teachers and pupils to use them fruitfully. These trials often proved to be valuable INSET for those involved, even if the materials were rejected in the end. There were instances when the trials were somewhat artificial and were neither good as INSET nor useful as feedback for

the producer. For example, there was one product developed for use by modern languages teachers which was being tried in a school by a lively and efficient teacher. She had experienced difficulty in incorporating the use of the computer into some of her work because of problems of access to appropriate micros. The producer of the software loaned the school a micro with which to conduct the trial, but this created an unnatural situation, which could not have been built upon at the end of the trial. After trying the program the school judged that this software should have allowed pupils and teachers to amend some of the phrases and vocabulary used in the program so as to fit in with different courses, but the publisher was concerned that security of the software would be breached if this request were granted. The trial was therefore of little value to staff at the school or to the product.

5.3.6 The need for co-ordinated support was apparent. There were, for example, two projects concerned with the programming language LOGO where participating schools had benefited from good collaboration between their LEAs and the MEP regarding the supply of hardware and project material, the provision of INSET and the secondment of teachers. On the other hand there were schools where trials of MEP project material were undertaken where INSET was needed but not available.

5.3.7 Schools which had no specific involvement with MEP projects had benefited from MEP INSET to varying extents. During the middle years of the Programme there was a good proportion of schools visited - about a third - in which it was judged that INSET provided by MEP had made a contribution to teachers' knowledge of and competence at using IT. In the latter part of the Programme this proportion had understandably increased as more schools which had participated in MEP INSET were visited, although the actual provision of and participation in INSET had declined because of industrial action.

5.3.8 At the other end of the spectrum during the same middle years, in just over a third of the schools visited, the MEP seemed to have had little or no influence. Many teachers in these schools were unaware of MEP services - even where there was a teacher with responsibility for links with the MEP. In some instances the geographical inaccessibility of the nearest MEP centre was partly responsible for this failure to take advantage of regional facilities. The inadequacy of communications with, and within some schools, however, was doubtless another important factor. By the end of the Programme many teachers were finding that their own LEA had established an IT centre that was able to provide INSET and information. This was particularly the case where the school was a long way from the RIC. Generally these LEA centres were appreciative of the support they themselves could obtain from RICs. It is significant that, with the demise of the MEP, most LEAs, even those with a strong IT programme of their own, were making arrangements to continue some form of regional centre.

Conclusion

5.3.9 The MEP rightly regarded INSET as being of crucial importance if schools were to be helped to incorporate microelectronics and computing technology into the content of their curriculum and their methods of teaching Correspondingly,

the provision of INSET and facilities to support teachers together with the production of curriculum materials have been on a considerable scale.

5.3.10 The courses visited have generally been of good quality. Mostly, INSET centres were in good accommodation and well resourced. Preparation by lecturers was thorough, though their experience of applying IT in school was often limited. A range of beneficial experiences was usually provided with the opportunity for practical work being of particular value. The integration of INSET with planned follow-up support was rare but more likely to be observed where there was strong liaison between MEP and the LEA. Such collaboration also contributed to a better identification of the most appropriate courses and better communication links between the MEP and schools.

5.3.11 On some visits to schools, colleges and to LEAs the links within the 'cascade' process could be clearly identified but on others the connections were more tenuous. Nevertheless, there was no doubt that, through the INSET programme and the various other forms of teacher support, MEP has contributed both directly and indirectly to the awareness of IT and the professional expertise of a significant number of teachers, lecturers and advisers. In this sense, not only the 'cascade' process, but also the 'pump-priming' objective of the Programme, could be judged to have been successfully implemented.

5.3.12 During the period of the survey a clear, encouraging and accelerating improvement in both the quality and quantity of IT related work in schools was observed which was directly or indirectly a consequence of INSET. This was particularly true of the primary schools where, by the end of the Programme, a rapidly growing number of teachers and pupils were using IT facilities. In secondary schools on the other hand, although progress was apparent, it was still the case that outside specific computer courses IT was rarely used. Nevertheless, there was much evidence that, where teachers were using microcomputers, with good software and appropriate support materials, pupils' learning had been enhanced by the use of IT. The MEP had made a major contribution and influence in this respect.

CHAPTER 6: SUMMARY AND CONCLUSIONS

Context

6.1 The MEP was established in November 1980 to help schools to prepare children for "life in a society in which devices and systems based on microelectronics are commonplace and pervasive". It started to undertake this task at a time when the teaching profession was very short of experience and expertise in microelectronics and educational computing. The majority of secondary schools and virtually all primary schools had little, if any, computing or microelectronics-based equipment and few LEAs had appointed advisers or instituted INSET to foster expertise and confidence in using this technology.

Impact of IT on Schools

6.2 Since then various factors and agencies have played an important part in the growth of schools' awareness of IT and teachers' confidence in applying it to their work with children. INSET from various sources has no doubt played an important role in bringing about this change, particularly in primary schools, where, by the end of the Programme, a growing number of teachers and pupils were regularly using IT facilities. In secondary schools on the other hand, although an increased awareness of IT became apparent, it was still the case that, outside specific computer and electronics courses, IT was rarely used. Where secondary school teachers were using microcomputers in various subject studies, with good software and appropriate support materials, pupils' learning was often enhanced. While the MEP was only one of the agents of change and innovation in this field, the work with IT in schools and associated staff development owed much directly, and even more indirectly, to the Programme.

6.3 It is not always possible to identify the effect of a particular aspect of MEP activity in schools, nor necessarily to separate MEP's impact from other influences on the curriculum. It must be remembered that the resources MEP commanded were usually channelled indirectly to schools themselves. This meant that the Programme was unlikely directly to address or to affect a number of important policy issues in schools. Thus, in the bulk of schools visited MEP did not seem to affect the quality of accommodation for IT and its use nor the deployment of human and material resources on IT-related work. It may well be that the MEP's impact on the curriculum and staff development will in retrospect be far larger than this report is able to indicate. The concluding sections of prevous chapters attempt to outline the present position in specific aspects of MEP's work.

6.4 As far as the pupils were concerned, much of the software produced in the early days of the MEP had little effect on their work. But gradually the use of the computer for "drill and practice" gave way to more varied and interesting forms of learning. Creative writing, musical composition and mathematical investigations were examples of what pupils did better using some of MEP's materials, which often supported products originated by others. Communication skills improved through the use of suitable equipment and well documented text processing application packages. Skills of deduction prediction and seeking for relationships were developed where pupils carefully handled and evaluated information, and used databases and historical simulations with well chosen documentation. Experience of solving problems was fostered by the use of such materials as the 'floor turtle' and MEP's Microelectronics For All kit. For older pupils programming the computer, using just the BASIC and LOGO languages and little else, provided a useful stimulus to the development of concepts and

the exploration of ideas. Often all these activities contributed to pupils' general confidence in using information technology. Pupils with learning difficulties were often motivated by MEP's materials and responded to computer animation and to exercises involving completion of pictures, patterns or sentences in a way that would not have been possible by conventional means. Thus, despite the fact that, as the Programme drew to a close good practice was not yet widespread, there were many examples of useful work with information technology and with MEP's materials and approaches.

Positive Features and Strengths

6.5 The following factors seemed to help MEP's impact on the work of schools:

a) the three-stranded strategy, encompassing curriculum development, information dissemination and in-service training. This was appropriate;

b) the co-operative strategy adopted by MEP considerably strengthened the cadre of well-informed teachers and trainers. It promoted curriculum development in this field and also strengthened groups of LEAs to the point where they were able to take on the role of encouraging and supporting IT. In these respects the "pump priming" objective of the programme seems to have been achieved;

c) MEP staff were often highly creative, committed and hardworking; they frequently showed outstanding ability to "rise to an occasion" and exhibited resilience in the face of difficulties and uncertainties;

d) the range of materials developed with MEP funding was impressive, and the quality of many of the later items was high. Where schools had an opportunity to use them, their impact on the pupils' learning was generally beneficial;

e) in the course of the Programme closer links began to be formed between in-service training and curriculum development in IT. This yielded successful training materials, training courses and some good models for classroom work;

f) MEP-inspired INSET was usually well prepared and, where organised in conjunction with LEAs, more likely to be appropriate to the needs of participants, though not always adequately followed up;

g) the "cascade" principle of teacher training in IT operated successfully wherever opportunities were offered to trained personnel for sharing their experiences with others. Towards the end of the Programme there was a noticeable increase in the use made of MEP materials in initial teacher training.

Negative Features and Weaknesses

6.6 The following factors seemed to hinder MEP's impact on the work of schools:

a) MEP had to work through other agencies; its contact with schools was mainly indirect, and on occasion there were conflicting views between agencies on what schools needed and who should provide it;

b) there were problems of communication between schools and various agencies seeking to promote microelectronics education. Communications concerning the use of IT were not always easy within schools themselves, especially within secondary schools. Distances to the nearest RIC or SEMERC were an additional hindrance to good and sustained communications. Several RICs were not well informed about the work of the schools in their region;

c) a better central information service to RICs and other MEP staff at an early stage should have underpinned a national information dissemination strategy, using existing channels of communications rather than relying on new ones. As it turned out, until the last year of the Programme schools were largely unaware of the wide range of resources available to them through the MEP;

d) delay in getting development projects approved and under way was discouraging to proposers and to MEP staff, and slowed the work;

e) there was some unnecessary duplication of effort in curriculum and materials development and many items were not fully exploited; a lot of products funded by MEP were never developed to the point where they could be satisfactorily used by others not involved in the projects;

f) MEP liberated ideas and supported enthusiasm and that was right, but it was less effective in building in sufficient checks and balances to assure the quality of outcomes. The limited time allowed for monitoring the progress of many MEP-funded development projects resulted in a lack of close evaluation of such projects and of funded agencies until the last year of the Programme;

g) leadership of MEP was concerned, creative and enthusiastic, but the organisation as a whole was complex and often lacked a clear, corporate purpose.

6.7 Staff morale was low at several points in MEP's history, especially when staff were faced with uncertainties concerning their futures. It is to their credit that such a wealth of new ideas and imaginative approaches to teaching and learning were nurtured and supported during the Programme.

CHAPTER 7: SOME IMPLICATIONS FOR THE FUTURE

Special Funding

7.1 The development of computing and microelectronics in schools has been a joint enterprise between central and local government as well as sundry other bodies. Without central government initiatives it would have been very difficult to reach sufficient consensus and achieve co-operation in this field. The speed of development in information technology is such that continued leadership by government is needed. The model of specific government funding, which promoted particular developments and encouraged co-operative rather than competitive working among LEAs, was beneficial.

The Need for Continuing Development

7.2 The imaginative lead provided in so many activities by many of the MEP's staff and collaborators needs to continue in some form. Mistakes have been made and will continue to be made in attempts to develop curricular approaches which incorporate the use of IT. False and faltering steps in a new area are an inevitable part of the learning process. While there can be no certainty of outcome from development and in-service training activity, it is desirable that those involved in this process should have the opportunity to build jointly on their experience and to continue to share it.

Range of Expertise

7.3 The expertise gained is not concentrated in one location or in one aspect of the education service. It is distributed amongst teacher trainers, teachers, advisers and teacher centre staff, librarians and writers as well as among many of those outside education, like publishers, broadcasters and industrialists, who have been the MEP's partners in its development effort. To link together such widely distributed expertise and enable it to be used to facilitate the work of schools applying IT needs determined leadership and sensitivity. One of the challenges facing the newly established Micro electronics Education Support Unit (MESU) will be to connect up this network of expertise and to enable it to be extended and strengthened.

Factors Influencing Change

7.4 The visits to schools have shown that curriculum change has been brought about by the coming together of various factors: the availability of suitable hardware; appropriate learning materials; and keen teachers ready to respond to suitable in-service training and to let pupils explore such material resources as are available. Where any one of the above ingredients is deficient intended curricular provision for pupils is less than adequate, and sometimes indeed, counterproductive.

7.5 LEA advisers are closely involved with in-service training and are crucial to the effectiveness of the use of IT in schools. The most successful MEP projects recognised this and directed INSET materials to advisers, advisory teachers and teacher trainers. The best of these materials were of direct relevance and application not merely in INSET but in the classroom. This strategy needs to be used in future initiatives. Similarly, where professional associations or suitable groups of experienced teachers are actively involved in IT-related curriculum development, they should be supported in these initiatives to ensure that existing channels of communication and INSET are utilised, and new developments are embedded in sound curriculum practice.

7.6 The commitment of a school, notably that of the head teacher, is an important factor for sustained and significant development in the use of IT in teaching and learning. It is therefore important for senior management in schools to be made aware of this activity, and to be shown examples of good practice.

Inequalities of Provision

7.7 A great increase has taken place in the last five years in the number of computers and in the amount of microelectronics equipment in schools. Many schools are equipped to run information technology awareness courses and specialist courses in computing and microelectronics. This is welcome. There are, however significant differences in the levels of IT resources between schools which are otherwise similar, and the number of units of hardware in the average school is not sufficient to enable more than a few of its teachers to apply IT conveniently to their classroom work. While this situation persists, it is unlikely that computers will become a natural and generally accepted part of the ordinary curriculum. The MEP's central aim of seeking to apply IT to various forms and aspects of learning will remain hard to realise.

New Technology

7.8 The MEP operated against a background of developing technology and was able quickly to respond to change, taking advantage of new hardware and software. As new generations of computers and telecommunications appear, attention will need to be focussed on the means of:

a) selectively upgrading equipment in schools;

b) converting the more valuable software and documentation developed by the MEP and others to run on upgraded or new equipment where necessary;

c) developing new materials which take full advantage of the extended powers of new equipment.

Consolidation and Further Development

7.9 While a development programme needs to continue, the gap between those who are in the forefront of applying IT in schools and those who are well behind in this field should be reduced. There is a need to spread the best practice seen in some schools more generally, particularly in relation to learning styles and information handling, before forging ahead yet further by incorporating the latest technological advances. However, alongside such consolidation there is a need for continued exploration of the potential of new technology, both that which is now available in schools and that which is likely to become available within the next five years or so. This should be aided by effective and timely research into the ways in which pupils may use IT to gain new insights, or to engage in a wider range of styles of learning either individually or in groups.

Teacher Confidence in the Use of IT

7.10 Taking full advantage of the opportunities which IT provides for investigation, problem solving, communications, independent learning and pupil assessment, is no easy task for teachers. It calls for a radical appraisal of teaching styles and objectives at the individual classroom and whole-school levels. By comparison, learning the simple mechanics of using some new items of software or equipment is easier.

7.11 Nevertheless, only a comparatively narrow band of the wide spectrum of ideas and materials promoted by MEP has so far been visible in schools. Many teachers operate quite happily and effectively with just a handful of types of equipment and software facilities. They often retain their favourite materials for quite a long time, choosing those which are easy to use, reliable in performance, well supported with documentation or worksheets and perceived as presenting no management or motivation problems in class. Once confidence is gained, a teacher is likely gradually to extend the range of facilities and software used. High standards of production and appearance did not seem to be as relevant a factor in the take-up of materials as the means of publicity and distribution and the associated support. Teachers have found many materials which were produced quite inexpensively to be as good as, and perhaps more easily accessible (and transferable to computer networks, for instance) than some expensively produced titles.

7.12 A priority for the next few years is the integration of examples of good approaches to learning with IT into the initial and in-service training given to all teachers specialising in primary, secondary and special educational needs work. To help in this process, use might be made of the approach to INSET adopted by the National Primary Project. The bulk of the training materials and ideas published by the Project are firmly rooted in the context of good primary curriculum practice. Support materials of similar quality, some of them in a format which renders them more suitable for independent and group study, are needed for trainers and teachers in other aspects of education. Above all, curriculum development and in-service training should be firmly linked together.

The Management of Co-operative Projects

7.13 A co-operative approach to the development of curriculum materials appears to be a sound strategy in many projects. It has been particularly helpful to have practising teachers involved in identifying an application of IT to teaching and learning. Conducting trials of such materials in class and refining the product as necessary, has proved to be an essential part of the development process. Such a co-operative approach needs careful orchestration. The importance and cost of management and monitoring of development should not be underestimated or, worse, ignored. The teachers doing the actual curriculum development work often need help in defining and managing the project. Furthermore, since the pace of change is so great in IT, it is important that all software and hardware facilities on which an educational project relies should be in place and available to those involved in development before implementation work starts.

7.14 While there is room for duplication of effort in certain aspects of curriculum and materials development, such duplication should be intended and not accidental. Monitoring individual projects and relating them to others is a skilled function, calling for a broad view of the curriculum and expertise in management and technological factors. If a wide range of teachers is to be served by future products and learning materials, then the MEP's approach of gathering multi-disciplinary teams to become involved in advising projects is a useful approach. It may be that any such future teams should have a steering rather than merely an advisory role; should be less numerous; and meet sufficiently frequently to provide support and exercise effective control. Standards of project management and of software writing should be set to facilitate the creation of programs which are easily transferable to other computing equipment; and user documentation provided which will need only minor amendment for use on other systems. This approach to the creation of materials will be valuable not only for British schools but for overseas users.

Teacher Secondment

7.15 One of the lessons learnt from the MEP's operation is that secondment of teachers to undertake study and curriculum development or information dissemination can have beneficial results lasting well beyond a secondment. For the teacher participating in curriculum development, for instance, personal benefits often accrued, increasing the range of ideas debated; the range of contacts made; and the depth of exposure to educational and technological issues related to broad uses of IT. The subsequent use of seconded teachers by their employers is likely to be successful where:

a) the teacher has been carefully selected for a task which is a realistic one to undertake in the allotted time;

b) the task is liberally interpreted yet carefully monitored and there are no undue conflicts of loyalties or interests, such as may result from working to two or more masters;

c) the secondee is able to function within a group which is large enough and has sufficient expertise and experience to make the secondment an informative one for all participants;

d) if the secondment is a short one, there is follow-up support when the teacher returns to school;

e) if the secondment is a substantial one, there is sufficient timetabled time for the "cascade" process to take effect both within the school and in the locality.

Information Dissemination

7.16 Particular attention should be paid to providing information about:

a) currently available curriculum and materials development which may be suitable for use by teachers of particular groups of children;

b) local, regional and national materials and projects which are not complete as yet but in a trial state, the use of which might be encouraged, and awareness of which might prevent unnecessary duplication of development effort;

c) up-to-date technical information and expertise for those engaged in the development of curriculum or in providing resources for schools;

d) a compendium of abstracts of the wisdom generated by school teacher fellows, researchers and others concerning the practical applications of IT and related work in schools.

Planning of Future Resources

7.17 The MEP years will be remembered by those directly involved, and by most of those on its periphery, as a time of creativity and fruitful development. There was a new found and remarkable enthusiasm for IT and its potential impact on all phases and many aspects of the curriculum. This enthusiasm was justified in many respects but suffered its ups and downs related to uncertainties about project budgets and the MEP's future. The arrangements of any future funding for programmes of this kind need to be reasonably secure and known if maximum efficiency is to be achieved and the deleterious effects of "crisis management" and ad hoc responses to long term educational opportunities are to be minimised. In this way a sound foundation would be established for future development.

GLOSSARY OF TERMS

CAL	Computer Assisted Learning
CAIS	Communication and Information Systems (a teacher training domain in MEP)
CBL	Computer Based Learning (a teacher training domain in MEP)
CDT	Craft, Design and Technology
CET	Council for Educational Technology
debugging	Identifying and correcting errors in a computer program
DES	Department of Education and Science
ECT	Electronics and Control Technology (a teacher training domain in MEP)
EDWORD	A MEP funded program to help children learn about word processing
hardware	Units like the keyboard, disc drive, central processor and printer associated with a computer
INSET	In-service training
IT	Information Technology
ITMA	Investigation on Teaching with Microcomputers as an Aid
LOGO	A computer language with specially good facilities for controlling a vehicle or an arrow on the screen
MEP	Microelectronics Education Programme
MFA	"Microelectronics For All" kit
modem	A device interprosed between a computer and a telephone line to facilitate communication of electronic signals
network	A set of microcomputers sharing a filestore or some peripherals and linked to a master console
NPP	The National Primary Project (of the MEP)
peripheral	An item of ancillary equipment attached to a computer
RIC	(MEP's) Regional Information Centre
SEMERC	Special Education Microelectronics Education Resource Centre
software	The written programs which instruct the computer how to respond to the users commands. Also used of INSET (q.v.) materials, such as videofilm or written suggestions for teachers
TVEI	Technical and Vocational Education Initiative
VDU	Visual Display Unit