

# The Work of the Microelectronics Education Programme

Her Majesty's Inspectorate\*

Many readers of *Studies in Design Education Craft and Technology* have played an active part in the work of the Microelectronics Education Programme and will be keenly interested in the detailed HMI report on the Programme recently issued by the Department of Education and Science. We print, with permission, the concluding chapters of the document.

## Context

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

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.

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 previous chapters attempt to outline the present position in specific aspects of MEP's work.

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

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.

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**Negative Features and Weaknesses**

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.

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.

**SOME IMPLICATIONS FOR THE FUTURE****Special Funding**

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**

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**

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**

The visits to school 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.

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.

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**

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**

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**

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**

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.

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.

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**

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.

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 advertising 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**

One of the lessons learnt from the MEP's operation is that secondment of teachers to undertake study and curriculum development of 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 seconded 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**

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**

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.

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