MICRO-SCOPE 8

Newman College with MAPE

Contents

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MICRO-SCOPE 8

Editorial

In the temporary lull before the merry-go-round of the Easter conferences, we sense a rare mood of reflection. There is, amazingly, a breathing space to take stock and to reconsider some wider issues.

Some kind of plateau has been reached, and this is in itself a measure of the achievements of the last three years. Crucially, the burdens carried so long by inspired and obstinate *individuals* have been picked up by *agencies*, with the prospect of continuity and self-sustaining growth. The Department of Industry scheme to subsidise hardware is well under way. The associated MEP *Micro Primer* pack is the most significant contribution yet to support for teachers on the scale required. The continuing commitment of the BBC promises still more. The advent of telesoftware opens an Aladdin's cave. Enlightened software houses (and others) are ready to chip in. MEP and MAPE regional developments give a new local accessibility. Information Technology Year 1982 has raised general awareness.

Of course, consolidation of the base camp is still needed. Feedback from long-term evaluation studies and more formal research will help to establish standards and purposes. We have already expressed reservations about the current levels of teacher training.

But for a moment the pioneers can afford to look up from the entrails of the machines and join with new enthusiasts and even with sceptics in scanning the heavens. We mention here just two of the wider issues coming into view.

The new technology will affect not just the child but the family; not just the family but the nation; not just the nation but mankind. Historically, technological changes have, initially at least, widened existing social and cultural gaps. Will the unrivalled power of the micro revolution be harnessed for division or for co-operation?

In a post-colonial world, the double-edged effects of international aid have suggested a new coinage: 'to under-develop'. To bring the metaphor back home – which schools in which social areas will be best placed to take advantage of government subsidies? Which parents will give support by buying home computers? Will the pursuit of new technology widen existing gaps in standards, and so institutionalise the under-development of some children? These are awkward questions, and they are in our minds partly because we are also engaged in planning a *MICRO-SCOPE Special* aimed directly at children and parents.

MICRO-SCOPE has already declared an interest in the exploration of 'new' programming languages for children. Versions of LOGO and, to some extent, of micro-PROLOG, with supporting literature, are becoming readily available. We are currently preparing another *MICRO-SCOPE Special* in collaboration with the newly-formed British LOGO Users Group.

We invite ideas and contributions on both topics. Also we welcome readers' letters, criticisms, general articles and reviews of programs and books. The deadline for the next issue is 26 April.

* * *

This is an appropriate moment for us to acknowledge the debt we all owe to Ron Jones, founder and first Chairman of MAPE. His inspiration, determination and energy have been crucial in creating the organisation. We wish him well in his new job, and hope he will continue regularly to consult his diary notes and his crystal ball for the benefit of *MICRO-SCOPE* readers!

* * *

MAPE members will soon receive details of a cassette of programs for use on BBC or 480Z machines – free to members! Join now!

The 'Mary Rose'

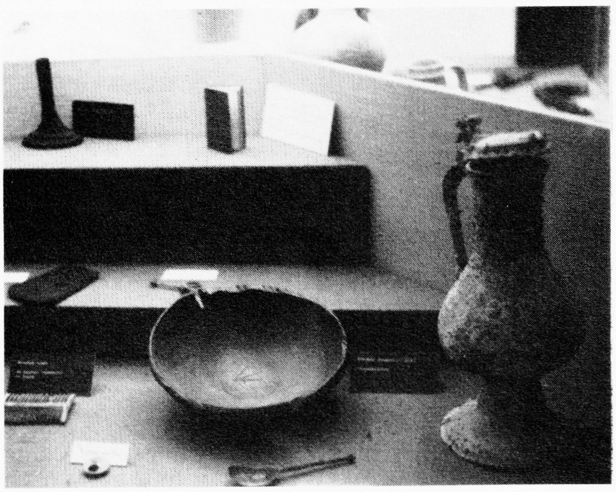
Barry Holmes
St Helen's C.P. School, Bluntisham, Cambs.

The early morning alarm shatters the silence. It's 6 a.m. and still dark outside. Dress, wash, shave, without waking the rest of the family. A quick cup of coffee – check camera, maps, notebook. Wait for Ian to arrive as slowly consciousness begins to creep through.

This is one of several early morning starts to a day's trip to gather information. The development of our latest program, *The 'Mary Rose'*, can be used to illustrate the various stages which Ian and I undergo when developing a simulation.

First the idea. Either Ian or I will have the initial ideas for a program, which we discuss in very broad terms. A major consideration at this stage is the educational value and philosophy underlying the program. How will it fit into the curriculum? Will the results be based on good primary practice? Such questions must be asked and answered before going further. Some ideas sound excellent but the resultant program can fail because these questions have not been given full consideration. As an aside, I often feel that we are putting the cart before the horse when dealing with the micro. It is becoming the sacred cow of education. All too often we concentrate on the capabilities of the machine rather than on how we should be developing its potential for real educational benefit. Education comes first. I'll get off my soap-box now.

Once we have decided that an idea has potential, is relevant and can be developed within our educational philosophy, the next stage begins. This is establishing the flow of the program – how it will work, what will be expected of the children. What skills are needed?



What are the anticipated outcomes? What areas of the curriculum will be involved? Also at this stage the research is started. What information do we need to write the program? What references will be required by the children? Where do we get the information and, if necessary, expert advice on the subjects involved? Which brings me back to our early morning trips.

Especially with a subject like the 'Mary Rose', the information (and the experts) may be concentrated in one particular place and therefore the only way it can be obtained, in depth, is to go and visit. We needed to talk to divers and obtain information from the museum at Southsea Castle and from the Trust, which entailed several trips to Portsmouth.

Gathering information and researching a subject has its own fascination. Meeting people who are experts in their own field, photographing material, collecting references, trying to gain an insight into the problems facing the archaeologist or diver all serve to aid the realism we are attempting to create.

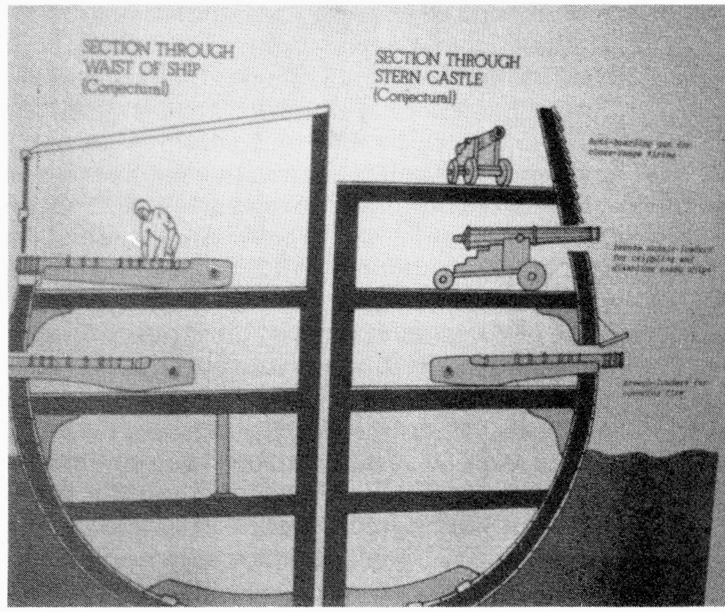
Once the basic information has been gathered it is time to talk to the programmer. Here, we are particularly lucky as our 'tame' programmer has an educational background and does bring further ideas to the programs. For instance, he suggested that on the 'Mary Rose' Diving program, it would be possible to have the mud infilling if the children dig down too many levels or attempt to dig horizontally when there is mud above them.

It is important that the programmer is involved as early as possible so that he can influence the structure of the program and help to design the detailed flow. Defining variables, consequences of inputs and screen formats is also undertaken with his assistance. The percentage chance of a particular event or the time taken to 'air-lift' an area of mud must be calculated, and perhaps altered after trials.

Now the program begins to take shape. It has a flow, a structure and data ready for the programming stage to commence. Throughout the period of programming regular visits to check progress, discuss details and examine screen formats are made by Ian and myself. The paperwork (teachers' notes, maps, drawings, etc.) is started during this stage. This will almost certainly entail further visits to gather the final documents.

At last, the back-up material is assembled ready for the final stage – testing and debugging. This is always a nightmare as most simulations tend to be rather complex and contain a multitude of consequences which interrelate and affect the running of the program. It is at this stage also that further subtleties which could enhance the program may become apparent and are often added, or part of the logic may be changed. For instance, the time taken to 'air-lift' mud was altered on several occasions to enable children to make reasonable progress during a dive.

The length of time which may be required to produce the finished program will obviously vary, depending on the complexities involved and the availability of information. The 'Mary Rose' took seven months to finalise. It almost took over our lives during that time. Be warned – designing programs can become as addictive as programming!



Photos taken on research trips to Portsmouth.

Software—an evolutionary model

Tony Mullan
Plympton St Maurice C.P. School, Plymouth

The phrase 'technology in education' invariably means teaching the same old stuff in a thinly disguised version of the same old way.

Seymour Papert[1]

At the risk of offending people I would like to suggest that the software that is currently available for children in the primary school leaves a lot to be desired. Although there are some interesting programs available they all suffer from one large drawback. Whether the program is a drill and practice exercise or a complex simulation, the level of *decision making* on the part of children is limited.

The teacher has been used to making decisions for children; and to a great extent the children have been content to follow the teacher's decisions. In designing a program the teacher has to make decisions regarding the way he expects the child to respond, and the information he is willing to give the child at any particular time.

Golby[2] suggests that the three traditions in the primary school militate against the wholesale acceptance of any particular innovation. The conflict between the *elementary* and *progressive* traditions is well documented and the development of *technology* has added to the pressure. Again at the risk of offending colleagues, I would suggest that the elementary school tradition is still very firmly fixed at the centre of many teachers' philosophy:

> In the survey classes about three-quarters of the teachers employed a mainly didactic approach (to teaching methods) while less than one in twenty relied mainly on an exploratory approach. In about one-fifth of the classes teachers employed an appropriate combination of didactic and exploratory methods . . .[3]

Although this is not full evidence of the predominance of the elementary school tradition it is an indication. Didactic methods tend to be related to a view of knowledge as fixed, whereas exploratory methods tend to view knowledge as mutable.

So here is a sweeping statement, unsupported by much evidence except a feeling. The majority of software that is currently available is based to a great extent on the elementary school tradition, and thus does not lend itself to full exploration and decision making on the part of the child. The writer of the most complex simulation has made many of the decisions before the child comes to use it. He has decided what will be found where, what results of actions will be. To allow a very large number of possible lines to be taken by the child would produce a program of almost unwieldy magnitude.

Even with this constraint in mind, there will arguably still be a need for programs similar to the ones currently available, for the foreseeable future. Traditions in education change slowly. What new software may be available in the next five years is as yet unknown. I would like to suggest that the 'closed' program is a dead end. A closed program has as a characteristic a predetermined limited use. A drill and practice program could be used by many children, but since children are dissimilar, the efficacy of the program must be brought into question. Do all children learn in the same way? I would suggest not, and if this is the case any program that sets out to transmit or allow practice of a specific body of knowledge must have built into it many different learning styles, not to mention teaching styles. The simulation may have at its origin an open view of the educational process, but again by its very nature it is closed. It is closed since it will simulate one particular situation, and is only transferred with difficulty to a situation containing similar concepts, but with different parameters.

It could be argued with considerable authority that simulations present children with opportunities for learning. If the computer gives alternative or extra information and experience, then that is a reasonable role. The simulation may be well researched, it may add further dimensions to the children's learning: but what advantage does the computer give over a television set, slide projector or film camera? One obvious argument is that the extra dimension of interactivity is available through the computer. This I would dispute, since once again we come against the problem that the important decisions have already been made, and the interactive aspects become key pressing, rather than reasoning. Real decisions are not made, at least by the children. The root cause of the lack of decision is that the program is dedicated to one particular task, *ergo* is closed.

The other side of the spectrum is the 'open' program. Two metaphors will illustrate what I mean by this. Firstly, let us briefly consider the child as a writer. The child in school has at his disposal a 'program' that is infinitely variable, with opportunities to be used in a large variety of situations. This is his spoken and written language. The items of language serve purposes that can vary from the crying of the young child (an acceptable manifestation of language?) through to the sublime uses of Shakespeare. With this richness available, many things can be done. If we compare a computer program with its drawbacks of 'limitedness' to the variety of language we can see the differences. Even with a limited dictionary of words the child can construct many different meanings. The dedicated or closed program cannot generate new meanings because its dictionary is fixed by the programmer. Consider a similar metaphor. With a limited number of notes a musician can compose a large variety of musical pieces. It is the combination of language units that produces the poetry or the play, and the combination of musical notes that produces the symphony or the pop song. In both cases, from a small set of available units, many possibilities can be generated. In both situations the combinations are under the control of the writer or composer – and, in the case I am considering, under the control of the child. A teacher may set the writing task but the child executes it in his own way, using his own words. With music, again the teacher may lead the situation but, if the music is to be created by the child, then the teacher must give control of the creative situation to the child. This is not to say the teacher abdicates his responsibilities. The child is constrained by the rules of syntax or harmony, and the teacher is the final arbiter (unless the child is James Joyce).

The question is then raised: can we combine the richness of the child's language with the power of the computer? The answer is yes – if only to a limited extent at present. The resultant program is not drill and practice, nor yet a simulation. Both of these are not rich enough to allow the flexibility I feel needs to be there. The child's language possibilities are non-specialised and are capable of mutation and change. It is the way the language units are used that is important. Software that contains the same magnitude of possibilities must itself be non-specialised. We could call this non-specialised software a 'system'.

The English language is a system. Language units are the elements of the system and English syntax forms the rules of combination. As has been argued, language units can be used in many ways, so an ability to be flexible is one characteristic of a system. The second characteristic is that system elements have meaning in their own right yet, by combining meanings, extra or further meaning can be imparted. The third characteristic of a system is that the range of possible meanings is very large. Think of the very large number of possible words that can be generated by the 26 letters of the alphabet. The fourth characteristic concerns control. A system is under the control of the user in the way he combines units into meanings.

The software we have traditionally seen is in the form of a host program, usually interactive with the user. One example of a system would be a host program that formed an environment that was capable of expansion by the user. How these expansions are combined by the user into the host program would be the real decision of the user. A second example would be a control environment that allowed the user to institute his own rules within his own design of host environment.

Such examples illustrate the most important ideas regarding choice and decision making. If the child as a computer user is given power over the environment, then he has to make true decisions, rather than the pseudo-decisions manifested in the more traditional aspects of educational software.

As was mentioned earlier, Golby suggests three ideologies that exercise pressure on the primary curriculum. The concept of a system owes nothing to the elementary school tradition, yet has not planted its flag in the progressive camp. It is firmly ensconced in the technological ideology and in fact could not exist without the technological backup.

I would suggest that there is an evolutionary hierachy in educational software. The first level is the *drill and practice program*. This has its roots very firmly fixed in the elementary school tradition. Its prime purpose is to quiz children and to present an infinite number of similar problems – the silicon textbook. Next in my evolutionary hierachy comes the *simulation*. This, I feel, is in an uncomfortable position, trying to find a foothold in the progressive tradition, but keeping one eye over its shoulder to make sure its flanks in the elementary school tradition are still secure. It is not Unstead in silicon, since the good ones seek to offer more than that. The third level I would suggest is the *problem solving program*. From my point of view it still suffers from the disadvantages that all dedicated programs suffer; that is, the possibilities of real choice and decision making are limited. At the pinnacle, at least at present, is the *system* that is non-specialised, but can respond as the user wishes. Even these have their own hierachy, with database programs, which are a limited system, through to a computer language in its own right.

Mike Thorne has offered a plea: 'No more drill and practice programs'.[4] I would like to finish with another plea. Let us put our efforts into developing non-specialised systems that are capable of expansion at the behest of the child. Let the children have the computers, and not the other way round.

This article presents some partially-formed thoughts. I would welcome correspondence.

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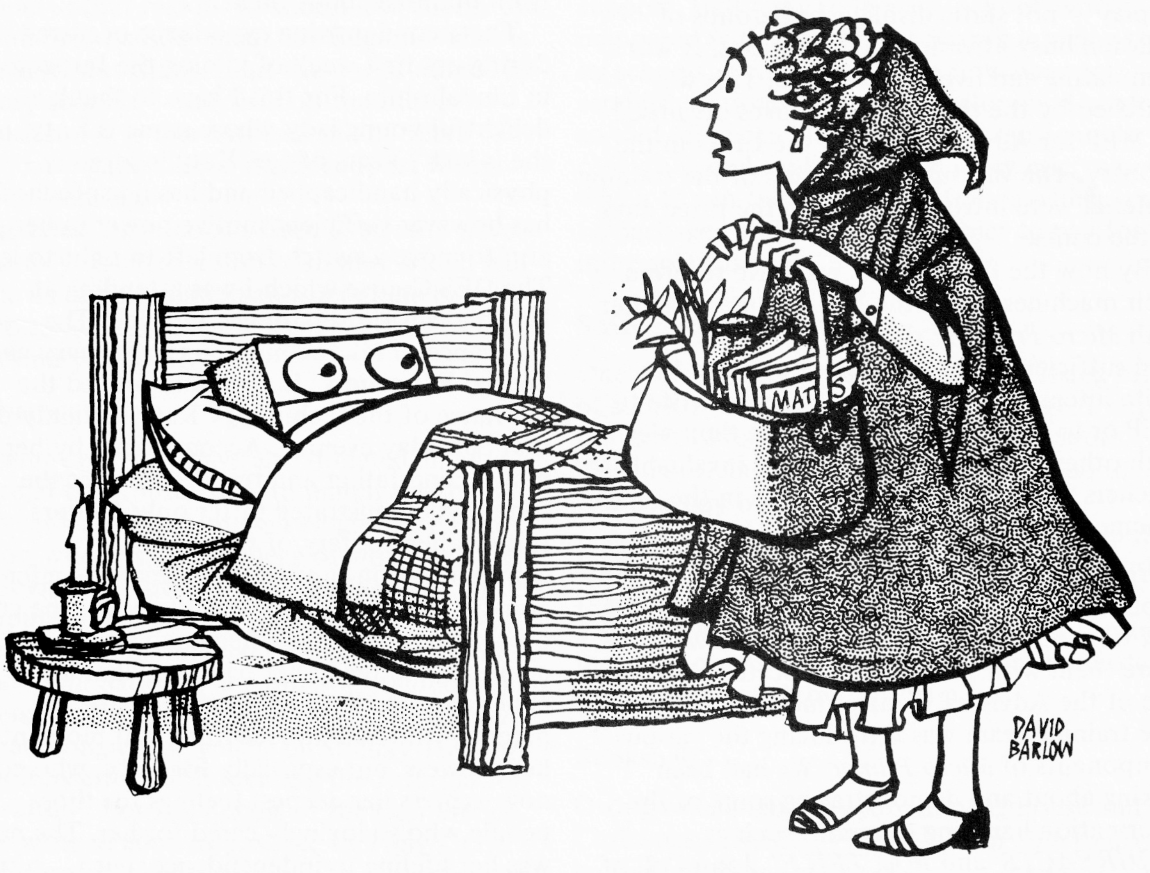


'Oh, Grandma, what big eyes you've got!'

MAPE matters

Ron Jones
Chairman of MAPE
Upwood County Primary School, Cambs.

I mentioned the rapidity of change in the opening paragraph of my last 'MAPE matters', and I am pleased to report that it has not abated. A great deal has been happening on the primary front in the past three months, and I hope through this column to bring you up to date.

Micro Primer launch

The most auspicious event was the official launch of *Micro Primer* at the very impressive Civic Centre in Newcastle-upon-Tyne. The Junior Minister for Education made an impressive speech which laid emphasis on the important role the primary schools are to play in educating the Information Generation. The training package – in particular its software – was very well received by the public, especially as they could see the imaginative use being made of the software by the schools in the North East. There was some excellent work on display – not static displays but groups of children busy at various workstations. It was a stimulating and lively experience. This was matched by the three major courses organised by MEP for Advisers from all the LEAs in the country. The various components of the training material were introduced during the three days of the course.

By now the first schools will have received their machines under the DoI scheme, together with *Micro Primer*. I do hope that some will find sufficient time to break away from the quite intensive work units in order to write to MEP or to *MICRO-SCOPE* to share their views with other teachers. It could prove invaluable for teachers using the material later on in the scheme.

During December and January I have had two experiences which have jolted me, and which I feel were important enough for me to want to share them with you. The first occurred during one of the Advisers' Courses mentioned earlier. The training team was introducing the various components of *Micro Primer*. We had been talking about and demonstrating some of the information handling programs such as *'YOURFACTS'* and *'FACTFILE'*. John Coll of Acorn demonstrated extremely effectively the attributes of the BBC machine – as had John Bowden for the RML 480Z and John Wright for the Spectrum. John Coll then asked for a telephone line and proceeded, through his portable modem, to answer his mail which had been left by his Cambridge-based secretary on the Electronic Mail Service in London. Having dealt quite quickly with his administration, he linked the system via the satellite to Maryland USA, and began to interrogate a database there. It is quite difficult to describe on paper the feeling in that room – watching a man using the very machine that shortly before had been demonstrating programs for use with 6 and 7 year olds. The cost of the satellite call? . . . just 12 pence! and the cost of the telephone call to London . . . well!

The very first article in 'the Reader' (one of the components of *Micro Primer*) is called 'The Day after Tomorrow' and is an extract from Peter Large's book *The Micro Revolution* (Pan 1980). He talks of Jane Babbage contacting her office in New York via a satellite – perhaps we should have called the article 'Tomorrow'. The implications for primary education of that demonstration are enormous – I am still reeling from thinking about them.

The second moving experience occurred during my first week of joining the Inspectorate in Lincolnshire. For this I have to thank a delightful young lady whose name is Katy, and she is just 7 years of age. Katy is severely physically handicapped and has no speech; she has however sufficient motive power in her right arm to move a switch from left to right to left. The DES Course which I was attending at Nottingham University was entitled 'The Relevance of Microcomputers to Primary and Special Education'. If any child proved the relevance of the technology Katy certainly did that Saturday evening. Accompanied by her mother and father and teenage brother she proudly demonstrated (after only 6 hours' tuition) her mastery of the art of communication through her use of the micro. She did this through patiently guiding the cursor over key letters which then enabled her to compose a letter to her parents. What an experience for the small audience, for her parents, who had no idea until that moment of her prowess, but especially for Katy, who could now express her deepest feelings for those people who so lovingly cared for her. The micro was her lifeline to independence, her communication to the outside world. It made me realise that MAPE must offer more support and help to colleagues in Special Education: and in terms of using the micro in its control mode they have so much to share with us.

It was on that same course that the importance of the MAPE Conference was reinforced – a Nottinghamshire Headteacher stated how her interest in using micros in her school had all started from her attendance at the 1981 Exeter Conference. She even quoted from the Conference Organiser's letter an invitation for the novice to explore the new technology. I do hope that there will always be room on our Annual Conference for this type of approach. All of us who have safely passed over that first threshold of awe or apprehension and emerged from the experience without a lessening of our enthusiasm should be wary of turning ourselves into computer buffs – the magicians of the new technology. There is nothing worse for our colleagues who are now contemplating taking their first tentative steps. They will need patience and sympathy.

Please lend a hand wherever you recognise the need, and by all means have them join MAPE – hopefully through attending a Regional Meeting, for it is at local level that help and support will be needed. I have only managed to attend two Regional Meetings so far. I regret through tragic circumstances I was unable to attend the very successful East Midlands event, which certainly made a great impression on the teachers in that region. Keenness and energy are outstanding qualities in all our Regions. That is the marvellous thing about the use of micros in primary schools – they run on the fuel of enthusiasm. It is this enthusiasm and verve which have gained us so much support from various agencies.

The latest offer comes from IBM, who have generously donated a sum of money which will enable us to commission another guide in the MAPE series – on information handling skills in the primary school.

Conference '83

The same company have also donated an annual lecture at the Conference, to match that of BP. This year's IBM Lecture will be given by Bob Lawlor, who has the privilege of working alongside Seymour Papert in Paris, and its title will be 'Computer materials for young children: an alternative to commercial products'. This will be delivered on Saturday 9 April at Loughborough University. The second annual BP Lecture, by Norman Longworth, will be on Sunday 10 April, and will be entitled 'Educating the Information Generation'. For full details of the Conference, please write as soon as possible to Tony Gray, MAPE Conference Organiser, The Department of Education, Loughborough University, Loughborough.

The Conference will provide the highlight of the year – offering a forum for the exchange of experiences and ideas. Conference '83 is of particular importance for the future wellbeing of MAPE, for it is here that the new Executive Committee will be formed. For my own part, it will be tinged with regret, for under the constitution I will hand over the chair to some other person. I have thoroughly enjoyed helping with the birth of the organisation and seeing it grow into the healthy youngster it is today. We have of course to remember that it is still very young and in need of a great deal of careful nurturing. No doubt the next Executive Committee will be made up from the representatives from the 14 Regions. This places a great deal of responsibility on the Regions to put forward people who they feel will represent not only the interests of their Region, but will also serve the Association at a national level. It will be a critical period.

By the end of 1984, when the DoI scheme comes to an end, all primary schools will have at least one micro, and the need for advanced curriculum development will be to the fore. So will the need to tap the vast potential of classroom teacher software ideas and to help, perhaps through other agencies such as MEP (in its extended period), to ensure that such ideas can be implemented. It will also prove to be a critical period for tapping the nation for more support. Half a micro in every school, when compared with the support France is giving to its schools, is not enough. We now need to establish national software development centres so that ideas can be developed in our schools quickly and cheaply; we need more micros on which to run the software, software which could be packaged and exported in order to pay for more software . . .

Software Worries

One worrying aspect of all this is the rising price of some of our more advanced software. I hope that publishing houses will adopt a far more realistic pricing system: not high prices so that few can buy but many can 'pirate', but programs at reasonable prices, so reasonable that 'piracy' will not be worth the risk or the effort. It needs a different attitude to be engendered, big price wars, small mark-up but profit through the sheer quantity sold. Publishers please note, and reply through our letters page.

Bookshelf

Owing to changing my job, moving house and Christmas activities, I haven't been able to do more than glance at the books on the bookshelf. I seem to have absorbed more the magazines in the rack.

Nevertheless one slim red volume which I did read is MEP's Case Study 3, *BIGTRAK PLUS*, written by Maurice Meredith and Brenda Briggs of Southampton University – available from CET, 3 Devonshire Street, London W1M 1BA, price £6.50. Those of you contemplating the use of BIGTRAK with your children will find this illustrated account of work in schools of interest. In many cases you can follow the action through photographs, diary excerpts, reproduction of children's work and transcripts. Why *PLUS*? – because the book includes a user guide for a LOGO-like program called MOVES.

Two magazines which I am finding extremely useful for help with the BBC micro are *Acorn User* and *BEEBUG*. I would recommend all teachers having access to a BBC machine to join BEEBUG, the independent national users group. You can join for half a year for £4.50 or a full year for £8.50. The address is: BEEBUG, PO Box 65, St Albans, Herts AL2 AR.

Acorn User, which is the official Acorn magazine, contains some very interesting and specific articles. The annual subscription is £15.00 from *Acorn User*, MAGSUB Ltd, Oakfield House, Perrymount Road, Haywards Heath, West Sussex.

As we are in high tech., I suppose we are tending to keep updated through the TV, and Series II of the Computer Programmes – *Making the Most of the Micro* – is no exception. The programmes are currently being shown, on BBC 1 late night on Mondays, BBC 2 on Monday afternoons, and Sunday mornings on BBC 1. It is promised that there will be repeats later in the year. The topics offered will provide very useful training material for the future.

We have a great deal to thank the BBC for in its drive to improve our computer literacy – let's make the most of the material offered. From merely raising the problems, the BBC has made positive contributions towards solving some of them. An innovation which they officially launched in January is the video disc system linked to a BBC micro. The implications for education are enormous – children will be able to interact with moving pictures of high quality. It makes one wonder if the best buy is a colour monitor, when there will clearly be an increasing need for a colour television – perhaps one which easily and effectively converts to a monitor would be a better buy.

This is my last 'MAPE Matters' as Chairman – but no doubt I will continue to contribute to *MICRO-SCOPE*. It offers us an ideal means of communication on a national scale; please use it to make your own views felt or those of your Region. We need to share our experiences if we are to continue to move ourselves and the children forward into the Information Age.

'Of course the little perrishers drive me mad too, but I just count up to ten million and say nothing . . .'

Micro Primer:

A review

David Whitehead and Howard Sayle
Newman College

Thousands of primary schools will shortly be receiving their first computers through the Department of Industry scheme. The only feasible approach to the task of induction of all the teachers involved is to include a training package with each computer. The MEP has compiled the *Micro Primer* pack for this purpose.

Micro Primer aims to introduce you to:
- some of the uses of microcomputers in schools;
- using the micro with confidence *throughout* the curriculum;
- some of the concepts of information technology, and their social and educational implications.

The pack is composed of six elements.

1. Overview

The components of the *Micro Primer* pack have been designed with a particular planned sequence in mind, but of course they can be used in a variety of ways to suit yourself. The Overview provides a suggested 'routeway'.

After a brief introduction and explanation of the components of *Micro Primer*, the Overview details 22 'work-units'. Each work-unit directs the reader to study specific sections of the books and to attempt various practical activities, such as setting up the computer or working through a particular program. The activities increase in complexity in order to give the beginner confidence and the more experienced food for thought.

2. Easel

The Easel is a guide for the complete beginner on the setting up and operation of the computer and the various components of the system. It is a ring-bound book designed to stand by the computer as a reference guide, to supplement the maker's manual. The Easel is specific to the particular machine ordered through the DoI scheme.

3. Reader

The Reader is a collection of articles and case studies. A wide range of topics is covered, under the headings 'Social Implications', 'Computers in the Classroom', and 'Implications for Primary Education'. The articles are intended to provide background information and topics for discussion, and can be heartily recommended.

One quotation I find very apt is taken from an article by Joe Telford: 'If primary education is centred on children, it cannot be centred on computers. The computer must be placed correctly within the teaching strategy of the primary classroom.'

4. Study Text

This is the core of distance learning in the package. Seven self-contained units introduce various facets of microcomputing to the teacher: hardware; social implications; models of learning; applications in primary schools; classroom management; the teacher's role; and future prospects. Many teachers will begin with Unit 4, which examines four approaches – structured reinforcement; information handling; games and simulations; and problem-solving. Useful bibliographies and a glossary of technical terms are given. The text is clear, with effective illustrations, cartoons and 'pictograms' to suggest follow-up activities.

5. Audio Tapes

These are two cassette tapes containing recordings of teachers explaining the different ways they have used microcomputers in primary school. There are three case studies covering major types of programs, i.e. 'Structured Reinforcement', 'Data Handling' and 'Simulations' (including LOGO), and one study on 'Managing the Micro'. Each lasts approximately twenty-five minutes.

6. Computer Programs

MEP has undertaken to provide approximately fifty programs, free of charge, with each computer ordered through the DoI scheme. The programs supplied will be written in the dialect of BASIC appropriate for the machine selected.

At the time of writing only one pack of two cassettes is available, plus a major program called FACTFILE. New programs will be forwarded to schools as they become available.

The programs included in the first pack are listed below:

HELLO: A check on your cassette volume setting.

TESTCARD: A check on your monitor control setting.

CRASH: (reviewed opposite)

SHOPPING: (reviewed below)

QUIZ/MQUIZ: (reviewed below)

DIET: Pupils (age 10+) enter details of a daily diet; the program analyses it for energy, protein, fat, carbohydrate and fibre, and compares the result graphically with a recommended standard.

LITTER: A simulation in which a councillor seeks to gain popularity for a local election by running an anti-litter campaign. A major objective is to encourage group discussion of possible strategies and of the consequences of decisions.

FARMER: The old ferry puzzle: the farmer crossing a river with dog, chicken and grain, only one at a time, without disastrous consequences.

ANIMAL: A language development program with a lot of potential, using a guessing game. The computer tells you: 'Think of an animal.' It then asks a question – for example, 'Does it live in water?' If you answer yes, it asks: 'Is it a goldfish?' When you answer no, it sensibly gives up, and asks you for the name of the animal. If, for example, you type in 'whale', the computer prints: 'Please type in a question that would distinguish a whale from a goldfish.' You then type in a question such as: 'Does it live in a bowl?' The computer asks: 'For a whale the answer would be . . .?' (The answer must be yes or no.) Each time the game goes back to the beginning the computer can use the information built up from previous games. The interaction between computer and user is great fun and very popular with children. Finding good questions can lead to lively discussion and valuable logical concepts. The accumulated information can be saved on tape as a file and loaded back for further use. The presentation is very clear, and the program is easy to use.

FACTFILE: A database program for storing and retrieving information on any subject. Two subsidiary programs are included – YOURFACTS, in which children record and handle information about themselves, and DINO, a specimen file on dinosaurs for loading into FACTFILE.

SHOPPING and QUIZ

Rod Chaplin
Deputy Head, Priory Primary School, Tynemouth

'MEP are staging the national press launch of their Micros in Primary Schools scheme in Newcastle Civic Centre in a month's time. They have asked a North Tyneside primary school to put on a stand and you are it!'

This was the way in which my school became far more heavily involved in microcomputers than we had anticipated.

We had had a microcomputer (RML 480Z) in school on a number of brief occasions. I had attended a DES course on 'Microcomputers with children 5–11', and part of the follow-up involved evaluation of a number of programs. The nature of this evaluation work meant that the programs were seen in isolation and not as part of a series of programs nor as part of my usual teaching pattern.

When I was asked to put on the stand at the exhibition, I decided that I would attempt to make at least one of the selected programs part of a topic of work and not an end in itself. The programs selected were SHOPPING and QUIZ.

SHOPPING

Because of the limited time available, I decided to focus most of the work in the classroom on SHOPPING. For those unfamiliar with *Micro Primer*, this is a shopping simulation in which the user selects items on a given shopping list, to practise skills of giving money and receiving change.

Although the children in my class were 9–11 years old, I decided to develop a topic of work which took them right from the first concepts of handling money: using different denominations of coins to add up to a total; working out change from various amounts; and gradually, through a series of workcards and worksheets, building up the background to the program itself. This preliminary work went on for a number of lessons before the computer program was introduced. By this time the children were working out bills using workcards and a classroom shop with pictures and price tags. The children worked individually and, when they were sufficiently confident, they moved on to the program.

Some children found this a very easy, natural next stage; but to others the program proved extremely taxing and further reinforcement of one or more of the preliminary stages of work was needed. Most children soon became very quick and confident in their use of the program and were soon moving to more abstract calculations and more complicated bills. For slower children, the idea of having to complete all their shopping before they 'missed the bus' was a little off-putting. In the end I found that they were trying to get their shopping done and all their bills totalled . . . and then walking home! They liked getting the answers right, no matter how long it took. We found the time factor to be a hindrance rather than a stimulus to faster work. We found the program fitted nicely into our maths scheme, with scope for plenty of preliminary work, and also laid good foundations for more abstract calculations.

QUIZ

The second program that was to form part of our exhibition was QUIZ. This is a double program, again from *Micro Primer*, and is very different. It can be used in any curriculum area, in almost any age-range where reading is fairly confident, and by teacher or pupil alike. The programs allow adults or children to construct their own computer quiz without needing to know anything about programming. Because I had decided to spend a larger proportion of time on the previous program, I left the children very much to their own devices. We had a preliminary discussion on the construction of a quiz such as the one required. The children realised that they had to choose their questions carefully and to make sure that, in their choice of answers, only one could actually be correct. This led to a great deal of valuable discussion. Because of the limited time, each quiz was restricted to ten questions with three answers to each.

This then was very much a child-based task and I only came in at the end – to help the children record their quizzes on tape. Some of the resulting quizzes were quite remarkable, showing a great deal of original thought. Some were simply general knowledge quizzes, some were on more specialised topics and there were a few very novel and original ideas. One girl came up with the idea of ten questions which required 'True' or 'False' as the answer. Another used the question 'Which is the correct spelling?' throughout and the answer was chosen from three given spellings (the wrong ones all containing common mistakes). The class would have gone on making up quizzes for the rest of the term and certainly the possibilities of the program are endless.

Our time was up, and I was certainly favourably impressed by these two programs from *Micro Primer* Pack 1. I have since seen the rest of the pack and must admit I am rather glad I saw these two programs first. The two programs that we tried are very different, and they serve to show how a computer and its programs can have their place in any primary classroom and in many branches of the curriculum. The micro need not dictate what we teach, provided the right software is forthcoming.

CRASH

David Jackson and Senga Whiteman
Newman College

If you take advantage of the DoI scheme and buy a microcomputer, it will arrive accompanied by a *Micro Primer* pack. 'CRASH' is the name of one of the progams included.

CRASH simulates the movement of an arrow around an obstacle course displayed on a squared grid on the screen. The user controls the movement through commands of two kinds. 'F3' is a forward move of 3 squares; 'R2' and 'L1' are turns to the right and left respectively, in units of 45 degrees. It is possible for the user to select up to six different courses. In actual fact, only the first four options produce unique courses: the fifth and sixth choices are amalgamations of the first four. Until you start to use a program in the classroom it is difficult to be aware of its potential. Here are some suggestions for your own investigations.

If you wish to demonstrate a program to a group of children or indeed to the whole class, it is essential that everyone can see the screen display. Because of its size a monitor has a built-in limitation in this respect. It may be helpful to make one large-scale version of the grid which could be used as a wall chart. The start and finish squares remain constant and the obstacles are adjusted, as necessary, for courses 1, 2 or 3. A moveable arrow can be attached with a piece of Blue-Tack. During the running of the program the arrow moves relatively rapidly as it turns on the screen: consequently it is, perhaps, prudent to use the wall chart to demonstrate the method of arrow movements.

If each member of a group working with CRASH has a smaller duplicated copy of the grid then they will all be more involved in plotting courses. It's not possible for everyone to get his finger on the screen! Discussion can then take place away from the computer. Those children who cannot resist the keyboard will be restrained until a group decision is reached.

Moving on to more specific activities, the individual grids already described can be used in two further ways. Firstly, they can be marked with a route for which the children have to work out a sequence of commands. The routes can vary from the very simple to the more complex (see Figs. 1 and 2). Secondly, the children can be given a sequence of commands from which they can predict the path that the arrow will take, for example, F2R2F7L2F3R1F4R1F2. They then plot the predicted route on their own copy of the grid (see Fig. 3). These predictions can be compared with the actual result obtained from running the program.

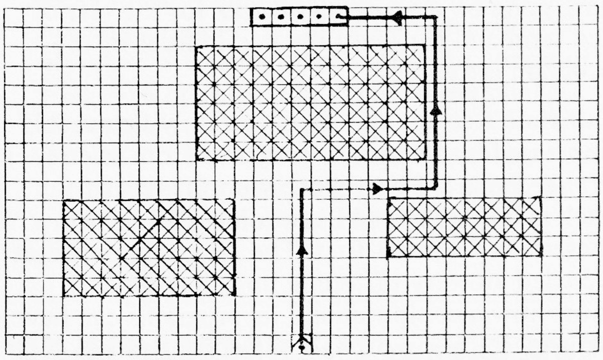


Fig. 1 Commands: F8R2F7L2F9L2F5

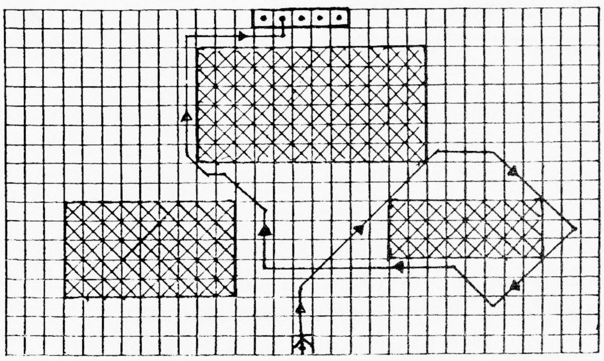


Fig. 2 Commands: F3R1F7R1F3R1F4R2 F4R2F2L1F9F1R2F3L1F2L1F1R1F1R1F6 R2F5L2F1

Once the children have mastered the program, variations can be introduced. A particular command can be excluded from those available to the user: for example, exclude L. (Left turns can either be avoided or achieved by R6 or R7.)

Conversely, the users may be given one or more commands which must be included in their command sequence. Attention can thus be directed to a specific move which might not

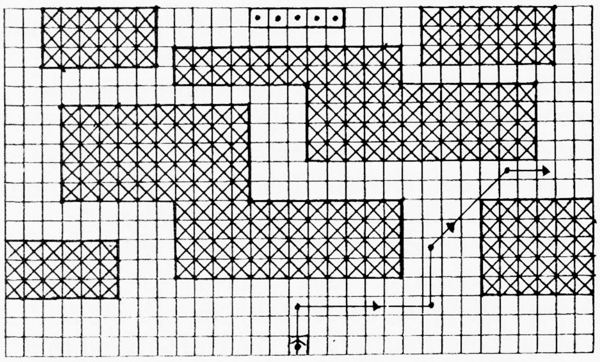


Fig. 3 Commands: F2R2F7L2F3R1F4R1F2

previously have been considered. If the children are only familiar with moving the arrow in a straight line and turning through right angles, then including L1 or R1 in a command sequence will introduce the possibility of travelling along a diagonal and lead to work on short cuts. It is interesting to note different children's approaches to the problem of including a specific command. If, for example, L3 must be included, an intelligent child might spot its inverse, R3, and start the command sequence with L3R3 and then find the most efficient way to construct a course without further constraint.

The children can be encouraged to find the most efficient route with a given restriction. For example, an upper limit could be set on the number of commands allowed in the construction of a successful route. Look again at Fig. 1, with an added task: 'This route takes 7 commands. can you do it in less?'

Alternatively, emphasis could be placed on the actual number of squares visited. This time the task for Fig. 1 reads: 'This route visits 29 squares. Can you get there in less?' The exercise could remain open ended. Successful negotiation of the course while visiting, for example, forty squares, would lead to a wide range of possible routes. These could then be assessed from a different standpoint.

As has already been mentioned, the arrow does move relatively rapidly but on the more complicated courses a record could be kept of the time taken for various routes. The reason for the fastest time could then be analysed.

Finally, a course could be mapped out using co-ordinates (although the grid is fairly large, 31 squares by 18 squares). Once again restrictions could be introduced with respect to squares which must or must not be visited as the arrow moves over the course.

Some of these suggestions may be regarded as fairly tortuous. The person most able to expand and develop CRASH to the best advantage of a particular class is the teacher. However, the program will fit in with a wider range of work. It can be preceded by, or associated with, investigations involving BIGTRAK or a floor turtle, and could lead to experiments with LOGO.

Project reports:

The Dundee project

Many fundamental questions about the value of using microcomputers in primary schools await the results of research and further experience. A significant contribution has now come from Dundee College of Education in a report of a 30-month research project funded by the Scottish Education Department and the Scottish Microelectronics Development Programme.

Detailed observation of use in two pilot schools was followed by a second phase of software development. In the final phase, each of six classrooms (in different schools) had the use of a micro for a whole term, with support of many kinds from the project team.

This is a well-documented descriptive study. It offers no easy judgements nor ready-made solutions, but plenty of concrete evidence for identifying problems and prospects.

We wish to thank Russel Wills, a director of the project, for permission to summarise part of the final chapter. The report is available (price £1.50) from: Computer Education Department, Dundee College, Gardyne Road, Broughty Ferry, Dundee, DD5 1NY.

A: CONCLUSIONS

1. Success? The teachers' viewpoint

Was the use of the microcomputer a success? First, a definition of success must be reached before an answer can be given. If success means simply that the microcomputer was incorporated into the classroom routine to the teacher's satisfaction then success was observed in the majority of cases, either because of forethought or attention to advice given. The exceptions were found in those classes where a basic interest in the microcomputer or in innovation was lacking, where perhaps a colleague or enthusiastic head teacher had placed the PET with an apparently co-operative member of staff.

If success means that the teacher was freed by the microcomputer to undertake work of a less mundane nature with the class, this kind of success was not seen. For the dedicated teacher, the microcomputer made work. For most of the teachers in the project, the microcomputer was an addition to, rather than a replacement of, teacher work even in the basic bread-and-butter skills. From what teachers said in respect of this aspect of microcomputer work, it seemed that the delegation of basic drill wholly to the microcomputer was seen as counter-productive for several reasons:

(a) It identified the microcomputer with the most tedious work.

(b) The teacher preferred as wide a variety of approaches to tables, etc. as possible (microcomputer, games, drill, competitions, etc).

(c) The teacher liked to keep in touch with class aptitude personally rather than at one remove all the time.

If success meant that the teacher revolutionised the teaching in the classroom, this was most certainly not the case. The ideal of the pupils learning to create a world of mathematics in the LOGO/Papert style was not open to the teachers in the project, because of the range and type of software available to them. Some teachers in Phase III involved the pupils in computer programming, but this was on the whole on the teacher's terms, under the teacher's control. Teachers likewise retained control over access to learning, in that who did which program was almost invariably a matter of teacher decision.

2. Integration into the curriculum

Integration into the daily routine was fairly straightforward for most of the project teachers, once they had identified areas of conflict. Integration into the curriculum rested in the main on the division of the software into categories. Certain programs were seen as appropriate for days when the class did map work, others for sessions of number work, etc. Some programs were seen as useful for remediation for weak pupils, others as stretching the able pupils. A few teachers went further and inserted data into the programs, to tie them more firmly to current work.

A very few teachers involved their pupils in the collection of data and the creation of 'new' programs. This last approach appeared to be highly successful in terms of drawing on pupil motivation, and creating interest in normally tedious topics. Spin-off benefits arose from discussion of the program being 'created', both in terms of the topic and of the exigencies of programming.

Integration of the microcomputer into the curriculum was viewed by the teachers as being based on forward planning of library-type unit work, in an ideal world. Teaching units and reinforcement units were suggested as program ideas, in punctuation, for example, 'to use when we get to that point'. Some sort of Teachers' Centre was envisaged as creating these units at teacher demand. It was not clear whether teachers saw all pupils as being processed individually through such units, or what. Furthermore, such suggestions were made on the assumption of one microcomputer per class, rather than per school. Such suggestions were perhaps also made on the basis of a relatively static curriculum.

3. The pupils' viewpoint

In short, the pupils enjoyed the microcomputer work. Those who were freely allowed access learned how to use the microcomputer; those who were given tuition by the teacher (or the observer, in one school) learned how to program.

On those occasions when the pupils asked questions of the observer or the research directors or the programmer, either casually or at special discussion sessions, their awareness of the role of computers in the world of jobs seemed acute. They mentioned parents or other relatives who worked with computers, or they themselves might have a microcomputer at home ('I can work it better than my Dad now'). They also asked about the job prospects and wages in the computer world. A few pupils were surprised to find that the programmer was female; 'do they let women do that kind of job?'

4. The Outsider's Viewpoint

As noted in the detailed descriptions of individual classrooms, pupils could still be bored, inattentive or badly behaved, even with the 'carrot' of the microcomputer. Programs could be dull, obscure, too difficult, too easy – and easily ignored, misunderstood and misused. The mere fact of a microcomputer does not guarantee a transformation in a class.

This obvious point is all too often glossed over by enthusiasts, or those fortunate enough (or skilled enough) to have capable, sensible and motivated pupils. The simple stimulus–response behaviouristic rationale behind most of the software used in the project assumed that the 'reward' in the program is desirable to the pupil. In other programs the element of competition against the microcomputer, or against the clock, or against another pupil, is the motivation. Not all pupils respond positively to these types of reinforcement, of course, but it is very difficult to create programs giving new and different approaches to sugaring the pill.

Perhaps the root of this difficulty is in the perception of learning as a medicine to be disguised – as unpalatable but good for you? On the other hand, the Utopian restructuring of education envisaged by Papert makes exceedingly high demands on the teacher. Is there a middle course between the kind of drill and practice software largely available at this stage, and the completely child-centred approach postulated by Papert? Will this middle course take the form of lengthy simulation work based on programs but bolstered by pupil book and paper work? Will the writing of more tutorial work avoid pupil misdirection and error? If the simple stimulus–response mode remains the mainstream, will the pupils eventually become totally bored with the microcomputer?

5. What are teacher and pupil characterisations of 'good' and 'bad' programs?

The characterisation of a good program for the teachers appeared to be in its relevance to current work (i.e., 'The Tayside program fits well with our local geography project on Tayside') or to accepted practice (i.e., 'MULT SQUARE helps them to build on their number line work').

The characterisation of 'good' for pupils appeared to be in the physical screen layout of the program, the enjoyment derived from the program and the mental stimulation provided. For both parties 'bad' implied difficult for the pupil, complex instructions, inappropriate language – all of this summed up as programs that required the teacher to interpret them to the pupil.

6. Does the program value for pupils lie in the 'game' approach associated with computers?

Pupil definitions of good programs are mentioned above, and in the tabulation of responses to the pupil questionnaire. This remains a difficult question to answer, when pupils have been observed oblivious or bored with a game-playing approach in a program. Sheer novelty rather than 'games' may appeal to the pupils.

Certainly there appeared to be no decrease in pupil willingness to use the microcomputer or indignation at missing a turn, even in the pilot schools where the PET stayed for a year. Dissatisfaction was expressed with programs at this stage by the pupils, but this did not spill over to the machine. Instead, the pupils attempted to make the microcomputer do what they wanted and tackled simple programming. The true value of the microcomputer may lie in its stimulation of the pupils – but this may be an ideal rather than a practicality.

B: QUESTIONS

The microcomputer is attractive, it is useful, and it is becoming cheaper. Software is available, but it is patchy. If a school gets a microcomputer, various decisions must be made:

1. Who uses it? Which teacher(s), which classes?

This decision may rest on the question of available software, or on the willingness of teachers to attempt program writing. The latter can be done, not readily, probably not to a professional standard, but acceptably – given persistence and time. There is no limit to the age-level of pupils who can use a micro-computer, except that non-readers will need assistance and teacher time.

2. How can 'key teachers' be identified?

Selection by enthusiasm could be the obvious method, but the enthusiast may become addicted to writing what might be unkindly described as half-baked programs, instead of helping other teachers use the micro with their pupils. Also, if an enthusiast monopolises the microcomputer, others may lack the incentive to participate.

3. What software is most useful?

Different classes may be seen as having different needs. The individual pupils in the same class may have different needs. Furthermore, different types of software make different demands on the class teacher. It would be advisable to go through the curriculum to view the software in relation to curricular demands. Documentation would help here, but there is no real substitute for working through the programs.

4. What if there isn't enough software?

There is no answer to this, until some centralised policy is defined. Teachers can write their own, slowly. A general bank of tapes can be assembled which give practice in key areas like number bonds, tables and spelling. Too much software can be just as difficult to handle as too little.A few good robust programs may be better than 100 poor tapes.

5. What if something goes wrong?

As far as the hardware goes, a reputable dealer will be able to handle this. Errors, crashing or simply unclear programs could be amended in the school, by the 'key teacher' or even skilled pupils, or programs purchased could be returned to the vendor, or reliance could be placed on outside or self-help groups. The class teacher ought to be able to deal with common bugs (as outlined in the simplified PET Manual used in this project).

6. What training is needed?

For the interested average class teacher as user, relatively little training would be needed, provided there is the opportunity for private practice at LOADing and RUNning. Ideally such training would take place outside the working classroom, perhaps even outside the school. For the 'key teacher' a short course on basic data alteration and simple programming would be very helpful. In either case, a really good text would be essential. Back-up help from a Teachers' Centre or a peripatetic computer adviser would be extremely useful.

7. Can teachers write their own software?

This may be possible but is it worthwhile? Is a technically poor program which is used better than a technically sound program which is not? The educational content of either could be excellent – or it could be very poor. A programming addict cannot be stopped from writing programs, but perhaps his/her labours can be directed.

8. What leads to successful use?

The physical conditions within the classroom, the teacher's routine organisation of pupil time and resources; these are the basic areas to be considered for smooth daily running of the microcomputer. The teacher's own input of time into identifying suitable programs, collecting data lists (possibly for someone else to type up?), involving the pupils in data creation or other program work all add up to more fruitful use. Either the microcomputer can be a point of prestige, or it can work. To work, it needs teacher time, teacher thought and teacher willingness to innovate. The most successful use observed in the project has been found in classrooms where the teacher felt that the programs were personal and relevant to the class. This was achieved by teacher effort.

Pentland Primary School

Not all MEP projects come from the top down; the strategy has always emphasised the importance of local initiatives. When teachers in a primary school develop their own project, with significant support from regional funding, you can expect the results to be relevant to classroom needs. The second half of this report from a promising project gives an outsider's view: an example of professional interaction which will become more common.

1. From small beginnings

Anne Liddle
Head Teacher

Pentland Primary School is in Billingham, Cleveland. There is a separate nursery building; on the site we have children aged from 3+ to 11+. The number on roll is just over 400, with the children divided into mixed-ability age-grouped classes, with some vertical grouping in the lower age range.

Early in 1980 the school was approached by the LEA to take part in a project to explore the use of computers in the primary school. The project began in April 1980 and we were given our first computer – a Commodore PET.

Although the staff were apprehensive about this 'new technology', they already regularly used other technological aids (Language Master, Synchrofax machine, cassette recorders and video machines) and therefore were prepared to explore what additional educational help the computer could offer.

Deciding who would use the machine was quite difficult. We felt sharing the computer widely meant fairly rigid timetabling, with the danger of teachers 'fitting children to the machine' instead of having time to investigate its facilities and develop its potential as a genuine educational supportive aid. Our wish to familiarise children with the use of the computer, to have opportunities to observe children's reactions and difficulties, and to produce necessary software, suggested the need for intensive, consistent use of the computer. Therefore for the first term the computer was shared by only two classes. Although the computer was used primarily by two teachers, all the staff became involved in the development discussions. We regarded total staff involvement as very necessary if the school was to establish successful computer development.

One of the main problems we encountered was trying to identify how we wanted the computer to be used. The earliest software we used consisted of programs produced to give children practice and reinforcement of certain skills, and to promote the acquisition of certain specified concepts. The teachers also felt the computer could be used to extend the presentation of certain concepts which teachers identified as being 'difficult to teach'. Eventually we found that to define computer use meant a re-examination of our curriculum policies, teaching practices and strategies.

During the following year, the school became full of 'computer activity'. Our very supportive parents began busily raising money, which resulted in the school being presented with a further three computers. Every member of the staff attended in-service courses, which helped them in the designing, staging and structuring of software, and the production of very necessary support documentation. A lot of time was spent on the production of program support apparatus, as we quickly established that this was essential if programs were to be fully integrated into the curriculum classroom activities.

Towards the end of our second year's involvement, we became aware that some of our more successful programs were ones which contained elements which could monitor a child's performance. This gave teachers insight into children's attitudes, reactions, understandings and (of great significance) misunderstandings in their work. Interest in this particular aspect developed into the formation and submission of a project to MEP. The project, entitled 'The use of the computer in the monitoring and assessment of children's development in the primary school' was granted support and funding by MEP and Cleveland LEA, and is to be conducted in the school over the next two years, 1983/4. The project entails a further twelve BBC computers being used in the school, and a programmer being assigned to the staff.

We are undoubtedly on the threshold of a challenging but nevertheless exciting two years of activity!

2. Starting school

Robin Kennedy

On arriving at the school my initial impression was the age of the building, and how far this 'age' was compatible with the 'micro-age' project in which I was involved. However, although the building was old the goings on inside were very much alive – never a dull moment!

As I am not and never have been a teacher, it was strange to find myself accepted by the staff and children as a full member of their team. I found it embarrassing to be introduced to parents at an assembly: all I remember is a sea of faces, and feeling that the glow inside me would keep the central heating system going for a week.

Before beginning work at Pentland, I had been involved with the production of the *Micro Primer* pack programs for MEP, and therefore had some insight into the work of primary school children. This helped me considerably in the project's early stages. However, there are still many obstacles for me to overcome in the educational reasoning behind the programs we are developing. If you really want to know about a school, go and sit in the staffroom and listen – what a lot you can learn in a short time! It did not take long to realise that teachers cope with a very difficult and harassing job.

One of the things I have most enjoyed is establishing relationships with the children: their friendliness has been most rewarding. I have also noticed how well behaved they appear to be , compared to children outside school. The thing that has most impressed me is the enjoyment and satisfaction the children get when using the computer. I think they most enjoy the programs that provide a challenge – the more demanding the program the better. A very simple example I heard was: 'I'm going to learn my 7 times table tonight – that computer is not going to beat me!'

The project has unfortunately got off to a slow start, as the computer equipment has arrived in dribs and drabs, the main bulk of the equipment not arriving until November 1982. We now have 12 BBC model B computers, each with a colour monitor and cassette recorder. Two of the computers use discs. As anyone who has used a cassette-based computer will know, they are not the most reliable of machines with regard to the loading of programs or the saving of data. For that and a number of other reasons, we will shortly be upgrading our system to what is known as an ECONET system.

Every computer on the ECONET will be connected to a central BBC computer, which will hold all of the programs or data that a teacher may wish to run. The computer in the classroom will no longer use a cassette recorder, thus solving the problem of loading. In fact, the loading process is made approximately 20 times faster and becomes a very simple operation for the teacher, in that there is no need to go through the normal procedure of LOAD "PROGRAMNAME". The programs can be loaded via a menu, thus requiring only the pressing of a relevant key. The ECONET also has a printer connected to the central BBC computer; a teacher can instruct his computer to print out the results of a program and collect the printout later from the central computer. Another interesting aspect of the ECONET is its ability to take programs from CEEFAX or ORACLE directly off the air, and then run them if required.

The installation of the ECONET will hopefully begin in the spring, no doubt bringing many frustrating but interesting and exciting hours.

Getting started

As the DoI scheme gains momentum, more and more teachers are meeting the challenge of using the micro for the first time. We believe they can help each other by sharing their experiences.

Reports from three teachers at Hollyhedge School, participating in the Newman Project, are followed here by advice from the Project Co-ordinator.

1. Breaking the barriers

As a teacher of 4 to 6 year olds I must admit I was extremely sceptical about the arrival of the school computer. I envisaged a glorified video game for use with only the older junior children. The 480Z appeared regardless, and all staff were given an introductory session on its use. Unfortunately this merely served to confuse me and confirm my doubts.

The impetus to come to terms with the machinery came, as might be expected, from the class. They had no fears or barriers and only showed enthusiasm coupled with slight disbelief at the expression on my face! I gradually became confident with its use only after taking the whole set-up home and battling with it in the privacy of my own four walls. Now I could set it up, load and run programs – great achievements!

By this time the school was involved with the Newman Project and my small amount of confidence was boosted by some positive feed-back. An idea discussed in the staffroom became concrete: the ROCKET program. This is where I started to enjoy the computer rather than suffer quietly. It is something directly relevant to infants and, with the file facility, relevant to each individual if required. The file instructions

are so easy to operate that I have managed 15 files to date – quite painlessly! ROCKET is basically concerned with visual discrimination; the files are graded according to the reading scheme (Ginn 360), approximately 3 to each level, covering 'odd one out', word families and rhyming words. Since then we have more infant-orientated programs (LINK UP, SPELL, MATCH, COUNT, and so on), many with the file facility.

I have been converted, now what? The help the computer has given to the reading in my class cannot be denied, but to be a true part of the learning process rather than more reinforcement there must I feel be a computer permanently in every classroom. A printout or a similar method of recording results is also essential for the continuity of lessons – leaping up for one minute in every ten can be very disruptive! I also feel concern that no communication is required when using the computer: oral skills seem to be lacking more and more. Perhaps the day will come when we can talk to and be answered by these machines?

There is no doubt in my mind of the value of familiarisation with the computer to children at this early age. After all, the computer will be an important part of their lives. It is an extremely valuable teaching aid and as such should have extensive use.

I feel the main disadvantage is the need to break down barriers amongst the adults – I still feel great confusion over terminology, and most articles and meetings leave me standing. This should not be so. More education for the staff and, above all, time should be given to assist the removal of the barriers. If this training can be given I feel confident that all can adapt programs to their personal requirements and so experience some positive feedback, thus allowing computers to realise their potential as a great teaching aid.

Frances Bowen

2. Facing the music

My first reaction on learning we were going to be involved with computers was that I couldn't see what help it was going to be to me as a music teacher. However, once I had begun to be involved, my ideas changed.

I began by using programs such as KP with infants. Having found that 2 seconds' time allowance for a response was insufficient I learned how to edit the appropriate line – my first step towards programming – I was hooked! When I moved on to do addition programs, again with infants, I thought I saw a need for a program to teach number bonds, so I sat down and after quite a lot of outside help the program is now being field tested.

I then thought about music, and felt that programs (a) to help children with a learning difficulty and (b) to stretch brighter children would be valuable; so I began to write a program which would give children themes upon which to compose their own music. This is still being worked out, the main problem being the graphics.

I found that while I was sitting programming at lunch time, children tended to appear to see what I was doing: so I tried to explain certain steps and when I had time we wrote very short, simple programs together. I believe that this is a valuable activity to encourage logical and structured thought.

As regards the programs we have been given, we have found a few changes to be necessary. In the main these have been the allowance of time for a GET (infants are usually slower!), the substitution of lower case for capital letters and sometimes revising the vocabulary of instructions.

The children themselves have taken to the computer and often work in their own time. The main complaint seems to be that they can't use it often enough (we need more than one!).

In my own field – music – I hope to produce programs to help with music reading, rhythm work, composition, harmony and perhaps some musical games. It will be very valuable if I can get an input from a keyboard – say a synthesiser. Programs of this sort will enable me to coach poorer children and extend brighter ones.

Mike Compson

3. Machines were mice . . .

. . . And men were lions
Once upon a time
But now that it's the opposite
It's twice upon a time

'Good morning, Mr Supply Teacher, this is our computer – you'll be working with it.' 'Pardon!!' I'm very good at impromptu lessons, when the gerbil has just had babies, the hot tap is stuck full on, we've run out of pencils, the nurse and dentist have come, it's time for the orchestra and remedial groups to go, and I've lost my pen – *but a computer* – that's out of line. Some jumbled words that might as well have been Persian with a Hindi accent, flying fingers and numbers and figures appear on the screen. This is all too much; I can bluff my way through most things, but not this!

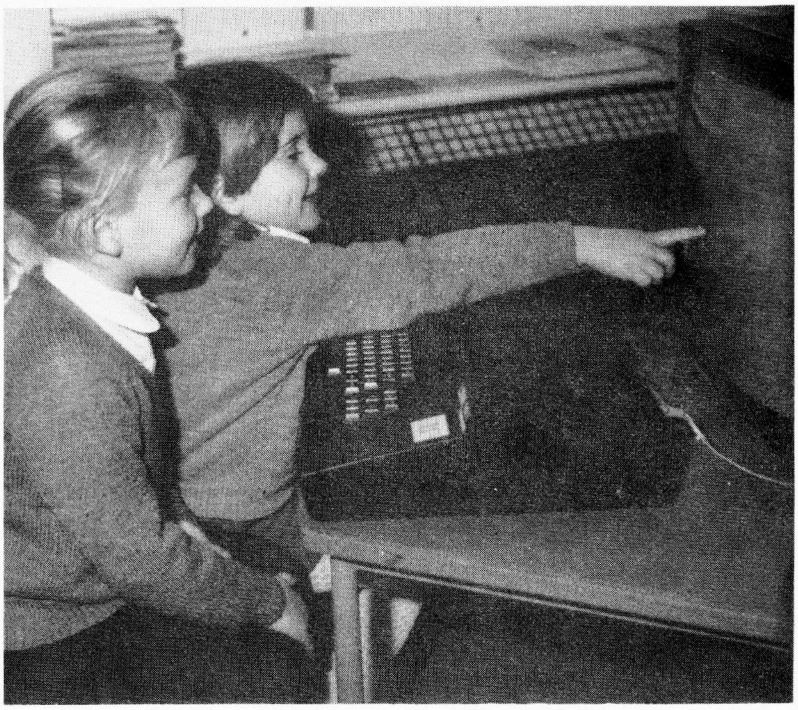
I stopped my kind, enthusiastic instructors and explained that I had not understood a word yet spoken. I was looked on with kindness, almost pity, and they started from the beginning.

I was given a pad and pencil, and wrote down in number order the steps that had to be taken to load the program. Part of my job in my base school has been taking children from various classes to the reference library to work on a program selected by the teacher. At first I was scared rigid, forgetting to press 'RETURN', and waiting for ages for something to happen; not reading the title with enough care and trying to type in too many letters. The silly mistakes persisted for two or three days – the best being unable to clear graphics (pictures) from the screen. The kids were very understanding and helped when they could. This makes you feel even more of a fool, but gets you out of the mess. I started writing down all the little bits of information that I was given, and discovered at a very early stage that there is a panic button (this clears the computer memory and screen); but it was two weeks later that I learned that you could use it and still save the program.

The attitude of the staff and kids to the computer depends mainly upon how much contact they have had with it. The more contact, the more at ease they are. Children seem to accept the computer more easily than adults, they seem able to absorb the mechanics of its operation without the worry of how it works, even to the extent of a reception infant who can run the ORDER program. Adults seem less able to adapt in this way as they can see many problems that *might* occur, and are more afraid of being wrong or failing.

By working regularly with kids of varying ages on different programs, I am now completely at ease with the computer, and am now trying to learn how to program it.

About the second week of working with the computer I was convinced that it was the ultimate teaching machine, capable of answering all educational problems. With further usage I am now becoming more sceptical of its overall wonder but more convinced that it has a most important part to play in education.



Already our lives are more and more involved with computers: bank statements, pay cheques, driving licences, etc. Many adults regard this as '1984', but for the children we are teaching it is going to be an increasing part of everyday life. Their familiarity with it will give them a greater understanding of its capabilities and limitations.

When starting out make a written note of instructions, even to the extent of adding 'Press RETURN button' when necessary. When someone explains something (*beware*: computer addicts talk a different language), make them explain it in words that you understand. Only worry about what you *need* to know to start with. The more you learn, the more you need to know.

I think the computer I have been working with is a very versatile and valuable tool. Like all tools, it must be used with competent hands and an innovative mind, and, *most importantly*, be used to achieve something, not just as an end in itself.

PS Be warned: computers can be addictive.

Geoff Franklin

4. Making the most of a new resource

When I first took a micro into my own class, the children were beside themselves with excitement and curiosity. Tables, spelling and punctuation, along with the more imaginative activities I had tried to provide, were received with an equal degree of enthusiasm and delight. The new experience was a refreshing one for me. The renewed interest and vitality spilled over into virtually everything else that we were doing in class at that time. However, it was clear that this extraordinary response was mainly due to novelty. I realised that it could not be expected to last for more than a few weeks.

The experience I had will soon be shared by many teachers, as machines acquired under the DoI scheme begin to arrive in schools. Teachers can do much during the first few weeks, while enthusiasm is at its highest, to ensure that the new machine and materials will prove to be of lasting interest and value. Unfortunately, this is the time when teacher expertise in handling the new resource is at its lowest!

Teachers, and children, who find their first experiences with the micro valuable and stimulating are likely to continue to gain benefit as the machine settles down to become part of school life. It is important that the first few sessions do not fall flat; but they will, like any activity, if they have not been properly organised and planned beforehand. Preparing a computer-based session frequently takes less time than preparing one that depends on, say, a number of elaborate visual aids. The following suggestions are intended for teachers who are about to become involved with micros for the first time. Please forgive me if some of them seem glaringly obvious! However, they are all worth bearing in mind.

There is no substitute for spending a little time beforehand loading and running the programs you plan to use. Read the accompanying notes through carefully, so that you are sure of what the children will be expected to do. Try and visualise problems that might arise with individual children, and how you might cope. If possible, talk to a colleague who has already used the program. Find out whether anyone will be available to help you during your session if things go wrong. You will quickly gain the necessary expertise yourself! Well-designed programs, such as those in the MEP package, will present few, if any, loading and running problems. Less 'robust' software of the amateur variety may break down, if, for example, a child types an unexpected key. Please bear in mind that this is never the child's fault, and certainly not yours, but is a failing of the program. Be prepared to let its author know, if you get the chance!

You should aim, as you gain experience in class, to become a critical judge of the programs you use. Do they really meet your and your children's needs? Are they likely to prove exciting and fascinating once their newness has faded, or do difficulties and frustrations begin to creep in? All programs can, and should, be changed to suit individual requirements. You may be able to carry out some changes yourself, even if you know little or nothing about BASIC programming. For example, a program which presents Cloze procedure may contain unsuitable passages. It is not difficult to change these.

A colleague who has already used the program may be able to help you get started. The notes accompanying the program should explain how it can be done. They may also explain how other important factors such as timing, range and difficulty of the activities offered may also easily be controlled by you. It really is worth being prepared to spare a little time in order to investigate these possibilities. Children will gain much more from the version which you have specially prepared than from the original if, as often happens, it is ill-matched to their needs.

Unfortunately, an increasing number of commercially-distributed programs are being 'protected', so that one cannot list the program in order to make changes. I feel that this is an undesirable trend, since, if the language that appears on the screen and the timing at which events take place cannot be altered, the program has limited value. Alternatively, options can be provided for teachers to enter their own requirements, while the program remains 'copy-proof'. I appreciate the problem that has arisen over the illegal duplication of copyright software, but it is possible for an unscrupulous professional programmer to break the copy-protection, in any case!

Other changes may require rather more time and programming expertise than you or your colleagues have at your disposal. A program may appear to be badly designed, or it may miss out an important stage in developing a new skill. Alternatively, an excellent program may suggest to you a range of alternative applications. Do not put your thoughts to the back of your mind – the improvements that you envisage may not present a problem to an experienced programmer. If they can be implemented, many other users in your area may benefit as well. An increasing number of good programs has been produced by teams of people with a vested interest in primary education. Without feedback from teachers, it is very difficult to judge the success of any program in a range of varying situations. Be positive and specific about the improvements that you would like to see – your comments will be valuable.

You may indeed have an idea for a totally new program. By all means contact a member of your local advisory team, or MEP regional centre. Your ideas will be welcome – but remember that a major problem in writing programs based on suggestions from teachers has been the lack of detail in the original specification. What you wish the program to do, and what you would like to see displayed on the screen, must be precisely explained. You must also consider how children's errors are to be dealt with, and how they are to be helped if difficulties arise. Seek advice before working on your specification. There is a shortage of useful, well-designed primary software at present, and good specifications are welcomed in many quarters.

Some teachers see the micro as a potential threat that will ultimately replace us all if not suppressed. Others fear that one day a centrally-controlled curriculum will be administered by means of prescribed programs. On the other hand, it seems to me that the importance of the teacher's role is central if this new learning resource is to be used effectively.

I hope I have succeeded in showing that it is vital, from the first weeks of having one in school, that what the machine does, and how it is used, is under the teacher's control. You will no doubt form your own opinions, when you observe its use in class, as to what the micro can do better than you, and what it cannot. You will find, although there is not room to go into details here, that there are applications where the computer may provide new scope for learning that cannot be achieved with any other resource.

However you decide to use the micro, remember that it has not come to take over your job! It may, if you use it successfully, enhance and extend the learning opportunities that your classroom provides. Whether or not it achieves this success depends, of course, on you. Good luck!

Helen Smith
Co-ordinator, Newman Schools Project

'I'll take that one!'

What is LOGO?

D. T. Radburn
Chairman, British LOGO Users Group
Long Clawson Primary School, Melton Mowbray

There are broadly two ways in which a computer can be used in a classroom. Both reflect something of the style of teaching and the philosophy of the teacher. The first way is one in which the pupils work in a closed system. The program in the computer is designed to facilitate the learning of a selected body of knowledge or skills. There is a growing number of such programs available. The second way is open-ended, though not necessarily without structure. The computer is used by the pupil not simply to reinforce the existing curriculum, but rather to develop the new intellectual and other skills needed to control the technology. The computer is used as a tool. The pupil is often able to select learning targets and devise means of achieving them – the teacher is not redundant, just less prominent. The first method can be seen as teacher-centred, the second as child-centred.

Understandably, apprehension is a feeling near to the surface of many teachers' minds when thinking of using computers in the classroom. Those who are already involved in using computers began generally out of interest, and voluntarily. They were under no external pressure to embrace a new and seemingly formidable technology. Now the intention to put a computer into every primary school will put pressure on most primary teachers to use the technology. As yet there is no accumulated body of software available for use on the machines. One of the dangers of this situation is that the closed (or 'drills and skills') software is easy to produce, and commercial interests are likely to ensure that this type of material will be freely available. Teachers who do not wish to adopt an entirely closed approach, in which the computer is used simply as a pedagogic aid, may find themselves under another sort of pressure. If the child-centred, problem-solving way is to flourish, there is need for a medium which is accessible to the pupil and is not of threatening complexity to the teacher. Such a medium exists.

Though it is not the only medium, LOGO is special in that it has been evolved for child use. This does not mean that it is in any sense a toy, inferior to other programming languages. Though simple it is very powerful. It is often capable of achieving with incredible economy results which by other means would be elaborate and lengthy.

Of the two facets to its nature, the one which is better known is '*Turtle Graphics*'. In this, a cursor (called the 'turtle') is moved around the screen by commands such as 'FORWARD' so many steps, 'RIGHT' so many degrees. The turtle can either have its pen up or down and thus can move leaving a trace or not. This facility is called graphics because the evidence of its use takes the form of drawings, rather than text or words. Reading Seymour Papert's book *Mindstorms* will reveal that, ideally, the commands should be executed by a small robot, controlled by the computer, which runs about on the floor. This has the advantage that the child can relate the movements which he wants the turtle to make to the movements of his own body in the same plane. I have seen children who, when the screen turtle is pointing downwards, turn their backs on the screen and bend, to orientate themselves with the turtle and thus work out the commands they want. The term which Papert uses to describe this is 'syntonic'.

LOGO arose in the sixties in the United States as a result of a project to investigate how computer programming languages might facilitate and improve the formation of mathematical concepts. In his book Papert recalls how his experience, as a child, with gears in a scrapyard, gave him a model which made accessible to him the truth behind an algebraic proposition such as $3x + 4y = 10$. The turtle in LOGO is an attempt to create an environment rich in mathematical potential, one in which, through the child's own body geometry, mathematical understanding has a secure foundation.

But more than this is asserted by Papert: he claims that children gain experience in devising strategies for handling problems, by breaking them down into 'mind-sized bites', as he calls them. If a child wished to make the turtle draw a square he might say four times, 'FORWARD 100, RIGHT 90'. With experience he could instead use the REPEAT command. The next stage would be to define a *procedure*, like this:

```
TO SQUARE
REPEAT 4 (FORWARD 100 RIGHT 90)
END
```

Now typing the word SQUARE will cause the computer to draw a square at whatever point on the screen the turtle happens to be. Compare this with the complexities of Cartesian co-ordinates! Compare it again if the square is repeatedly drawn smaller and smaller and rotated at each drawing! Such a task is simple in LOGO using the variable SIZE:

```
TO SQUARE :SIZE
IF :SIZE < 5 THEN STOP
REPEAT 4 (FORWARD :SIZE RIGHT 90)
RIGHT 5
SQUARE MAKE :SIZE=:SIZE–5
```

This procedure shows another property of LOGO recursion; part of the definition of the procedure may be the procedure itself. This might seem confusing, but in fact recursion is a common experience in the real world. For example, the process of swimming can be stated in recursive terms:

```
TO SWIM:
SWIM
HAVE YOU REACHED THE SIDE?
IF YES STOP
IF NO SWIM
```

This recursive property is very powerful and economical.

So far we have cosidered LOGO and *graphics*. The second aspect of LOGO is that of *symbolic list processing*. LOGO is more effective in the handling of words and their meanings than almost any other available computer language. For this reason alone, LOGO must be seen to have applications beyond the primary level of education. Though the languages LISP (from which the list-processing of LOGO is derived) and PROLOG have similar properties, neither combines them with the powerful graphics of LOGO (nor, I would assert, has the same simplicity in using lists). By creating suitable structures the computer is able to make inferences. For example an animal with the categories TEETH POINTED and EYES FORWARD could be inferred to be CARNIVORE. This represents the 'germ' of what is often referred to as Artificial Intelligence. At present this aspect of the language remains relatively unexplored, but time may yet prove it to be the most significant feature of LOGO.

One facet of computer usage which it is easy to overlook and not give full value to is the effects on the pupil's self-image. Papert perceives the importance of being at ease with the mistakes which occur naturally in the learning process. He sees that when the child finds the computer does not do what he wants it to, a very important piece of analysis leading to correction should occur. This is most likely to happen when the child has set his own target. My own experience concurs with this, and I will finish with two anecdotes.

The first involved a group of three eight-year-old girls who were trying to make a floor turtle draw a curve. They had made a start and things were going wrong; the teacher perceived this and came over to offer help.

All three girls had been animated and fully involved in hypothesizing what the next step might be. But with the intervention of the teacher there was a policy of 'wait and see', and in the case of one particular girl there was a complete withdrawal from the problem and a restless looking around the room. Something had been taken from her.

The second case involved a child in my own class, a ten-year-old boy called Adam. Adam was a highly sensitive boy who had a sharp lack of self-confidence. Any new situation had the power to reduce Adam to tears, and he had a reading problem. Even tasks which Adam was perfectly capable of doing he would become inept at if he thought he was being watched. Adam was given some extra time to use the computer.

Because he suffered no inhibitions from previous failure he made rapid progress, and he became the first child in my school to be able to make the turtle draw a circle. (The only help which he received from me was the suggestion that he should walk in a circle and think about what he was doing, if he wanted to know what to tell the turtle to do.)

At an evening arranged for parents to see and use computers, I invited the adults present to come and see if they could make the turtle draw a circle. Needless to say, no one was trampled in the stampede to do it! When I asked the children Adam's hand was the first up and the highest. With obvious confidence and keenness Adam made his way to the front and, without any fluster or hestitation, in front of all, produced the circle.

If it were only for what it did for Adam I would have cause to be grateful for LOGO.

Turtles go home!!!

Bob Coates
Computing Manager, MEP

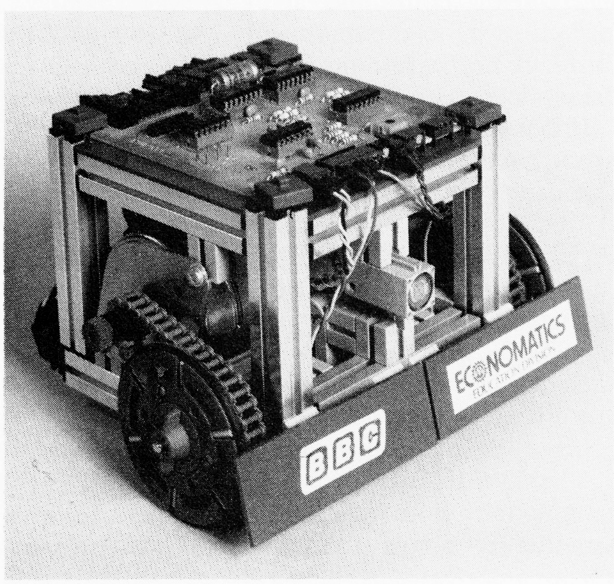
One aim of *MICRO-SCOPE* is to keep readers informed of new developments on the horizon. The BBC Buggy is one such device, offering exciting possibilities in the field of control, and opening up many new areas of exploration.

The development team provides an instructive example of new kinds of professional co-operation, including contributions from Newcastle and Doncaster MEP Centres, from the BBC and from Economatics. We are indebted to Bob Coates for this summary.

Introduction

The BBC Buggy is a package developed by MEP for the BBC Computer Literacy Project as a complement to the series *Making the Most of the Micro*. The package consists of a three-wheeled precision vehicle which operates from a BBC model B microcomputer. The vehicle is equipped with a number of sensors which provide the Buggy with 'senses'. Supplied with the vehicle kit is a series of graded programs which are designed to demonstrate the nature of programmable control using the vehicle in an imaginative manner.

The Buggy is designed as an example of real technology, a programmable robotic device which could be used both in the home and in school to explore some of the important elements of modern microprocessor-based technology.



The construction of the vehicle allows expansion so that, say, a grab arm can be fitted. The software also is written in a 'building block' manner to encourage the user to 'bolt on' new sections of program to enable the Buggy to perform more subtle tasks.

The Buggy

The vehicle is about five inches square and is driven by two precision stepper motors. To the front is a split bumper with microswitch collision detectors and a light detector. Underneath is an infra-red transceiver which can read special bar-codes or follow a line. The centre axle has room for a pen-up, pen-down mechanism, so that the Buggy can leave a trace of its journey.

The computer programs

Thirteen programs will be supplied. They aim to involve the user in an interactive manner to demonstrate how a microcomputer can be configured progressively as a switching device, a memory, a graphics terminal, a programmable device, an information processor and a problem-solving unit. The programs are user-friendly and structured so as to aid understanding. Full documentation will be available in the kit.

1. TEST This program checks that the Buggy is set up correctly and that all sensors are working.
2. SWITCH A simple program to show the essential commands in BASIC which drive the Buggy.
3. MEMORY SWITCH As the Buggy is driven manually by the user (using the arrow keys) the computer records the key presses and will replay them in sequence or in reverse order.
4. RECORDER This program uses computer graphics to draw an animated on-screen map of the progress of the Buggy.
5. SNAIL This program is like RECORDER, but the instructions are given as a simple coded sequence: e.g. F20, R90 . . . meaning go forward 20 cms., turn right 90 degrees, etc. A 'snail trail' is then drawn on the screen to map the Buggy's progress.
6. ROUTE PLANNER This program demonstrates the elements of computer aided design. A 'pen' is commanded to move and draw a route for the Buggy on the screen. This screen information is then

interpreted and relayed to the Buggy as a set of instructions, and the Buggy then enacts the designed route.

7. BAR-CODE ROUTE PLANNER This program shows that information can be given to a microcomputer other than by keyboard entry. Route instructions are read by the Buggy from special bar-coded cards. These are then interpreted and the route enacted.
8. EXPLORE FOR OBJECT This program demonstrates the principles of artificial intelligence. The task is for the Buggy to seek out an object, work out how large it is, draw its shape to scale on an on-screen map and then return home by the shortest route.
9. EXPLORE FOR WALL The Buggy is placed anywhere in a bordered area. It will then measure the area and draw a correctly scaled map of its territory and itself.
10. SUNSEEKER The task is to seek out a light source, negotiating any objects in the way.
11. MAN VERSUS BUGGY The task is as for SUNSEEKER but the user is driving the Buggy using only the same information as the computer had available in SUNSEEKER. Information is presented on an instrument panel. As objects are struck they are plotted on to an animated map.
12. LINE FOLLOWER The classic program performed by the Buggy; it will follow a black or white line.
13. TIN PAN ALLEY In this program the Buggy reads musical information from a line of special bar-codes. The program shows how quite complex information can be simply represented. In this case two complete octaves and a choice of note type ranging from semiquaver to minim can be represented by just eight cards. Several pages of score can be built up progressively, to be later replayed on an animated score. Examples are provided for the musically uninitiated.

▪The Buggy will be available from March 1983 from:
Economatics Education Division, 4 Orgreave House, Handsworth, Sheffield, S13 9NQ. Tel. (0742) 690801.

News from the Regions

Merseyside and Cheshire

A steering committee has been formed with teachers from each local LEA, from colleges and support services. Questions of constitution and finance were to be investigated. Current LEA provision (notably from Wirral) was discussed. A first conference took place on 12 February, with talks from Mike Thorne and Peter Gill and interest groups run by local teachers. A termly newsletter is planned. Contact: Jim Fawcett, 15 Berbice Road, Liverpool, L18 0HK.

Isle of Wight

Frank Gregory has sent an account of a 10-week information handling course for middle school (9–13) pupils. Contact him at: County Hall, Newport, IoW.

West Sussex

George Wells, at Downview C.P. School, Felpham, Bognor Regis, PO22 8ER, would welcome contacts to help form a local group.

Northern

A list of committee members and plans is available from: Anne Liddle, Pentland Primary School, Cleveland, TS23 2RG. She sends outlines of two promising curriculum development projects backed by MEP and based in Newcastle: one on mathematics, one on the education of low attainers, both for ages 9 to 13.

East Anglia

A day conference on 29 January helped to launch this committee. Virginia Makins, of the *Times Ed*, offered a critical view, and there were demonstrations of Turtle (Beryl Maxwell), of *Micro Primer* and of software from Ely Resources Centre. Contact: Don Walton, Houghton C.P. School, Huntingdon, Cambs.

Capital

The Capital RIC is at ILEA Educational Computer Centre, Bethwin Road, SE5 0PQ. Tel: 735 9123 (Sandra Crapper).

Courses for teachers

The following check-list is based on a session at Exeter by Ron Gatfield. We wish to hear of specific ventures in this field and to record successes, imaginative proposals and unfilled gaps.

The normal route into the profession is an academic one. We should not be surprised, therefore, that it is basically a non-technical profession. Yet the profession is faced with the greatest influx of technology that there has ever been. Little wonder that there is a great deal of confusion and even genuine fear among the majority of teachers. Any future courses offered for beginners will need to take account of these fears as a major factor in course design.

General background

1. *Reassurance* – that computer use is not difficult at the operation level and that the machines are quite robust. Operation of a hi-fi system, of an automatic washing machine, driving a car, are useful comparisons.
2. The question of computer use is a *current issue* and not a matter for two or three years' time.
3. Some statement of *future possibilities* – in say 5 years' time – to forecast something of the real world at the time current pupils will be leaving school.
4. An attempt to deal with teachers' conscience about *jobs* and the effect of machine development on the world at large.
5. The needs of *industry and commerce* – their view of schools and the schools' view of them.

Current use

1. Demonstrably *normal use* of micros in the classroom rather than specially set-up situations.
2. Not just computers, but calculators, BIGTRAK, 'Speak & Spell', etc.
3. Micros as just *one resource* among the many available in school.
4. The use of micros as a very *versatile and powerful tool.*
5. The *common modes* for use – CAL, CAT and CML.
6. *Support* for the teacher is becoming increasingly available.

Terms explained: Nesting Loops

Course Components

1. A statement of the course *objectives*.
2. A discussion of teachers' *views and expectations.*
3. Course components to meet these views.
4. *INSET and teacher skills*
   It is vital that teachers should quickly appreciate their possible level of involvement in microcomputer work. Apart from an introductory phase to heighten awareness and to stimulate involvement, three distinct levels of training course are emerging and teachers may identify with one or more of them.
   (a) *An initial training course* – aimed at ALL teachers:
      The awareness element necessary in all courses.
      Operating skills – machine familiarity.
      An introduction to classroom work.
      Types of programs currently available.
      The kind of LEA and other support available.
   (b) *Mid-range courses* – for far fewer teachers, those with some feeling of commitment:
      Limited introduction to BASIC programming.
      Alteration to DATA lines, adapting and modifying existing programs.
      Applications of value in schools, CAL, etc.
      Some evaluation of existing programs.
      Demonstration of simple word processors, information retrieval, etc.
      Classroom management. Practical implications.
      School applications outside the classroom, e.g. library, administration.
      Greater familiarity with machines – setting up hardware and peripherals.
      Organisation and control of software.
   (c) *Advanced courses* – required for consultants/specialists, enthusiastic committed teachers and possible leaders of introductory and initial courses:
      More advanced programming skills.
      Conversion skills between BASIC dialects.
      Greater skills involving hardware.
      Evaluation skills (software).
      Leadership of software design groups.
5. *Micro-computer talents* – program design and evaluation.
   The 'human' characteristics of programs – language used – styles and tactics – program objectives.
6. *Problems* involved in microcomputer use.
   Problems associated with the school – with buildings – with staff – with management – staff training. Hardware problems – compatibility – cost. Software problems – quality – quantity.
7. *Course evaluation*
   It is essential that efforts are made to evaluate all courses, particularly in these early days. does the course meet the declared objectives? Are the objectives appropriate?

Micros in the primary curriculum
An ITMA/Shell course

Jane Petty
East Midlands Regional Information Centre

Just under a year ago the Department of Industry funding scheme for primary schools was only a rumour and the MEP *Micro Primer* pack a mere twinkle in Ron Jones' eye! After considering the style and content of the INPUT pack produced by MEP for the secondary teachers, we felt that some teachers would consider an in-service programme that augmented their initial training most useful. Primary education is less subject-based and more child-centred, with staff involved across the curriculum. It seemed reasonable to assume that microcomputers in primary education would be used across the range of subjects, ages and styles of teaching. So the Primary In-service Course from ITMA/Shell was born!

In the draft version used by the 27 pilot schools across 12 counties the first chapter had to introduce the computer novice to the hardware and its operation. It was not then assumed that the teachers involved would have knowledge such as they now can gain from the *Micro Primer* pack. Documentation for the in-service course consisted of the following support materials:

• *The Course Reader* is the key to the course. As well as presenting ideas and information in the notes for each session, it defines the sequence of activities for the reader which are the most important elements of the course, illustrating them with reference to the suite of progams around which it is designed.

• *The Teaching Unit Pack* consists of *tape cassettes* containing the programs and a few associated notes on the learning activities each program can support, as well as how to 'drive' it.

• *A Course Record Folder* supplied to each member – to help the user build up a complete record of his own progress through the course and how the micro was used in school; each Folder section was already headed with a few notes of guidance, and more detailed direction was given in the text.

The Reader and Folder sections were divided into six sections, each with its associated programs, corresponding to the course sessions described below.

Session 1: Plug in and switch on
– meeting the computer.

Members of the pilot project started by learning how to operate the machine. This involved a procedure similar to playing a tape on a cassette recorder – very clear directions to get started were given.

The programs explored in the session were aimed at enhancing familiar teaching and learning activities. Teachers were asked to consider how the software might be used with children. This activity was assisted either by reading accounts of sessions that had been observed in school or by taking part in a simulated activity during the session.

Session 2: What shall we do with it?
– the computer and the primary curriculum.

Moving from matching activities and skills learning to concept development and problem solving, the session was supported by reading materials and programs aimed to focus on this area. One of the tasks was to begin to identify where these programs could assist – this could well be at different places in the curriculum for different teachers.

The value of the exploration was to raise awareness of wider possibilities.

Session 3: Was it worth the effort?
– evaluating the micro in the classroom.

This was planned as the major report-back session. Success and failures were equally important for the record sheet – indeed, if the pilot group had had no problems at all with organising the machine it would have been very lucky! Feedback was particularly valuable to everybody, offering a chance to sort out problems that were now 'real' through experience gained. Also in this session a check-list was used to assist evaluation of a program, using a very different approach from that in session 2. Two more programs were introduced – one involved the use of another set of apparatus as well as the computer, the other illustrated a 'film-mode' type of activity.

Session 4: And now who's the boss?
– managing the micro in the classroom.

This session was devoted to discussion or consideration of the management problems encountered so far – pushing forward to look at more programs which had been selected for this session as they offered a variety of challenges both in management and in the curriculum. Again this session was fully supported with reports of other teaching experiences or by simulating activities to begin to show educational uses for the materials.

Session 5: Add an egg
– problems and advantages of teacher authorship.

'With any other apparatus or resource you will be used to adding your own materials. This is possible with the computer as well. Not only could you write example sheets and workcards to enhance the activity: it is also possible in some cases to enter some of your own ideas and materials into the machine, *without any knowledge of computer languages*. The program chosen in this session will be very supportive in this way and the aim is that you will be very much involved in creating your own materials.'

Session 6: Where next?
– a look to the future.

Discussion of the teachers' experiences in using the programs and in creating their own exercises formed the first part of this session. Further developments of importance, soon to be available in school, were described. Either a video tape or a written report was made to help in looking forward.

The software made available for the course included two of the original ITMA programs (namely JANEPLUS and PIRATES, already published by Longmans) as well as new programs specifically written to support the content of the specific sessions. These included LOGIBLOK, which requires the children to use attribute materials alongside the program, and SEEK, a content-free binary search program that enables the teacher and the children to produce data files of objects and the questions needed to sort them. Along with these four programs there were a further eight programs. Several methods of evaluation were attempted which are being analysed at present.

Software for infants

Roger Keeling
Newman College

It is not difficult to justify the use of the micro-computer within the junior school curriculum. Unfortunately many teachers' first acquaintance with a micro is through drill and practice programs, and, quite rightly, this often tends to reinforce any doubts that they may already have had. What we should be emphasising is the enormous potential of the micro in the areas of problem solving, simulations and information retrieval.

Yet what of the infant school? Imaginative software for this age range is much harder to find, particularly if you disregard drill and practice programs. However perhaps there is a great deal of mileage in the latter type of program with young children; after all it is one activity on which infants spend a great deal of time. But it may not always be presented in the best way.

We are currently examining a simple counting program from a slightly different angle. The child has to count a number of shapes that appear on the screen. In the first mode they are not generated at random. The child uses the space bar to put them there in the first place and then selects the answer from the scale below (see Fig. 1). If the answer is correct a tune plays: if it is wrong then the shapes are individually numbered (see Fig. 2). A record is kept for the teachers to access at any time.

Question: How will children respond to the task of setting their own question and then answering it?

A second mode of use is for two children to work together. John presses the space bar and puts up the shapes for Mary to count; she selects the answer and then puts up shapes for John to count. A scoring system is built into the program (see Fig. 3).

Question: Does this mode of use encourage motivation and communication? Too often in an infant school we have a situation of one child occupying one machine with the others standing idly by. How do we involve two or more children actively?

A third mode puts up a random number of shapes and the arrow under the scale moves automatically. When it matches, John tries to press J before Mary can press M.

Question: Does this encourage concentration and friendly competition?

I have posed the questions without the answers. The idea only developed recently from watching some infants working at a micro with enthusiasm, but without being stretched and without a great deal of communication with their peers.

We now have the draft program written. The next stage is to take it back into schools to view the results. What age/ability range is it best suited for? Can it be used independently of a teacher's presence? Is it sufficiently simple in operation for these children to grasp? Is it interesting enough to hold their attention? For what time span? When we have the answers to these questions, perhaps we will have learnt something about how to encourage infants to interact positively with a micro.

If you are already using successful infant software, please do write in and tell us about it.

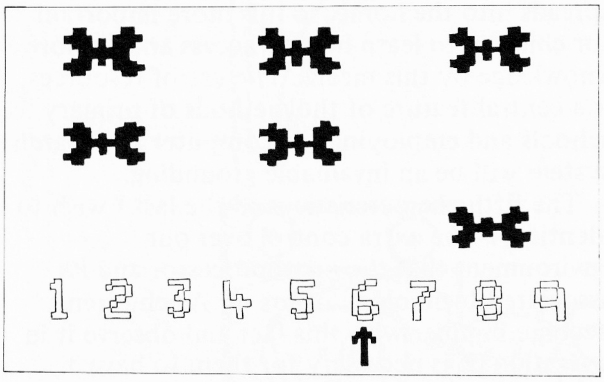


Fig. 1

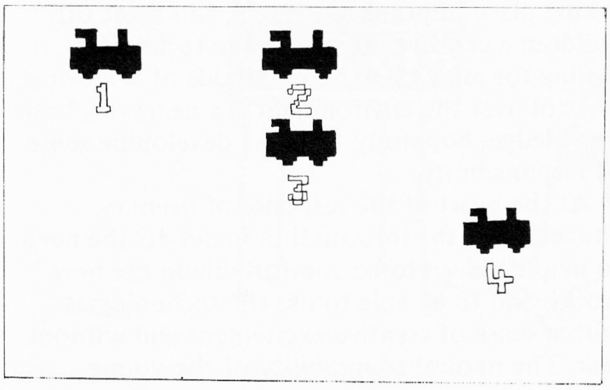


Fig. 2

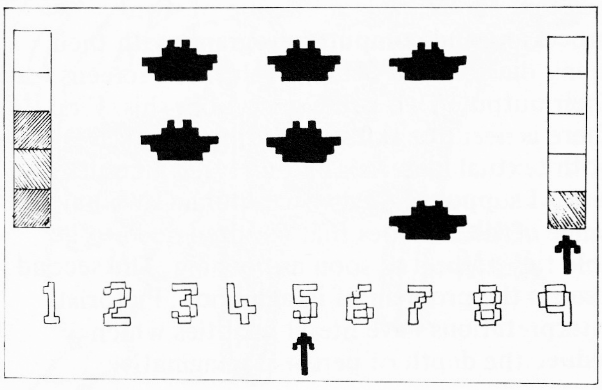


Fig. 3

The Information Society

Richard Fothergill
MEP

This is a summary of a key speech at the 1982 MAPE Conference.

For our children, living within our future society requires skills and competence with technology, and the groundwork and experiences necessary to develop these can and should begin in the primary school. The prospect of the information society is exciting and invigorating, offering potential solutions to many of the problems that confront us in coping with our environment now. The appearance of many practical uses of the technology in our domestic and everyday life gives much relevance to the work children will be doing. There are many characteristics of this information society which should influence the planning of an appropriate curriculum and other activities.

First, parental nervousness and even ignorance complements the increasing ease and familiarity that children show with the technology. Look in Smith's at the crowd around the demonstration Sinclair, and who dominate the scene? The children. Here then is an added responsibility for the primary schools, 'in-service training' for the parents. Many primaries have active parent/teacher groups who are interested and eager to learn and usually to co-operate. Perhaps this is the group through which to start your campaign. An appropriate and supportive atmosphere at home is a considerable asset in encouraging children's understanding, and in addition you are providing a useful service to the community in general.

Secondly, the information society is dominated by screens, normally television sets. Not only are we about to have four broadcast channels, a range of satellite programmes, video cassette recorder playbacks (and maybe video-discs), but also the retrieval of information via Teletext and Viewdata, the use of word processing and computer programs with their many diagrams all demand television screens for their output. Two issues arise from this. First there is need for skills in reading from screens, both textual materials and pictures/graphics, the latter I suppose called visual literacy. We have a range of visual codes that children need to be able to interpret as soon as possible. The second issue is the problem of imagination. Pictorial interpretations have literal qualities which reduce the depth of personal imaginative interpretation that is required, and the primary school is essential in ensuring that this important facility of the human brain is stimulated and encouraged. So much available from the television set also means developing skills in learning from it. In particular there is a need to help children to read from the screen constructively. Learning skills are an essential early basic requirement now that so much more material and information is accessible to the young child.

A third characteristic is the excessive enthusiasm for accuracy. The quartz crystal and the calculator produce results that are far more accurate than we have been used to, and digital watches are observed to the second. Yet how many children understand the meaning of this or appreciate the importance of estimation? On the other hand, can they tell the time more quickly and do they need the same arithmetic practice?

We have long been aware of the rapid growth of information, and this is already proving a real problem of organisation, storage and retrieval. One of the blessings of the computer is its capacity to help with these processes, and the rationalisation of the information deluge is increasingly being taken over by this new technology. As this method of control and order spreads into the home, so it is more important for children to learn how to access and explore knowledge by this means. The use of resources is a central feature of the methods of primary schools and employing the computer as a search system will be an invaluable grounding.

The fifth characteristic, and the last I wish to identify, is the extra control over our environment that the microprocessor and its associated technology offers us. As children become familiar with this fact and observe it in operation, it is necessary for them to have a simple appreciation of how it works. Some exciting work in electronics clubs is already taking place in primary schools, and these offer children a creative interest in the technology. A feeling for man's skill and methods of achieving control over the environment is a necessary basic knowledge, hopefully tied to a developing sense of responsibility.

At the heart of the response of primary education to the information society is the need to help children to be comfortable in the new world, and to be able to use the technologies with a sense of creative excitement and without fear. The natural adaptability of the young child is a great asset in achieving this, even though it is also slightly demoralising to the more technologically illiterate of our teachers.

Curriculum change

We are only at the beginning of this revolution, but its effects will be profound and widespread. The challenge to the total school curriculum has therefore begun, and discussion on the issues is now urgent. Perhaps two levels of consideration need to be given: the first, amending and enhancing the present curriculum at the level of topics; the other a deeper rethink – adjusting balance and approach.

All that can be given here are a few hints as to how that may be developed. As yet there has not been time for the more considered thinking that is necessary. At the first level, I am concerned about the approach to teaching binary and not infrequent reference that this is how computers work. The unfortunate result is that many children believe that computers are only numeric machines, whereas they also use and manipulate letters, usually through the ASCII code. That means they handle equally effectively both words and numbers, and store both. The binary theorem is about numbers to different bases and should not be used to confuse children about computers.

This leads me to my second example at this level, the whole business of working. Naturally children need to learn to write, to manipulate a pen to produce intelligible shapes. However, keyboards to computers and the microwriter with its six button keypad raise other questions about the further development of written work, not just writing. Part of the reason for children only creating short pieces of work is the sheer effort of writing, but does the creation of this with electronic devices encourage longer and

'Varlet, fetch another program!'

more revealing results? Because of the ease of correction, will children be more expansive in their self-expression?

Turning now to the second level of curriculum analysis, there are two questions that can be raised to promote the depth of thought we should see arising. First, the appearance of this technology helps children to conceptualise earlier and more quickly than has occurred in the past. For example, the appreciation that 'R' and 'r' are the same letter normally takes some time but is almost instantaneous on the electronic keyboard. Which of the fundamental concepts has been affected by the results of the technology and what changes should be made in the curriculum as a consequence? The second question concerns the availability of learning materials. The interactive nature of the computer promotes the possibility of more interesting and deeper learning in the home environment, but how should this be linked into the school curriculum? At this stage, the primary schools may well be able to influence what is made available at home, provided it is incorporated into the general structure of learning for our children, but this must affect the total curriculum and of course can only occur as a result of a careful analysis.

All the above is about change, radical change in some cases. Such a disturbance to the routine of teaching can be thoroughly unnerving, but is typical of the effects of the technology on our society. It is also disturbing to our children, and as there is no sign of this rate of change slowing, it is a circumstance of life they are likely to have to endure into their own adulthood. Perhaps the most helpful ability that we can develop in all children is that which helps them cope with change, an ability which we need as much to find in ourselves.

Computers and primary science

David Harris
Newman College

There is a well-established link between computers and scientific investigation at all levels of professional research. In secondary education there is an increasing trend towards the use of the micro as a tool in the study of the physical and biological world. Children in primary schools are presented with many and varied phenomena for investigation; now that micros are becoming available, the question arises as to how primary children could use them in science work, and yet retain the freshness and enthusiasm we would wish them to have.

At the moment there is little or no software available – a few test programs, multiple choice, demonstration, etc., but nothing tailored to the kind of activities proposed by publications like *Science 5/13*. Given this paucity of good software, what guidelines should be made for development of program specifications in this area?

A number of suggestions follow. Software should:

(a) be as open-ended and flexible as possible in operation;
(b) be readily adaptable to a variety of approaches in primary science topics;
(c) ensure that interaction with external equipment is uncomplicated, and the equipment easily assembled;
(d) accept data collected during experimentation with ease, and display it with clarity;
(e) develop the skills practised by 'real' scientists, and encourage the use of these skills in all areas of work.

Primary science should encourage children to test their thoughts (hypotheses) by well-designed and controlled experiments, to record the results and then to evaluate their predictions in terms of the actual outcome of the experiment. This means that software should be able to accept a wide variety of inputs and show, in an unambiguous way, the effect of variable changes. Science programs should fit in easily with a wide selection of approaches to science in school. The teacher and the investigation – not the programmer – must define the way in which a program is used. This means that software should have a number of different operating modes – simulation, data acceptance and saving, graphical representation of data, interaction with external devices – each mode being easily called from within the program.

A number of well-defined skills associated with scientific investigation have been delineated by various writers – in particular, *observation*, *measurement*, *hypothesising*, *drawing comparisons*, *sorting*, *description*, *record-keeping*, *prediction* and *fair-testing*. These skills must have a place in primary science software – they are the basis of scientific work at all levels. The use to which computers are put by scientists and technologists must be reflected at primary level, not in a watered-down form, but genuinely pursuing the same aims of objective testing, prediction and discovery.

Notebook

Publications

Five new offerings from CET, 3 Devonshire Street, London W1N 2BA:

1. *Aspects of Programming for Teaching Unit Design and Development* by Colin Wells (£15.00)

This text, orientated as it is at users of Research Machines hardware, is a very valuable aid for the teacher/programmer. It examines the problems of design and encourages the development of worthwhile material.

2. *Design and Development of Programs as Teaching Material* by Hugh Burkhardt and Rosemary Fraser (£6.50)

This MEP Information Guide describes the systematic ways of designing and developing computer programs for classroom use by teachers. A valuable guide for those teachers who want to formalise their original ideas with a view to seeking programmer support.

3. *BIGTRAK Plus* by M. Meredith and B. Briggs (£6.50)

A report of what can be achieved in the classroom with this 'programmable' toy.

4. *Videotex in Education: a New Technology briefing* by Vincent Thompson, Mike Brown and Chris Knowles (£3.00)

A very sound introduction to Teletext and Viewdata systems, and a look at classroom applications.

5. *The Kingdom of Sand* by William Gosling (£4.50)

A set of forward-looking essays from a 'literate engineer'.

And from Ellis Horwood/Heinemann Computers in Education:

1. *Beginning micro-PROLOG* by Richard Ennals (£6.50 paper, £12.50 cased)

An authoritative introduction to a computing language claimed to have clear advantages for use with young children.

2. *Structured Programming with BBC BASIC* by Roy Atherton (£6.50 paper, £12.50 cased)

A thorough and practical introduction to this advanced and flexible version of the BASIC language.

Films

Look out for *TRON* at your local cinema. From the stables of Walt Disney, the computer generated graphics are something special.

LOGO

A number of versions are now available. Two worth investigating are *LOGO Challenge* from Addison-Wesley, 53 Bedford Square, London WC1B 3DZ and *Arrow* (480Z) and *Dart* (BBC) from AUCBE, Endymion Road, Hatfield, Herts, AL10 8AU.

The fundamental text on LOGO is *Mindstorms: Children, Computers and Powerful Ideas* by Seymour Papert. Price £3.95 in paperback from Harvester Press.

Courses

1. *DES/Regional Course on 'Microcomputer Workshop for Primary Teachers'*: 6 days (27, 29 April, 9, 16, 23, 24 May). A course for teachers who wish to concentrate on specification, design and evaluation. Details from R. Keeling, Newman College, Bartley Green, Birmingham.

2. *British LOGO Users Group national conference at Loughborough University* on 9, 10, 11 September. Further details from J. Petty, 4 Frisby Road, Long Eaton, Nottingham.

Software for Survival

World problems of resources, ecology and overpopulation. Further interest has followed from Henry Liebling's article in *MICRO-SCOPE* 7. He hopes to meet interested teachers informally at MAPE's Easter Conference, or welcomes ideas on the way forward – write to him at Newman College.

Roger Keeling
Newman College

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