PRIMARY EDUCATION
The contribution of the micro

SPECIAL

MICRO SCOPE

Newman College with MAPE

Contents

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ISBN 0-948-04801-8
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Tel: 021 476 1181

Published by Castlefield (Publishers) Ltd.

Individual copies from Castlefield (Publishers) Ltd, 12 Chater Street, Moulton, Northants NN3 1UD.
Tel: (0604) 494660

Typeset by The Castlefield Press, Northampton.
Printed by The Heyford Press, Northampton.

MICRO-SCOPE SPECIAL
PRIMARY EDUCATION: THE CONTRIBUTION OF THE MICRO

Editorial

In the short time since microcomputers first made their appearance in primary schools, the focus of debate and discussion about their use has changed. In the early days there was an emphasis on the technical knowledge which teachers needed to acquire, in order to manage their machines and produce their own software. In-service (and pre-service) training sometimes consisted of an introduction to the hardware and a course in BASIC programming.

As more and more educationally valuable software has been made available it has become clear that few teachers have the time or the expertise to develop sophisticated programs of their own. The task of individual teachers is no longer to plug the software gap single-handed, but to use existing programs to extend and enhance the learning opportunities for the children in their classes.

To achieve this task teachers need in-service support, not just from those with technical knowledge of microcomputers, but also from those with expertise in various parts of the primary curriculum. A partnership between primary experts and experts with a background in micro-technology must be forged in order to support primary teachers in their exploration of the educational issues which arise from a consideration of the role of microcomputers in primary schools.

Last summer term the MEP Primary Project arranged two types of courses. The first was for primary advisers, inspectors and lecturers with little or no experience of computers. The aim of this course was to persuade participants that they have an important role to play in ensuring that computer use becomes an integral part of the primary curriculum, and builds on a tradition of good primary practice. The other type of course was for computer advisers with no primary background, thrown by force of circumstance into providing in-service training for primary teachers.

At all these courses practising primary teachers gave an account of what use they were making of the computer in their classroom, and how the micro fitted in with their educational philosophy. In this special issue of *MICRO-SCOPE*, we are printing some of these accounts which, we feel, represent the best of what is going on in primary classrooms in 1984, and point the way forward to future developments. We have also included two articles from our packs of in-service support materials together with details of what the primary project has produced so far, and what we hope to produce in the future.

Norman Thomas, formerly Chief Inspector for Primary Education in HMI, has written an introduction to this collection. We hope that his thought-provoking article, and this collection as a whole, will help to promote discussions about the use of computers that start from a consideration, and re-evaluation, of the primary curriculum and the ways in which young children learn.

Christopher Schenk — *December 1984*
MEP Primary Project

Microcomputing in primary schools

One way and another we have been offered a number of sets of aims for education in recent years. Governments and the Schools Council, among others, have had their say. The sets largely overlap and I have no wish to produce another. It might, though, be helpful to begin the present discussion with a broad assertion about education: our general purpose as teachers is to help children appreciate, come to terms with and use those aspects of themselves and their circumstances they cannot change, and to change those they can when they see advantage in changing. Of course, that leaves enormous scope for argument about what should or can be changed, and I make the point more to draw attention to the issues raised than to make life seem simpler. It is an added complication that the circumstances in which children live change around them, whether they or we like it or not.

Which, you might suppose, would bring us to microcomputers. But I hope you will be patient with me for a little longer for there are some things to say about learning in school that have more than a passing validity, and we ought to be clear whether and how microcomputers fit.

Aspects

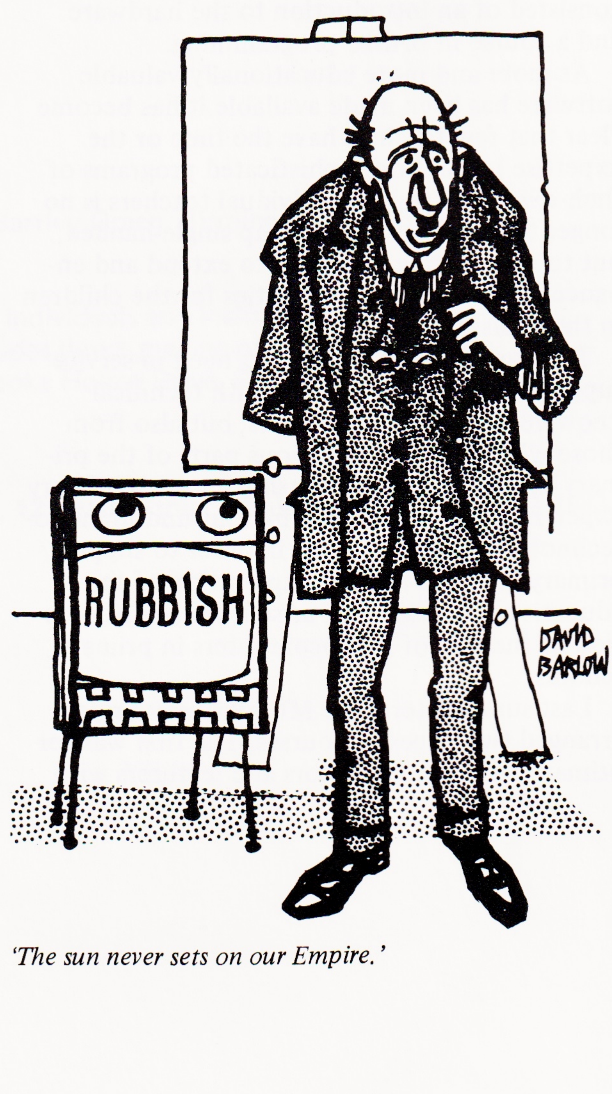
Just as we have been recommended sets of aims for schools so we have been offered various ways of analysing and discussing the curriculum. Perhaps, for the moment, we can concern ourselves with four main aspects: factual content, skills, ideas or concepts, and attitudes. I choose to call these aspects because they each offer different viewpoints across the activities that children and teachers undertake. They are not parts of the time-table, and each activity is likely to contain each aspect to a greater or lesser degree.

Factual content

Factual content is sometimes dismissed curtly by writers on primary education: anything will do that happens to be of interest to the children. That is hardly a tenable position. The content of what is taught ought to be as accurate as possible – and some still is not; it ought usually to be relevant to the children's personal experience and to extend experience; it ought usually to be information that is and will continue to be useful, as well as being of immediate interest.

If those requirements sound easy or so obvious as not to merit attention, give a thought to some common difficulties. Relatively few primary schools have managed to draw together and transcribe historical information, including census data, about any part of the area from which their pupils come. Children are still, in a good many schools, being provided with some information about people's alleged lives overseas, and even in this country, that has been out of date for twenty years or more, or which gives an inaccurate impression because it is so crude: 'It's hot at the equator'.

Providing specific, local information and keeping information up to date are difficult processes for teachers, most of whose energies must be given to arranging the presentation of the information and seeing that it is learnt.



'The sun never sets on our Empire.'

It is unreasonable to expect that every teacher in a primary school should have enough knowledge of every aspect of the curriculum to know which, out of all the possible information, is most likely to be useful again next year or in a few years time.

Skills

I would like to return to data after considering skills, ideas and attitudes, and to use the word 'skills' to refer to knowledge that has been or is being committed to memory through practice so that it is automatic or semi-automatic: the results of adding small numbers; handwriting; using a saw; reading and spelling common words; the fingering necessary to produce particular notes or chords on the piano.

Once again the points I have to make are obvious and obviously difficult. There is not a clear boundary-line between applying skills and simply practising them in isolation, but there is an important difference. Isolated practice can help to produce the automatic response and the accuracy and speed that is needed. But if the practice has to be continued for long it is often rather dull and requires external motivation such as pleasing the teacher. Practice does not do much to help learners know when and how to use the skill, which, after all is the point of the learning; and practice done without knowledge of the context of what is being learnt generates howlers, mathematical as well as historical. Given the right working understanding of what is involved, practice leading to memorisation can be essential.

What is silly is to practise things you can already do well enough without further practice. Application is what is then needed, and if the application is not required the skill might as well atrophy. Not many would think it worth practising Fivestones daily for forty years in the hope of a moment of glory with their grandchildren.

Yet is has been common in the past to get children to practise spellings they already know perfectly well, and there are programs for microcomputers that encourage the same time wasting. Some of the skills programs are even worse. Not only are they packaged in such a way that it is difficult for teachers to single out specific and appropriate items for children to practise, but the procedure is more cumbersome and time-consuming than using books or blackboard, pencil and paper. Fun is not a good enough reason alone for using a computer though it is often worth having as part of the package. Novelty may catch the attention for a little while but is by its own nature short-lived, and there has to be something of substance if attention is to be held.

If skills are to be well used in ordinary life they must be chosen well for the purpose in hand. Which skill is best to use may not always be immediately obvious, as anyone knows who has watched young children struggling to decide whether to add or subtract when told to find how much A costs if B, at £10.50, costs 90p more. Of course, they sometimes manage the practicalities of real life better than a text book – or a computer program, come to that.

Some broad concepts

The application of skills requires working understandings of many associated ideas, and this is not the place to try to list those that primary school children should properly meet. There are four very general notions, however, that pervade the learning of children, and might, using a different definition, have been referred to as skills.

One is the development of powers of discrimination through consideration of such properties as shape, colour, quantity, movement, temperature and, later, proportion, speed, density, and so on. Another, concurrently, is the power to generalise and to see common, underlying features in superficially different circumstances. For example, to comprehend the essential characteristics of liquids, or volume, or conservation which is not to say that there are not continuing difficulties as children are taken towards the edges of these ideas.

A third is the growing recognition of interaction and consequence, through which children learn to look out for products of change, not all expected beforehand. What happens to the area of a growing square as its side lengthens? What is the effect of adding an 'e' to the end of a word like 'gap'? If the workgroup is enlarged is it always more effective?

A fourth is the increasing use of symbols to represent and 'manipulate' reality: words both in the mouth and written; numbers and algebraic symbols; maps, diagrams, pictures and models; movement; rituals and signs.

Attitudes

The last aspect of the curriculum that I want to mention here is concerned with the development of attitudes. We often say that we want children to learn to be independent, and so we do. We also want them to seek help when they need it, and to recognise that life would be impossible unless we could rely on the help of countless others. We want children to be adaptable, and yet to learn to persevere. What we are seeking most of all is that children adopt attitudes suited to the occasion – which raises difficult questions about who is to be the judge.

Nevertheless, we must be confident in requiring a high level of co-operation, tolerance within limits and a determination to do as well as possible in the community and work of the school.

Some criteria and uses of computers

Anyone interested in computers will have had many applications of microcomputers come to mind while reading the preceding paragraphs. But other questions must be asked as well as the simple 'Can a computer be used here?'.

Undoubtedly, the first question must be: is the computer being used to teach something that is in itself worth learning? The second is: will the use of the computer be effective in enabling the child or children to learn? The third and fourth questions are: will the learning be economical in time and resources? The fifth, given that there is only one or a few computers in the school: does this piece of work provide the most sensible and urgent use of the machine?

All this said, there are undoubtedly important ways in which the microcomputer can enhance the work of primary school children. Quite often, perhaps usually, children need to be working in twos or threes on a machine if they are to get full benefit, for the discussion that accompanies the work can be as important as the explicit goal set.

Word processing

One use still in its infancy in schools, even by computer standards, is word processing. Primary school teachers and children spend much time revising pieces of written work to make them more presentable. Concentration is almost always on spelling, grammar and handwriting. Important though these are, it is equally vital that children should be learning to write in styles that are appropriate to their purpose; should be expressing their thoughts accurately, interestingly and as succinctly as the occasion requires; and displaying their argument, if so it be, in a logical form. To do so requires a considerable working-over of text and it is altogether too time-consuming and tedious to expect children to do much of this if they must rewrite every draft. If we can get suitable word processing equipment, and there are promising examples now being developed, then the opportunities may be great for the improvement of children's writing.

Some word processing packages are accompanied by spelling checkers or dictionaries. It would be helpful if someone could devise a spelling check program, to be used in conjunction with a word processor, that picked out just the two or three most common, wrongly-spelt words that should be the next for the writer to learn to spell. That would be a far more productive 'skills' program than most available now.

Databases

Another promising use of microcomputers that is appearing is in handling sets of data that are apposite to the children but not easily dealt with in their original form. Some teachers have collected census data and of these some have found benefit in putting the information on tape, or better still disc, so that the children can examine, collate and re-collate the material. Others have enabled the children to insert and recover information from bird observations or from measurements connected with the weather, and no doubt the list of possibilities is endless. The point is that the tedium is cut and the time is increased for discussion and thinking: for discriminating, generalising, noticing interactions and expressing findings symbolically or graphically.

Simulations

There are a number of simulations available, and there is no doubt that some of these are far superior to much of the topic work now done in schools. Examples on archaeological 'digs' have been carefully researched. When well used they give children a sense of immediacy and involvement and call for much use of books, charts and pictures, visits to museums, writing and discussion. Even the best may need frequent updating of their subject as the next ancient ship breaks the surface, but it is too narrow-minded a complaint to say that they are not first-hand experience: reading a novel is not first hand experience of the circumstances it describes nor of the story it tells, but it is none the less an important experience if the quality of its telling is good enough.

Other programs that claim to be simulations are less commendable. Watching a stylized screen figure struggling to heave a pixelated bag on his shoulder is no substitute for lifting a real sack of corn if one is to learn something more about weight.

LOGO

The use of the microcomputer in primary schools that probably receives more attention than any other is in connection with LOGO. Perhaps it would be better if the cognoscenti felt less irate than they do about inferior or counterfeit examples of LOGO so that they would tell the rest of us in layman's language what the differences are and what to look out for; especially if they could help us to understand the educational significance of the discussion. Instinct says that there is something important and powerful about a language that enables children to analyse and program movement, but ignorance, no doubt, makes uncertain the advantages of listing if it is no more than a modest thesaurus.

Changes hardly begun

Quite plainly there is far to go. Locking in to powerful databases is a way of keeping up to date and being able to choose from an ever wider range of information. Care will continue to have to be taken, and more so, in the selection of material. Concept keyboards and others capable of signalling the same range of symbols as old-fashioned typewriters but differently arranged may offer more opportunities, just as the modern railway carriage does when compared with the imitation stage coaches that first ran on iron rails.

What is clear is that the introduction of microcomputers is nothing like the introduction of teaching machines in the 1960s. They were school and college peculiarities. Microcomputers are still commoner in the children's homes than in schools and there can be no working assumption but that they are here to stay.

Some may come to gather dust because teachers are uncomfortable with them; or because the machines are so few or otherwise awkward in use that they defeat best intentions; or because, initially, they are used to do things that are hardly worth doing or could be done better some other way.

But overall, the number in use will grow. Children and teachers will come to see more uses for them. And learning should become more effective.

Norman Thomas
Former Chief Inspector for Primary Education, DES.

Goats, ponds, graveyards . . . and a computer

Three weeks in the life of a small, rural primary school

I would like to invite you to spend three weeks at my school. I will tell you about the activities that were taking place towards the end of the Spring term of 1984. The school has two full time staff, a part time ancilliary helper and 41 children on roll. I will begin with a description of the school and its surroundings. The school was opened ten years ago. In the school grounds there is a nature reserve and a pond, and we have planted a large number of trees, shrubs and 'wild' flowers. We have a chequerboard garden, which is rather like a draughts board, made with paving slabs with bits of garden between. We added a bird table last term. It is a very attractive school in a rural setting. The long side faces onto open fields with a lovely view with the River Thames about three hundred metres on the other side of the school field. The other side backs onto buildings and the road to the centre of the village so the school site infills a corner of the village.

Turning to the premises of the school, as we enter the main door we pass a white box fixed to the exterior wall. This is a weather station that we have set up. Through the foyer we enter the school hall which also serves as a Community Hall. Our Parish Council contributed £4000 to the initial building and the hall is, consequently, larger than it would have been. Lots of uses are made of the premises in and out of school hours. Branching off the hall are the three teaching areas and the kitchen.

We have a goat called Emma. The children who look after her talk to her and she recognises their voices and will reply in her own language. We had to call in our friendly goat expert the other day because she wasn't behaving in character. The children said, 'Something is wrong with Emma'. They picked this up intuitively. Fortunately all was well. It was the time of year when goats behave oddly!

We tether Emma out during the day on various parts of the site so that she can get fresh grass. Our computer arrived at about the same time as Emma the goat and I think there are a lot of parallels to be drawn between goats and computers. In a sense they both need somewhere to live: Emma, a shed and paddock; the computer, a trolley, and they both need things to make them work: Emma, grass and hay; the computer,

'RSPCA, You know that goat you lent us?'

tapes with programs. Their common link is the interaction of children by their involvement with them.

The pond is an important resource for first hand learning by our children. The other day I had various activities planned for the afternoon. My plans were totally upset when the children who had been at the Nature Reserve during the lunchbreak came in with eleven frogs in one bucket and fifteen newts in another container. The children spent the afternoon looking at these animals, observing them, drawing them, painting them, writing about them and generally splashing water all over the floor!

The past on file

A lot of the work that goes on in our school is directly related to our immediate environment. Recently we embarked on a study of the village as it was a hundred years ago. I had obtained the 1881 census records for the village. I went to the Public Records Office in London and paid £34 for thirty-four photocopies of the records. I am certain it was money very well spent. I had all this information on the original sheets and we had to start transferring it to a computer data file using *Quest*.

I took the children to the churchyard to look for names of any people that were buried in our graveyard who were also on the 1881 census returns. I asked the children to look out for people who were alive in 1881, but told them not to go into the newer part of the churchyard. Surprisingly we only found four people out of a total of 373 who had been alive in that period. The question was where did all those other people go? Did they move away from the village or were they buried without stones? We still haven't got to the bottom of this mystery.

The children recorded the details and we came back and started to look for the names using the photocopies of the census sheets. The children started to look through the names to find connections and of course it was quite a laborious job. They found that the copper-plate handwriting was very difficult to read. Two particular children got very interested in finding out individual families. The children started to look up people and try to trace families and they found several old family names in the village that are still about today. Some of 'my' parents spent hours deciphering the census returns onto another sheet that I had made up which had all the fields listed in the right order and organised for the computer. Over the weekend I entered all the information into a *Quest* data file.

The children were not involved in entering this data. I feel that while it is very good for children to enter a relatively small amount of data into short files, the sheer size of this task would be too great! They did make a data file of all the information taken from the gravestones. That enabled us to print it out very easily and give children copies of it. They took the names and the details to question the census data file. They found that only four names matched. My ancilliary helper went with a small group of children who were interested and did rubbings of those four gravestones. So, in a sense we brought those four people back to life in our school. Two of them had descendants who were still alive. Philip Dandridge's great nephew, Jack

Dandridge, is now 86 and the oldest man in the village. Another rubbing was of Thomas Wood's gravestone. I said to the children that it would be interesting to find out how many other people with that surname there were on the census. There were twenty-one 'Woods' in the records and they found Thomas amongst them and put a ring round his name.

We have a fortnightly Senior Citizens' Club that meets in our hall during school hours. Vic and May Woods are an old couple living in the village who are regulars at the club. Vic is in his early eighties and May is in her late seventies. Our children use the hall and corridor between different parts of the building, and naturally mix with the senior citizens. I sent them out to Vic and first of all they asked him if his family had lived in the village for a long time. He said they had, so they asked him if he knew any of the people on the computer printout of all the Woods in the 1881 census. He put on his reading glasses and looked at it very carefully. Thomas Wood was his father! Suddenly there was a direct connection with 100 years ago. It wasn't only something you read in a book. Vic's father was four years old in 1881. Vic was born in 1901. He identified uncles, aunts and grandparents.

The children displayed their work and the results of their investigations in the library. At one end were the rubbings of the four gravestones with accompanied printouts showing all the members of each family. At the other end of the library they displayed bar charts, histograms, pie charts and frequency tables, that they had made using *Display*. These were accompanied by descriptions written by the children explaining the significance of the printouts. All sorts of questions and possible answers were thrown up. The age spread of the population raised lots of questions. There were so many children and so few old people. Quite a contrast to the village today. Using the computer to handle the large amounts of information enabled the children to ask questions and create hypotheses. But it was also important that the children actually handled photocopies of the original documents.

The long and the short and . . . dinosaurs

From time to time in our school, as in many others, children measure and weigh themselves and use the data they collect to work out averages and make comparisons. They compiled a chart with all the information on and then transferred it to a *Quest* data file. We have collected these statistics every term since January of last year so we now have four sets of data which will eventually enable the children to examine their own personal growth and to notice the leaps and jumps in growth that happen occasionally. A small group of children used the computer to handle the information in different ways using *Display*. They ended up by making a display of their work which featured lifesize drawings of the tallest and shortest children in the school. It seemed obvious to them to make a direct comparison between those two and compare their average with that of the whole school which they had already found using the computer.

'It's the Pentagon. They say you've been hacking into their computer codes again!'

Using a computer children can do things with numbers that they can't do any other way. Primary school children can extend their understanding by using the computer. A pie chart is a very good example to illustrate the point. Drawing accurate pie charts is a very sophisticated operation but the computer can do it very readily. Children can understand the 'slice of cake' concept easily, particularly when they can present the same information in histogram form with ease on the computer.

Infant children can also use information retrieval programs. The younger class did some work on a project about dinosaurs. There were lots of displays of fossils from home, fossils which we have at school and a few from our museum service. We were lent two dinosaur teeth. They were wonderful to look at. My infant teacher, Pam Larkins, was using *Factfile* with the children. Some of the work using *Factfile* and *Display* was put on the wall. There were graphs to show how many dinosaurs have sharp teeth, blunt teeth or have neither blunt nor sharp teeth. The children were finding out what the ones with blunt teeth ate and what the ones with sharp teeth ate. Their language was being extended with words like carnivores, herbivores and omnivores in common use, as well as the names of the different geological periods!

Adventures

I became involved in a software development group consisting of teachers and programmers, that meets regularly at my school. We draw in interested primary teachers from a ten mile radius. We have produced the specifications for several programs. I don't know how to program at all. I don't know anything about the gobbledygook that makes a computer work but I do know what makes children tick, what excites, motivates, or confuses them and the things that get particular children going.

When I saw my first adventure program I was very impressed. It was a BBC program so we were unable to use it on our 480Z machines. I started thinking that it would be nice if we had our own. So, in our software group we eventually developed a program called *Rescue*. We tried to make the adventure non-sexist, non-racist and non-violent, which is very difficult to do! I don't know if it quite succeeds. The first version of the program involved a small group of children in a co-operative space rescue. Version two arrived recently.

I should like to illustrate the impact of this type of program by telling you about a child called David. He is not the sort of child who takes very kindly to books. In fact, he doesn't like books. He likes football, playing games and going down to the nature reserve and stirring up the pond! He is a likeable child, but not the sort of child who naturally takes to the academic side of school life. David became interested in *Rescue* last term. As we were developing *Rescue* we had several versions to test. We would find a fault with the program and let our programmer know and he would produce another version for trial. David would run up to him and say, 'Where is it? Where is it? Let me have it.' If the computer wasn't being used David would go straight to it and soon would be testing out the latest version of the program. When *Rescue Mark 2* arrived he was eager to find out about it. I told him that now he would be able to make up his own adventure. He could put his adventure anywhere he liked and think of his own problems, his own solutions, his own equipment. 'Great,' said David.

The next day David began to work on his adventure and within a minute and a half two other boys, obviously selected by David, came to me and asked if they could work with him. The three of them went off after I had discussed the new program with them and told them of the limitations that they were to work within. They came back to me with various ideas. David's first idea was an underground adventure based in a coal mine but that went by the board and the group developed the idea of an adventure inside an Egyptian pyramid. They needed information about Egypt and Pyramids. David went to the history bookshelves and with my help we selected suitable books. We had four or five books they could use and the three children took these books and sat in a corner where they spent all morning planning their adventure. They carried on during their lunchbreak so that, by the end of the day, they had a plan of the inside of their pyramid with its various chambers and a few ideas about the tasks and problems. By the next day they were able to play their own adventure game.

One point that really needs to be made is that children must be allowed enough time with the computer, as with other activities, to achieve depth in their work. Too short a time means shallow and worthless work. Children succeed when they have enough time. On the computer they need this time in one big go. They will know when they have had enough.

Back in 1963, President Kennedy said, 'Man is still the most extraordinary computer of all.' I believe that Kennedy's words remain true today and I hope that this account of three weeks in my primary school illustrates this successfully.

Joe Johnson
Head Teacher, Stadhampton Primary School

Reference

Display (DSPLAY), *Editor, Relate* are extensions to *Quest* for the RML 380Z and RML 480Z. They are available from Oxfordshire County Council, Microtechnology Advisory Group, Macclesfield House, New Road, Oxford OX1 1NA.

Information, icons and hypothesising

Children investigating people's attitudes towards their banks

This article describes how a class of fourth year junior children conducted a project on banking, part of which included a survey of public opinion on banks. They used an information handling program to make a data file of their survey results, and then interrogated this to test hypotheses about people's attitudes to their banks. The program was able to display the results of their enquiries in various graphical forms, which greatly increased the children's understanding of the significance of their data.

Our school has been developing a social studies curriculum over the past three years. This attempts to develop transferable skills and concepts, and to ensure that there is continuity and progression in such development over the seven years of primary education. One aspect which we are particularly keen to develop is for children to recognise and value information they can collect from people in the local area. We try to explore particular concepts that help children organise their knowledge of the social world. Our school Industry Project arose out of these aspects. We wanted our children, as part of the school curriculum, to study local workplaces ('Industry' in its widest sense), and to talk to people at work about how they worked together to produce goods or to provide a service. We believed that by questioning people, both when we had invited them into the school and when we visited them in their workplace, children could build up a meaningful idea of how an industry is organised, how it operates, and how the people within it relate to each other. With the help of the Schools Council Industry Project, we approached the Schools/Industry Unit of the Department of Trade and Industry, and were given some financial assistance in planning our programme. The intention was that in a limited period of two terms (Spring and Summer 1984), ten or eleven of our classes would each make a term-long case study of one workplace. By concentrating our efforts in a short space of time, we felt that the cross-fertilisation of ideas would mean that the idea might take off, and become a permanent, though less intense, feature of our curriculum. Our choices of industry were varied – including light engineering, supermarkets, hotels – and a bank.

One of our staff had a contact in the regional marketing department of one of the large commercial banks. Although we were not quite sure how banking as a topic would suit primary age children, we made some tentative enquiries, and were eventually put in touch with the deputy manager ('accountant', in the bank's terminology) of a branch close to the school. After we had explained our intentions, he agreed that the children could visit and talk to the staff, and a total of four visits were made, in which the children spoke at length with the accountant, toured the bank, interviewed many of the staff in the back of the bank, and went to sit for a while behind the counter with the bank clerks. We don't know what the customers thought when they were confronted with ten-year-old tellers!

Another aspect of the bank work we were anxious to develop was a study of consumers' viewpoints. We thought that this might provide an interesting comparison with the bank's view. The children were asked to help devise a questionnaire that could be used with the public, and that could then be entered for analysis on the school computer. We were using the program

Dataprobe, running it on an RML 380Z with a printer. *Dataprobe* is an information handling program that allows the creation and interrogation of data files, and displays the findings in a variety of ways in addition to the conventional listing. The program was in a trial state when we used it: but we felt that the ability to show complex results in a diagrammatic or graphical form would make it possible for the children to detect patterns and relationships that would not otherwise be apparent. If, in the newspaper industry, a picture is worth a thousand words, in information handling a graph can summarise a thousand numbers in such a way that the eye can quickly determine if there are any correlations or tendencies worth exploring.

The class had many ideas for questions – when we asked, they said that they had heard many people, especially their parents, talking about their banks! We discussed the questions, and drew up a shortlist of about a dozen items. Then, to make sure that the questions 'worked', the children took them home and tried them out on their parents. The results of this exercise – we didn't use the answers the parents gave as such – was to tighten up the questions, and to add a few more. Only one parent raised a query: she worked in a bank herself, and thought that some of the questions might be too personal. The completed questionnaire was as shown opposite.

Several points can be made about this questionnaire. The first two items (age and sex) were not asked, but filled in by the children. Most of the questions were 'closed' – they could be answered by ticking a box or circling a word. The only two open questions (1 and 15) required some more lengthy written answer. We did not want to keep people waiting while answers were written down. At two points there are alternative questions to be given, depending on the answers to

the preceding questions (2 and 10). The column on the extreme right was the beginning of the children's attempt at classifying the answers before entering them on the computer.

The questionnaire duplicated, we set off in the morning for the local high street. Pairs of children approached people who were not too obviously in a hurry, and asked if they would co-operate: most agreed. One woman, half way through her interview, marched off as the questions, she said, were much too personal; but most

OPINION POLL ON BANKING

Age: <20
21–35
36–50
51–65
>65

Sex: M
F

AGE –
SEX –

We are conducting an opinion poll. Would you mind answering a few questions?

1. What is your occupation? .... CODE –

2. Do you have a bank account? YES/NO A/C –

(YES)
3. Which is your bank?
NATIONAL WESTMINSTER
BARCLAYS
MIDLAND
LLOYDS
Other (Name):

(NO)
3. Why not? .... NOT –

4. Where do you keep your money? WHERE –
POST OFFICE
BUILDING SOCIETY
AT HOME
ELSEWHERE

Thank you for helping

BANK –

4. Do you have any of the following kinds of accounts?
JOINT account
DEPOSIT account
CURRENT account

JOINT –
DEPOSIT –
CURRENT –

5. How long have you had a bank account?
0–5 yrs 5–10 yrs 10–15 yrs 15–20 yrs 20 yrs YRS –

6. What would be your ideal banking hours? FROM: TO:
FROM –
TO –
HRS –

7. Would you like your bank to be open on Saturdays? YES/NO SAT –

8. Do you have a cash card? YES/NO CARD –

9. Do you think cash cards are useful? YES/NO USEFUL –

10. Do you know your bank manager? YES/NO MANAGER –

11. (If YES) How well do you get on with him or her?
VERY WELL WELL ALL RIGHT NOT WELL GET ON –

12. Have you ever changed your bank? YES/NO CHANGE –

13. Have you ever thought of changing? YES/NO THOUGHT OF –

14. Would you like interest on your current account? YES/NO INT –

15. What extra services should your bank provide? ....

Thank you for helping

people were very friendly and helpful. It was a cold January morning, and we had only collected 133 results before deciding to return to school. Nevertheless, we felt that we had enough data with which to proceed.

The next stage was to construct a data file. This meant deciding on the shape and size of a table of results: how many columns (fields) would there be; what would the fields be called (fieldnames); how big would they be; and so on. When the table (or data file) was constructed, the individual answers could then be typed in, each response being one record.

The children decided to code a great deal of the information that they had collected. This was facilitated by the closed nature of the questions they asked, but the degree of coding they used was quite complex, and might not be suitable for all classes – but with this particular group it worked. Their data file looked like this:

File: Banks
Description: opinion poll on banks: Ken; Jan '84

Field	Length	Notes
AGE	1	coded – <20=1, 21–35=2, etc
SEX	1	M or F
JOB	15	in words
JOBCODE	2	coding system grouping similar occupations
A/C	1	Account – Y or N
NOT?	15	If not, why not (in words)
WHERE?	1	If not, where kept – coded, Post Office=1, etc
BANK	1	Name of bank – coded NatWest=1, Barclays=2, etc
JOINT	1	Joint account – Y or N
DEPOSIT	1	Deposit account – Y or N
CURRENT	1	Current account – Y or N
YEARS	1	years account held, coded 0–5=1, 5–10=2, etc
OPEN	2	when should bank open
CLOSE	2	when should bank close
TOTAL	2	number of hours bank should be open
SATS?	1	want Saturday opening, Y or N
CASHCARD	1	has a cashcard, Y or N
CCUSEFUL	1	thinks a cashcard useful, Y or N
MANAGER	1	knows bank manager, Y or N
LIKE?	1	how well gets on – coded very well=1, well=2, etc
CHANGED?	1	changed bank, Y or N
MIGHTCHANGE	1	considered changing banks, Y or N
INTEREST?	1	would like interest on current a/c, Y or N
SERVICES?	15	extra services bank could provide (in words)

The amount of coding was considerable. The jobcode grouped together similar occupations, which made for easier analysis of some results. But because so much information was coded into single letters or numbers, entering the data was very easy, involving relatively little typing.

This work of compiling the data was split up between members of the class, each child perhaps typing in five or six records, and watching and helping another five or six being typed in by a friend. The rest of the class were getting on with other work. The information was simply typed in response to the fieldname appearing as a prompt.

The file complete, the next stage was the analysis of the findings.

The class was divided into groups of three or four children, each of which tackled one or two particular areas of enquiry. One group, for example, looked at how various customers knew and regarded their bank managers; another looked at the different kinds of accounts held by men and women; and a third looked at the respondents' preferences for banking hours.

In each of these investigations, the group could have requested that the program give a list of all matched answers, and could have printed these and taken them away for analysis. More often, however, they requested one of a number of displays of the matched data. Using the *Dataprobe* program, this can be achieved in one of two ways. After an enquiry has been made – for example, to find all the women with bank accounts by typing ENQUIRE BANKS, SEX=F AND A/C=Y – the child can either directly select a particular graphical form and directly specify the necessary parameters, or can be prompted for each necessary parameter in turn.

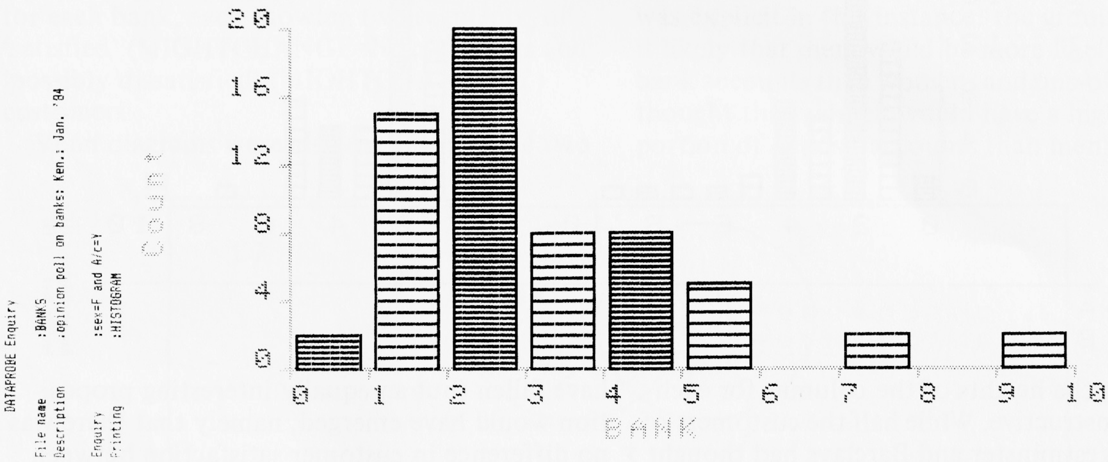
(Incidentally, whether the user types in upper or lower case is irrelevant in *Dataprobe*: both are matched; but in this article keyed commands are shown in upper case.) Now suppose, for example, that the children wished to see a histogram of all the banks used by the women. They could type in request to prompts as follows:

PROMPT	USER TYPES	EXPLANATION
Command:	SHOW	the information being sorted is to be shown . . .
Show what?	HISTOGRAM	. . . in the form of a histogram
Which field?	BANK	the BANK field of the sorted records will be used in the histogram
Number of intervals?	10	entries in the field BANK can be from 0 to 9, so there will be 10 columns
Minimum value?	0	the first column will start with value 0
Size of intervals?	1	the histogram will go up in steps of 1 (ie, bars at 0, 1, 2, 3, 4, etc)

Alternatively, the following single line could be typed:

Command: SHOW HISTOGRAM, BANK, 10, 0, 1

Either route will cause the following display to appear on the screen:



This histogram needs a little interpretation: the columns represent banks as follows:

0 Building Society (sometimes given by those who in fact had no bank account)
1 National Westminster
2 Barclays
3 Midland
4 Lloyds
5 William and Glyns
6 Post Office Giro
7 Coutts
8 Midland and National Westminster
9 Barclays and Lloyds

The scale on the y axis, which here runs up to 20, extends itself automatically as the histogram is built up, so that both large and small counts of matched records can be displayed. Should a 'wrong' parameter be chosen – so that, for example, there are insufficient bars for the data, then a message showing the number of records not displayed will be shown, and the users can, if they wish, change the parameters to accommodate them.

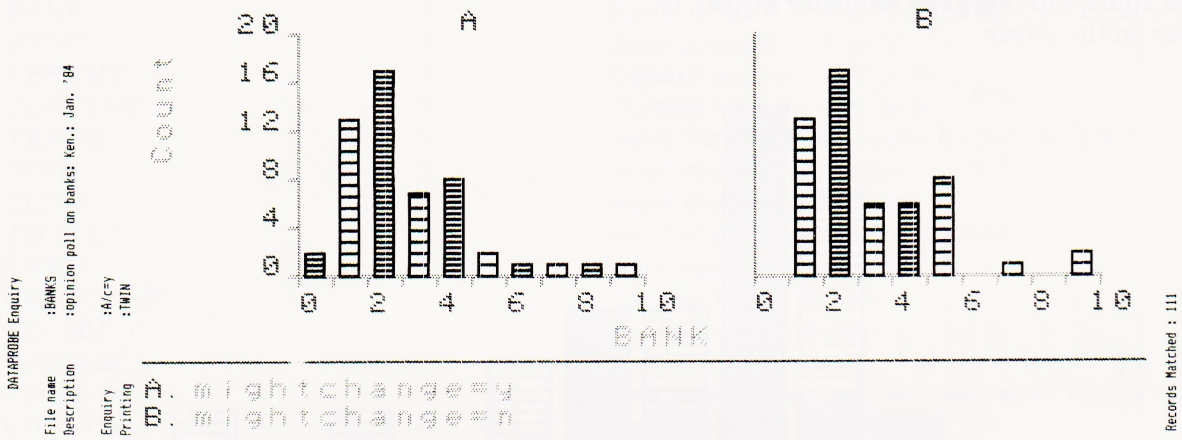
The advantages over a list are immediately apparent. As the children watch, a model of their own information is being constructed. The forms available for display constitute a range of models that are useful for understanding relationships between items of data, and using this range children are able to understand their data, to judge if it is relevant, and to see if it is well displayed in the format they have chosen for display. As Seymour Papert puts it, 'anything is easy if you can assimilate it to your collection of models. . . . What an individual can learn, and how he learns it, depends on the models he has available.'[1] The models commonly available for displaying information are iconographs: that is, they do not represent things in a realistic way (as does, say, a photograph), but in a stylised way that helps the observer detect, for example, layers of importance, relationships and connections that are not immediately seen in a realistic representation. (The term icon is used to describe a representation of a sacred scene, often in the Eastern Orthodox Church: in such icons the laws of perspective are suspended so that degrees of importance between figures can be seen.)

The models or icons that these children had available were some of the ways that statistical data is commonly presented:

- graphs (straight line);
- scatter graphs;
- barcharts (where bars represent items not numerically related);
- histograms (where each bar has a numerical relationship to the surrounding bars);
- pie charts;
- Venn diagrams (showing the relationship between two or three subsets);
- maps (showing the spatial distribution of data).

The *Dataprobe* package also provides a facility for displaying two related histograms (twin histograms) side-by-side.

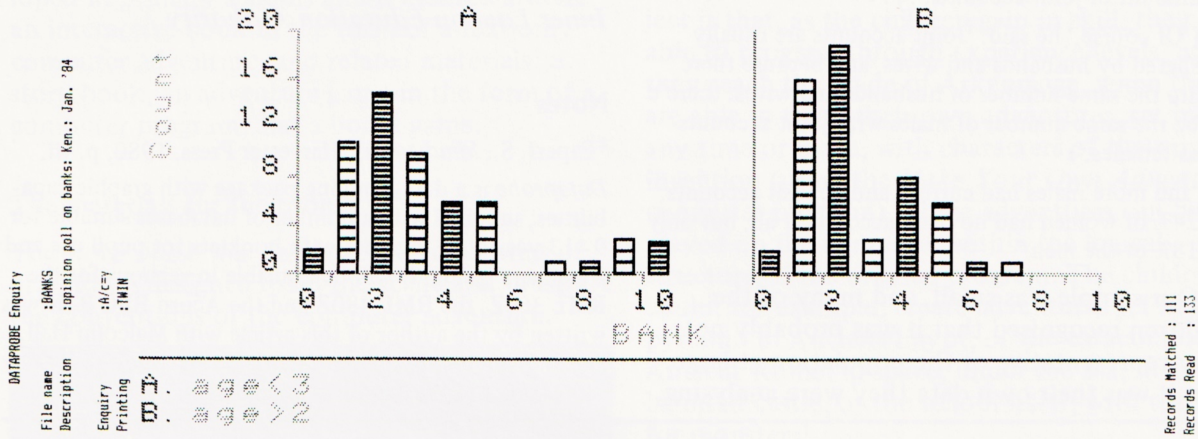
The file on Banks that the children had created did not require all these forms to be used. There was no information on spatial relationships (though they could have collected data on where people lived and/or banked), so the map facility was not used. Double histograms were particularly useful. One group was looking at how satisfied customers were with their present bank. They used the answers to the question 'Have you ever thought of changing your bank?' to compose two histograms, one of those who had considered changing (and were thus perhaps not wholly satisfied) and those who said that they had not thought of changing.



Comparing the heights of the columns for each bank was instructive. While half the customers of National Westminster and Barclays had thought of changing (both columns 1 and both columns 2 are the same height), far fewer customers at William and Glyns (column 5) appeared to want to change. One member of the group concluded 'The most popular bank was William and Glyns. Three-quarters of the people who went there did not want to change their account.'

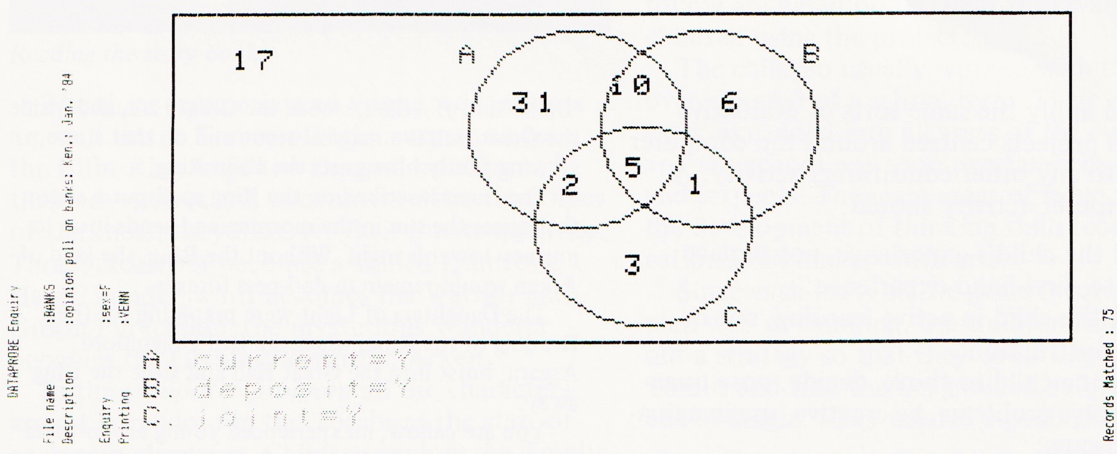
What each group was doing, in this and the other examples that follow, was testing a hypothesis. This was often an implicit hypothesis, not dignified with formal statement. In the instance above, the hypothesis was that there would be significant differences between the customers of various banks when they answered the question about thinking of changing their banks. There was no prediction of what the differences would be: merely that there would be differences. This was a hypothesis which was capable of falsification: had the two histograms appeared very similar in proportion, it would have fallen (but an equally interesting proposition would have emerged, namely that there was no difference in customer satisfaction between banks). The important role of the microcomputer in this process is that it adds speed and accuracy to the testing of such hypotheses: indeed, with junior-aged children the testing of ideas in this way without a computer is so time-consuming and laborious that it is hardly worth while. Suddenly, it becomes possible to test one's hunches. The significance of the visual display is that the eye can detect the correlation – or lack of correlation – very simply. Generally, there is no need to quantify precisely the tendency at this stage. The processes become so straightforward that the skills of hypothesising, testing, analysing for significance can be developed without stress. Time becomes available for thinking and talking about results, instead of working away simply to discover the results.

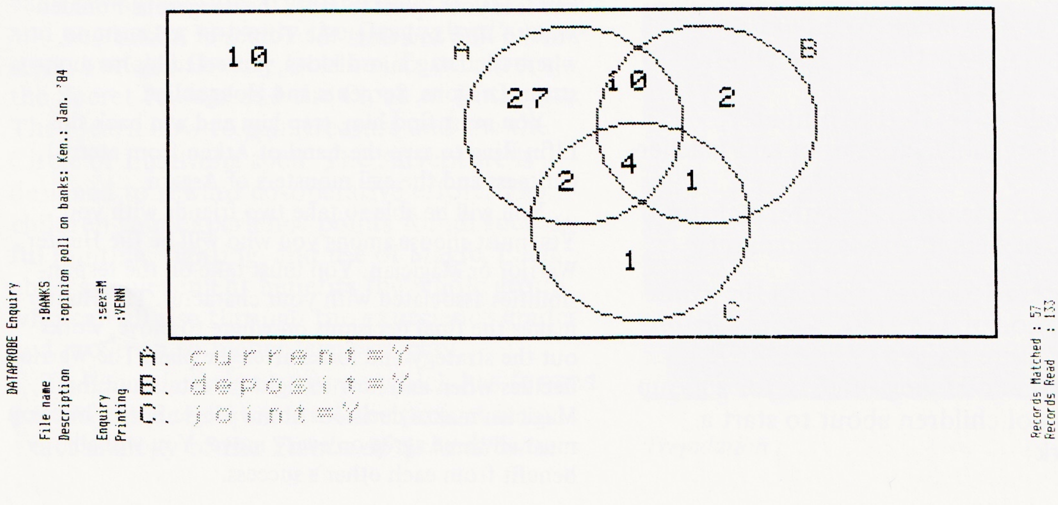
A second group of children looked at the popularity of different banks with different age groups. The hypothesis here was that older and younger people might tend to use different banks. The computer was instructed to draw two graphs, one showing banks used by people under the age of thirty-five, and the other one showing the banks used by people over thirty-five. It was discovered that, even though Barclays was the most popular bank in both graphs, more people in the older category used it. Midland was on the whole far more popular with younger people than with older people. In both graphs National Westminster was the second most popular, and Midland was third on the younger graph, whereas it was fifth on the older one. The younger people seemed to go to a wider range of banks, while the older people went to fewer.



The children went on to make further tests on this finding, preparing a series of pie charts, one for each bank, each showing two segments, of 'satisfied' (MIGHTCHANGE=N) customers and 'possibly dissatisfied' (MIGHTCHANGE=Y) customers.

Venn diagrams were also useful. In these two examples, each kind of account (current, deposit or joint) were sorted into sets. The hypothesis was explicit in this instance: the group thought it likely that men would be more likely to have bank accounts than women, and one of the group thought that women would have a higher proportion of deposit accounts than men.





Some quick work with a calculator yielded percentages, which were more useful given that they had evidently interviewed more females than males.

> '76% of the males had current accounts, 31% had deposit and 15% joint. With the females 64% had current, 29% deposit accounts and 15% had joint accounts. The males and females had the same amount of joint accounts. . . .'

> ('Of course,' he said. 'Joint accounts are usually shared by husbands and wives, and because there are the same number of husbands and wives, there'd be the same number of males with joint accounts as females.')

> 'and more males had current and deposit accounts. 24% of women had no bank account at all, but only 18% of the men.'

Our sample was small, and many of the children recognised that it was probably not very representative of the population at large. But it was their own data they were analysing, and this made them more aware of its limitations. The importance of this kind of work lies less in the information in the data file than in the mental processes the children were going through, hypothesising, testing and analysing significance.

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Notes

[1] Papert, S., *Mindstorms*, Harvester Press, 1980, p. vii.

Dataprobe is a data-handling package with graphic capabilities, supplied with a number of databases suitable for 9–13 year olds, together with booklets for pupil use and a teachers' guide. It will be available in versions for the RML 380Z, the RML 480Z and the Acorn BBC B. It was written by the author of this article with Malcolm Hall, and is being published in March 1985 by Addison Wesley Publishers Ltd, 53 Bedford Square, London WC1.

The Tombs of Arkenstone

An adventure in education

We should apply the same sorts of evaluative criteria to projects centred around the computer as we do to any other educational activity. A good computer activity should:

* extend the child's experience, not replace concrete, first-hand experience;
* involve the child in active learning, not in passive instruction;
* require the child to think, decide, pose questions, solve problems, be creative, use imagination, discuss;
* stimulate activities away from the computer, such as research, experiment, presentation of ideas in several media;
* allow the child to teach the computer;
* be rigorously reliable, childproof and teacherproof;
* be aesthetically pleasing, accurate, realistic, elegant, and of high quality throughout.

These critical principles underpinned the evolution and evaluation of *The Tombs of Arkenstone* computer adventure project.

How about the following briefing for a group of primary school children about to start a morning's work:

> 'In the land of Arken, stands the Great Hall, and inside the Great Hall is a magical stone and on that stone, glowing gently blue, rests the Elfin Ring.
>
> The runes inscribed on the Ring spell out a charm that raises the sun in the morning and sends it on its journey towards night. Without the Ring, the land of Arken would remain in darkness forever.
>
> The Daughters of Light were preparing for the Reading of the Ring, when the Evil Dragonlord, Asgarn, burst into the Great Hall and stole the Ring away.
>
> You are callow, inexperienced young adventurers and it is your quest to cross the dangerous Foulden Mire to find and enter the Tombs of Arkenstone, where the Dragonlord hides, protected by his monstrous Dragons, Serpents and Hobgoblins.
>
> You must find him, trap him and win back the Elfin Ring to save the Land of Arken from eternal darkness and the evil monsters of Asgarn.
>
> You will be able to take two friends with you. You must choose among you who will be the Hunter, Warrior or Magician. You must take on the responsibilities associated with your character. The Hunter makes the final decisions on where to move, works out the strategy and looks after the plan. The Warrior decides when and how to fight monsters and the Magician makes decisions about Magic Spells, but you must all three agree on every move. You will all benefit from each other's success.

I have given you a plan of the tombs. I have also sent an elf friend to give you advice – listen to him well. Good luck my Friends – your quest for the good in Arken.'

Wouldn't it be wonderful if the reader of such a story could become one of its characters, change the story and watch the logical outcome?

The Tombs of Arkenstone project was developed in primary schools and is centred around an interactive book in the form of a text-only computer adventure, and related materials: a story book, an adventure game in the form of a computer program, and a board game.

The materials for the project

The *story book* was developed from a series of oral stories designed to set the scene and illustrate the conventions of the computer adventure.

Reading the story book

The three inexperienced young Adventurers are sent to the Tombs of Arkenstone to regain the Elfin Ring from the Dragonlord. Through their adventures and encounters with the Forces of Darkness, they discover their innate qualities. Tara Quicksilver becomes a skilled Huntress, Ham Thundersword becomes the Warrior and Gifkin Purechilde, the mysterious Wanderer, becomes the Greatest Wizard in Arken.

In the *computer program* all the characters are set at random in the Tombs at the start of each new adventure. Children explore the Tombs and encounter not only the Dragonlord's monsters, but also Greedy Goblins, Touchstones, the Secret Passage and the Cloak of Darkness. They learn how to gain treasure and use the Circle of Lightning spell. The Adventure is designed to reward co-operative effort. The children gain experience points for all successful hunting, fighting, and use of Magic. Each child's achievement benefits the whole group, who can all rise through the experience grades and move on to higher levels of play.

The *board adventure game* which has formed part of the development of the project is an exact analogy of the *Tombs of Arkenstone* computer adventure, but played on a board with spinners, counters, dice and calculation cards. In addition to the Adventurer roles, children take on the role of the computer which is divided between two characters – the Adventure Master and the Elf Friend. (The board adventure, however, is not included in the published version.)

One further very exciting aspect of the project is that, as the children gain in skill, they are able to progress through experience levels, until they reach the grade of Arkenmage, when they are able to write their own adventures, set in any time or place, with characters of their own invention (using the *Make Your Own Adventure* computer program). These adventures can be played on the computer within the logical structure of the original program. The children could, for example, create adventures set in a pyramid in Ancient Egypt, or the catacombs of Ancient Rome, in space, under the sea, in a haunted castle, or the school itself, with teachers for monsters!

The project in school

The Tombs of Arkenstone adventure project was developed in The Pines School, Hertford, and also evaluated in two other Hertfordshire schools – Longlands School in Turnford and High Wych School in Sawbridgeworth. The descriptions that follow are based on teachers' observations of children using the project.

The children usually worked with the project over a period of a school term. Their creative work expanded into all areas of the curriculum and the school was soon overtaken by dragons and serpents. The main areas of value were in the development of thinking skills, communication skills and creative arts.

Since each move in the game involved a complex web of thinking, the children had to work out a strategy so that they could explore the Tombs and find the Dragonlord before they ran out of Magic. They needed a good grasp of the

Trepidation

topology of the plan and had to weigh up all the factors of Magic, Time, and Treasure, work out the possibilities, judge their current priorities and consider the consequences. Then they were ready to make a decision and move. Since all decisions had to be agreed by all adventurers, the children needed to discuss each move. Children had to argue their viewpoints and give evidence of their reasoning to fellow adventurers.

Some of the issues arising in their adventures were exploited in class discussions that focussed on the moral issues. For example: co-operation, discussion to consensus, democracy, freedom to act versus responsibility for others, what are evil and good?

The language on the screen has been very carefully selected and reduced to the minimum. However, a twenty-minute adventure involves the reading of about 4000 words and 800 numbers. They all have to be skimmed and sampled for relevance and their meaning extracted with speed and accuracy. These higher order reading skills are very valuable, and from what we saw, the children were able to cope extremely well.

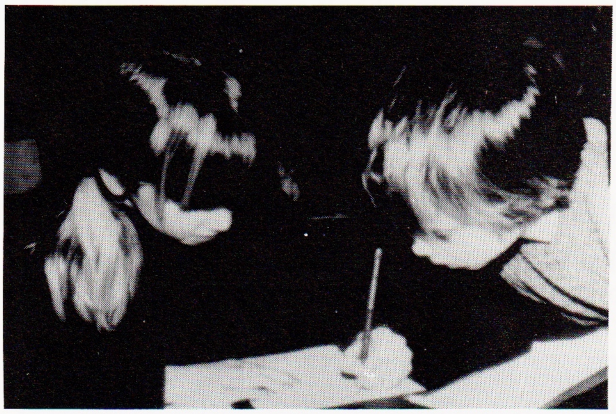
The creative writing inspired by the adventure was, for many children, the best work they had done. They wanted to write; they were narrating adventures that they had experienced only moments before. The experience was immediate and their involvement was intense. The resulting work was lively, vivid, colourful and flowed with easy narrative style.

Jubilation

Children took their role play during adventures very seriously, and we were able to exploit this further in their drama. We used improvisation to encourage children to visualise when preparing for their story writing, and this in turn led to drama and dance of value in its own right. Groups of children also made primitive instruments to accompany the dancers.

The project also became a very rich and colourful source of inspiration for a whole range of art work – clay and plasticine monsters, puppets, paintings, prints, enormous paper serpents and tiny clay fantasy landscapes were all produced.

Perhaps most interesting during the whole project was the way that the children learned valuable lessons about the place of the computer and their relationship with it. In this project it was not a question of the computer 'knowing'



Writing adventures

all the answers and the children trying to outguess it. We began to see three important aspects of this child-computer relationship. Firstly, children acted as equal partners. The *Tombs of Arkenstone* computer adventure gave the children experience of an equal relationship with the computer. The child moved, the computer responded, and together the child and the author generated a story. Secondly, some children became leaders, perhaps for the first time. In using *Make Your Own Adventure*, the children took the lead in the relationship. The child became the author of the program and the computer became his/her assistant, helping to collate the images into a logical structure. Thirdly, children started to appreciate the use of the computer as a tool, since much of the work that evolved was done away from the computer.

In short, the *Tombs of Arkenstone* adventure certainly extended the children's experience into a fantasy microworld where they could explore their own logical reasoning. The role play element encouraged communication very effectively. The children were highly motivated by the project, and it was not only a rich stimulus for ideas in all the creative media, but also helped the children gain valuable reading skills.

Bob Hart
MEP Co-ordinator, Chiltern Region

Reference

Tombs of Arkenstone (BBC) is published by Arnold-Wheaton Software, c/o EJ Arnold & Son Ltd., Parkside Lane, Leeds LS11 5TD. It costs £15.00 + VAT.

Micro Primer maths— there's more than meets the eye

There is little doubt that quite a number of primary teachers have found the Micro Primer pack a disappointment. It is difficult to say how much this is the fault of the pack itself, and how much is due to raised hopes dashed by the realities of faulty equipment and other frustrations. These notes try to extend the usefulness of some of the Micro Primer mathematics programs by suggesting some of the less obvious ways that they can be used in the classroom.

Some teachers regard a microcomputer principally as a labour-saving device, and see educational software as providing self-contained lesson modules, to be plugged in rather like computer games cartridges. The documentation that accompanies programs is often seen as useful for the beginner, but to be discarded by the more experienced user.

The approach offered here is quite the opposite. Although the computer can be a labour-saving device for the busy teacher, this overlooks the fact that some of the most exciting computer work is done by children working with a computer *and* a teacher. It is better to regard programs as teaching aids, rather than as pre-packaged lessons. Like other teaching aids, programs can be used to good effect in quite a number of different ways, and sometimes in ways that were not envisaged by the program's authors. But it is not always easy to see how materials can be used. No one can run through a program and immediately see all of its classroom potential. Ideas for using teaching aids evolve slowly and experiences need to be passed on. Program documentation is far more than a guide to what keys to press: it should record what has worked well for other teachers, to start you thinking out your own ideas. The difficulty in writing this kind of documentation is in finding the good ideas. These notes are an attempt to do just this; but it is possible that you have taught a much better lesson than any described here. Perhaps you should be writing about it?

To understand these notes you will need to be familiar with the programs they describe. They are all in the Micro Primer Software Packs.

Ergo

Ergo is easy for individuals and small groups to use, but how do you use it with a whole class? Here is a lesson which has worked well with a wide range of ages and abilities.

Everyone sits where they can see the large television monitor clearly. The teacher introduces the program and pretends she has not seen it before. She reads out the information and puts up a problem. Pupils take turns at guessing the numbers.

135	108	81	54	27
162	135	108	81	54
189	162	135	108	81
216	189	162	135	108
243	216	189	162	135

12	10	8	6	4
24	20	16	12	8
36	30	24	18	12
48	40	32	24	16
60	50	40	30	20

Figure 1 *Some of the number patterns produced by a third year primary class. Some work was done with calculators.*

34	26	18	10	2
39	31	23	15	7
44	36	28	20	12
49	41	33	25	17
54	46	38	30	22

15	7.5	3.75	1.875	0.9375
22.5	11.25	0.5	0.25	0.125
33.75	16.875	8.4375	4.21875	2.109375
50.625	25.3125	12.65625	6.328125	3.1640625
75.9375	37.964375	18.984375	9.491875	4.7460937

For most of the time, the teacher is playing a fairly passive role as the keyboard operator for the class. But there are times when she may intervene. 'What is the pattern?' 'Can you see any other patterns?' 'Is there an easier way to do that?' . . . etc. Sometimes a game seems to go on for too long and she uses the 'secret option' to finish off the pattern automatically[1]. If the class is finding it rather too easy, the teacher can move the cursor into a difficult position. There is also a choice of easy and difficult problems: it is probably best to keep to easy ones except for top juniors.

After two or three games as a whole class, interest is high and the teacher switches off the computer.

'I want you to work in pairs. First I want you to make up your own number patterns on squared paper. Do it like the computer on a square which is five across and five down. Don't let your partner see your pattern! When you have both made up patterns, take turns at playing the game. One of you is the 'computer' and one is the player. The computer gives two numbers to start with, and then says "Too large" or "Too small" if a guess is incorrect.'

Children have no difficulty in copying the role of the computer in this way. It is best to encourage the less able pairs to produce patterns which are similar to those used in the program, but for the more able it is a challenge to produce patterns which are altogether different. These may involve numbers spiralling out of the centre, negative numbers, fractions, decimals and very large numbers. Some children's work makes the patterns generated by *Ergo* look very tame!

Watchperson and *Farmer*

Problem solving activities are difficult to organise well in the classroom because it is so easy to give too much away too soon. Problems, like those in *Watchperson* and *Farmer*, offer a series of intellectual hurdles. For the teacher, the challenge is to get as many children as possible to tackle each stage in the problem themselves. It is easy to teach children to produce the right answers, and much harder to ensure that everyone (especially the less able) has tackled as much as they can themselves.

Both programs offer a series of challenges. In *Farmer*, the biggest obstacle for young children is the need to discover that it is useful to carry objects *back* across the river. But this is only one of several components of the solution. *Watchperson* is similar but probably has rather more levels of understanding to it.

There seem to be two good reasons for doing these problems on a computer. The first is the computer's use of graphics. In both programs the presentation of the information is very clear. The important details are laid out in front of you. Nothing unimportant needs to be remembered and there is no need to write anything down. The cognitive loads are kept to a minimum. The environment is ripe for grasping the problem. Of course, at some stage, it is useful to write things down, but there are stages in problem solving when all other activities are just a distraction.

The other reason for using a computer is the ease with which a group can tackle the problem. The television screen lays out the problem for all to see, like the pieces on a board game. It is easy to discuss the problem and there is a social pressure to agree on what should be done next. When a whole class tackles the problem together there is a need to give everyone time to think. There are quite a number of teaching strategies available, for example, to get everyone to write down the next step, or to put up their hands when they know what to do. But with small groups and whole classes there is always the same danger lurking: that someone will say too much, too soon, and that no real problem solving will be left to do.

Spanish Main

A review of *Spanish Main* in the *TES*[2] spoke favourably of the program but complained that 'the machine would have to stand idle for long periods if the necessary discussions took place.' This remark reflects a common attitude: that the school's computer should perpetually be the centre of frenetic activity. But most educational resources (many costing more than a computer) stand idle most of the time. Surely, if a computer can stimulate a good classroom discussion, it has earned its keep, and it hardly matters that it stands idle for the rest of the lesson.

The best way to use *Spanish Main* is stated very clearly in the Micro Primer pack and there is little to add, except to recommend it.

Eureka

Eureka was written as a *graph interpretation* program. We are quite good at teaching children how to plot graphs but rather poorer at teaching them how to interpret graphs produced by other people.

In one lesson, the whole class viewed the program on a large television monitor. The teacher introduced *Eureka* by taking the man through the usual sequence of events when having a bath, and then got the class to point out these events on the graph. 'When did the taps go off? When did the man start singing?'.

The rest of the lesson was spent on interpreting the examples which are built into the program. The teacher pressed / 2 G RETURN to see the graph for example 2 without any pictures. A number of pupils attempted to explain the graph and there was some argument about what it showed. At one stage the man gets out of the bath and then gets back in again. 'Why?' asked the teacher. 'Because he's forgotten the soap.' 'Because the telephone rang.' 'Because he wanted his rubber duck.'

It is a mistake to dismiss this kind of elaboration as a game. It is more serious than this. Consider the real life skill of interpreting a graph. We open a newspaper and see a graph of unemployment statistics. The unemployment rate goes up and down at different times of the year. To understand this graph, it is not sufficient to read off values, or to note which month unemployment is highest. To make sense of it, we have to put a story to it, even though we cannot be certain that our story is true. We might say 'It's low there because there are more jobs in the summer' or 'It's high there because of school leavers'. This is real *graph interpretation*.

Back in the classroom, they were working through a number of the examples in the program by discussing them and trying to agree on the story behind the graph. Sometimes the teacher replayed the pictures with the graph to see whether they matched the class's story: a mismatch did not necessarily mean that the story was wrong.

Example 6 is quite difficult. But here is the story one boy produced in the course of a whole class discussion:

> 'Our house has caught fire. I go into the bathroom, put in the plug and turn on the taps. I know the bath is going to overflow, but it doesn't matter because it's an emergency. I go and look for a bucket, and fill this from the bath, and throw the water at the fire. I fill the bucket again and throw the water at the fire. The third bucket of water puts the fire out. I rush back into the bathroom and pull out the plug to stop it overflowing. Then I turn off the taps.'

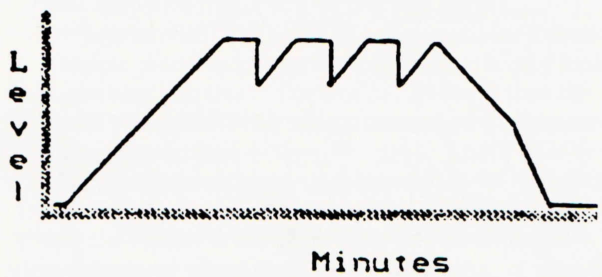


Figure 2 *Example 6 from* Eureka.

This description matches the graph very well. It really does not matter that it does not match the pictures in the program.

Another lesson only used the program briefly to introduce the idea of making a graph about a man having a bath. After this introduction, the computer was switched off and pupils worked in pairs.

Suzanne created her own version of events (see Figure 3). After writing the story and drawing some pictures, she sketched the graph. After folding the paper above the graph it was given to Jonathan to interpret. Suzanne's comments on his version of the story are very perceptive. She not only sees how graphs communicate, but understands their limitations.

Although *Eureka* is a mathematics program, it is not uncommon for lessons using *Eureka* to make no use of numbers, and to make extensive use of spoken and written language.

It is worth mentioning two less structured uses for the program. It is fun for children just to play with the four commands: T, P, M, and S. It is interesting that low ability children can often explain a graph which they have made themselves in this way. This must partly depend on their remembering the events but interpretation also seems to play a part.

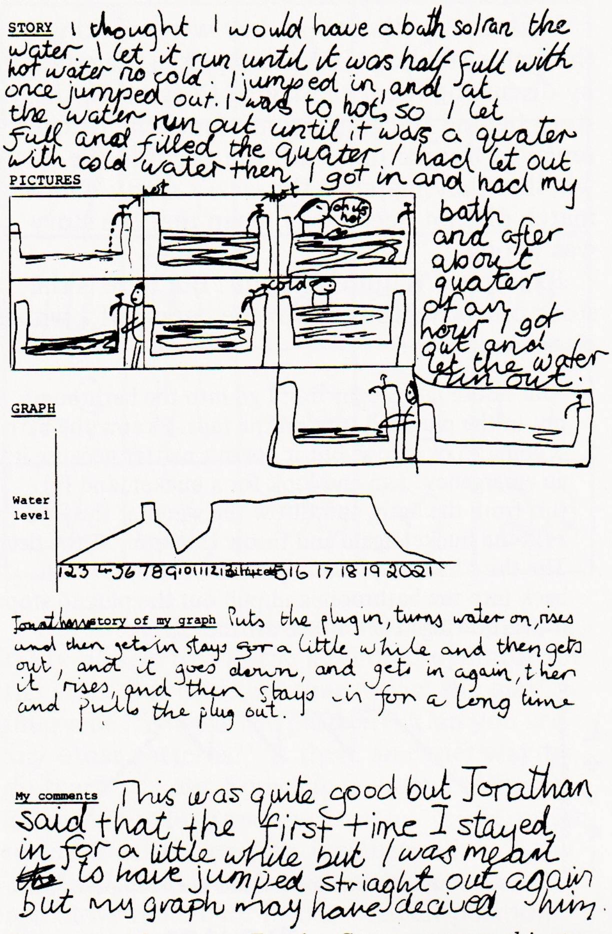


Figure 3 *After seeing* Eureka, *Suzanne wrote this story, drew the pictures and sketched the graph. Jonathan interpreted her graph. Note Suzanne's final comment.*

Finally, the program has been used with reception-class infants, but not for graph interpretation! With only four keys to learn, it is not difficult for very young children to control the pictures. *Eureka* becomes a sequencing program which also teaches the letters T, P, M and S. It is difficult to know whether this use should be encouraged and some teachers are unhappy about the use of capital letters.[3]

Build

Build was not designed to support any particular classroom activity. But it does seem to offer an interesting experience to those who play with it. It can also be used to support a number of more structured activities.

Teachers sometimes comment that *Build* is less useful than a box of interlocking plastic cubes. This is true, but rather misses the point. *Build* lets you manipulate a picture of three-dimensional value. With cubes, you are dealing with the reality of three-dimensional space. The simple but formal commands needed to instruct the computer, and the conventions of perspective drawing, provide different experiences from those gained by using real cubes.

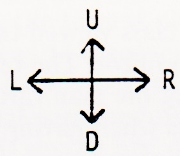
If children are given the opportunity to play with the program they will usually discover its possibilities quite quickly. It is fun to draw futuristic cityscapes, or to contruct the initials of your name from three-dimensional blocks. There is certainly a little drama in drawing a cube which occupies the whole screen and another which is so tiny it is almost a dot.

A good question to ask is, 'If you go off the edge of the screen, what command will always bring you back again?'. *Wherever you are* pressing I for In will always bring you back. Why is this? If you are unclear, experiment with the program and see.

Getting home

Here are descriptions of two lessons which make use of *Build*. The first was an activity with some nine-year-olds. It took the form of an investigation which brought in some spatial thinking and the use of a simple symbolic notation. Everyone gathered round a large television monitor and I introduced *Build* by creating a few pictures on the screen. There was a little discussion about the meaning of *in* and *out*. Then the serious business began. Everyone had a sheet of paper like this:

Getting Home



(1) D RRR ...

(2) UUUUU RR ...

(3) LL UUUU ...

(4) U II RRR ...

(5) U RRR U RRR ...

(6) L UU L UUU ...

(7) UR UR UR UR UR UR UR ...

(8) D RR UUU ...

(9) LL UUUUU RRRRR DD ...

(10) OO UUUU RRR I D ...

I cleared the screen and typed the first example: D RRR. A simple modification to the program[4] caused the first cube to be drawn in red; all the others were white.

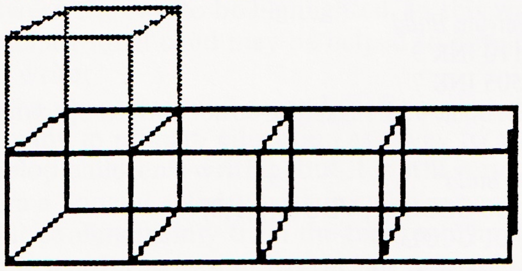


Figure 4 *The first example with* Build.

'What do I need to type to get back where I started?' Almost everyone had a suggestion. Some were more complicated than others, for example, UU LLL D, or LLL U, or U LLL, or D LLLL UUU R D.

'Which gets us home fastest, without going anywhere we've been before?' After trying quite a few on the screen we chose U LLL as the best way to get home.

We tried the second example and this seemed quite easy: we thought DDDDD LL was the shortest route home. The third example was similar and the fourth example brought in the third dimension.

We then spent a little time looking at the notation:

Journey out	*Best journey home*
D RRR . . .	U LLL
UUUUU RR . . .	DDDDD LL
LL UUUU . . .	RR DDDD
U II RRR . . .	D OO LLL

We had several explanations of what was going on.

The first suggestion for example (5) was D LLL D LLL but when we looked at the screen someone could see a more direct route: DD LLLLLL seemed better because there were less corners to turn.

With example (6) someone explained that I needed to press D five times because I had pressed U five times. Everyone liked the staircase pattern in example (7) and our best route was DDDDDD LLLLLL.

I cleared the screen and typed D RR UUU for example (8). A little experimenting on the screen showed that the best route home was LL DD. But this was a puzzle. On the journey out I had typed U three times, but going home I only needed to type D twice. Why was this? It took quite a bit of discussion before someone came up with a clear explanation.

Example (9) was similar. We could see on the screen that getting home involved typing L and D but it was difficult to *see* how many to press, so we had to work it out. With example (10), after some discussion, I took a vote on the number of Ds, Ls and Is needed.

There is another activity which might have been worth exploring if there had been more time. How well could pupils do this type of exercise without the screen to look at? There are two strategies: either use the notation, or close your eyes and try to visualise what would happen.

Communicating your ideas
The second lesson with *Build* is described by David Wooldridge in ATM's *Some Lessons in Mathematics with a Microcomputer*. The aim of this lesson is to encourage pupils to analyse their own language when communicating with each other and to contrast this with their communication with a computer.

Apparatus: Interlocking plastic cubes (e.g. Multilink) and folded paper screens that can stand on desks.

Pupils will need to sit in pairs opposite each other.

'Have you ever played a game where you have to describe a drawing, in words, to someone else who cannot see it?'

'Can you think of a shape which is difficult to describe without naming it?' (E.g. circle, spiral.)

'I want you to help me in an experiment in seeing how easy or difficult it is to describe shapes.'

'In a moment I'm going to ask one of you to build a simple model using, perhaps, six cubes. It may look something like this . . . or this . . . You will then describe your model to your partners to see if they can make one similar.'

'Just to make things more interesting we are using these paper screens so that you can't see each other, and the builder is not allowed to ask questions or make a noise whilst making her model.'

'When the describer is satisfied, you may remove the screens and discuss why the models are different or were difficult to build. Then swap round and try again.'

The describing/building then takes place in pairs for around twenty minutes until they have some confidence in their ability. The no talking rule for the builder is important during this time.

When the class have some confidence in building from their partners' descriptions ask them which words in their language are most important but try to avoid dropping any useful hints. The pairs may then make up lists of phrases which are important and discuss in fours how their phrases differ. (It's a useful technique to concentrate on the differences.)

Some pupils, especially if they are friends, seem to have an implicit understanding of each other's vocabulary (e.g. 'Take a base four and put a line of three on one end.').

Resume the previous activity, this time using their phrase lists. As this progresses have groups of four, in turns, around the computer using the *Build* program to reproduce their plastic models.

'Which was easier, instructing your partner, or the machine?'

'In your groups of four try to write down what were the real differences in your phrases and the computer's word-list.'

More than meets the eye

Whether or not any of the above are lessons which you would want to teach yourself, they clearly demonstrate that the same computer program can often be used in quite different ways. Take another look at Micro Primer. When it comes to evaluating computer software, only one question really matters: Can I make something of this in my own teaching?

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References

1. On BBC and RML 480Z versions of *Ergo*, the teacher can complete the pattern automatically by holding down the CTRL key and pressing W.
2. McGee, Paul (1983): Primary Shapes. *Times Educational Supplement*, 3 June 1983, p. 32.
3. On the BBC version of *Eureka*, young children may have difficulties because they hold down a key for too long and the letter repeats. This is easily cured by typing *FX11,0 and pressing RETURN before the program is run.
4. In order to modify *Build* so that the first cube is drawn in red, these lines should be typed before the program is run.

Spectrum *Build*
```
110 INK 3
505 INK 7
```
(N.B. Some of the examples do not work on Spectrum *Build*.)

BBC *Build*
```
230 GCOL0,2; VDU19,2,1;0;
501 GCOL0,3
```

RML 480Z *Build*
```
80  CALL"RESOLUTION",0,2:CALL"OFFSET",
    -160,-96:CALL"COLOUR",0,0,0,2:CC=1
190 FOR N=0 TO 3:CALL"PLOT",XF(N+1),
    YF(N+1),CC: CALL"LINE",XF(N), YF(N),CC
200 CALL"LINE",XB(N), YB(N),CC:
    CALL"LINE",XB(N+1),YB(N+1),CC:NEXT N
215 CC=3
```

Acknowledgements

The excerpt from *Some Lessons in Mathematics with a Microcomputer* is reproduced with permission of the Association of Teachers of Mathematics. Figure 3 first appeared in *Exploring English with Microcomputers* (ed. D. Chandler, CET, 1983).

Word processors and the development of children's written language

A research project

Introduction

Work is presently being carried out in the School of Teacher Education at Humberside College of Higher Education, to investigate the development of children's written language abilities through the use of a wordprocessor. At the moment the project is involved in carrying out pilot studies and no definitive conclusions can be drawn from our findings so far. We are using the observations and formative evaluations to develop a more controlled research model and to highlight problem areas.

We are very conscious of the fact that many of our local primary schools have not had their microcomputers for very long. We do feel however that this is no reason to neglect what may well be an extremely valuable application and have established our research project on that principle. We seek to place our work in the context of existing, as well as developing, classroom practice. With that in mind we also try to monitor ways in which the micro and suitable software may be used within an existing language programme in the primary school. This allows us to place our specific application of the micro within its proper context. It is our hope that as children come to use the computer more and more within their normal classroom activities, the move to some writing being done on the wordprocessor will seem a natural one.

Written language is the most difficult of the four modes of language for children to master as it makes demands upon them that are often outside their experience. It is the most abstract of the four modes and is often expected to develop almost solely through the individual as a 'lonely' writer. The use of a wordprocessor alongside the normal classroom practices (*not instead of them*) may well provide for *some* children the additional experience they need. Group discussion and interaction while creating text, allows written language to draw on spoken language and the differences and similarities between the two to be highlighted. In this way each individual child may be helped to develop as a writer.

The use of first and second drafts is accepted by many in primary education as a way to develop children's writing, but it is still very often a 'lonely' activity with initial ideas and input coming mainly from the teacher. The use of the wordprocessor draws on this principle of first and second drafts, but also regards writing as a group learning and sharing activity. We believe the discussion element, taking place in a group rather than in a class situation, is important if real development at an individual level is to take place. Whilst this is true of all areas of language development, we feel it is particularly true with regard to writing. Talk is an area often neglected in lessons devoted to creative writing. We as teachers are very much aware of the need for adequate and stimulating preparatory work in lessons devoted to writing. However, we often neglect the value of peer group discussion, for the development of ideas, as opposed to classroom discussion in which the teacher is often a controlling, or perhaps an inhibiting, factor. The group-discussion approach to writing achieves a more valuable place in the curriculum as a result of the much greater ease of correction and alteration made possible by the micro's use as a wordprocessor.

The wordprocessor and its introduction

The wordprocessor being used by the research project is *Wordwise*, a ROM chip, as opposed to a tape- or disc-based wordprocessor. We were looking for a wordprocessing package that was essentially a 'text-editor'; one which would allow the children to write without having to be taught to 'wordprocess' as a prerequisite. We felt that *Wordwise* fitted our requirements, and would allow us to introduce its various functions to the children as they indicated a need for them. This has been our approach with all of the groups involved in our pilot studies. We look carefully and critically at what we felt were the basic instructions and functions the children would need to know before they could begin writing, and progressed from there. *Wordwise* allows the children to create text on screen, and to alter, correct, delete or insert text at will, either immediately or later. This ease of amendment and correction has produced animated and involved discussion whilst writing as a group activity has taken place. The fact that *Wordwise* allows the text to be created in 40 column mode, and not in 80 column in which it is previewed and printed out, creates no problem for the children once they know about it.

The functions which we feel it is essential to introduce to the children are listed below with brief outlines of how we introduce them.

Note: we are presently working on developing a series of Run Cards which could be referred to and used by the children when working on their own.

Screen	Think of it as being a piece of paper.
Cursor	This is like a pencil point (when typing letters) or a rubber (when using the delete key). Think of a pencil which has a rubber on the top.
Shift key	For capital letters you need to press this key. (We introduce its use for certain punctuation marks when necessary.)
Delete key	This is used to 'rub out' letters or words you don't want. It can also 'rub out' spaces.
Return key	Only use this for new paragraphs or after a title as it has the effect of moving the cursor to the start of a new line.
Arrow keys	These keys move the cursor around the text for insertion, deletion and alteration.
Escape	This lets you move from the writing to the main menu. (This becomes important when the children want to see what their work will look like on screen before they print it out.)
7) Preview text	This will let you see what the piece of work will look like when printed out.
Embedded commands	These are only introduced when the children want to do something like move the title to the middle or space the lines out more. The ones we have used so far are: LS2 – double spaces the lines, EP – organises the text into pages for printing if it is long enough, and CE – this centres a piece of text about the centre of the page and is used with titles.

The children's work

At present we have piloted work in four different schools and have worked with three different ages: seven years, eight years, and ten years and over.

Three of the schools already have microcomputers though only the middle school has had one for longer than six months. One of the primary schools has yet to get its microcomputer under the Government sponsored scheme. However, none of the children involved in the pilot studies was using a micro regularly at other times, though a few members of the overall group had some familiarity through home-computer use. In general a lack of keyboard familiarity was common to all the children involved. Awareness of this possibility helped determine the kind of wordprocessor we used, and the way in which we introduced it and worked with the children.

The following are examples of the work produced by children during the course of the pilot studies. The first two include comments and observations made at the time, whilst the last two are included without detailed comments. At no time did we attempt to be more than a reference point for queries from the children, since we wanted to observe how quickly group discussion and interaction began. It soon developed in all cases, though the younger age groups tended to seek more reassurance from the researcher that what they were writing was correct. What did become obvious very quickly was that the discussion was not merely about content but about grammar and syntax as well – even to a degree with the seven year olds.

In all the examples the work is exactly as the children input it. Any titles which are centred are so because the children asked how it could be done.

School 1*: Middle School (9–13) in an urban but not inner-city area. Age of children 10+.*

Here the work was carried out with a group of five children (two boys and three girls) in a total withdrawal situation. This piece was completed during the last two sessions working with this age group on a task they had chosen. It involved an experience common to all of them, which they had to recount to someone for whom it was not such an experience.

Our Trip to York

On Wednesday we went to York , it was a wet rainy day. We set off from school at 9.15am. On the coach we played games and sang some songs.We arrived at York at 11.00am.When we got to York we all walked to the railway museum but some of us went the wrong way.We were all put into groups Mr Brooks, Mr Nicholsons , Mr Haighs, Mrs Naidoos and Mrs Gibbins.We were all given questionnaires some of us were given a pencil each. We all had a partner each to walk round the museums with.We all went train spotting and filled in our questionnaires.In the train museum there were steps leading up to some of the trains so that we could have a look around them.Up stairs there was a small cinema were you could watch films about the history of trains and who invented them.We were very glad to be inside because it was still very cold and wet outside.There was a little souvenir shop where we could buy gifts for your friends and families.Some of us saw some model trains which were in a glass case.If you pressed a button the train would light up and would move round the track.Also there were stairs leading underneath a train where we could see how the train worked. After we had had a look around the museum we went back to the coach to have our lunch.For our lunch we had sandwiches, sausage rolls, crisps, tucs biscuits, cakes, penguins, shandy, orange (ade) and coca cola.Then we set of to go to the castle museum. When we got to the Castle museum we had to wait outside because the teachers had to persuade the owners to let us in. When we got in there were some suits of armour , along with them there were some weapons which they used.We saw the dungeon where Dick Turpin was held prisoner.

Comments

The group had few problems with the word-processing facility itself, and while their typing speed was indeed a little on the slow side, this did not appear to create any real problems. We would suggest that, if the micro were being used as a matter of course in the classroom, then a greater degree of expertise would be developed. They rapidly became involved in discussion and it became obvious that this was directed not solely at the content but also at syntactical and grammatical structure also. This does not mean that all errors were necessarily spotted by the children. It was apparent during the session that they were not always in agreement about what happened on the visit, and this led to some debate leading towards an agreed version which was then included.

School 2: *Primary School (5–9) in an inner city area some of which is scheduled for redevelopment. Age of children 8+.*

Here the work was also carried out in a total withdrawal situation and with a group of five children (three boys and two girls) aged 8+ years. One of the group, M., was in need of remedial reading and writing activities in the normal classroom situation. Their task as set by their teacher was to write about a book which was being read to the class. With a book or story review it was felt the children would have a common core of knowledge upon which to draw.

The Silver Sword

There was a man called Josph, and he was captured by Jermans. He was taken to a prison camp.He knocked him out and stole a Jermen uniform and he put it on. He walked

across a hill,soon he saw a drunken Jermen
,came after him .He started to run away from
the Jermen solider.
Then he got on a cablecar and . . .?

Comments and observations made at the time
J. kept looking to researcher for reassurance about how to do it – sort of 'Am I right?'. M. was very active verbally. Slow development of general group discussion. A lot of discussion about the content with reference to exactly what did happen in the story. They also began to focus on style. Accuracy of detail was subject of much discussion. There was some query about who (in the story) is being knocked out. (Is the content accurately relaying information to an uninformed audience?) M. had lots of information about the story and awareness of some shades of meaning: e.g. 'why not write Nazi instead of German?'. M. was very much in oral control of the group. He became the typist and typed in 'solider' for 'soldier' – all the correct letters are there though they are scrambled.

The next piece was produced the following week by the same group who were able to correct and extend the piece they had already started.

The Silver Sword

There was a man called Joseph, and he
was captured by Germans. He was taken to a
prison camp.He knocked him out and stole a
German uniform and he put it on. He walked
out of the camp with some of the Germans.He
walked across a hill, soon he saw a drunken
German coming after him. He started to run
away from the German Soldier.Then he got on
a cablecar and went across to the other side and
met a farmer. He stayed until the summer,one
day two German patrol guards come to the
farm house.The farmers wife told Joseph to hide
up the chimney.The Germans began to search
the house.They looked all over the house.Then
they fired a bullet up the chimney and soot fell
down. . . .?
This is a good book so read it.

Comments and observations made at the time
Before he even sat down, M. was saying 'we've got to change something'. He was keen to finish it off and do some of the corrections. Looking at it J. commented 'that's wrong', referring to 'he knocked him out'. N. wanted to put 'he stayed in his house until . . .' but M. insisted it should only be 'he stayed until'.

'Jermen' in the original work from last week is for many young children a word more commonly heard these days than read. The use of J rather than G is a sound phonetically correct in this instance, for J and G can sound the same in some words; e.g. in jump and german the J and g have the same sound but the g in gun does not. There was a lot of debate about the spelling of 'chimney' amongst them and after several tries (on screen) they got it right. Even M. participated in this. Search was originally input as 'surch'. There was some debate as soon as 'sur . .' appeared on the screen, though M. was quite happy with it. After printing out the unamended version, they moved on to making changes. This required us to remind them of how this was done. Corrections to the text were made one line at a time, and involved reading back the text and looking critically at it. For M. the wordprocessor for writing has a positive advantage. Because it is so easy to make corrections and amendments to the text, he was more motivated to re-read and to look for changes and improvements he could make.

School 3: *Primary School (5–11) in a rural area drawing children from villages with some light industry and from a large agricultural/farming community.*

Here the work was carried out with a group of three eight-year-old children (two boys and a girl) in an open-plan teaching area with normal classroom activities going on at the same time. This could have resulted in a high level of distraction, but no such problem was encountered. They had already completed a teacher-set task and when offered a free choice they asked if they could write about a story they had had read to them. The work was carried out over two weeks: one session each week of about 35 minutes length.

Week 1

Charlotte's Web

Mrs Arable went to see Dr Dorian about Fern.
She said Fern was spending most of her time
at the Zuckerman's farm playing with the
animals. Since the writing had apeared in the
web, lots of people had come to see this fantastic
pig called Wilber. Fern told her mother that the
animals could speak. Dr Dorian said the animals
might be able to speak but he had never heard
one himself. Dr Dorian said "When she gets older
she will be more interested in boys than animals."
Dr Dorian asked if Fern knew any boys. Mrs
Arable said Fern knows Henry Fussy. Dr Dorian
sat thinking about Henry Fussy.

Week 2

Charlotte's Web

Mrs Arable went to see Dr Dorian about Fern.
She said Fern was spending most of her time at
the Zuckerman's farm playing with the animals.

Since Charlotte the spider had woven her writing in the web, lots of people had come to see this fantastic pig called Wilber. Fern told her mother that the animals could speak. Dr Dorian said the animals might be able to speak but he had never heard one himself. Dr Dorian said "When she gets older she will be more interested in boys than animals."Dr Dorian asked if Fern knew any boys. Mrs Arable said "Fern knows Henry Fussy". Dr Dorian sat thinking about Henry Fussy. Then Dr Dorian said "There is nothing to worry about". Soon the day of the show came, Mr Zuckerman took Wilber to take part in the show which was to choose the best pig, but Wilber did not win.

We like Charlotte's Web because it shows that animals might be able to talk. The animals are the main part of the story.

School 4: *Infants School (5–7) in an old market town with the school situated in the town itself. Not an inner city location. Age of children, almost seven years.*

Here the work was carried out in the classroom (not open-plan) and with the rest of the class going about their normal activities. The group comprised three girls, all of approximately the same age and ability level, though one was an extremely able writer. There were two 35-minute sessions each week and the work below is from the first three sessions.

Week 1: Session 1

The Iron Man
Once upon a time there was an iron man. He had a head like a dustbin but as big as a bedroom.His eyes were like headlamps. He was standing on the edge of a cliff.The wind rustled through his fingers. He put his leg off the cliff. He broke to bits. CRASH CLATTER BANG.His head like a dustbin, his eyes like some headlamps all tumbled down.

Week 1: Session 2

The Iron Man
Once upon a time there was an iron man. He had a head like a dustbin but as big as a bedroom.His eyes were like headlamps.He was standing on the edge of a cliff.The wind rustled through his fingers. He put his leg off the cliff. He broke to bits.CRASH CRASH CRASH! He went over the edge of the cliff. CRASH CLATTER BANG. His head like a dustbin, his eyes like some headlamps all tumbled down. Suddenly two gulls flew overhead, and one found an eye of the iron man,another found a hand of the iron man.And they both took it back to the nest, SQEEK SQARK they went. SQEEK SQAAAAARK!They thought that the hand was a crab. The hand held the eye inbetween his two fingers then the hand went off to find the other hand and the other eye.Then they found the other hand and went off to look for the other eye.The hand that could see found an eye for the blind hand.

Week 2: Session 1

The Iron Man
Once upon a time there was an iron man. He had a head like a dustbin but as big as a bedroom.His eyes were like headlamps.He was standing on the edge of a cliff.The wind rustled through his fingers. He put his leg off the cliff. He broke to bits.CRASH CRASH CRASH! He went over the edge of the cliff. CRASH CLATTER BANG. His head like a dustbin, his eyes like some headlamps all tumbled down. Suddenly two gulls flew overhead, and one found an eye of the iron man, another found a hand of the iron man. And they both took it back to the nest, SQEEK SQARK they went. SQEEK SQAAAAARK! They thought that the hand was a crab. The hand held the eye inbetween his two fingers then the hand went off to find the other hand and the other eye.Then they found the other hand and went off to look for the other eye.The hand that could see found an eye for the blind hand. And then the iron man found his self. And put him self together again and he started to walk. And the seagulls saw him and they went SQEEEEEEEEEEEK SQAAAAAAAAAARK SQEEEEEK SQAAAAARK. and the iron man went into the sea. A little boy called Hogarth was going fishing and he saw the iron man. And Hogarth went home as fast as he could run to his house to his father! And his father belived him. His father got in his van and drove off to all of the other farm's to tell the other farmer's. One of the other farmer's did not belive him. But the next day all their machinary had been eaten.There were large teeth marks. That was a clue.

Acknowledgement

The Research Team would like to thank the staff and pupils of the following schools for allowing us into their classrooms to carry out our work: Driffield Infants, Wheeler Street Primary, Gilberdyke County Primary and Shakespeare Junior High.

Judith Baskerville
Humberside College of Higher Education

References

Hughes, Ted 1968: *The Iron Man*, Faber.
White, E.B. 1963: *Charlotte's Web*, Penguin.
Serraillier, Ian, 1957: *The Silver Sword*, Heinemann.

The MEP Primary Project: its contribution

In his article which forms the introduction to this special issue of *MICRO-SCOPE*, Norman Thomas identifies several applications of micro-computers which he considers can enhance the work of primary school children. He casts doubts on the use of drill and practice programs, except perhaps in very special circumstances. He talks instead about the need for us to consider software which increases children's opportunities for discussion and thinking, and for discriminating, noticing relationships and generalising. He mentions particular applications which are already proving their worth, such as the use of data bases like Alistair Ross's *Dataprobe*, and carefully selected simulations and adventure games, like Bob Hart's *Tombs of Arkenstone*. He draws our attention to the exciting prospect, when disc drives and printers are commonplace in primary schools, of being able to use word processing facilities in the way that Judith Baskerville describes in her article. He reminds us not to proceed aimlessly, in our enthusiasm for the new technology, without giving proper consideration to the educational significance of the full use of the LOGO language in primary schools. He could perhaps have given us a similar warning about how far we should proceed with electronics and control technology, when good practice in both technology and in primary science are not yet established in all primary school classrooms.

We have indeed got a lot to think about.

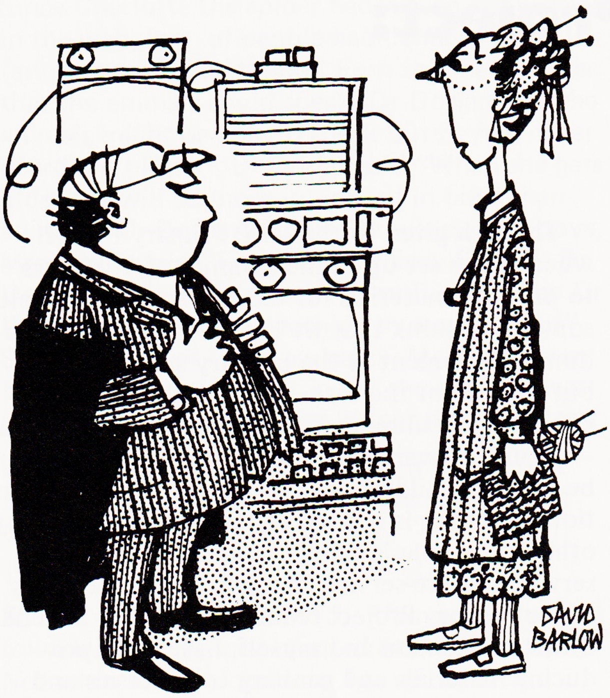
Learning how to use powerful software can be quite daunting for primary school teachers. Many of them have only just begun to feel confident about how to handle microcomputer equipment and the peripherals which go with it such as disc drives and printers. Considering how the software can be put to profitable educational use in the classroom is the next major step. Helping teachers take that step can also be a daunting prospect for those who normally organise in-service training courses. Teacher trainers themselves need materials which they can make use of in training sessions: resource lists, OHPs, video or tape/slide presentations, and sample programs which can not only be demonstrated during a course but can also be taken away afterwards and tried out in school. There is nothing worse than being shown a new program and then being told 'This will be available in June next year and it will probably cost you about £35.'!

The task given to the MEP Primary Project when it was set up in the summer of 1983 was to produce materials for teacher trainers. People sometimes think that we are involved in curriculum development at the primary school level, but that is not the case. Decisions about what kind of curriculum materials should be developed – about software and other resources that can be used by children in schools, and what proportional funding is needed for them – are taken by others. Our role is simply concerned with in-service and pre-service training. Three members of the Primary Project team, Christopher Schenk, Christine Robson and myself, have been producing materials and running conferences and courses which should help to disseminate those materials through England, Wales and Northern Ireland. (Scotland has its own separate and complementary scheme.)

One of the first decisions which we took was that we would supply our materials directly to LEAs and to teacher training institutions using a 'cottage industry' form of publishing. We are all too conscious that the packaging and marketing of materials by commercial publishers seems to delay the publishing date and to add considerably to the cost of the end product. We wanted our materials to be available as soon as they were ready, and to be free to those who would use them. We also wanted to ensure that as much as possible of any in-service pack which we produced could be copied freely without any infringement of copyright by teachers who have attended courses based on the materials.

So what have we produced so far?
One of our first actions was to set up a software catalogue (using the database *Quest*), which lists information about the kind of programs referred to by Norman Thomas. Drill and practice material is not included in our catalogue which now covers some 600 records. A copy of the catalogue file has been provided on disc for LEAs who wished to have a copy. Printed versions which can be photocopied for teachers have also been sent out to each LEA and to each teacher training establishment.

Next, we produced a support pack of in-service material to help teacher trainers who were looking at the use of simulations as part of their introductory DOI courses for primary teachers. Since a free copy of the *Mary Rose* program, published by Ginn, had already been sent to



'You might find it a little strange at first, Miss Candlewyke, but I'm sure you'll cope.'

each LEA, this pack was centred around the use of the *Mary Rose* in the classroom. It includes posters and resource lists, mounted photographs of pupils' work which arose from the use of the program, 35 mm slides showing children working in the classroom, and a taped discussion amongst teachers who had used the program themselves.

Our next task was to produce a pack which looks at the role of the micro in supporting primary mathematics. The pack takes as its theme paragraph 243 of the Cockcroft report which emphasises the need to extend opportunities in mathematics for discussion, for investigation and for problem-solving. This pack was different from the first one in that it also included a disc of twelve programs – BBC versions on one side, and 480Z versions on the other side – all of which can be freely copied. These programs are accompanied by a booklet which suggests many supplementary activities of a practical nature which children might undertake alongside their use of each program. Further activities, away from the micro, are described in background articles. One of these, 'Micro Primer maths – there's more than meets the eye' – has also been included in this *MICRO-SCOPE* Special. The pack also contains a tape/slide presentation which illustrates the mathematics which can arise from programs like *Giant, Monster* and *Micromap*, all available from Longman. Sample training sessions making use of the material in the pack are described in a booklet of tutor guidelines. These sessions could easily be incorporated into any course which deals with primary mathematics, including a series of after-school meetings which a maths co-ordinator in a primary school might organise for his or her colleagues.

The major item on which we have worked during the summer of 1984 is a language development pack. The pack, like its predecessors, contains a wide variety of material which is freely copiable: OHP transparencies, slides, background reading material, tutor guidelines, resource lists and freely copiable software (BBC/480Z), again with a set of program notes describing related classroom activities. The language pack software is more complex than the mathematics software in that it allows teachers and children to explore their own ideas using their own selection of words, phrases or text. In consequence, the programs are harder to use and most of them will need the direct support of an in-service course before they are used in the classroom. This pack is accompanied by a video film, *Talking point*, which highlights the language work which arises in the classroom from the use of a turtle, from the use of an adventure game, and from the use of a database.

Our Project Work Pack on which we also worked during the summer has been edited by Jan Stewart of ITMA. The freely copiable BBC/480Z software in this pack includes an infant word processor called *Writer*, a utility to convert *Factfile* files to *Quest* format and vice versa, *Copier* (for BBC only, which is a utility to convert tape/disc files in any order), together with some sample files for powerful data retrieval programs which we very much hope schools already have access to: *Factfile* and *Picfile* (from CUP), *Quest* (from AUCBE), *Clues, Seek,* and *Slyfox* (from Longman).

And what about the coming year?

Future plans on which we have made a tentative start include a continuing programme of courses, with possible in-service packs with themes of infant school work (Easter 1985), LOGO (Summer 1985), problem solving (Autumn 1985) and control technology (Spring 1986). Heather Govier, from Croydon LEA, is co-ordinating work on the problem solving pack, which will draw on the material produced by Croydon's Problem Solving Project. Roy Richardson, from Lincoln LEA, in a joint initiative with British School Technology, is co-ordinating work on the control technology pack.

The dates suggested for the publication of these packs are, at the moment, very provisional! The contents of the packs are equally so. We are all too conscious of the kind of questions that Norman Thomas has asked: to what extent is the use of a full LOGO language educationally desirable, or even necessary, in the primary school; how many children under the age of eleven might be affected; what are the implications for the resources required, not just for hardware and software but also for in-service training? We are planning to consider these issues in some detail in the coming term.

We are also planning to produce a video on control technology, which follows three teachers and their classes through a school year, and which looks at the in-service support which the teachers needed.

Distribution – how and to whom?
The policies which the MEP Primary Project has developed for the production and dissemination of its materials are not without their problems. The first is finding the right channel of communication, and the names of appropriate people who might receive and make use of our packs. Sending one to The Dean, School of Education, The University, in no way guarantees progress beyond the post room! A pack addressed by name to Mrs Jones, Primary Adviser, may be delegated to the pending tray if Mrs Jones has decided to leave all in-service training to do with microtechnology to the Computing Adviser, Mr Smith. Mr Smith himself, probably already overworked by demands on his technical expertise, may not feel that disseminating a pack concerned with the role of the micro in the language development of infants is the best use of his time!

As time goes by, and as we get to know personally more LEA advisers or inspectors, and more people involved in the initial training of primary teachers, the communication problem diminishes, but it is certainly not yet solved. At the present moment, we send two separate copies of our in-service packs to each LEA, one addressed to the senior primary adviser, with a second copy to a specialist adviser. For example, the second copy of our mathematics pack was sent to the maths adviser. In addition, we send two copies to teacher training institutions, addressing one to the most senior lecturer in primary education, and one to the microcomputing centre.

The second problem is connected with the variation in the provision of reprographic facilities within individual LEAs. Some advisers have ready access to both a photocopying service and the internal post system. These advisers are able to photocopy, for example, our fairly comprehensive software catalogue, and send it out to all primary schools without encountering any particular difficulties. For others, it is not at all easy. Sometimes advisers make just a few copies and place them in Teachers' Centres, so that visitors to the Centre can make their own copies there. Sometimes materials are made available through courses, and are actually copied by those attending during the course itself. If you feel that there are materials of ours which you would like to have, and have not received so far, then the first person to contact is your senior primary adviser to whom a copy of everything is sent. He or she should certainly know of the dissemination policy adopted by your particular LEA.

An alternative person to contact if you are really stuck is the primary co-ordinator attached to each MEP Regional Information Centre. The regional primary co-ordinators have just been appointed, most of them on a part-time basis, to assist with in-service activities within each region. They will themselves organise and run some courses, and will help with courses organised and run by local authorities. They will also, as far as they possibly can, help with the provision of information about primary school activities.

We know that, given extra funding, we could produce more materials, and make them more directly available to individual schools. In spite of this, we hope that, by March 1986 when the Primary Project ends, we will have made a contribution to the kind of micro-related activities which Norman Thomas urges us to move towards: increasing children's opportunities for discussion and thinking, for discriminating, noticing relationships and generalising.

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Published by Castlefield (Publishers) Ltd.,
12 Chater Street, Moulton, Northants. NN3 1UD.
Tel: (0604) 494660.

£1.75