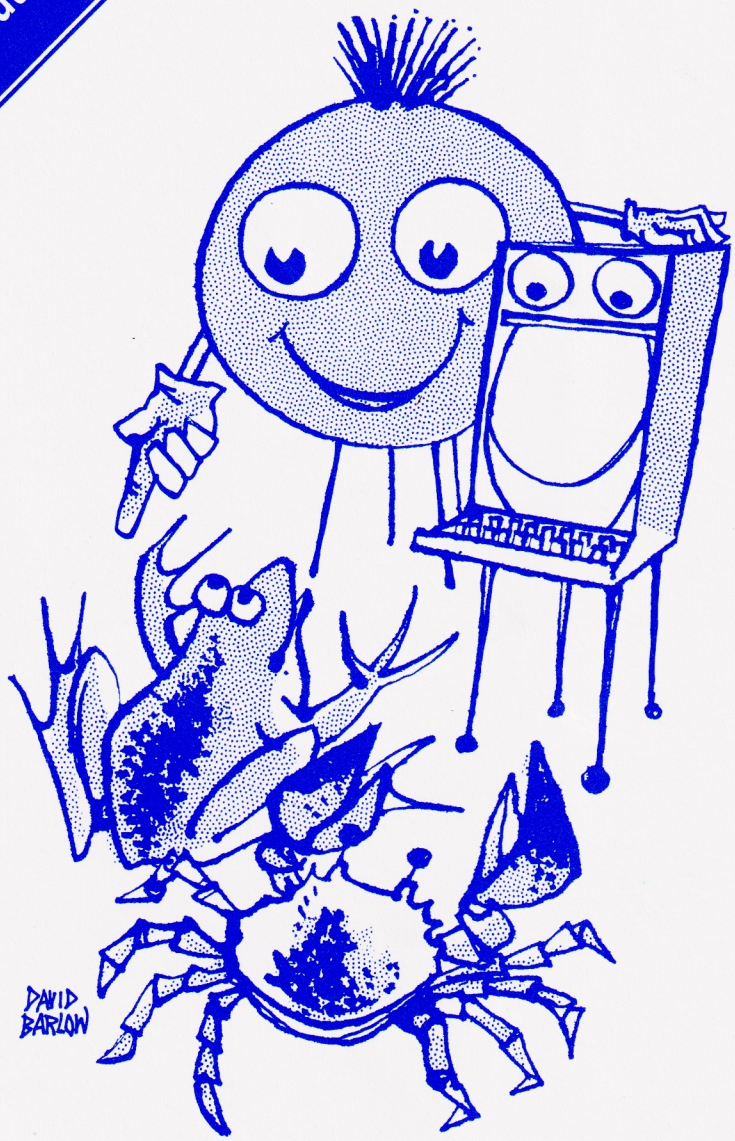
YOUNG LEARNERS
The contribution of the micro

SPECIAL



MICRO SCOPE

Newman College with MAPE

Contents

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MICRO-SCOPE SPECIAL YOUNG LEARNERS: THE CONTRIBUTION OF THE MICRO

INFANTS AND THE MICRO: a personal overview

David Marshall
Rocks Park Junior School, Sussex

It is a mystery to me that there are infant teachers who still question the validity of using a micro-computer in their classroom. I can already hear the voices raised in defence of their traditional practice.

'I have always taught reading with these pre-reading tasks. I see no virtue in changing.'

or 'I can't find the time to fit everything in as it is! How am I supposed to become a computer expert as well?'

or 'It's no good me getting interested in using the computer. We have only got one and I hardly ever get a turn.'

or 'I'm too old to start learning new fangled methods now. I'll stick to what I know!'

Do you recognise yourself in there? I suspect not otherwise you probably wouldn't be reading this. If you do then – shame!! If you recognise a colleague then read on.

Surely there is something anomalous in an individual theory of teaching which does not allow for change. After all, the essence of education is a change of state. The more we learn, the more we have to accommodate our new knowledge. Any child who learns to read is intellectually and emotionally different from the way he was before he learned. How can any teacher, well aware of this process, be estranged from the learning continuum if they are asked to be a part of it? It is certainly a truism that the best work with computers in the early years of education is to be found in those schools acknowledged as 'good' prior to the advent of the micro.

The schools with well organised and established early learning curricula, based on a fully discussed, and acknowledged, shared experience are precisely those where the introduction of the micro could be seen as an intrusion. And yet it is those schools which have seen the positive benefits of the micro and have striven hardest to assimilate this new educative tool. The motto seems to be 'no matter how good we are – we can be better'. What better adage for any establishment?

None of us has been using the micro for long enough to have reached that splendid, unrealistic state of perfection, and we should beware of those that claim different. There are some, however, who are beginning to see the product of their new endeavours: the excited urgency of their children; their greater facility in problem solving; the greater understanding of fundamental concepts; their familiarity with ideas, and their delight in swapping and discussing them. Some of these splendid developments are amplified elsewhere in this issue, but what do these schools, or teachers, have in common?

Firstly, these schools are adequately resourced. It is, perhaps, painfully obvious to say that without the proper tools the job is impossible. It is also obvious that many infant teachers are faced by just this dilemma. They would love to grapple with the intricacies of Turtle graphics, but they only see a micro on Tuesday mornings and Friday afternoons. Almost impossible odds! The solution is equally obvious – get more micros. Or get better organised (more of this later). It is no good seeing the real benefits a micro could bring if you haven't got a micro to use! (If you are in this

position then take this article and suggest whoever holds the purse strings reads it!) The children have to be familiar with the micro before they can truly benefit – so do the teachers. Buy enough.

Have you ever noticed how often the children press ESCAPE, or BREAK, on the BBC? It has something to do with Murphy's law I am told. This practical factor, plus a more important educational one, make disc-drives an absolute essential. The 'more important one' is to do with an infant's attention span. If you have had to reload a cassette program that takes four or five minutes you do not need to be told what havoc can be created in that time. Not physical havoc – just emotional and mental havoc. If you are doing information handling you need to have rapid access to data the children have collected in previous sessions. There should also be the facility to change programs to suit the micro to the child – not the other way round. All these tasks need to done quickly and reliably – the very opposite of cassette loading. I hope we are seeing the advent of a generation of teachers who never see 'DATA – BLOCK – HEADER' or 'REWIND TAPE' on their monitor screen.

Whilst on the subject of hardware, there are many good, and varied, programs for infants which are only truly complete if you have a printer. For instance *Picture Builder* from Hill MacGibbon is an essential in any teachers' resource library – but it is twice the program if you can dump the final picture. The printer options in programs such as *Dragon World* also give you so much more scope. Word processing and databases are two of the most exciting possibilities in using a computer – without a printer they are far less positive.

Elsewhere in this issue there is an article on the Concept Keyboard and infants – read it and be convinced.

Our 'ideal' school, therefore, has an adequacy of micros, disc-drives, printers and alternative keyboards. It also has a policy for organising its wealth. To be truthful, there is no one absolute way to manage your resources. Only what is best for you. There are, however, many possibilities. Children in any infant school are at different developmental stages. There is no reason why a middle infant or two should not be involved in ESM's *Early Reading Pack*, if that is appropriate for them. Never mind that the reception class has the micro and that software. That is what these children need now! Share it! Be aware of what each, and every, class is doing with the micro, and when. Swap ideas, swap times, swap programs, swap children! Be flexible. If the micro is timetabled for Mrs Smith's class, and she leaves it switched off for the morning, and you could have used it profitably, you are both guilty of doing the children a disservice. You have also wasted your good ideas, and £500 worth of equipment. All because you forgot to ask, or had no organisation that encouraged you to ask. If you are planning a long term project negotiate for a greater amount of computer time. You must be prepared to release your time later for someone else. If you know what you are trying to achieve then timetabling is fairly straightforward. Remember that relative wealth if spread too thinly amounts to poverty.

If you plan, and timetable, your use of computers with this care, and remember to be flexible, you will not commit the very worst crime – that is adapting the children to fit your zeal to use the computer. If you only have a few programs in your school, and you do not like them, or find no point in them, do not use them. This issue highlights some of the exciting ways of using the micro. Take note. Your use should be part of your general teaching strategy. It should enhance what you can offer the children. I well remember seeing a whole class, in pairs, doing a simple letter matching program. There was nothing wrong with the program but it was totally inappropriate for about 80 per cent of the children. Because the teacher had the micro and that program they all did it! What a waste of time and a valuable tool.

Only if you choose the best software can you hope to enrich your children's experience. You can only know what is 'best' if you take the time and energy to find out. Yes, more work I'm afraid.

There are many MEP files, *MICRO-SCOPE*s and other journals etc. which can, and do, help with this choice. Ultimately though, each teacher must decide for herself. There is now an enormous amount of software available. Most is still drill and practice – some of this is quite good, much is not. Surely it is not appropriate when there is still such a poverty of hardware to tie it up practising certain skills that could be practised just as well without a micro. Just think of the workbooks and cards you could buy for the price of a computer. (And just think how many young minds you could close.) The fact that these drill programs are more accessible for teachers is no recommendation. If real progress is to be made then real effort is required. Remember you must not confuse the myth of 'I know what I like' with the reality of 'I like what I know'.

Whatever you are using it should be a part of your curriculum – if not written then certainly spoken and thought. As you will read later, *Podd* is a super program which is even better when it is used at the appropriate stage of a child's development.

To try to give a definitive list of software would

be both misleading and self defeating. After all, what I want is for everyone to find their own salvation – not to find mine. My prescription for success could be your prescription for failure. However there are certain types of software you should have access to:-

A good, simple, word processor;
A Turtle graphics (or intro. to LOGO) program;
A simple data handler;
A selection of early language programs;
The best of the many adventure programs;
A few good simulations, if appropriate;
The best of the early numeracy programs.

If you have the right resources as far as equipment is concerned, and you are well and sensibly organised, and you have an awareness of what the micro could do for you, then your software requirements will become apparent to you. When you have acquired these programs you will perhaps be fortunate enough to witness the equivalent of these experiences:-
— A child, with the light of triumph in her eyes, who can drive *BigTrak* through an obstacle course perfectly. She has learned, and is using, the associative and commutative laws of mathematics – but please don't spoil it by telling her! Her grasp of certain fundamental concepts is extended. Her skill at estimation is refined beyond measure – and she has enjoyed it!
— A very different child who became captivated by the baby dragon in *Dragon World*, and wrote stories and poems. He drew pictures and made models. He worked, (that would suprise him!), because his imagination was fired and set free.
— A little boy who believed quite passionately that he could not draw. In the end he couldn't! After a while using *Picture Builder* he thought perhaps he could. Now he can!!
— Groups of children sorting and classifying data as to the manner born because of *Factfile* (or better still *Ourselves*) – and really enjoying it.

If you still need convincing you should just listen to a recording of the discussion this creates. Or you should read the rest of the articles in this special.

I have been fortunate enough to witness all the above, and much more. But these events did not happen by accident. They happened for children who had teachers who were aware of what the computer could do. Who realised just what was now available. Who planned accordingly. Who involved mums in their classrooms, to release their own time or to keep 'an eye on' activities. Who committed themselves to finding out more and building on what they already knew of computers and software. But above all else these results, and many like them, were achieved by teachers who are aware that education is changing, open-ended and precious. And who are prepared, if necessary, to think again about the way they teach our young children, and then to change.

Eighteen months with infants and a micro

Mary Bascombe

Yourfacts is part of the *Factfile* package which was given to all primary schools who joined the DTI scheme. *Factfile* is published by Cambridge University Press. There are versions for the Acorn BBC B and the RML480Z. The program can be adapted, as described in this particular article, to take information about alternative topics. Technical details of the alterations are not included here. The MEP Primary Project has produced a similar program which is included in the INSET Infant Pack (see resource list). The accompanying documentation describes how to change the program.

The Animal Game (Animal) is included in Micro Primer Pack 1.

More or Less (Morless) is included in Micro Primer Pack 3.

Slyfox is part of Pack 5 of 'Micros in the Primary Curriculum' (ITMA), published by Longman Micro Software, Longman Group Limited, Longman House, Harlow, Essex CM20 2JE. Acorn BBC B and RML380Z/480Z, disc or cassette, £20+ VAT.

The package also contains *Scene*. This program allows the users to create their own files of information on which the game can be based.

Five terms ago I enrolled in a course 'Micro-computers for Beginners', at the College of St. Paul and St. Mary, Cheltenham. I knew nothing at all about computers. I was unfamiliar with the 'typewriter' keyboard. I had a class made up of 21 reception whose ages ranged from 4 years 8 months to 5 years 4 months and 11 middle infants. So I consoled myself with the thought that nobody would actually expect children of that age to be able to do any valuable work with computers anyway – even though a new computer had arrived at school!

The ten-week course was very interesting. I was fascinated, but felt that everyone else knew so much more than I did. They talked of using the computer with their classes, of software, of disc drives, and of programs they had tried. Perhaps it was beyond me – they were all junior teachers! However, the computer came home with me at weekends and during the Christmas holiday and, by January, at least I wasn't afraid of it any more and I knew how to plug it in and get it started.

With the new term, and starting a new year with good resolutions, I plucked up courage and set everything up in the classroom with the datafile tape *Yourfacts*. With the whole class gathered around so that we could learn together, and to familiarise the children with the language used; we watched the screen and read aloud the words which appeared. Three of the more able children, Rachel, Ben and Samantha (the youngest girl in the class) typed in the Yes or No answers to the 6 simple questions:

What is your name?
Are you a boy/girl?
Do you have a bicycle?
Do you have a watch?
Do you have a pet?
Do you have a brother or sister?

At this point a small group was left in the charge of Rachel who organised them to type in their facts. When this group had finished, Ben, and then Samantha, helped the rest of the class to do the same. When all the facts were in and recorded we gathered together again to learn about the next stage, a game where the computer guesses who you are. Playing the game was taken very seriously at first and I'm sure the children thought of the computer as a person, for they whispered together things like 'don't tell him your name, let him guess', or pointed to the person they had decided would be the one the computer should try to guess, first. Much laughter greeted a failure to guess correctly, and disappointment if the name was guessed too quickly.

Then we made two wallcharts. 'Our Computer Chart' (Fig. 1) where we simply wrote our names and coloured in the appropriate spaces under the question headings, and 'A graph about our facts' (Fig. 2) where, again, we filled in spaces for facts pertaining to ourselves, but this time we used numbers up to 32 (the total number of children in the class). We added two more sections on our charts:

Do you have a grandma?
Do you like working with the computers?

Our Computer Chart								
Names	Boy	Girl	Bicycle	Brother	Sister	Watch	Pet	Grandmother
Rachel								
Kelly								
Simon								
Daniel								

Figure 1

A graph about our facts									
Children in class	Boys	Girls	Watches	Bicycles	Brother	Sister	Grandma	Pet	Like computers
32									Yes
31									Yes
30									Yes
29									Yes
28									Yes
27									Yes
6									Yes
5									Yes
4									Yes
3									Yes
2									Yes
1									Yes

Figure 2

– this last column was filled entirely with 'yes' answers.

The children had now learnt what a graph was, and were able to make comparisons between the two charts and also between the charts and the information they could get from the computer. So they were now ascertaining relationships between the various categories. Observations such as these were made: 'There are 18 boys in our class', 'There are 14 girls in our class', 'There are 4 more boys than girls', 'There are 4 less girls than boys'. Questions were asked, such as 'Which girls have bicycles?', 'Do more girls than boys have watches?' We had now begun to ask the computer about two facts and cross check them with the block graphs.

Lots of other work about ourselves and our facts then materialised. We painted 'a picture of myself'. We measured ourselves against the wall, and every month repeated the exercise to see how much we had grown. We graded ourselves in size order and then made a size graph where we each drew a picture of ourselves in the correct ordering. Rachel was the tallest then – she still is (16 months later).

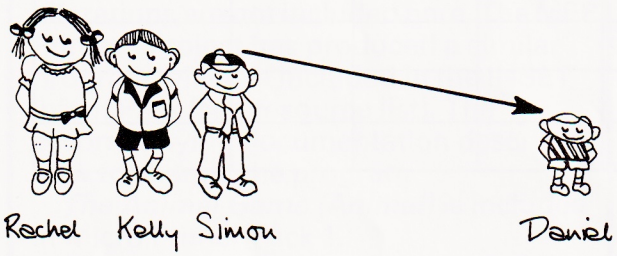


Figure 3

Other related work in connection with *Yourfacts* led us into great discussions about caring:

1 *Caring for our pets*. We drew pictures, talked about what they were, what they ate, who looked after them, their names and characteristics, their habits etc. Another block graph was made with pictures drawn by the children and those children with pets wrote their names in the appropriate spaces (Fig. 4). Following this we looked through magazines and cut out pictures of dogs, (big dogs, little dogs), and cats, and then graded them into big, bigger, biggest, fat, fatter, fattest, long, longer, longest and so on. We also used our work about pets to talk about colours, and cut out and labelled a black cat, a white mouse, two yellow fish, a brown hamster etc.

2 *Caring for grandparents*. We talked about where they lived and how we visited them. Paintings and sentences accompanied this aspect of our work. A graph of the transport used to

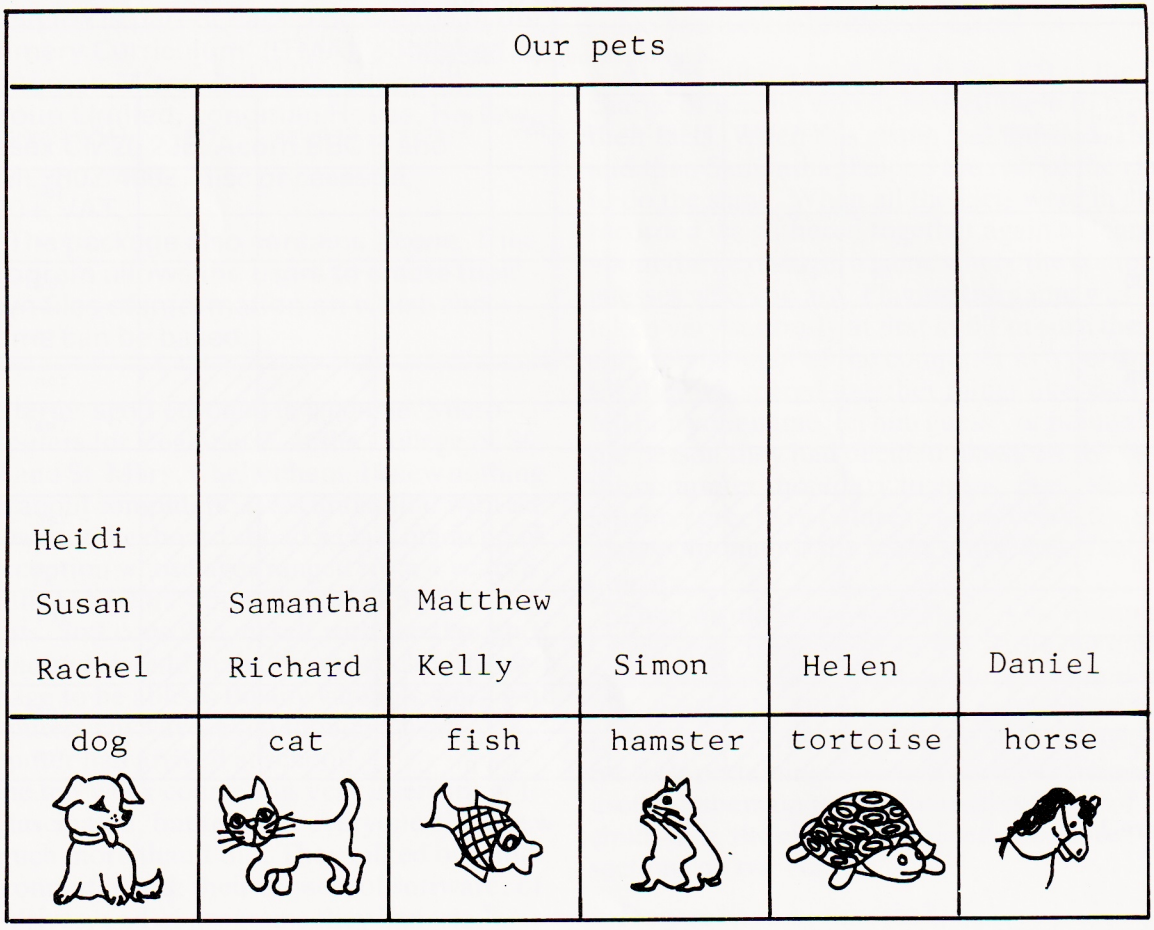


Figure 4

visit grandparents was made, and nobody was surprised to find that almost everyone used a car, while only two went by train and two walked. (The children wrote letters to their grandparents and most received replies.)

3 *Caring for other people*. After talking about others both in our own country and abroad and referring back to *Yourfacts*, the children could see that they were fortunate to have watches and bicycles, and, indeed, enough to eat. The class cut out pictures of bicycles and watches from catalogues and also pictures from newspapers of starving people and mounted them on wall sheets. We thought of how we could help. We held a class sale of cakes and sent the money to Oxfam.

Our turn for taking the class assembly for the school was at that time in the term so we chose 'caring' for our theme and used much information collected from our computer work, together with paintings for this.

We had talked a lot about 'more' and 'less' and 'same' in conjunction with *Yourfacts* so we now learned the signs > < and = and used the computer maths game *Morless* on several occasions. (The children didn't seem to be confused by the square type numbers displayed on the screen.)

The work on *Yourfacts* lasted all the term – we had incorporated Maths, Art, R.E. and written English. We had learnt a lot. We had also had constant use of the computer in the classroom!

Summer term began and for the first week only we used *Petfax*, a version of *Yourfacts* but related to our pets. As we had already done a lot of work, both written and oral, and had made collections and drawings on this theme previously, we did not pursue this program further. However we did enjoy *The Animal Game*. We learnt about this in the same way as before, by sitting around the computer at first, and reading the screen together:

Think of an animal.
Does it live in a kennel? (Answer Yes/No)
If Yes, Is it a dog?
If No, I give up. Tell me the name of your animal, (e.g. horse)

Type in a question that will distinguish a horse from a dog. (e.g. Do you go for rides on it)
The answer for a horse would be (Yes).

To help them to formulate their questions I made a list of useful words: does, has, live, legs, eat, in, fly, swim, it, climb, can, nest. The children worked in small groups of two, three and four and then wrote about what they had done and about working with the computer.

We adapted the program so that the children were prompted to think of a bird rather than an animal, *Anibird*. They found this much more exacting. It was more difficult for them to discriminate between birds. We decided to visit a bird park for our class summer outing and followed this with writing and paintings and then played *Anibird* again. This time, having had the experience of seeing some rather unusual birds the children could more easily find questions to ask the computer. However they still preferred *Animal*.

We had not had exclusive use of the computer during the summer term but we had used it a lot.

Autumn term arrived, and with the need to establish an extra infant class I was fortunate to be able to go with most of my children as they moved on to class 5 and thus we were able to continue with the computer-related work which we had already started. We were now a smaller class, thirteen top infants, aged six, and thirteen middle infants who would be six during the autumn term.

On the first day back, naturally we talked about our holidays. This was followed up by each child producing a piece of writing, a painting, a crayon drawing and cut-outs of pictures with photos or postcards which were then mounted on individual sheets entitled 'My Holiday'.

Now, with another computer newly installed at school, once more we were able to keep one in our classroom and use it each day, and so, on advice and help from Mr Eyre, *Yourfacts* was adapted to *Holfax* and was duly put into use. Here the questions requiring Yes/No answers, as before, went:

What is your name?
Are you a boy/girl?
Did you go to the seaside for your holiday?
Did you go in a tent or caravan?
Did you go to a foreign country?
Did you go with your grandparents?

Again, the children were grouped near the computer so that they were reminded of the vocabulary used in the questions. When they had recorded all their holiday facts we gathered to discuss the meaning of the options used on the 'choice' page. The children were quite confident and excited and ready to begin work. Some decided to play the guessing game, others wanted to look at facts. The children enjoyed the program and produced written work of a high standard.

We made a chart, similar in style to Fig. 1, 'Facts about our holiday' and coloured the appropriate squares. Six questions were displayed on a wall sheet:

Things to find out from the computer:
1) How many people went to the seaside?

2) How many girls stayed in a tent or caravan?
3) Which boys had their grandparents with them?
4) Which girls went to a foreign country?
5) How many grandparents went to the seaside?
6) Who took a tent or a caravan to a foreign country?

The children were able to cope with editing the information on the few occasions when it had been entered incorrectly.

In one of our class discussions about *Holfax* we talked about which other questions we could have been asked, and from the childrens' suggestions a questionnaire was produced. This asked:

Did you go for a holiday this year?
If you did, where did you go?
Did you go by boat or train or car or aeroplane or how?
Did you stay in a tent or caravan or cottage or hotel or in some other building?
Did you have grandma or grandpa with you?
Who went with you?
Did it take a long time to get there?
Was it more than 100 miles?

The questionnaires were taken home, filled in, decorated, and returned to school and from this much more work ensued.

1 We made a simple map of the British Isles. We marked the places where we stayed with red spots and names and then drew black lines from Cheltenham to those places. We cut out little drawings of cars, trains, aeroplanes etc., and fixed these on to the black lines to show how we travelled. The one child who had not been away, even for a day, cut out a house and put this on the Cheltenham spot (Fig. 5).

2 We did some maths work on sets, drawing the appropriate form of transport used:

a set of 17 cars
a set of 3 aeroplanes
a set of 1 coach
a set of 3 cars and boats
a set of 1 train
a set of 1 house
26 altogether

3 We made another chart and divided the children into those who went more than 100 miles and those who did not. We had a special notice which named the children who had stayed in Cheltenham.

4 We painted large pictures of the kind of accommodation stayed in.

5 A graph, similar to the pets one (Fig. 4), was made. This time the children drew pictures of types of accommodation (Fig. 6).

6 On the wall a poster invited the children to:

Take some paper and play this game:
Who stayed in a hotel?
Draw a picture of the people who went to a foreign country.
Who travelled by coach?
Who did not go to the seaside?
Cut out enough pictures of aeroplanes to match

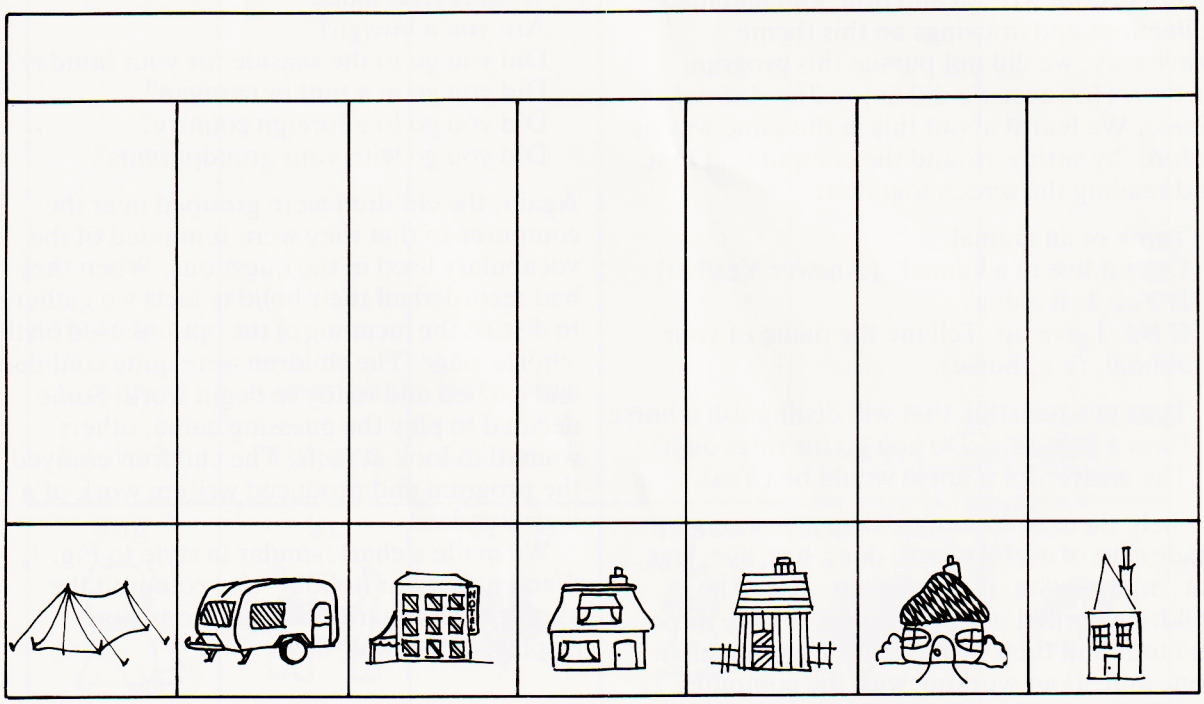


Figure 6

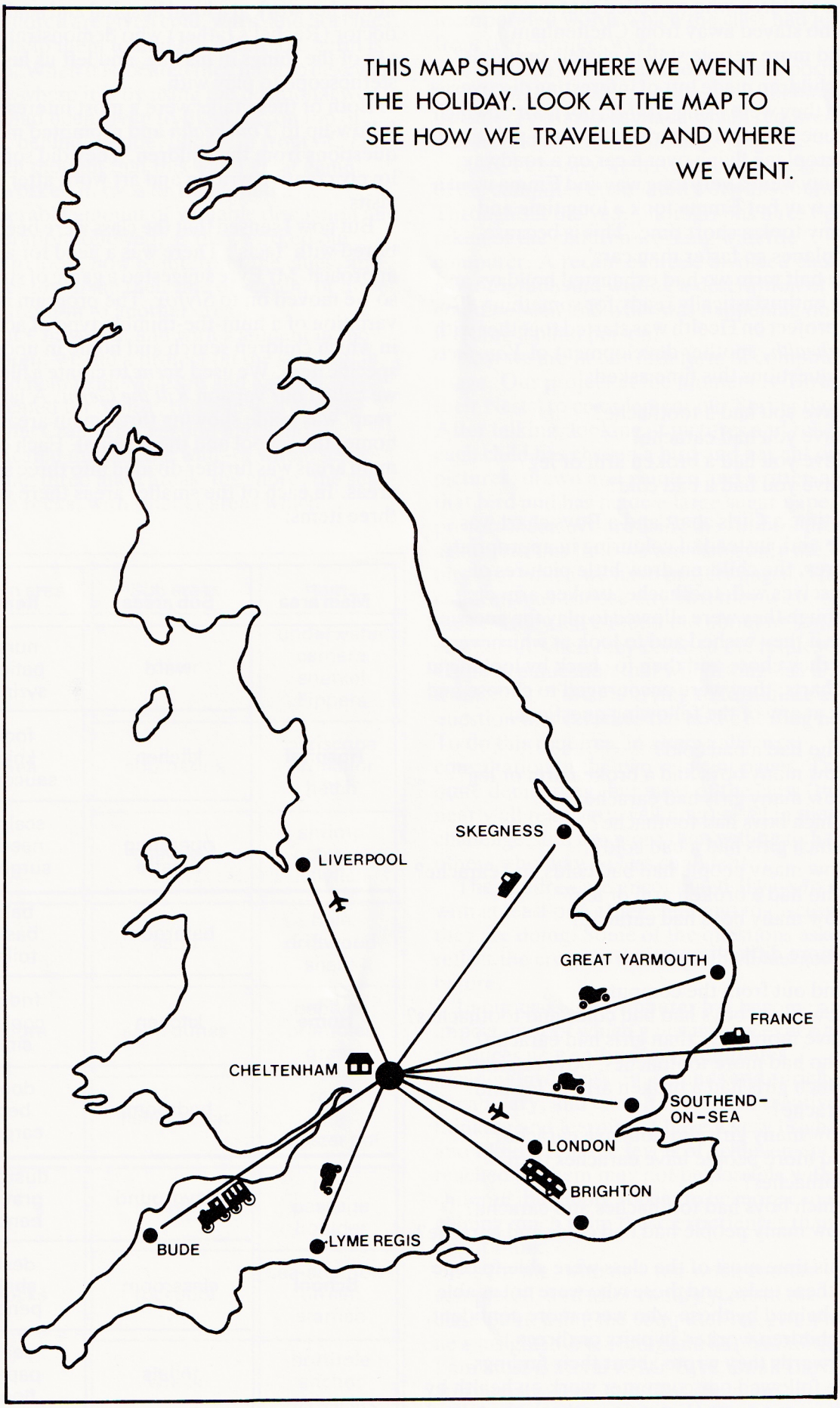

THIS MAP SHOW WHERE WE WENT IN THE HOLIDAY. LOOK AT THE MAP TO SEE HOW WE TRAVELLED AND WHERE WE WENT.
SKEGNESS
LIVERPOOL
GREAT YARMOUTH
FRANCE
CHELTENHAM
SOUTHEND-ON-SEA
LONDON
BRIGHTON
BUDE
LYME REGIS

Figure 5

the children who travelled that way.
Who stayed away from Cheltenham?
Did more people stay in chalets or hotels?

The children made lots of interesting discoveries when they were using *Holfax*, not least of which was one observation written under a painting of an aeroplane flying over a car on a roadway, 'Jeremy went a very long way and Emma went a short way but Emma took a long time and Jeremy took a short time. This is because aeroplanes go faster than cars'.

By half term we had exhausted holidays and were enthusiastically ready for something else, so a project on Health was started together with *Yourhealth*, another development of *Yourfacts*. Our questions this time asked:

Have you had a toothache?
Have you had earache?
Have you had a broken arm or leg?
Have you had a bad cold?

This time a Girls chart and a Boys chart was made and, instead of colouring in appropriate squares, the children drew little pictures of themselves with toothache, broken arm etc. Although they were allowed to play the guessing game if they wished and to look at whichever facts they chose and then to check by looking at the charts, they were encouraged to choose and work at any of the following questions:

Who had a bad cold?
How many boys had a broken arm or leg?
How many girls had earache?
Which boys had toothache?
Which girls had a bad cold?
How many people had bad colds and earache?
Who had a broken arm or leg?
How many boys had earache?

and more difficult questions:

Find out from the computer:
How many boys had bad colds and toothaches?
Have more boys than girls had earache?
Who had more toothaches, boys or girls?
Which girls had a broken arm or leg and earache?
How many girls did not have earache?
Did more people have earaches than toothaches?
Which boys had toothaches and earache?
How many people had bad colds and earache?

By this time most of the class were able to cope with these tasks, and those who were not as able were helped by those who were more confident. The children worked in pairs or threes. Afterwards they wrote about their findings.

We followed our computer work on health by a visit from a nurse (Emma's mother) who talked about her work at a local hospital and a talk by a doctor (Rachel's father) who demonstrated the use of the things in his bag, and left us his stethoscope to play with.

Both of these talks were a most interesting follow-up to *Yourhealth* and prompted many questions from the children. They did some lovely creative writing and art work after the visits.

But now I sensed that the class were becoming bored with 'facts'. There was a need for a new approach. Mr Eyre suggested a game of strategy, so we moved on to *Slyfox*. The program is a variation of a hunt-the-thimble type of activity in which children search and home in upon a specific item. We used *Scene* to create a file, and we called our version *Kill the Germ*. A large 'map' was made showing three main areas – the home, the school and the hospital. Each of the main areas was further divided into three smaller areas. In each of the smaller areas there were three items:

Main area	Sub areas	Items
Hospital	ward	nurse patient syringe
	kitchen	food knife saucepan
	operating theatre	scalpel needle surgeon
Home	bathroom	bath basin toilet
	kitchen	fridge cooker sink
	bedroom	door bed carpet
School	playground	dustbin gravel bench
	classroom	desk shelf pencil
	toilets	seat paper floor

Figure 7

The children are given cold, warm and hot clues which help them to find out where the germ is hidden. When it is located they have to discover exactly where it is by using the positional words which had been given to them: in, on top of, below, behind, beside, under, in front of. The children thought that this was a great game. They worked in twos or threes and a considerable amount of valuable discussion and co-operation followed, as they worked out where to look, how to interpret the clues, and whether to pursue their line of search, or direct their attention to another area.

After Christmas, and with a student in the classroom, we did a project on the sea. Again, I enlisted help from Mr Eyre and another scene was created for *Slyfox*, this one was entitled *Catch the Crab*. This version had a more complicated map on the wall – a whole scene depicting three main areas, the shore, the sea and the rocks, with smaller areas which incorporated words which the class had learnt from their project work.

Main area	Sub areas	Items
Sea	diver	underwater camera snorkel flippers
	submarine	periscope propellor hatch
	seaweed	shrimp octopus jellyfish
Shore	sand	hole driftwood shells
	sand dunes	pebbles brambles grass
	fishing boat	rope net lobster pot
Rocks	cave	roof passage boulder
	rockpool	sea-anemone tin can starfish
	wreck	porthole anchor barnacles

Figure 8

The children were given the following positional words: in, on, under, beside, over, behind, outside. A chart was made which required the children to fill in their findings (Fig. 9).

Since February we have not had exclusive use of the computer but related work has continued. Throughout the year photographs have been taken of the children working with the computer. A recent exercise involved choosing a photograph and writing a description of what could be seen and what was happening on it, as if telling a blind person.

Now we are in our fifth term of computer usage. Our project at the moment is 'Birds and their Nests' to complement our Spring theme. After talking, looking at pictures and reading, each child has chosen a bird and has cut out pictures, drawn and painted and written about that bird and has made a large sugar paper project sheet. We are using the *Anibird* program again, but this time we are using only the 26 birds for which we have project pages. The children may choose any bird they wish, either the one they have found out about or someone else's. But when they come to the request to 'Type in a question that will distinguish a . . . . from a . . . .', we are trying to formulate a question that refers to the bird's nesting habits. To do this requires, in almost all cases, consultation of the two relevant pages. This is quite demanding, but most of the class (they nearly all read very well now) revel in the challenge, and are more than willing to help others who may be less confident.

The children are encouraged always to work with at least one other child and to discuss what they are doing. Some of the questions asked reflect the creative thinking which has gone before.

In our class the computer has become an important tool which gives us new experiences, produces new enthusiasm, stimulates meaningful discussion, extends and enriches our vocabulary, and encourages much creative thinking and learning. I have a very bright class and I know that the levels of achievement reached by them may not be possible with all children, but many appear to be more capable of gaining much from these experiences than we might think.

As for me, with new ten-week courses completed, and after twenty years in the classroom, using the computer has given me a new insight into teaching and its possibilities and I am most grateful to Mr Eyre for all the help and encouragement he has given me.

Catch the crab				
Write your name here	In which part of the map was the crab?	Where exactly did you find him?	Which creature was hiding with him?	How many goes did you have?
Rachel	the sea	on the flippers	Eric Eel	9
Samantha	the shore	beside the grass	Lucy Limpet	15
Matthew	the rocks	beside the porthole	Eric Eel	19
Christopher	the shore	outside the hole	Olly Octopus	13

Figure 9

PODD

Di Wailing, *Information Technology Unit, Croydon* and
Della Cox, *Winterbourne Infant School, Thornton Heath*

Podd is a bright, cheerful-looking character who appears in the middle of the screen under the intriguing caption 'Podd can . . . .'. Immediately suggestions pour in – smile, jump, roll, etc.

Podd is published by *ASK*, London House, 68 Upper Richmond Road, London SW15 2RP, for the Acorn BBC B only, on disc at £11.50, or cassette at £9.95.

One thing that never fails to amaze me is the enthusiasm and lack of inhibition with which infants approach the computer keyboards. They are eager to have a go, to try things out and to investigate a new challenge, without wasting a moment worrying if they'll make a mistake. Older juniors initially seem to want to know what's the highest score possible or how they can undo what they have 'done wrong'. Adults tentatively ask, 'Will I break it.'

When considering buying software for an infant school, particularly in times of limited funds, naturally teachers are going to be looking for a program which offers the most potential for development both on and off the computer. Traditionally most people have come to associate micros with maths, yet much of the maths done at infant level, and beyond, is far better handled practically with paper, scissors, yogurt pots and string, so the child can acquire the skills of manipulation, estimation and formulating ideas. Perhaps the major contribution of the micro to our infant classrooms will be made when it is used as another tool in the field of language development.

Searching for a program which is simple to operate, generates immediate and lasting enthusiasm, sparks off plenty of activity away from the micro and has the potential for real creativity can be a rather daunting task, yet *Podd* manages to come close to fulfilling most of those criteria. The only extra ingredient required is an imaginative teacher. As computer programs go *Podd* also gains full marks for simplicity. It has no beginning, middle or end, so when the noise level reaches fever pitch or your patience runs out, just press the break key and Podd will VANISH out of sight, 'frightened away by all your noise!'

When introducing a program for the first time, it is handy if you can use the school's colour TV as the monitor. This way everyone can see and join in, even the quiet ones. Another bonus is that all the children can pick up the operating instructions at the same time, though not all will remember. Those who do remember can be used to help out the others, thus relieving pressure on the teacher. In order to get things moving the teacher may decide to do the typing herself. Soon the children will begin inching forward eager to take over the keyboard themselves. The first words chosen tend to be things that the children are usually told off for doing eg. kick, slap, swear, etc. After realising that Podd could in fact do no wrong, he becomes even more of a hero! At this point perhaps I

ought to explain the occurrence of the pronoun 'he'. This is because large numbers of children identify Podd with the Mr Men. In fact many of the children I have worked with call him 'Mr Podd', hence I find myself thinking of him as a 'he'!

Another strategy which might be useful when introducing *Podd* for the first time, is to prepare beforehand about ten pieces of plain white card, like extra-large flashcards. As the children uncover a new action Podd knows, it can be written on the card and then at the end of the session those actions will have been 'saved' so the class can use them again as references. These flashcards can be added to after each session, or even better, children can make their own picture dictionary of Podd's actions on the wall or in a book.

Later on when they begin working in groups, three is a very good number. One does the typing, one stands by the keyboard to help find the keys and one checks the screen (alternating tasks frequently). Friendship groups often work well. Less able children seem to build up their own stock of three or four words and stick with them – this proves to be a great boost to their confidence. One little boy was not too keen at first, but decided eventually that he wanted Podd 'to do this' and pulled a frowning face. Now it is standard practice for everyone to let Jermaine 'make Podd frown!'

Try and resist the temptation to say too much about who or what you think Podd is. Allow the children a week or two of exploring the program before enquiring what kind of character their imaginations have created for him. One group decided he might be some sort of fruit and made a graph of their ideas, ranging from a strawberry to a pumpkin. Another group of top infants, meeting Podd for the first time, tried the more sophisticated technique of elimination. First they entered 'bounce' because he looked like a ball. Next, obviously discarding the possibility that he might be 'humanoid,' they tried 'quack', 'bark', 'purr', 'croak' etc. in rapid succession, all of which met with the response 'Oh no I can't'. Five minutes of discussion later they tried 'talk'. This led one of the girls to suggest 'run'. 'No,' reasoned Michael, 'he hasn't got any legs.' More heated discussion followed before 'run' was duly typed in. They were a little taken aback to see Podd suddenly sprout legs, which disappeared again at the end of the sequence. Why then, they reasoned, couldn't Podd just vanish like his arms and legs. So they typed in 'vanish' and were delighted with the result.

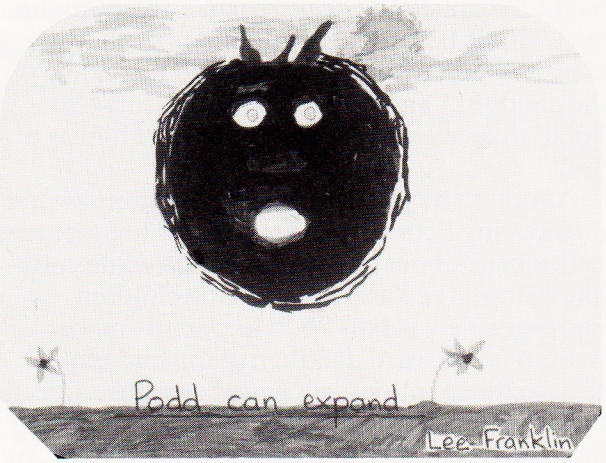
Used in this way, Podd is allowing these children an opportunity for playful thinking. There are no penalties for mistakes, because there are no mistakes. The children are testing hypotheses in a completely unrestricted way, simply by allowing their imaginations free range.

Correct spelling is essential, but fun is a great impetus to learning, and soon even the very young ones learn the magic formula (correct spelling) which triggers Podd off on their favourite action. I remember one particular group who were so convinced Podd should be able to skip, because he could hop, that they asked me to come and check their spelling. An impromptu science lesson was sparked off by discovering that Podd couldn't 'float' although he could 'sink', which didn't make 'sense' as surely all round things can float can't they?

Children enjoy collecting and need very little encouragement to make lists of Podd words, on wall charts or in books, spurred on by the knowledge that there are over 120 to discover. Mums, dads, grannies, grandads and even other teachers are all keen to suggest new avenues which might be searched fruitfully, particularly if the known words are prominently displayed and, through discussion, some discerning groups begin to notice relationships appearing. For example Podd can talk, speak and chatter, could he possibly mutter, whisper or murmur? He can be a great way of involving the whole family in a classroom activity. When making these collections, the actions Podd can't do need to be included as well, because they're not wrong answers, just actions Podd can't perform. To treat them as wrong answers would be harmful, as it might inhibit the children's enthusiasm for searching out new words to test on the program.

As I've already stressed, the discovered words need to be displayed around the classroom so that discussion can be generated and connections made between some of the words, many of which are synonyms, eg. eat and chew. Yet even more interesting discussions will occur when comparing what Podd can do with what he can't. For instance Podd can 'eat', 'chew' and 'munch', but poor Podd can't 'swallow'. So where does food can go is a question many genuinely interested groups have wanted answered. And why can't Podd 'see' when he can 'look'? Some very ingenious reasoning has been invented, by children, who find they have a strong need to explain these phenomena away.

Using *Podd* in a reception classroom as a spring-board for language development gives another dimension to this program's usefulness. If the teacher blanks out the top half of the screen with a piece of paper, then her class or group won't be able to see what action from Podd's repertoire she's chosen. They now have to guess what Podd is up to. Each guess needs to be typed in on the now uncovered screen, and the children can watch and see whether or not Podd is repeating his original action.

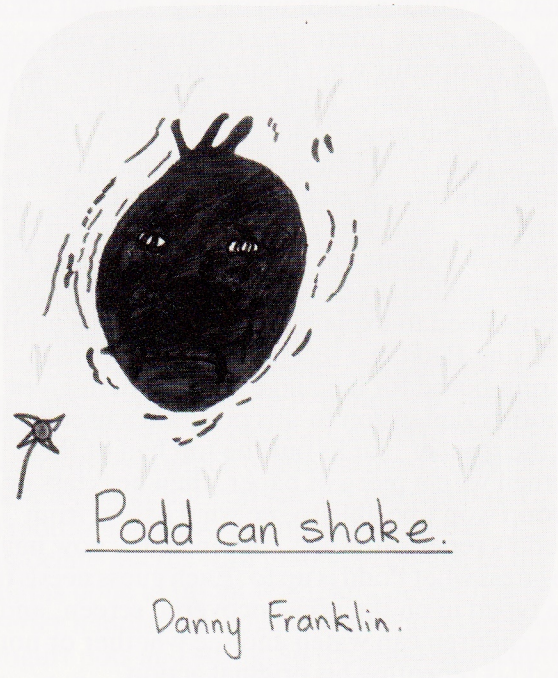


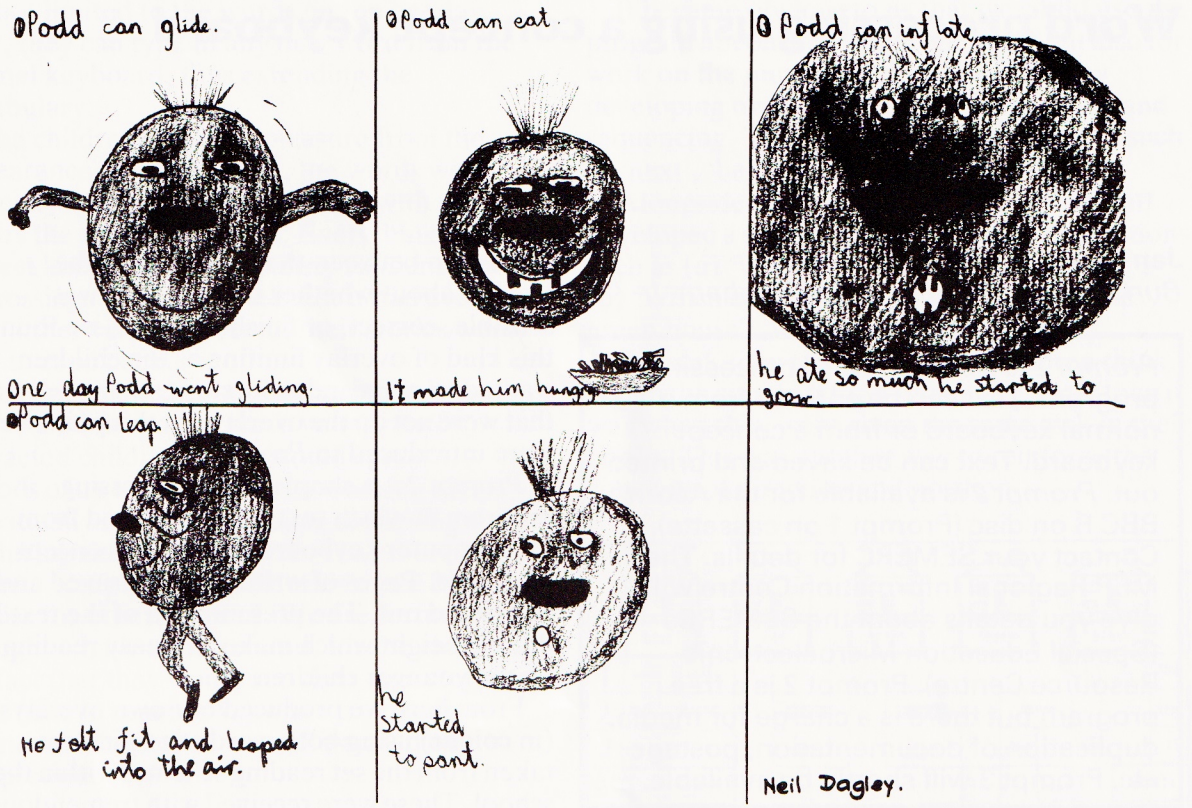
Links can also be made with other activities such as P.E. and Art. Podd is such a simple shape to copy or paint that he has a wide appeal to children. One class made their own Podd masks and acted out simple little plays. Podd's actions were also used as a basis for music and movement lessons, and what was normally a rather over-enthusiastic class became a far more relaxed, manageable and creative group when safely behind their masks and happily confident they were completely anonymous.

Extending the options

After a period of investigation and word-gathering the children will be ready to be introduced to *Podd*'s second and more creative option. This allows them to chain together between two and five of Podd's actions to form a continuous sequence. (To begin with it might be an idea to restrict the group to just three actions.) Then, while Podd is performing on the screen, the child can narrate a simple story based around his actions. Here is one child's effort:

BLUSH
RUN
PANT
WHISTLE
WALK
BLUSH – Podd is blushing because his girlfriend has just kissed him.
RUN – He is running because he is excited that his girlfriend has just kissed him.
PANT – Podd was panting because he had been running fast.
WHISTLE – Podd is whistling because he is happy.
WALK – Podd was walking home feeling very happy.





The children have power over the micro, Podd is being programmed by them and moving to their commands. This encourages children to become storytellers, for although not all of them can write fluently, they can talk, discuss and juggle ideas verbally. Their imaginations are only limited by the actions they can make Podd perform and, even then, they soon learn to adapt many of his words to their needs. For example, Podd can 'shake' but he can't say 'no'. Thus 'no' is inferred from a 'shaking' Podd. Children who feel inhibited by their poor spelling or illegible handwriting, can exhibit a command of vocabulary hitherto unsuspected by the teacher.

Stories are a natural medium for children to work in. Their reading books are composed of stories. Teachers and parents read them stories, and they are always being asked to compose stories of their own. One important facet of story writing, often ignored, is that they are created with other people in mind. They are meant to be shared, by the narrator and an audience. This kind of verbal story creation gives children the opportunity to develop specific skills, like adlibbing for instance, when Podd takes longer than expected to perform an action, or making their voices go quiet in the creepy bits. The children also get instant feedback in the form of appreciation from their peers, which encourages them to go on and create some more. Even the shy but capable story-teller is freed of anxiety, for while he is reciting his story the audience is riveted to the screen.

In time the demands that the children make on the program will grow, and, inevitably, they will discover its limitations and want to move on to create more ambitious and more varied tales. Some might be ready for the greater freedom of word-processing, others for the more structured approach of programs like *Story*. Yet in the long term what Podd may have given them was the impetus to work with and learn from others, the incentive to expand, refine and improve their own ideas and, most important of all, the thrill of having enraptured an audience and the satisfaction of having entertained their peers.

* * *

The illustrations were done by children from Morden Primary School.

Word processing using a concept keyboard

Jen Knowles and **Jim Bradbury**
Burford Primary School, Nottingham

Prompt 2 is a simple word processing program. Text can be entered from a normal keyboard or from a concept keyboard. Text can be saved and printed out. *Prompt 2* is available for the Acorn BBC B on disc (Prompt 1 on cassette). Contact your SEMERC for details. The MEP Regional Information Centre will give you details about the SEMERCs (Special Education Microelectronic Resource Centre). Prompt 2 is a free program but there is a charge for media, duplication of documentation, postage etc. Prompt 3 will shortly be available.

We have been using micros in our primary school for four years and all the members of staff have been very enthusiastic. However the teachers of the nursery and infant classes have always had reservations, mainly because of problems using the computer keyboard and the limitations of the programs we had seen and used. To overcome the former we bought a concept keyboard. From the beginning everyone could see tremendous possibilities. We began solving the latter by using *Sentence Builder* from ESM. This program uses an overlay on a concept keyboard to input words, or groups of words, into the computer with one touch, and so build sentences. We experimented with overlays of our own designs.

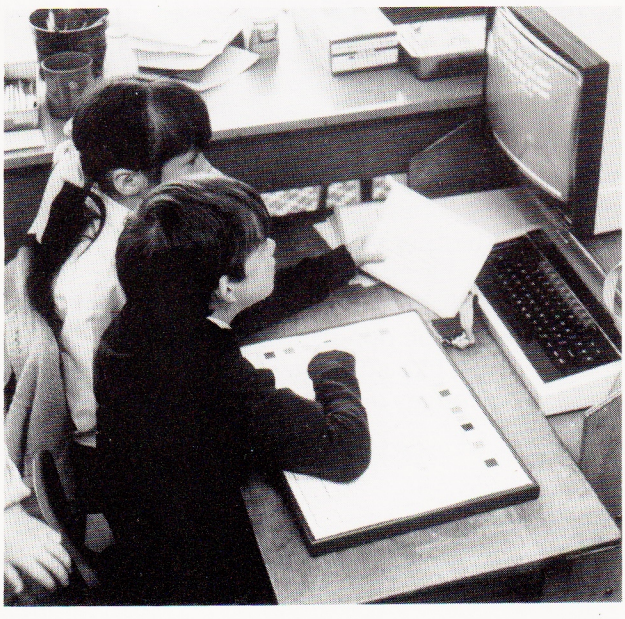
We used pictures from the children's reading books as well as the relevant vocabulary.

Getting young children to write in sentences is normally a difficult task, particularly in our area (SPA) where they even have difficulty verbalising coherently. Because of this the children need a great deal of stimulation to encourage them to write at all. The classrooms are full of bright, relevant displays and practical activities, as in most schools, but there is always a need for further stimulation. The concept keyboard provided this.

To begin with, the children formed simple sentences (from a limited overlay vocabulary) e.g. 'Mummy is in the house.' From this came discussion between the children and the teacher about whether the sentence was sensible, correct, or finished. Soon, we found this kind of overlay limiting as the children wanted to go on and write stories using words that were not on the overlay. At this point we were introduced to *Prompt 2*.

Prompt 2 is a simple word processing program in which text can be entered from the computer keyboard and/or the concept keyboard. Pages of writing can be saved and/or printed out. The presentation of the text is double height which makes for easy reading by the younger children.

From here we produced our own overlays (in colour) using both words and pictures taken from the set reading schemes within the school. These were received with tremendous enthusiasm. The children quickly recognised familiar words and characters. They were able to produce satisfying stories relating to stories read, and to create their own adventures for the characters. One of the great benefits of *Prompt 2* was that the children merely had to touch the word and the whole word appeared on the screen. This saved them the time which would have been taken by typing in letters and by having to wait for words from the teacher. It also released teacher time for other purposes. *Prompt 2* has another advantage: the children

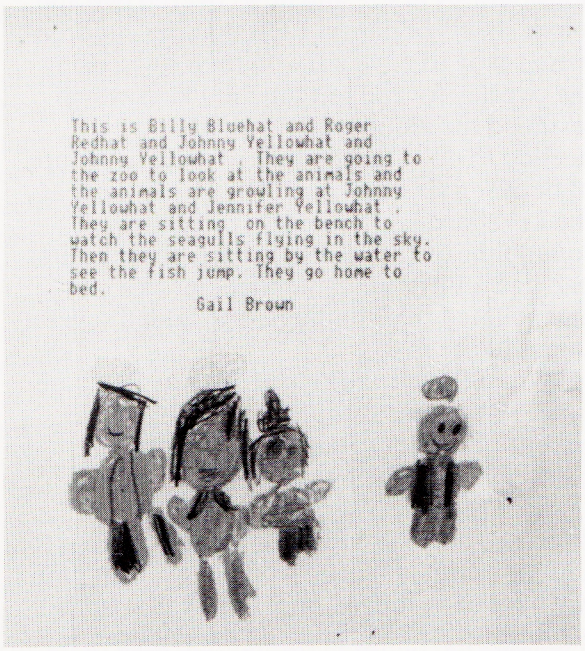


are not limited to the words on the overlay only, they can type in any new word from the normal keyboard, thus extending the vocabulary.

The children got great pleasure from the appearance of their stories, the words were correctly spaced, in straight lines, with the letters the right way round. Everything was correct and there were no dirty rubber marks or crossings out to indicate that it had ever been otherwise. Therefore, their stories were easy to read back.

The micro word-processor increased the concentration span of these young, easily distracted children. They would spend periods of up to thirty minutes working either individually or in small groups discussing and producing their stories.

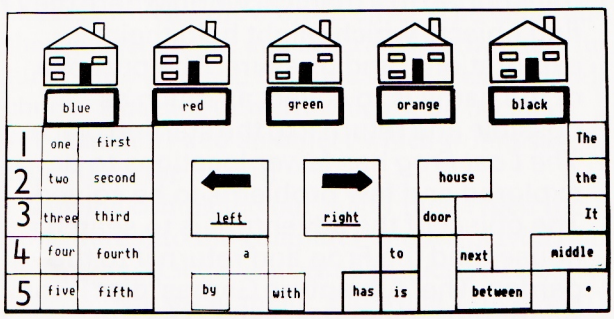
Once completed these stories could be saved on disc for others to read. We are fortunate enough to have a printer and, for the children, the fact that they would see their own stories in print (like in real books) was a tremendous incentive. The stories were illustrated on completion.



Because we had found immense success with the use of *Prompt 2* on stories we carried on to extend its uses. Working with the same overlays as for the stories, we developed (with the invaluable help of the infant teachers), (a) comprehension cards, and (b) cloze procedure problems, both of which could be answered either on the screen or in books.

It became obvious to us that we could use the program not only for language work, but also for work on the numerical side. We began by developing overlays on colour recognition and sequencing. The overlays contained words such as 'next', 'behind', 'first', 'left' etc.

Alongside this a member of the infant staff developed a series of workcards asking questions such as (a) 'What colour is the third house?', (b) 'Which colour house is on the left of the green house?' We found these extremely successful, they really made the children think. Again the concentration span was greater than it was when they were given the same task in their books. This was another way to reinforce the concepts of direction and position.



Prompt 2 has a vast range of applications to all topics within the school curriculum. At present we are working on overlays for money, shopping and problem solving. These not only reinforce concepts already acquired, but because the concept keyboard helps the child with slow or poor motor co-ordination, they put higher levels of success within reach. More effort is being used in the thought process than in the physical representation.

We have pointed out the ways in which *Prompt 2* has been used within our school, and the great success it has brought to both the teachers and the children. It is an excellent program with unlimited scope. Other teachers in other schools will find it equally valuable whether they use it in the way we have, or invent and develop new ideas of their own.

Adventure games

Gwenda Cottrell *Deputy Headteacher, Rumney Infant School, Cardiff*

The 'Adventure Games' disc includes two text only adventure games: *The Lost Frog* and *Merlin's Castle*. It also contains the programs necessary for writing and playing a simple adventure of your own. *Merlin's Castle* is the more complex of the two adventures. The players are transported to a magical world where they find objects which might help their explorations, and treasure. The purpose of the game is to collect as much as possible and return it to the starting place. *The Lost Frog* has fewer locations to be explored and few problems to be solved. The object of the adventure is to search a house, find the Frog and return it to the garden. The 'Adventure Games' disc is for Acorn BBC B and RML480Z. The BBC version is available from Mrs A. Straker, 'Mundays', St. Mary Bourne, Andover, Hampshire SP11 6AY. Price £20 or £100 to LEA (including licence to copy). The RML480Z versions have been included in the MEP Primary Project Infant Pack which was distributed in July 1985.

I began with *Merlin's Castle*, which may, at first, appear to be a surprising choice as a first adventure game for middle infants. My reasons were two-fold. Firstly, the children had no idea of what an adventure game was all about. Secondly, I did not want to use one of the easier games and thereby deprive the children of an adventure which they would later be able to solve without my assistance. I deliberately did not try out the adventure before using it, as I was afraid that I would subconsciously give the children too much help. This meant that all the children's suggestions were valid as I had no idea of the solution.

We began with a class lesson with all the children sitting on a carpeted area looking at the monitor. (The children were quite used to this procedure, having used the computer in this way on many occasions.) My best children were able to read the writing without much difficulty, but we began with my reading each page to the class and then the children decided which direction etc. we would take and I typed the instructions into the computer. I was surprised how quickly my slower children were able to spot their position. Although they were unable to read every word, they soon learnt to pick out the key words on each page. Even my slowest children had no difficulty with such words as 'toadstools' or 'giant'. Using the adventure has undoubtedly helped with their reading as it has given them confidence.

As we progressed, I drew our findings on a small easel. This was very rough at first, but the children did not appear to have any difficulty following what I was doing. At the end of the session, we saved our position and I drew our simple map onto a piece of sugar paper which was displayed on the wall.

In all, we spent three sessions in this way, by which time our map had increased considerably in size and now covered two and a half sheets of paper. I felt that the children were ready to have a try on their own, using the overlay for the red function keys which lessened the amount of typing that they needed to do. The children worked in groups of between six and eight. They took turns at the keyboard and there was rarely any squabbling over this. When each of the groups had had a turn, we came together as a class and collated their findings, and added several things to the map.

We continued working in this way for some time. While one group was working at the adventure, other groups were writing or painting about their experiences.

After each class session the map was discussed and the additions made. This led to a lot of useful language work, e.g. 'That path will have to be longer' and 'I think that tunnel is too short.' I had expected the children to experience some difficulty with the directional commands North, South, East and West, but to my surprise they accepted them without any difficulty. On one occasion I made an error on the map and it was not long before a child came to me and said, 'The balcony was to the east not the west,' as though it was the most natural thing in the world.

There came a time when the map was almost up to the ceiling and down to the floor and it was then that the children realised that something would have to be done, as there was no more room. They all agreed that the

map would have to be made smaller and a lengthy discussion ensued as to how small it should be. One child suggested putting it onto just one sheet but this idea was not at first accepted, the consensus of opinion being that this would be impossible. I deliberately kept quiet during this discussion and only intervened to calm them down when things got out of hand! The child who had originally suggested using just one sheet began to win support for his idea because he insisted that I *would* be able to make it small enough. Eventually, he turned to me for support and I, feeling that the discussion had continued long enough, said that I would try.

I then successfully made a smaller map and the children were again split into groups and were now able to have the map near the computer. Two of the groups chose one person to point at the map and so keep track of where they were in the adventure.

It was at this point we came upon two problems which had no obvious solution and although we tried several possibilities nothing succeeded. We had now run out of time so I suggested that they think about it overnight and we try their suggestions the following day.

The next morning the children came in bursting with all kinds of weird and wonderful ideas. We discussed some of the suggestions and many were discarded as either having already been tried or as being impossible, (the children's decisions, not mine). One child who rarely contributed to class discussions made an excellent suggestion which astonished everyone. (I'm not going to tell you what it was, it might spoil your fun!!) We tried out his idea and it proved to be very successful. As a result of this, the child has gained confidence and he now makes regular contributions to all discussions.

We had now almost solved the adventure, but it became obvious to me that we had missed something along the way as we had what appeared to be the complete map and nearly a full score. For the first time I found it necessary to spend some time solving the adventure myself in order to help the children. I found the missing pieces but I did not want to help the children too much, so I told them that we had missed a path somewhere and asked them to find it. The third group to try succeeded, and the following day we used the information to finally solve the adventure.

It had taken almost half a term to finally complete the adventure and many teachers may wonder if it was worth spending so much time on what appears to be a game. In answer I would say that the written work, produced at various stages, was very good and exceeded my expectations. The art work showed imagination and a surprising amount of detail. They also

1. learnt a lot of mathematical language,
2. learnt something about maps and scale,
3. improved their ability to express themselves verbally,
4. increased their vocabulary,
5. improved their reading skills, and
6. began to think more logically.

All in all, I feel it was time well spent.

My next project was for the children to write their own adventure games using *Make Your Own Adventure*. The instructions in the program are easy to follow and we began with a class lesson. The first stage is to draw a map, using squared paper, of from six to sixteen squares. We began with a very simple map using only six squares which I drew on an easel. The children then gave it a name and described each square in turn. They also had to name some treasure and choose a hazard (a word which soon became very familiar) and an object which would save them from the hazard.

Having completed our map I then typed the adventure into the computer and we played our own game to see if it worked properly. This caused great excitement, and when I suggested that they might like to write more difficult adventures in groups, the children were most enthusiastic.

I divided the class into four groups of seven or eight, ensuring that each group was of mixed ability. Each group was given a large sheet of squared paper and asked to draw a map of sixteen squares and to decide on a name for their adventure. This apparently easy task took a whole afternoon, not because of the map, which caused very few problems, but because of the important decision of the *name*. It was very interesting to listen to their animated discussions and although the noise, at times, seemed overwhelming, all the children were completely absorbed in what they were doing.

Their task for the next session was to label each of the squares on their map. Three of the groups had some difficulty with this as they described objects rather than places. For example, one group named their adventure 'Under The Sea' but they labelled their squares as 'a whale swimming' or 'an octopus with tentacles'. The only way I could explain to them what was required was to type in their adventure and then play it, with the result that we were told 'you are in a whale swimming'. After which they went away happily and started again. I used the same example to explain to the other groups who were having difficulty and there were no further problems.

The labelling, naming treasure and choosing of hazards took several sessions. At last the

great day came when I typed in their adventures. Each group came out in turn and the other groups were not allowed to listen as they intended to play each others' adventures and no one wanted to give away any information! I typed in precisely what I was told including several mistakes although I found it necessary to suggest a few small alterations e.g. the 'sea' group kept referring to the 'bottom of the sea' and so I suggested we change it to 'seabed'. (They later changed the name of their adventure to 'Seabed' as a result.)

Their adventures were a delight and, although obviously childlike, some of their language was excellent e.g. 'a cave with a camouflaged fish hidden in it', 'an attic full of junk' and 'a silver flower pot full of flowers'. They had used adjectives quite naturally because they wanted to make each place in their adventure 'special'.

When they came to play each others' adventures they had no difficulty because they understood just how they worked. I had warned them that they might find some mistakes and as they were discovered we used the editing facility to make the necessary alterations.

The whole project took several weeks with the children writing and painting etc. about what they were doing. Their enthusiasm did not wane and their use of language, both written and spoken, was often surprising. All the children benefited because even the slowest children were able to contribute. It was also a good example of how the computer can stimulate work away from the keyboard as most of this work did not require the computer at all. This would therefore be of value when computer time is limited to once a week or a fortnight.

The children have not yet finished playing the adventures and they have also begun playing *The Lost Frog*. They are now so familiar with drawing a map of their findings that they rarely require any assistance from me. They have not yet found the frog but are enjoying it and often compare notes. Listening to their conversations is amusing and shows that they really understand what they are doing. They work well in groups and take it in turns to write on the map or use the keyboard and the only squabbling is about the adventure itself and which way they should proceed.

Having discovered how easy it is to write an adventure using this disc, with my next class I shall begin in a different way. I intend to write a few simple adventures using just six squares and begin by playing one with them and then letting them play in groups until they become familiar with the commands. Hopefully, they will then be able to go on to play *The Lost Frog* and *Merlin's Castle* on their own.

Whatever the approach I am firmly in favour of this disc. The adventures are interesting and stimulating and *Make Your Own Adventure* has many possibilities.

Picture Builder

Gay Foxall, *Marlpool First School, Kidderminster*

Picture Builder provides the user with five basic shapes: an equilateral triangle, a square, a semicircle, a pentagon, a circle and a line. Each of these shapes can be enlarged, reduced, squashed, or stretched on the X axis. Additionally, the shapes can be rotated, (one press of the appropriate key rotates a shape by 45°), moved up or down, to the left or to the right and coloured in one of four selected colours chosen from a range of eight, (three colours being foreground colours and one background). A shape can be manipulated until it is coloured, (that is the final operation for each shape), then a further shape must be chosen. Once completed, pictures can be labelled, saved and printed out. Subsequently, designs can be reloaded and modifications or extensions made.

The program itself is simple to operate and infant children can cope with it easily. All the facilities are accessed via the function keys. Saving, loading or printing out a design is simply a matter of pressing one key. The label command can be used to print the keyboard characters on the screen as part of the design, for example the * could be used as a snowflake. Although the program includes only five shapes, any possible shape can be made by partly covering one shape with a second, then colouring the second one in the background colour. This will make it disappear and so 'erase' part of the first shape. *Picture Builder* is available for Acorn BBC B, from Collins/Hill MacGibbon, 8 Grafton St, London W1X 3LA at £12.95 (disc) £10.00 (cassette). The RML480Z version will be on MAPE Tape 3.

Picture Builder was used in our school in the following context. Two classes, each composed of top infants and first year juniors, were working on a fairground project, the stimulus for which had been the *Look and Read* television broadcast. The children had engaged in a range of creative activities before the use of *Picture Builder* was ever considered. They had all written both creative and factual accounts of fairground experiences, and had illustrated these with vivid pictures. Groups of children, with parental help, had worked together to design and produce three-dimensional scale models of fairground rides, and 'real' fairground stalls, approximately a quarter of life size. The models were made out of the sort of 'junk' well known to any teacher of young children, and were then glued together, painted and 'varnished' with P.V.A. This work naturally led to a discussion of both two- and three-dimensional shapes and patterns.

The classroom walls were covered with posters of fairgrounds. Many books were available for reference. An additional stimulus was provided by a fair which arrived in town during the project. The children had many sources for ideas. It was at this point that I went into school and began to observe what was going on. Here was a situation where the computer could provide the children with an additional medium for experimentation, and where an environment conducive to mathematical discussion could be created. With these thoughts in mind, I approached the two teachers who were working on the fairground project and voiced my ideas. I explained the format of the program to them and offered to demonstrate it to both of their classes the following week. This offer was received with enthusiasm, so one week later I returned to school. I had already prepared a simple fairground picture to give the children some idea of the potential of the program. I began by showing them how the program worked and the facilities which were available to them. Then I showed them the picture which I had created, and explained that, if two shapes were to be superimposed one on top of the other, a decision had to be made about which shape to position first. I showed them how to use the background colour in order to create a wider variety of shapes, and how to use the background colour to 'erase' shapes which were not wanted. (This is achieved by moving the shape onto the background and then colouring it in the background colour.)

The children were very impressed by the facilities which they had seen, so we all worked together to produce a fairground picture on the screen. One of the teachers discussed with the children the sort of designs they would like to attempt to produce. In

addition to the expected suggestions of helter skelters, ferris wheels and waltzers, many children wanted to design fairground stalls. The children then suggested how they would reproduce their ideas using the computer program. As their suggestions were made a picture was built up on the blackboard. This made the children realise that there could be a problem in making the designs look realistic if all the facilities of the program were not used. A heated discussion evolved in which the children began to consider the possibilities of superimposing shapes to create new shapes.

After this discussion, the children were told that they were going to work in pairs to produce a joint design for their picture, which would then be put on to the computer. The children were grouped in pairs so that both children could actively participate in the creation of the design and, at the same time, be given an opportunity for meaningful discussion. I reminded the children of the need to limit their colour choice to four, and also of the fact that if they chose a bright background colour and bright foreground colours, they might have difficulty in seeing their designs when they were working on the monitor. With these considerations in mind the children were sent away to plan their designs and to begin drawing when they were ready. In some pairs both children contributed to the actual drawing of the design, in other pairs one child drew and the other child took on an 'advisory' role, suggesting modifications as the design developed. The children took great care with their pictures and filled their designs with bold, bright colours. Once the picture was completed, the children wrote how their design could be created on the computer. In doing this they had to consider the range of operations available within *Picture Builder* – rotating, enlarging or reducing size, and stretching or squashing the shapes. These activities ensured that the children had given a great deal of thought to their design before they attempted to reproduce it using the computer.

If *Picture Builder* simply resulted in the reproduction of designs already created using pencil and paper then, other than providing the motivation for the children, there would seem to be little point in using the program. However, using the program did much more than this. Some designs produced on *Picture Builder* were very like the originals, however others differed considerably. There are several possible reasons for this. Some children, particularly those with motor co-ordination difficulties, were able to produce designs using the computer which were far more elaborate than they could have managed using crayons and paper, simply because they were freed from their physical limitations. Other children found that their designs were difficult to implement because of the shape of the drawing area on the monitor. These children had designed helter skelters which, to be realistic, needed to be tall and narrow. When they attempted to reproduce such shapes on the screen, they found they either had to produce tall, extremely narrow helter skelters or, alternatively, short, squat ones. Short, squat ones allowed greater detail to be included in the decoration but did not give the necessary feeling of height, whereas tall, narrow ones only allowed very scant decoration. This problem was discussed by the children and various remedies were found. Children who opted for a tall, narrow helter skelter tended to extend their original designs sideways by adding balloon-sellers and fairground characters collecting the fare for the ride.

Sometimes the children's designs had to be modified due to the limitations of the actual program but again this limitation proved to be a challenge to the children. For instance, circles could not always be made as small as the original design demanded. One way of getting around this problem was to make the circle as small as possible and then to squash it, so that it changed into a slightly oval shape – 'Just what I wanted', remarked one child. Such problem solving activities resulted in a great deal of mathematical discussion about which basic shapes were needed to eventually produce a different result. Another 'problem' with the program was the difficulty in attempting to create diagonal stripes on the helter skelter. This lead to a number of interesting discussions. One group discovered that the best way of tackling the problem was to select the background colour for the stripes, then should a stripe overlap onto the background it would not show.

The development of problem-solving strategies was an important aspect of the work done with *Picture Builder*, as was the development of logical reasoning and the formulation of strategies. In addition, the children were involved in the application of estimation skills in a meaningful context. For example, sometimes they decided to place a line of triangles across a fairground stall to give a bold, vivid decoration. This may seem to be a simple task, but it requires careful thought, planning and estimation, if a space is not to be left at the far end, or half a triangle is left spilling out onto the background. I had explained to the children how to 'erase' unwanted shapes, and the fact that they actually applied this knowledge showed that they had understood what they had been told.

A busy teacher in an everyday classroom

situation might not appreciate the wealth of mathematical discussion that *Picture Builder* can stimulate. One way to overcome this 'problem', is to tape the children's conversation. This we achieved by giving each child in the pair a small microphone which was attached around their necks. Listening to these conversations was very enlightening and demonstrated that a wealth of mathematical discussion took place. Both less able and more able children benefited from the experience of using the program. The less able children produced less complicated designs and took a longer time than the more able to do so, but clearly found the experience a rewarding one. They could cope easily with the task and were extremely pleased with their achievements.

As each pair completed a design it was saved and subsequently printed out. In addition, a photograph was taken of each screen, either upon completion of the design, if this was convenient, or at a later date when the design was reloaded. If the photograph is taken at a later date, it is useful to keep a record of the exact sequence of colours which were chosen, rather than simply the colours themselves. If the colours are not noted in sequence, then trying to get the picture back on the screen in its original colours can be very frustrating.

By the end of the project the children were becoming quite proficient at using *Picture Builder* and it was obvious that those who used the program at the end of the project benefited greatly from the discoveries made by the preceding children. The later users tended to produce much more complex designs and complete them in a much shorter space of time. All the children were greatly motivated by their experience of using this program, so much so, that at Easter a few of the children suggested that they could use *Picture Builder* to create a scene set in the Garden of Gethsemane! This they managed to accomplish with very pleasing results. This serves to illustrate the point that here is a truly content free program.

In conclusion then, if *Picture Builder* is to be used successfully I feel it must be fully integrated into a project. Some projects are obviously more appropriate than others. Fairgrounds are, perhaps, a suitable project in that they naturally stimulate discussion concerned with shape and pattern. However I have used *Picture Builder* successfully with eight-year-old children in conjunction with the *Tombs of Arkenstone* adventure program to create imaginary monsters. If the children are to get the most from *Picture Builder* they must be aware of the range of ways in which a shape can be operated upon, in particular the potent force of superimposing one shape on top of the other to create novel results. If this latter possibility is not understood or utilised, then the creative potential of *Picture Builder* will be severely limited and the results will be stilted and lacking in imagination. Finally, if motivation is to remain at a peak, it is essential that the children have almost continual access to the program for the duration of the project. This can be achieved, even in a large primary school with only one computer, if a block booking policy is adopted.

Robot islands

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The program referred to in this article is *Dart*. This is available for the Acorn BBC B on disc and cassette. Single copies cost £13. To LEAs the cost is £75 and this includes a licence to copy the program. *Dart* is available from AUCBE, Endymion Road, Hatfield, Herts.

The equivalent program for the RML480Z is *Arrow*. Details from RML, PO Box 75, Oxford. This program was given to purchasers of 480Zs under the DTI scheme.

The ideas explored in this article are relevant to any turtle graphics implementation and to LOGO.

This article is an introduction to using *Dart* and the floor turtle and it is aimed at teachers not familiar with working with computers in the classroom. However, it is expected that the teacher will have had some introductory course on using the computer and its educational potential. My aim in producing this work is to emphasise the philosophy of the computer as a learning tool as opposed to a drill and practice machine in the field of mathematics.

Work with a computer needs to be carefully managed. Ideally, it should be used as a learning rather than a teaching environment. This does not mean that the teacher should not be in evidence, in fact the opposite. Through subtle intervention, the teacher gives guidance with an appropriate question or suggestion, and enhancement in the classroom as and when it seems necessary. This is essential for progress along the road of knowledge. As this pack builds on the philosophy of the child in control of the technology, it is hoped the worksheets will be used for guidance only and discarded entirely if the group takes off in its own direction.

Through the need to communicate with the floor turtle and each other, the child, working in a group –

is introduced in a natural way to problem solving techniques;
has to communicate in an initially natural, clear and concise language;
uses an increasingly more accurate mathematical language to communicate with others in the group;
frequently requires mental calculations to adjust movements;
learns at a pace in harmony with conceptual development, if the group proceeds at its own pace within a broad framework.

This article describes the learning experiences involved in the creation of the Robot Islands. There is a planned sequence of activities. The children begin by investigating how the turtle moves. Then go on to create a robot island, habitat and recreational activities making greater use of the commands available as confidence increases.

Aims and objectives

The general aim of turtling on 'The Robot Islands' is to promote the philosophy of Computer Assisted Learning in the teaching of mathematics. The child would be programming the computer rather than the computer programming the child and therefore see mathematical thinking as enjoyable and 'mistakes' as challenges.

The objectives of this teaching pack are:

a) To give teachers inexperienced with computer assisted learning a broad framework within which to introduce *Dart* and the floor turtle.
b) To give teachers guidance on when to recognise the appropriate time for intervention and the introduction of new commands.
c) To encourage, in the student, original and imaginative thinking leading towards mathematical patterns and structures.
d) To supply the motivation for using problem solving skills.
e) To encourage group co-operation and discussion.
f) To give practical experience of mathematical rules in the creation and recognition of patterns.
g) To give a greater precision to mathematical vocabulary used.
h) TO MAKE MATHEMATICS FUN.

Using the materials

After initial introduction, children work in

groups of two or three of similar ability, sharing experiences with the class when this is felt necessary.

Time – 30 to 40 minute sessions per group.

As a class to one computer is numerically a problem, it is suggested the groups be timetabled for computer use with separate planning time.

It should be remembered that children learn at different rates and should not be encouraged to move on to the next stage in the programming language until they are thoroughly conversant with their present one. Pleasure in achievement and a positive attitude to learning is what is aimed for, not fear of failure. The ideas can be adapted to work with any age group from 6 to 11 years.

The Chiltern LOGO Project researchers have found three common strategies which characterise the early phases of learning:

'Homing-in' children tended to home-in on the required length or angle by a process of guessing and testing. An example of this is shown as follows.

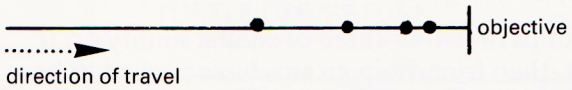


Fig 1. An example of homing-in with the floor turtle. (The dots show the pauses as smaller movements are made the closer the turtle moves to its objective.)

'De-planning' rather than debugging (a bug is a mistake in computer jargon) – the incorporation of errors into drawings or the devising of sometimes elaborate explanations to justify mistakes. For example one group wanted to draw a man with a hat, the square top of the hat ended up inside the larger square representing the face, the face was abandoned and a tunnel built with smaller squares inside.

Self-imposed restrictions children tended to set themselves realistic limits and to explore their new learning environment at a pace and in a style which suited them. You may introduce new commands but if they are not ready to progress these will not be incorporated into the planning. If they are ready they will be excited by the new challenge and eager to experiment.

These points are worth noting when intervention at first seems necessary.

The lesson plans are arranged as follows:

Time – the average number of sessions it is anticipated each group will require, to be introduced to and work through the worksheets. Some will require more, some less.

Objectives – the learning that it is anticipated the group will become involved in during the course of working with that particular section.

Vocabulary – to be used by the teacher and naturally acquired and used by the group.

Organisation – a suggested organisation to help the teacher prepare for the lesson and group sessions.

Introduction – a suggested outline for introducing the worksheet requirements either in a class or group lesson.

Teacher intervention – (perhaps the most important section).

The teacher needs to be unobtrusively aware of what the group is attempting to do; be able to leave them to argue through their problem but be ready to ask a question, or make a suggestion to guide their thinking as and when it is required. For example, 'What happened when you did?' – transferring knowledge of the known to the unknown. Or 'If you were the turtle and wanted to move like that how would you do it? Try it yourself.' – internalising the problem by acting it out.

Suggested classwork as enhancement – it is felt to be quite important to build on the experiences encountered. These cannot be exhaustively anticipated as each group will have different experiences but there are some that would seem more obvious than others. It is anticipated that the teacher will see the need for the specific requirements of her own class either in the mathematical skills and vocabulary needed to progress or enhancing the work done to draw on the interest stimulated.

The worksheets – the worksheets are for copying. The spaces left are for the name given to the floor turtle to make the worksheets more personal to the class. These should be filled in by the teacher before being given to the groups.

It is anticipated that each worksheet be introduced practically in the *Introduction*. Children should be encouraged to experiment freely within the framework.

Care of the hardware (computer and turtle) should be emphasised as suggested, as the floor turtle particularly is vulnerable to an excited child.

Finally it must be emphasised that this is an introduction to using the floor turtle. The ideas are suggestions to get the teacher and class started. It is anticipated that the teacher and children will soon feel that they can progress in their own direction.

Materials and equipment required

BBC Acorn Model B computer
Disc drive or cassette recorder
Monitor
Jessop Floor Turtle
Dart tape or disc
Dart handbook
Spare tapes or discs for recording pupil material when required
Paper of sufficient width for drawing with the floor turtle

1 Gaining Control – Direct Drive

For the teacher

Time: Approximately one to two sessions per group.

Objectives: To familiarise use of commands FORWARD, BACKWARD, RIGHT and LEFT.

To get to know length of turtle units and turns so that a more precise estimation of movement can be taken.

To learn to care for the physical well-being of the robot and learn commands TURTLE ON before starting and TURTLE OFF when finishing.

Vocabulary: Greater than, less than.

Organisation: Class lesson – have children sitting in semi-circle allowing space in centre for FT (Floor Turtle) to move.

FT (without pen) attached to computer, switched on and with the *Dart* program loaded.

Introduction: Initial introduction as a class lesson lasting approximately 30 minutes.

Before introduction of turtle discuss what a robot is, e.g. Can it think for itself? Can it feel if you hit it? Name a popular robot – e.g. K9 (dog in 'Dr Who'), R2D2 ('Star Wars').

Introduce FT (Floor Turtle). 'How can we make it move?' Try giving a verbal command. As it does not move ask for some ideas how to make it move. If and when the suggestion is made that we communicate with it through the computer, type TURTLE ON and RETURN. (Let children see you do this.)

Introduce FORWARD command, ask for suggestions of distance values. When several moves away from computer have been made, ask for total movements to bring it back to computer in one go (recall and mental calculations), then BACKWARD the agreed amount.

'FT would now like to say Hello to you all, but first I must give it some commands.' Let the children see you type in 'HI' procedure programmed as follows:

```
BUILD HI
REPEAT 6
LEFT 60
FORWARD 30
HOOT
BACKWARD 30
END
```

From this some will recognise the possibilities, e.g. it can turn; it can hoot; it can be told to do several things at once.

The first two can be introduced immediately but do not emphasise the third (i.e. repeats or building a procedure) yet until it is felt the child has fully understood the commands in direct drive (see 'Building on the Robot Islands').

Prepare for group work

Groups of two or three of similar ability or, if not, then friendship groups have proved to be the most workable.

Put obstacle on floor short distance in front of FT. Take FT up to obstacle (which will probably be done by 'homing in'); turn it round (also by 'homing in' acquiring knowledge of angles required); bring it back in one movement (the total number of moves taken to go out).

Groups need time to explore within the confines of the task set. As competence grows a more complicated arrangement of obstacles can be laid out. e.g. figure of eight round two objects.

Teacher intervention: Encourage mental calculations of moves or have one member of the group keep a record. Help to recall distances moved e.g. 'How far did it move when you typed in (last move)?'

'Is (the distance now required) less than or more than that?'

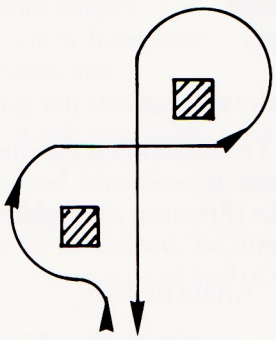
'How much?' (Perhaps a child could physically move the two distances).

NOTE Encourage groups to turn TURTLE OFF (which has to be physically typed in) followed by RETURN and put FT out of harm's way in an agreed place after each group finishes.

WORKSHEET 1 Gaining control

FIRST put the turtle on the floor.
THEN type TURTLE ON and press 'RETURN'.

A. Program your turtle to move up to an obstacle on the floor without hitting it. Now come back in one move.
B. This time move up to and go round the obstacle and back to the start.
C. Put two objects on floor. Now weave round them like this



Can you think of some other obstacle courses for your floor turtle?

**** REMEMBER ****
TURTLE OFF 'RETURN'

2 Drawing – Direct Drive

For the teacher

Time: One to two sessions per group.

Objectives: To familiarise use of additional commands PEN DOWN, PEN UP for leaving a trace with the pen on paper.

To recognise closed and open shapes.

To compare shapes in size, number of edges, number of angles turned.

To get to know the names of some shapes by the number of sides and as irregular polygons (they will probably already be familiar with the shapes of some regular polygons such as squares, hexagons, etc).

Vocabulary: (For names of polygons – see Appendix I); closed and open shapes; length and width; change position (when moving forward or backwards); change heading (when turning left or right).

Organisation: Group or class lesson when it is felt children are ready to move on.

Pen in FT with pen lid on.

Paper fixed to floor or board.

Introduction: Show how to take pen lid off. Place FT on paper. Type in TURTLE ON and 'RETURN'.

'We need to understand through FT how big the paper is so that when it starts drawing we don't go off the paper. We need to get FT to explore the length and width of the paper but you must help it to remember the size.' (Point in the direction of length and width when mentioning them.)

'Now it will not go off the paper if YOU have remembered the sizes'. Emphasis on the child being in control.

Type – PEN DOWN.

Get children to experiment with moving FT over paper with FORWARD, BACKWARD, LEFT and RIGHT commands.

Discuss shapes using vocabulary suggested noting whether open or closed.

When finished PEN UP, TURTLE OFF, put pen top on, and put FT away (emphasise order).

By now the floor turtle will probably have a name. Put its name in the space on the worksheets.

Teacher intervention: Encourage the children to describe how they made a shape.

Analyse results to give practice in use of vocabulary and estimation of size, e.g. which are the longest/shortest lines, the biggest/smallest angles of turn? What were the units used? Which are the closed shapes that the baby turtles can't get out of? Can any shapes be recognised by the number of sides? Which are the largest/smallest angles of turn? If aware of right angles, which turns are greater or smaller than a right angle?

When children are working together with the computer, because of the involvement usually generated, the teacher has a unique opportunity to listen to them talking, arguing or discussing their work and thereby coming to a greater understanding of their mathematical thinking and problem solving strategies.

Suggested classwork as enhancement

Drawing and naming of regular and irregular polygons on squared paper or with protractor (depending on age and ability of children).

WORKSHEET 2A Drawing

Take pen top off.
Put _____ on edge of paper facing across the width of paper.
Type TURTLE ON. (Remember to press 'RETURN' after each command.)

First, with PEN UP, find out how many turtle units across the width of your paper.
Then the number of turtle units up the length of the paper. Make a note of these.

Place _____ anywhere on the paper.
Help it to draw a shape by typing PEN DOWN and the commands to move it that you have already learnt.
You can also move with the PEN UP to a new position if you want _____ to draw a different pattern.
Take _____ for a walk all over your paper making lines across each other.

_____ loves making shapes. What shapes have you helped it make?
How many sides do the closed shapes have?
Can you name them?

WORKSHEET 2B Drawing a Robot Island

Make an island with bays, a peninsula, an estuary and river. How about some rocks in the sea and maybe a mountain.

Give your island a name.

Name the river, bays and any other part of the island that you feel may need one.

WORKSHEET 2C A Turtle Game – 'Greater than . . .'

Turtles also like playing games with your help.

Rules:
Place _____ in the centre of the paper.
Take turns.
Use commands FORWARD or BACKWARD, RIGHT or LEFT. Each movement must be slightly larger than the last.

Try these to start off with

1st player	FORWARD 2	RIGHT 5
Next player	FORWARD 4	LEFT 7
Next player	BACKWARD 6	RIGHT 10
Next player	FORWARD 10	

now you continue

Add a little more each time you change position or heading.

When you have finished don't forget to type
PEN UP ('RETURN')
TURTLE OFF ('RETURN')
Put pen top on
Put Turtle away
THIS MUST BE DONE EVERY TIME YOU FINISH

3 Visiting – Consolidation of work to date

For the teacher

Time: One or two sessions per group.

Objectives: To consolidate estimation of lengths and angles.
To recognise direction of angle changes when retracing steps.

Vocabulary: Angle of turn.

Organisation: Group or class lesson.
FT with pen in.
Two or three 'islands' that were made in last session.
Paper route laid out on floor leading to islands with a variety of angles included e.g. 90°, greater and lesser angles, curves.
Make roads with wide verges (see Fig. 2).
Do not make the course circular.

Introduction: Explain that the turtle is going to visit its robot friends on the robot islands.
Imaginary characters of other robots (not necessarily a floor turtle) could be used to build up a story of the Robot Islands. Perhaps each group involved could tell a story about their island and the robots that live on them.
The islands have not been joined into a circle to allow FT to retrace movements.
A record could be kept of the values used for each movement on the way out to make it easier to return although you may feel this is not necessary. The children may notice that the direction of angle turned will be opposite on the way back.
Note that when FT draws an angle it is the outside angle that is measured.
If a curve is included in the route this may be an introduction to drawing circles – FORWARD a bit, RIGHT a bit.

Teacher intervention: Encourage story telling of the route travelled. Perhaps reasons for the different angles of direction taken can be imagined, e.g. a rock with ten faces and jagged edges was in the way, etc. Encourage clear

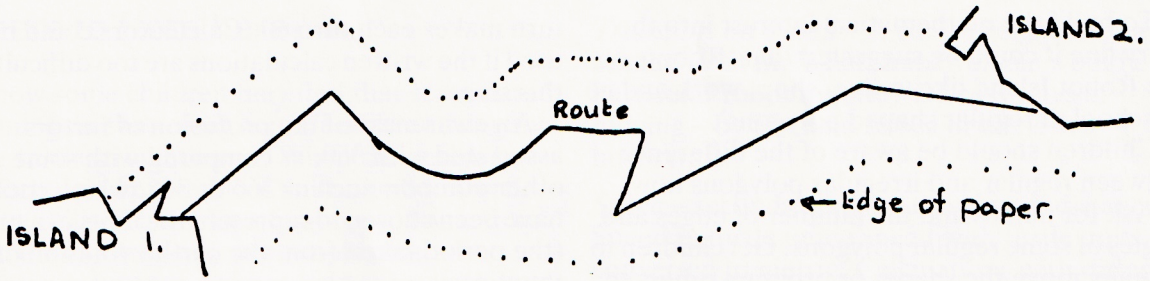


Fig. 2 An example of route to islands.

description and belief that robots on the islands love numbers and shapes. For example, they would want to know how many jagged edges a rock with ten faces has.

Suggested classwork as enhancement

Story of own island emphasising that robots like mathematical shapes.

Robot could be described, its function explained, family introduced and in fact a whole robotic way of life built.

Pictures could be made using some form of geometric paper (square, or isometric) to show robot, houses, animals, flowers, etc. This could be used as a planning stage for FT's next assignment.

WORKSHEET 3 Visiting the neighbours

Prepare _____ for work as you have learnt. (Take pen top off, place _____ on paper, type TURTLE ON, and when you are ready PEN DOWN).

A. Go to visit the other robot islands along the route laid out.

Keep a record of the total of each FORWARD movement and angle of turn so that it is quicker to return.

Something different will happen to the direction of the turn when you come home. Can you think what it is? Perhaps you will find out when you try it.

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4 Building on the Robot Islands – Regular polygons

For the teacher

Time: Two to three sessions per group.

Objectives: To introduce new command REPEAT;
to recognise difference between regular and irregular polygons;
to make regular polygons with FT;
to recognise the repeated movements needed in a regular polygon.

Part 2: When fully conversant with above, to save series of commands that make up a shape by building a procedure using commands BUILD (name of procedure), CHANGE (name of procedure) if wishing to alter it, or LIST (name of procedure) if wishing to view it. (see *Dart* handbook chapters 2 to 5).

Vocabulary: Procedure; debugging (a 'bug' is computer jargon for a mistake in the program).

Organisation: Group lesson as introduction.
FT with pen in.
Paper for planning stage; more able may require protractor for testing angles.
Paper for drawing with FT.
Dart handbook Chapter 2.

Introduction: Choose only group/s you feel are ready to move onto a new command. Others as and when they are ready will soon demand to know what to do through watching the chosen ones (Papert's subversive education).

When using the REPEAT command there has to be an awareness of what is being repeated e.g. a hexagon's movements are repeated six times – FORWARD (?) and LEFT (or RIGHT) 60.

When drawing shapes with the turtle the emphasis is on the 'process', the child needs to imagine 'doing' it rather than being 'given' the rules.

To build the mathematical interest into the story line it could be suggested that 'Robots on the Robot Island like to live, shop, work and go to school in regular shaped polygons'.

Children should be aware of the difference between regular and irregular polygons now.

Ask for names and the number of edges and angles of some regular polygons. Get children to actually move the shapes or program others to move them.

Ask for commands and values for drawing a square in direct drive, e.g. FORWARD 20 RIGHT 90 FORWARD 20 RIGHT 90 FORWARD 20 RIGHT 90 FORWARD 20 RIGHT 90.

Discuss the commands and values that have been repeated and the number of times they have been repeated. Look at the total number of angles turned and relate to the full turn of 360. It will probably need emphasising many times in the future that to make a closed shape the total number of turns (whether in a regular or irregular shape) must be 360 degrees.

Introduce REPEAT command, e.g. REPEAT 4 FORWARD 20 RIGHT 90 END. (See chapter 2 in the *Dart* handbook).

Allow for experimentation with this command before expecting a final planned shape. At first repeats and angles will be entered randomly. Refinement will gradually take place or ESCAPE can be used to stop FT if too many repeats have been entered.

Those who are ready can be introduced to Part 2 – BUILDING a procedure. (Chapters 3, 4 and 5 in the *Dart* handbook).

Teacher intervention: They should now be encouraged to recognise that FT takes 360° to turn right round if they have not already found this out, e.g. to make a square it turns 90° at each angle, 4 sets of 90 make 360. So to make a hexagon which has 6 angles share 360 into 6 equal sets and you have the size of angle required.

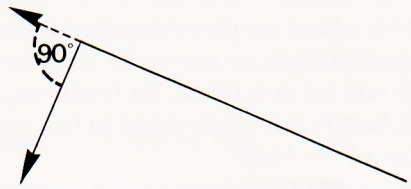
Suggested classwork as enhancement

Reinforcement of multiplication and division through practical work. Sharing out into equal sets and the recognition of the addition of a number of equal sets to create a selected whole number, e.g. 360 shared into 6 equal angles of turn makes each turn 60. Calculators could be used if the written calculations are too difficult at this stage.

An awareness of the profusion of factors associated with 360, as compared with some other numbers such as 366 or 365, which could have been chosen to represent the units of a turn (the period taken from the earth's rotation of the sun).

Records could be kept of regular polygons drawn by FT and angles turned, showing total number turned to finish shape.

NOTE It should be made clear on drawing which direction FT was facing and which angle it turned as follows:



WORKSHEET 4 Building on the Robot Islands

A. Get the Dart book and try making the shapes on pages 7, 8, 9 and 10 using the REPEAT command.

B. _____ likes to live in regular polygons. Help _____ to build one or more of the following for its island:
a house
a shop
a place to work in
a school
or you may have another building you would like to see on your island.

Before you start on the computer plan your building:
The length of the edges.
The size of the angles.
The number of repeats required.

C. Instead of losing your program or procedure every time it finishes, you can teach the computer to remember and keep it as a command by using BUILD.
See Chapter 3 in the Dart book.

Where to from here?

By now some children may find that secondary planning on the screen is preferable to using the floor turtle straight away. When the design is perfected and procedures built, the floor turtle can be utilised to make a final copy. Some may need the challenge of more sophisticated commands by now. Do not hold them back but allow them access to the *Dart* handbook to practise the commands in Chapters 6 and 7.

The research of the Chiltern LOGO Project (Noss 1984 pp. 14, 15) noted two aspects in problem solving techniques. One, the need to explore a new idea by looking at and manipulating existing programs, with 'the need to forge links between new ideas and their existing ones.' Another, the problem solving mode which is distinguished by its 'goal-directedness', requires the child to move straight towards a goal with its inherent problems coped with on the way.

It is essential to remember the different approaches to learning. Keeping the above in mind it is important to allow free access to the *Dart* handbook and to allow ideas to flow freely between groups. Although children may copy an idea for a start, it seems quickly to become their own when they have adapted it to their own needs. This, after all, is how children learn a language, by imitating and eventually using it as the effect of its use is experienced. When a thirsty young child says 'drink' and one appears, the association will be remembered next time. This should be our aim when attempting to create a mathematical environment.

Suggestions for further topics associated with the islands

The planning and drawing of many things for the islands e.g. plants, animals, insects, birds, furniture for the home (what would a robot need?), etc.

Shopping trip. Articles that robots may need could be drawn. Perhaps units of currency could be invented e.g. 100 polys = 1 gon.

Robot families could be drawn, mounted on card and supported with a stand.

Robot families at a picnic. Turtle as host. Deliver food (or whatever robots have at a picnic) to each in turn. Paper cutouts can be fixed to dome, with Blutack, for carrying. Discussion on who sits on the right, left, opposite, round the tablecloth. Discussion on shape of tablecloth – circular or polygon (or is a turtle circle a polygon with many sides and angles!). The philosophy behind King Arthur's round table of all being equal could be discussed.

Transport on islands. A car is designed for a human to sit in. What shape vehicle would a particular robot require? Discuss ways of moving – by air, land or sea or all as in a hovercraft.

Speed – seconds taken to travel a set distance. Speed in turtle units; speed with turtle units converted to metric. Calculations with different times and distances depending on age and ability of children. Comparison with other motorised toys.

Games can be invented for turtle to play, e.g.:

A maze from a spiral (see Chapter 6 on inventing a 'store'. *Dart* handbook).
A reflected pattern. One to draw a simple pattern without letting the other see the procedure. The next to try and copy it as a reflection.

A greater degree of sophistication can be achieved with using a 'store' – BUILD WITH; and using arithmetic with the MAKE command. (chapters 6 and 7 *Dart* handbook).

Conclusions

Dart is limiting and some children may have exhausted their interest after a few weeks and want to go on to controlling the computer in modes other than that of drawing. LOGO provides a much wider variety of avenues to explore. However, even *Dart* allows a sophistication of involvement in computer use that the drill and practice type programs cannot begin to compare with.

A *teacher and an open-ended program* are essential if children are to be immersed in the learning process.

Appendix I

Names of polygons

Name	Number of sides
Triangle	3
Quadrilateral	4
Pentagon	5
Hexagon	6
Heptagon	7
Octagon	8
Nonagon	9
Decagon	10
Hendecagon	11
Dodecagon	12

See Chapter 21 of Williams and Shuard (1970) *Primary Mathematics Today* (Longman).

Resources

Due to limitations of space this resource list is brief. The MEP Primary Project INSET Infant Pack (referred to below) contains an extremely comprehensive list which encompasses a wide range of resources.

Software

Treasure Hunt, distributed by MEP National Primary Project in the Infant Pack. The RML480Z version was also on MAPE Tape 2.

Puzzle Farm, distributed by MEP National Primary Project in the Infant Pack, for BBC and RML480Z.

Slyfox and *Scene*, Pack 5, Micros in the Primary Curriculum (ITMA), Longman Micro Software, Longman Group Limited, Longman House, Harlow, Essex CM20 2JE. BBC and RML380/480Z, disc or cassette, £20 + VAT.

Hunt the Thimble, Ginn and Co., Prebendal House, Parsons Fee, Aylesbury, Bucks HP20 2QZ. BBC disc or cassette £17.50.

Dinosaurs, Cambridgeshire Software House, The Town Hall, St. Ives, Huntingdon, Cambridgeshire PE11 4AL. BBC, RML480Z, disc or cassette, £13 + VAT + £1 post and packing.

Granny's Garden, 4MATION Educational Resources, Linden Lea, Rock Park, Barnstaple, Devon EX32 9AQ. BBC and RML480Z disc £12 + VAT, cassette £10 + VAT.

Magic Adventure, Kansas City Systems, Unit 3, Sutton Springs Wood, Chesterfield. BBC cassette £8.50. RML480Z version from NCEC, Northampton Teacher's Centre, Barry Rd, Northampton £9 disc, £5 cassette.

Magic Sword, Database Publications, 68 Chester Rd, Hazel Grove, Stockport, Cheshire SK7 5NY. BBC only, disc £9.95, cassette £8.95.

Jumbo, MAPE Tape 2. BBC only. Now distributed by MEP National Primary Project in the Infant Pack.

Sheepdog, Ladybird Longman, Longman Group Ltd. (Address as for *Slyfox*). BBC only, disc £13.95 + VAT, cassette £10.95 + VAT.

Story, H & H Software, 53 Holloway Road, Runcorn, Cheshire. BBC only, disc £8.50, cassette £7.50.

ABC, Acornsoft Ltd., Betjeman House, 104 Hills Road, Cambridge CB2 1LQ. BBC only, disc £11.50, cassette £9.95.

Write, Oxford LEA, Computer Education Centre, Macclesfield House, New Road, Oxford OX1 1NA. RML only, LEA licence available.

Book List

Handbook of Primary Education and Computing, D.W.W. Ellingham, Castle House Publications Ltd.

Children and Computers in the Classroom, A.P. Mullan, Castle House Publications Ltd.

Young Learners and the Microcomputer, D. Chandler, Open University.

Microcomputers and children in the Primary School, R. Garland (Ed.), Falmer Press.

Other resources

The MEP Primary Project have produced a series of packs for in-service education. These packs include a variety of software, some of which is appropriate for young children. They have also produced one pack in which the materials are specifically for use by teachers of infants. All LEAs have been sent a copy of each of the packs.

The MEP Primary Project also produces a range of software catalogues. One subset of the main catalogue is 'Primary Software for Infant and First Schools'. Your LEA has received a copy of this catalogue in the 'Infant Pack'.

The Walsall LOGO Project produced a comprehensive package for BigTrak users, entitled 'On the Right Track with BigTrak'. Supplies of this pack are no longer available, but the MEP Primary Project has distributed one copy to accompany its LOGO pack, to each LEA.

For further details about any of these materials contact your LEA Computer Adviser.

Software at discount prices for MAPE members

On behalf of MAPE, Reg Eyre has negotiated the following discounts on items of software featured in this *MICRO-SCOPE SPECIAL:*

Podd usually sells at £9.95 (cassette); MAPE members may purchase *Podd*, from ASK, at the reduced price of £8.50.

Picture Builder (BBC version) usually sells at £12.95 (disc) and £10.00 (cassette); MAPE members may purchase *Picture Builder*, from Collins/Hill MacGibbon at the reduced price of £10.00 (disc) and £7.95 (cassette).

Collins/Hill MacGibbon have donated the RML480Z version of this program to the next MAPE Tape.

In order to take advantage of these offers members must accompany their order with a copy of their name and address label from a *MICRO-SCOPE* publication. The full details about the publishers are listed alongside the relevant article.

Diploma in Computer Applications to Education, 5–13 age range

Applications are now being accepted for the full-time Diploma, commencing September 1986, at Newman College, Birmingham. It is a one-year course validated by the University of Birmingham and carries DES approval.

The course aims to equip teachers to understand, initiate and guide developments relating to the use of microcomputers as a teaching aid across the primary curriculum. It will enable teachers to assess critically possible applications and to participate in software design and evaluation. It is also intended to prepare teachers to lead colleagues within their own schools and local education authorities.

The College has a specially equipped Computer Centre with approximately 35 micros (mainly RML and Acorn).

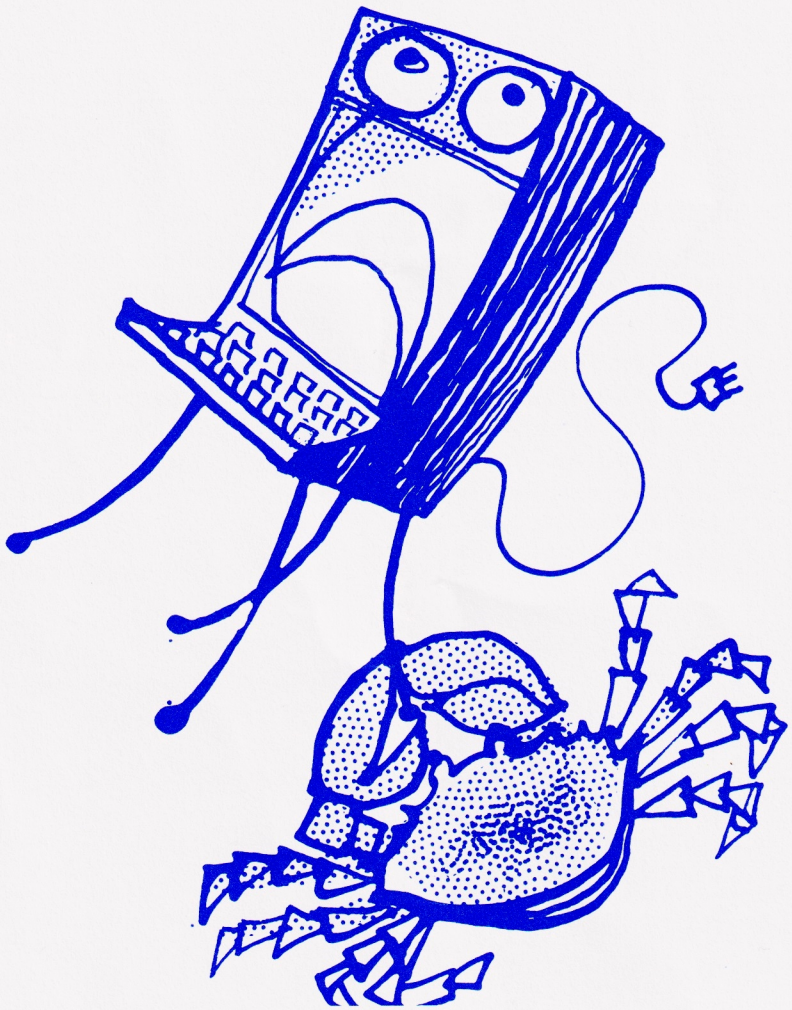
It will be possible to provide the accommodation on the campus. Further details and application form can be obtained by writing to The Registrar, Newman College, Bartley Green, Birmingham B32 3NT.

STOP PRESS:
The following programs on the cassette have all been developed by teachers attending this Diploma Course.

NINES	SITING and SURVEY
HUNT	DEETREE
FRONTP	

6th MAPE Annual Conference

This will be held at Manchester Polytechnic, All Saints Campus, from 25–27 March 1986. Further details available from David Whitehead, 550 Whitworth Road, Rochdale, Lancs OL12 0SW.



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