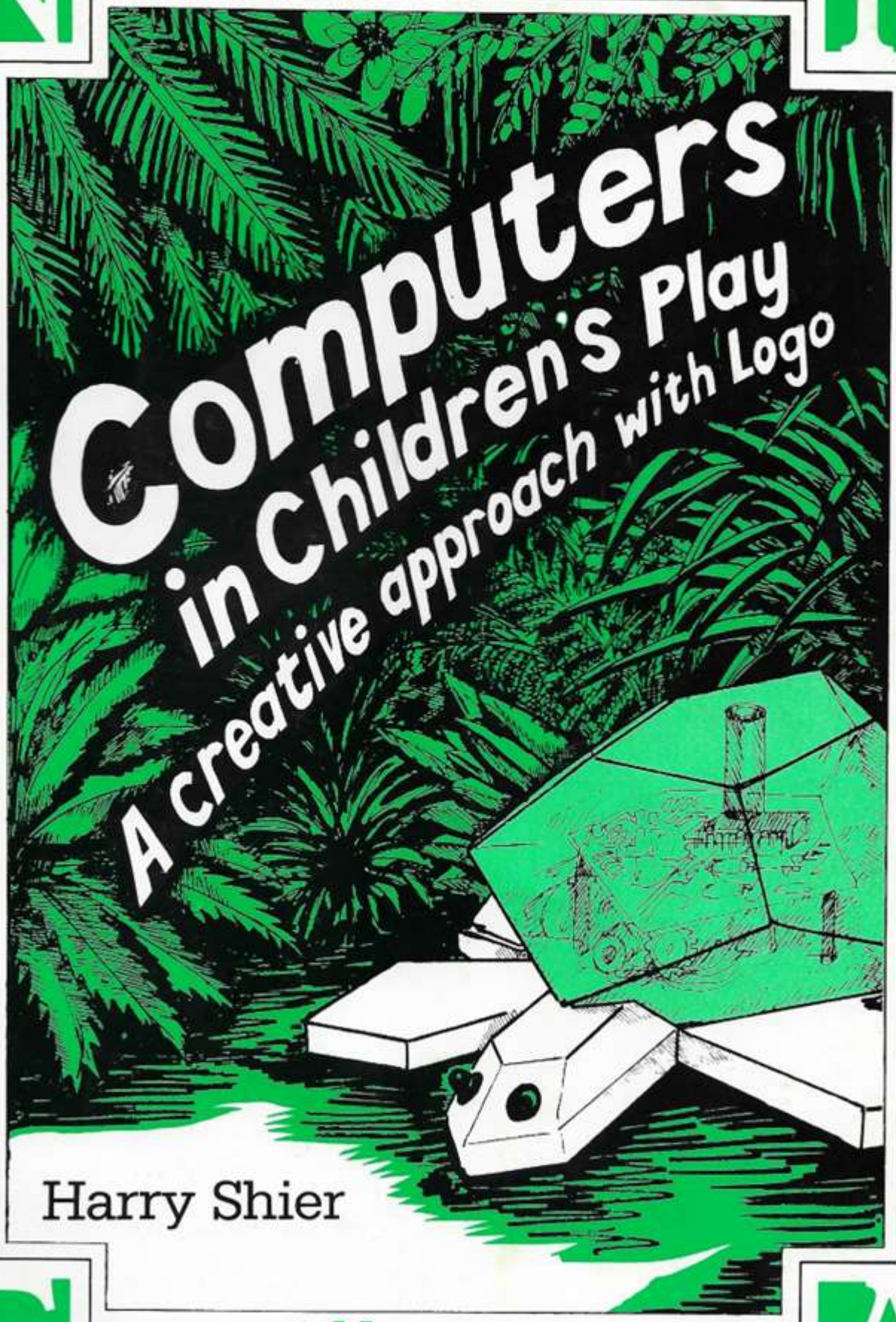
Computers in Children's Play

A creative approach with Logo



Harry Shier

NATIONAL
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ASSOCIATION

Editing and production: Peter Heseltine

Cover: Harry Shier

Photographs: Harry Shier

Research: Harry Shier, Gurmit Sall and David Razzell

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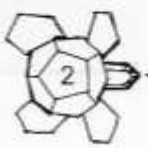
PLAY-TRAIN Papers: No. 1

'Computers in Children's Play' is the first in a series of publications from NPFA's PLAY-TRAIN project featuring new initiatives and important current developments in playwork.



INTRODUCTION

About PLAY-TRAIN

PLAY-TRAIN is the National Playing Fields Association's Art, Craft and Media Training and Development Project for Creative Playwork.

PLAY-TRAIN is based at the NPFA Resource Centre which was founded in 1979 and provides a comprehensive resources and support service to children's play throughout the West Midlands region. PLAY-TRAIN was started in 1981 to offer a highly flexible, relevant training service, providing a wide range of creative skills to people involved in children's play in the region. During the first two years, PLAY-TRAIN built up a sound reputation with a programme of basic craft skills workshops, with training events specifically designed to meet local needs, and with an increasing range of specialist training workshops covering a wide range of creative playwork skills. The PLAY-TRAIN Project is now staffed by two full-time Arts Training Officers and employs specialist tutors on a sessional basis.

During the third year, it became increasingly clear that PLAY-TRAIN had an important role to play, bringing innovation and inspiration to the play movement in the region, encouraging new approaches and new ideas through special development projects that went beyond the straightforward provision of training workshops. The Logo Project described in this booklet was one such Project.

Origin of an Idea: A Personal Account

I am employed by the National Playing Fields Association as PLAY-TRAIN Arts Training Officer, until recently the sole full-time worker on the PLAY-TRAIN Project. I worked formerly on Adventure Playgrounds, and when I started PLAY-TRAIN knew nothing about computers. I certainly did not believe they had any serious relevance to Playwork. Although I am now, albeit with reservations, a convert to computers, I have written this report as a Playworker and Trainer and not as a computer expert.

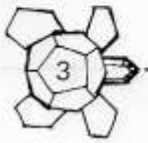
The PLAY-TRAIN Logo Project began March 1982, when, at a PlayEducation Conference in Bolton, I listened to a lecture by Professor Margaret Boden on the question "Are Computers Good Playmates?". The prevailing reaction was a general distaste for the whole idea of computers invading the world of children's play. I shared the view of most of the Playworkers present that computers were at best an irrelevant diversion and spoke against their potential use as a "substitute for caring human beings".

Eighteen months later, by the simple strategy of writing begging letters to all the manufacturers, the NPFA Resource Centre acquired a rudimentary home computer. I took it home one week-end to see what it could do. In teaching myself to use it, I discovered that, for me, learning to program a computer had nearly all the elements of an ideal Play experience: It caught my imagination, gripped my attention, encouraged me to think creatively, gave me the freedom to set my own goals and the excitement of exploring a route towards them. For me. programming a computer was a perfect example of learning through play. I was not interested in playing computer games, and have never even played a game of Space Invaders—I wanted to control the computer myself, and so set out to invent my own game.

Could the same be true for children? At first sight it seemed unlikely. BASIC, the standard home computer language, can be confusing and too much of a struggle for many children. I was lucky that, although I had never studied computing, I had done maths to beyond A-level, and my subsequent education had trained me well in the kind of pedantic logic needed for programming. The children I was most interested in working with would not have my advantages. Thinking about this problem, I remembered Margaret Boden's lecture, and particularly something about a computer language called Logo that was designed to help children learn through programming for themselves.

I got hold of a book by the inventor of Logo, Seymour Papert, called *Mindstorms; Children, Computers and Powerful Ideas* and was hooked from the first page. It was one of the most fascinating books I had read for years and I wanted to try Logo for myself. More important, I wanted to find a way to experiment with it in real Playwork situations, to see if it would live up to the promise of the book.

The local Educational Computing Centre was helpful, but preoccupied with the daunting task of making thousands of primary teachers computer-literate. It was not till I met Inter-Action's



Community Computers U.K. that I started to see how my ideas could be put into practice. What happened next is explained in this report:

Part One describes Logo, the theory behind its creation and why it has so much to offer in children's play.

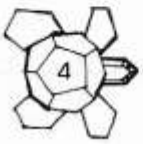
Part Two is a full report on the PLAY-TRAIN Summer Logo Project. This was our action/ research Project carried out during the 1984 Summer holidays, in which we put Logo to the test in Computer Camps, Playcentres and Holiday Playschemes throughout the West Midlands. The results of a six-week Project cannot be conclusive, but our findings are presented in the hope that they will stimulate further work and encourage playworkers to think seriously about computers in play.

Part Three makes use of our experience during the Summer Project to offer a practical guide for anyone using Logo in Playwork. It looks at getting the equipment, training and preparation, and organising and running the all-important introductory sessions.

I hope it will be useful.

Harry Shier

March 1986



PART ONE

CHILDREN, COMPUTERS AND PLAY: WHY LOGO

The action/research project described in **Part Two** involved a team of Playworkers travelling around the West Midlands introducing several hundred children on Computer Camps, Play-centres and Holiday Playschemes to a computer language called Logo, using a little green computer-controlled cybernetic animal called a Turtle. New items of Play equipment are always fun to try out, and for many better-off children, the home computer is just about the most exciting toy ever.

But what role do computers have in playwork, and why is Logo so different? To answer these questions we must look first at the impact computers are having on children's lives, then try to understand the philosophy behind Logo and the alternatives it offers.

Children in the Computer Culture

Many thousands of children have their own computers, and many more come into contact with them through friends or in the classroom. There has been a "computer revolution", but what, if anything, of real value has it given the children?

The home computer for children is dominated almost exclusively by the computer-games sub-culture. The games, commercially produced for a quick profit, offer instant excitement but, for the most part, little else. There is no room for creativity or imagination, no stimulus for learning or personal growth; many of the most popular are about violence, mass destruction and little else.

If children look beyond the flash and zap of computer-games, usually it will be to learn programming. They will do this by learning the computer language BASIC as no other language is built into all home computers on the market, and it has become completely entrenched in the home-computer culture.

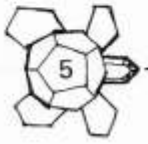
Learning to program in BASIC is more constructive than playing games, but as a tool for wider learning and development it has severe limitations. BASIC was designed by computer engineers to meet the requirements of the early low-powered micro-computers (unlike Logo which was designed by psychologists and educationalists to meet the needs of children's minds). All but the most trivial programes in BASIC develop labyrinthine complexity and none but the most mathematically able and determined children get beyond the initial steps. BASIC programming, as a usable tool, is accessible only to the gifted few. As an approach to computing, it favours those already favoured, and has no intellectual or social benefits to offer the others.

For many more children, the hard economics of life in Britain today ensure they will never own a home computer, even for games. For these children, access to the computer culture must come through school where they are used in many ways. Some are inspiring and creative, but most undervalue the potential contribution of the computer to real child-oriented learning and development. Instead of teachers drilling children on the more tedious parts of the traditional curriculum such as tables or grammar, the computer asks the questions and the child tries to make the correct response. It has been said that instead of the child programming the computer, the computer is helping to program the child.

If programming is taught, it will be usually through the medium of BASIC, with all its limitations and with the added drawback that it induces low expectations of most children as programmers, denying them the opportunity to develop their skills and understanding to their full potential.

Most schools are so under-resourced that there is simply not enough equipment for individual children to have the time they need to practise and develop computing skill without a computer at home—a system which favours again those already most privileged.

The computer-culture (in common with all of science and technology) is overwhelmingly male-dominated, and most schools appear to be neither aware, nor concerned enough to attempt to redress this imbalance in their approach to computing. Like mathematics, science and technology, computing is seen as a "boys' subject", and a complex web of social and cultural pressures deters girls from acquiring computing skills. If computer knowledge, as seems likely, comes to be a valuable personal asset in adult life and work, the social oppression of girls and women will be further reinforced.



Finally, for the large number of children who are alienated from the whole school experience, computer skills will be added to the long list of apparently useless and pointless "school knowledge".

Some schools do take these issues seriously and much good work is carried out in difficult conditions. Indeed, Logo and Turtles are found, almost exclusively at present, in schools, where they are gaining wider acceptance. Logo, however, was designed for learning, but explicitly **NOT** for schools.

About Logo

Logo is radically different in its origins from other computer languages, which were developed for the needs of computers and of certain types of tasks, by computer experts. Logo was designed by a team of developmental psychologists and educationalists led by Seymour Papert. Before starting work on Logo, Papert spent five years working with Jean Piaget, the founder of modern developmental psychology, studying and thinking about children's minds and how children learn. This was the starting point for the development of Logo.

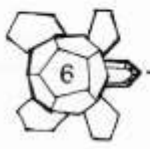
As people tend to associate learning with schools, Piaget's theories are frequently interpreted as ideas about what children should be taught at school. However, Paiget's most important ideas concern how children learn by themselves, and the vital importance of this learning in their development. Many of the most important concepts, and much of the most profound knowledge and understanding that children acquire as they grow takes place, not through teaching but through free exploration of, and interaction with, the world around them—the environment, the objects it contains and the people who are part of it. This is play. It was this concept of learning through play which inspired the search for a new computer language that would be fully accessible to children and in tune with their own ways of thinking about the world.

Although it's designed for children to play with, Logo is not a "toy" language. It is a powerful and sophisticated system for programming computers to carry out a wide variety of complex tasks. Adults as well as children can learn and grow through Logo. For children, Logo's advantage is that it has built in a "gateway" which allows anyone, even pre-school children, to learn to use it, and to learn from it at their own level. This gateway is called the Turtle.

The Turtle is a small cybernetic device (a technical term, meaning it is not a true robot, as it cannot respond to anything outside, only to direct commands from a computer). It moves about a flat surface in response to instructions typed on the computer keyboard. It can hold a felt-tipped pen and leave a trail as it goes. By controlling its path it can be made to draw patterns and pictures. (There is also a screen turtle, which moves in the same way, but exists only on a video screen. For most children, however, this comes later.)

If you type FORWARD 100, the Turtle will move forward in a straight line precisely 100 units (usually centimetres). Similarly it can move BACK any number of units. The command RIGHT 90 pivots it through 90 degrees and so on. Type PENUP and it will lift its pen from the paper, PENDOWN and it lowers the pen and is ready to draw again. These commands can be typed in any order, entering any number of units to move or turn. The turtle can be made to repeat commands, or whole strings of commands, any number of times. Learning a few elementary commands puts the child in complete control of the Turtle which can be made to draw practically any shape. Turtles are designed and engineered to give an astonishing degree of accuracy, so the shape the child sees appearing is an exact interpretation of the commands given.

When these concepts have been mastered, the idea of programming the computer can be introduced in terms of "teaching the Turtle a new word". For example, many children will begin by teaching the Turtle to respond to the word "SQUARE". This is done by entering the sequence of commands to make the Turtle draw a square, and storing them in the computer's memory so that, whenever the word "SQUARE" is typed, the Turtle undertakes the sequence of actions to draw a square. Many new words, or designs can be taught in this way and these commands can be used to define others. Complex pictures can be built from simpler ones. The following examples illustrate the process:



FD 100

FD 100 RT 90

FD 100 RT 90
FD 100 RT 90

FD 100 RT 90
FD 100 RT 90
FD 100 RT 90
FD 100 RT 90

Or alternatively. . .

```
REPEAT 4 [FD 100 RT 90]
```

A new word. . . .

```
TO SQUARE
  REPEAT 4 [FD 100 RT 90]
```

SQUARE

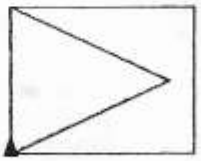
Try another. . .

```
TO TRIANGLE
  REPEAT 3 [FD 100 RT 120]
```

TRIANGLE

Let's make a picture

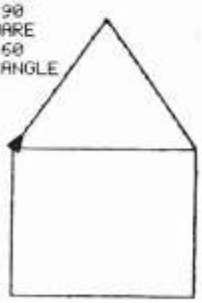
```
TO HOUSE
  SQUARE
  TRIANGLE
```



HOUSE

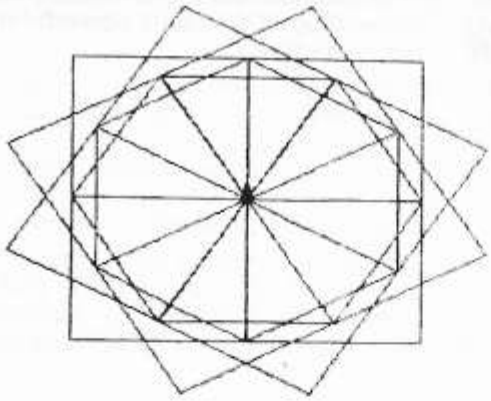
That's not right!
Let's try to fix it. . .

```
TO HOUSE
  RT 90
  SQUARE
  LT 60
  TRIANGLE
```



HOUSE

Let's do a lot of houses

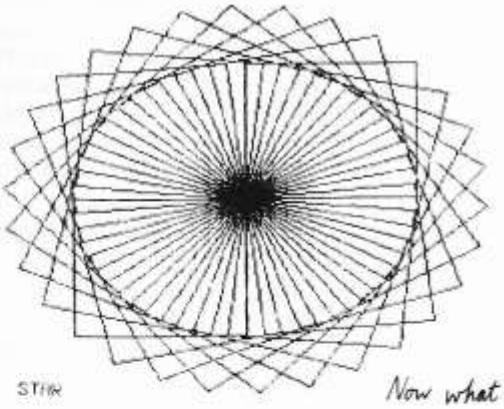


```
REPEAT 12 [HOUSE]
```

— now why did it do that?

Let's make more patterns.

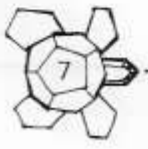
```
TO STAR
  REPEAT 30 [SQUARE RT 12]
```



STAR

Now what?

Children, particularly younger children, find the Turtle easy to understand and program, whilst they find computer programming in other forms baffling and incomprehensible. This is because the Turtle is a real object in three-dimensional space so children can relate it easily to other moving objects in the real world that they know already. In particular, they can relate it to their own bodies. Through their own experience of movement in space, children understand without much difficulty the idea of moving forward or back different distances, and turning to the left or right by different amounts. This is all that is needed in order to start exploring the world of the Turtle and Logo. For example, a child who needs to work out how to get the Turtle to move in a certain way, can tackle the problem by pretending to be the Turtle, carrying out the move, and then trying to express their body movement in the appropriate Turtle commands.



This often happens in Logo sessions when, for instance, a child asks whether the Turtle can be made to draw a circle (up to now, of course, we have only seen it draw patterns of straight lines). In line with the Logo philosophy, the adult facilitator should not dictate the method, but ask the child to see whether, pretending to be a Turtle, she can move in a circle. Thinking carfully about how this feat was performed, and perhaps with a little bit of help, the child will come up with a plan for creating a curved path that can be sent, as Logo commands, to the Turtle (a small step forwards followed by a small turn, repeated many times). The mathematical ideas involved in this process (seeing how a curve results when the individual straight elements of a path are reduced to negligible size, and how this curve becomes a complete circle) are some of the most important, yet subtle concepts in mathematics. Here the child discovers them through the analogy of Turtle movements with his or her own movement.

Children are generally held to have a limited capacity for formal, abstract thought. This lack of facility for dealing with abstract ideas and the relationships between them may be one of the reasons why children find mathematical ideas so difficult. They think best in concrete terms, and the vital function of the Turtle is to "concretise" many of the abstract, formal ideas that must be grasped before a true understanding of mathematics can develop.

The Turtle makes mathematical ideas "come to life" in another important way. A limitation of traditional classroom mathematics is that for many children, the activity lacks any purpose or relevance to their own lives and interests. Why struggle to find answers which have no meaning or value? With a Turtle, the goals can be set by the children themselves. There is fun and excitement in achieving a goal—a Turtle drawing or other Logo programme—that interests and involves them, so the effort of coming to terms with the mathematical ideas involved is no longer a chore, but a compelling need for understanding.

Because school mathematics involves material that, for most children, appears tedious and irrelevant, and for many the experience of learning mathematics is one of failure and frustration, Seymour Papert has suggested that our whole culture suffers from "mathophobia"—a fear of mathematics—which hinders us all in our work and our personal lives. "Learning is transformed from the early child's free exploration of the world to a chore beset by insecurities and self-imposed restrictions," he writes. Introducing children to the Turtle, however, can stimulate a completely different type of involvement in the mathematics process, leading to a much deeper and more useful understanding of the really powerful mathematical ideas than can be achieved by traditional classroom methods.

Besides purely mathematical learning, the programming skills gained from work with Logo may prove valuable in different ways. It involves methods of analysing problems and working out logical solutions step by step that can be adapted for use in other areas besides computing. The development of problem-solving skills is an important element in children's play, and while the computer's step-by-step approach is by no means the only way, the logical analysis of the components of a problem is a valuable skill in many areas of everyday life.

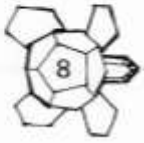
These are the claims made for Logo by its inventors and those who have already used it extensively with children. They inspired the setting up of the PLAY-TRAIN Logo Project. However, besides the enormous potential for mathematical learning through play and the development of problem-solving skills, there are other benefits of computing for children. It helps to develop:

- basic literacy and numeracy skills
- the increasingly important keyboard skills
- a better understanding of modern information technology or "computer awareness".

Computing with Logo offers all these and more.

For institutional and economic reasons, Logo is found today mainly in the classroom, but this is not its proper environment. The constraints already mentioned, combined with the limitations imposed by the time-table and the fixed curriculum, make it difficult for most schools to offer children the free self-directed interaction with computers which is crucial to the Logo philosophy. It is difficult to fit an ideology of playing with computers into an institution designed for teaching about them. It follows emphatically from the Logo philosophy that the right place for Logo is wherever children are freely working and learning out of school, and this, of course, means Playschemes, Play Centres, Adventure Playgrounds, Youth Centres, Junior Clubs, Out-of-School Projects, Computer Camps and so on.

Whether in or out of school, it is not accepted universally that computers are a good thing for children. Many of the concerns expressed warrant serious consideration, so it is important to look at some of the possible disadvantages of children becoming involved with computers in play.



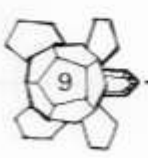
Computers are thought to be de-humanising and mechanistic, to dull the intellect and damage our creative faculties, perhaps even to blunt our sense of moral responsibility. The unthinking endless destruction embodied in computer games is cited as an example of this.

It is suggested that increasing reliance on computers will further widen the social division between the haves and have-nots and favour an elite of privileged experts. The non-mathematical will be excluded, and a further weight will be added to the oppression of women and girls. People will become isolated, withdrawing from human contact under the spell of the all-powerful computer, leading to the breakdown of social and family life.

There is evidence that all these are, or could be, very serious problems. However, the evidence is not against computers as such, but how we have chosen to use them. The problems lie within our already entrenched "computer culture". The use of Logo in playwork breaks away from the traditional computer culture, so that PLAY-TRAIN is able to claim that, without exception, the problems and fears that have been foreseen have been overcome, or have failed to materialise throughout our work with Logo. In some cases we witnessed the very opposite effects.

How did this happen?

The next section describes the PLAY-TRAIN Summer Logo Project and the results we came up with.



PART TWO

THE PLAY-TRAIN SUMMER LOGO PROJECT

Getting Started

By the beginning of 1984, I was convinced of three things:

- that Logo was potentially a wonderful solution to the problem of computers in children's play
- that Playwork Projects were the ideal situation for introducing children to Logo
- that a Turtle had to be taken into Playschemes and Computer Camps to see how well the claims made for Logo stood up to a real practical test.

Playworkers who had seen the Turtle had said, "It's great fun, but it would never work in a real Play Centre". I was sure this was too pessimistic, but I wanted to find out for myself since as far as I could ascertain, all the work done with Logo so far, at least in the United Kingdom had been in schools or in specially developed Logo environments created by researchers to investigate children's responses. Logo had been introduced on one or two Computer Camps the previous year, but had never yet been tried out on "ordinary" Playschemes in the course of normal playwork.

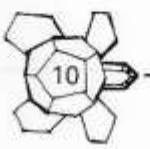
In January 1984, Community Computers U.K. launched a major national campaign, touring the country, organising meetings and practical demonstrations to promote the development of Computer Camps. (Computer Camps are children's holiday projects designed specifically to teach computing skills and give children experience in using computers constructively.) Birmingham was their first stop and at one of the demonstrations I mentioned that I was interested in Logo and within an hour Molly Lowell (of Community Computers U.K.) and myself had worked out the outline of a Summer Holiday Project, taking Logo and Turtles to Computer Camps and Playschemes throughout the West Midlands and recording and writing up the response.

A meeting at Inter-Action developed the idea further, and eventually came up with a proposal: PLAY-TRAIN would borrow or, if we could get finance, buy suitable computers and Turtles, recruit a co-worker for the summer holidays, and over the six weeks visit all the Computer Camps in the West Midlands and as many Play Centres and Playschemes as we could, using the Turtles to introduce children to Logo. The Project had three main aims:

- to demonstrate the potential of Logo to those involved in the emerging Computer Camp movement in the region.
- to evaluate the use of Logo as a tool for learning with different age-groups in a variety of non-school situations. This would cover both the computer-oriented Computer Camp environment and also Playcentres and Holiday Playschemes, where we would be introducing not just Logo, but Computers for the first time. The children's responses would be observed and their progress monitored, looking in particular for evidence of genuine learning through the use of Logo in these different situations. We would look also for other benefits and possible disadvantages of the Logo approach to computing with children.
- to document the project, producing a report and training material, to support others planning to introduce computers, and particularly Logo, in playwork contexts.

Although we wanted to work with and compare children of all age-groups, our concentration was on the 5-12 age range as these children find more conventional approaches to computer programming less accessible, and therefore have most to gain from involvement with Logo and the Turtle.

To visit all the Computer Camps and a reasonable number of playschemes meant that most of our visits would be limited to one day. However, we wanted to find put how children would use Logo given a longer period, so a week would be spent at one Playcentre to see more clearly the development of children's programming skills.
Borrowing the equipment we needed would be difficult, but if we could get our own, we would have a valuable permanent resource for children in the West Midlands after the Summer Project finished. Community Computers U.K. prepared a grant application to the National Playing Fields Association for the funds we needed. This process took a long time, and throughout the Spring we were pre-occupied with other things, and unsure of what form the



PLAY-TRAIN Logo Project would eventually take. It was not until the beginning of July, three weeks before we were due to begin, that we heard the Association had agreed to our request in full. Suddenly we were ready to go, and those were three very busy weeks.

Bruce Edmunds of Community Computers U.K. was now our liaison officer and he ordered the equipment we had chosen and costed in putting the application together. Apart from cost, the main deciding factor was the forthcoming availability of a revolutionary new design of floor Turtle. The original Turtle, and at that time the only one I had used, was a simple dome-shape, with no recognisable features, and was connected to a computer by a cable—a source of endless annoyance as it inevitably got twisted up or run over, pulling the Turtle off course. The new Turtle, just starting production after prototype field trials and due to be officially launched that same month, acutally looked like a Turtle. It had a green perspex shell, flippers and eyes that lit up. It was remote controlled, making it much easier to use and more appealing to children. It was a risk, putting our faith in such a new and (though extensively tested) unproven design, but we ordered two for immediate delivery. At the time, only seventeen Valiant Turtles had been made and we were very lucky to get one of the last prototypes, and one of the first ten to come off the production line, in time to start our project. We have not yet had cause to regret the choice.

We chose a Commodore 64 Computer as the cheapest system then available which offered a full (and very well thought of) implementation of Logo. It was also the only system which was fully compatible with the prototype Valiant Turtle, though this is no longer the case. We were not planning to use its notoriously bad BASIC, so it seemed an obvious choice.

Besides the two Turtles and two Commodore 64s, our other equipment consisted of two disk-drives (for loading Logo into the computer and storing the children's programs), two monitors (one colour and one black and white), a basic dot-matrix printer, and two Commodore Logo software packages, containing the Logo language on floppy disk, together with a very good Logo user's manual. It was all delivered on time and picked up from Inter-Action the weekend before the Project was due to begin. We had a third computer and disk-drive on short-term loan from Inter-Action, giving us three computer systems in all to work with.

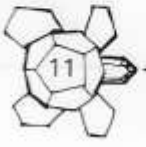
While Bruce was organising the equipment, I was organising the Project team.

The NPFA Grant included the salary for a second Project Worker for the six week holiday period. The job was advertised through the Birmingham University Student's Union and David Razzell was recruited to the team. As an Engineering student, Dave was experienced with computers and confident with technological equipment. He had been involved in playwork as a volunteer for several years, so was used to working with children. I was approached just at the right time, by Gurmit Sall, a student on the Diploma in Playleadership Course at Thurrock Technical College. Sall was looking for a placement for the Summer holiday period, was excited by the idea of the PLAY-TRAIN Logo Project and so became the third member of the team.

I was concerned that it was an all-male team, as I felt we needed at least one woman worker to help redress the male bias we expected to encounter, and provide a positive role model to encourage girls to get involved. It was not possible in the time available to organise things differently, but luckily, in the event, my worst fears proved unfounded, as we had a very good response from girls. As it turned out, we were a well-balanced team in other ways. Our personalities and styles, though very different complemented each other, and everything ran smoothly throughout the Project.

We did not have much time for staff preparation and training, but made the best of what was available. Birmingham Computer Camps organised a training day for Computer Camp workers which we attended. As Training Officer with PLAY-TRAIN, I was involved in it as a trainer, and successfully adapted some proven playwork training exercises to meet the special needs of Computer Camp staff. All of us found the day stimulating and useful. We had taken the opportunity to do a fair amount of homework with Logo, though none of us felt we knew as much as we would like to. We kept the Monday of the first week completely free, for rehearsing the setting up procedure, going over our session plans, finalising our schedule of visits and final checks to the equipment. At the last minute we discovered that if you use two Turtles in the same room, control signals meant for one can be picked up by the other and vice versa. This produced strange results, and we had always to take account of it in setting up our equipment on the Project.

Our final schedule for the six weeks is shown as **Appendix 1**. It included seven Birmingham Computer Camps (with return visits to four of them), one in Coventry and one in Redditch where we spent three days. We also visited four Holiday Playschemes and two Permanent



Play Centres. One of these was South Aston Play Centre where we spent a whole week. This totalled twenty-five days on the road, together with four days for preparation and planning, team meetings, maintenance, photographic work and de-briefing at the end.

On 24th July we set off to our first children's Logo workshop at Shard End Community Centre in South-East Birmingham.

Logo on the Computer Camps

Our inexperience showed on the first morning when we started the day with a panic. The Turtlegraphic images appearing on one monitor screen were all wrong, and the screen turtle appeared to be drawing lines where it should not. We tried swapping the computers around, and re-loading the program from different disks to no avail. Just as we were really starting to get worried, we discovered that a simple adjustment to the contrast of the video picture solved the problem instantly. We learnt from this experience how important it is to know your equipment and not to panic.

We started by introducing the Turtle to a group of about ten children, following a rough plan worked out in advance. We knew this introductory stage would be very important, and luckily our approach seemed to be effective, as the children were instantly captivated and involved, and eager to know more. Over the following weeks we stuck to the same basic approach for these introductory sessions, though we tried out many variations, and greatly refined our skill at presentation and groupwork as we went along. Full details of the way we structured these sessions are in **Part Three.**

Even in the very early stages of the project we felt it was going to be a success. The children were fascinated by the Turtle, and as we went on their interest and involvement grew. This group of 9-13 year olds grasped the essentials of Turtle drawing very quickly and within a couple of hours were eager to start programming their own pictures. By the end of a single day with Logo, some were becoming quite sophisticated at Turtlegraphics, and both they and we were very pleased with the results that were produced. We made a point of saving the children's work on floppy-disks (the actual Turtle drawings they always insisted on taking home!), and during the following weeks we built up a substantial file of children's computer programs as a permanent record.

This early feeling that we were on the right track persisted throughout the scheme, despite ups and downs. We visited three more Computer Camps the first week, two in schools, and largely staffed by teachers. These schemes tended to be highly structured, with the atmosphere of a Summer-school, and a fixed curriculum, rather than the sense of a free play environment. Children, for example, tended to put up their hands before speaking, and call us "Sir". This did not prevent the children who had chosen to sign up because they wanted to learn about computers, from enjoying themselves and remaining interested and motivated. Our sessions again went well, and equally lively and creative computer drawings emerged. However, we felt that what happened in this structured and totally computer-orientated environment could not be guaranteed to happen in an ordinary Playcentre or Adventure Playground.

Our fourth Computer Camp that week, at the Ark Community Centre, was held in the sports hall, but we were already starting to learn how Logo and Turtles could be used effectively in a range of different venues. We found a space for ourselves and worked reasonably well with everything else going on around us.

The second week brought five more Computer Camp visits, including return visits to some camps. These, however, had different groups of children starting each week, so we had a chance to start from the beginning again in the same environment, trying to improve our style of presentation, and building on the previous week's experience. Although by now we knew what to expect, we were frequently pleasantly surprised by original and creative ideas, and by the intense involvement and motivation to learn.

The groups varied from seven and eight year olds up to fifteen and sixteen. Only the older children, and those who were already highly computer-literate were able to programme original drawings unaided in one day's work, but everyone seemed to get a lot out of it, and we were sure that the younger children were well on the way, if they could only have more time.

By week three we needed a day at the Resource Centre for a full team meeting, reviewing the Project so far, planning ahead and discussing how we could further develop our skills and effectiveness as children's Logo facilitators. We then visited our first playscheme and three more computer camps—one return visit and two new ones. One of these was the Computer Camp at the Micro-Electronic Technology Centre at Coundon Court School in Coventry. This

was particularly interesting for us, as many of the children there had learnt Turtlegraphics using a quasi-Logo programme called "Dart". This meant they were ready to take a further step, and try out some of the more exciting possibilities of our real Logo system.

We were worried that the children would be confused by the differences in syntax (the way commands are put together) between our Commodore Logo and the version they had been using. However, these fears were groundless. Children have more flexible minds than many adults, and had no difficulty in switching from one version of Logo to another when we pointed out the relevant differences.

Some wanted to get to grips with new programming concepts, such as the use of variables and recursions, and used these to create complex and exciting spiral patterns. They also explored the possibilities of Logo's multi-coloured graphics to add another dimension to their work. Another group started to use the "sprites"—a facility which allows you to have up to seven different objects of any shape on the screen, all individually programmable to move and draw just like the original screen turtle. This group learned how to animate the sprites, and then started to explore the results of programming random motion, creating some exciting and unusual visual effects in the process. It was good to see what an easy step it was from simple, static turtle drawings to dynamic, animated displays, and what a range of new exciting possibilities were quickly opened up. Towards the end of the day, a couple of the more able programmers were starting to produce an interactive animated display as the first stage towards designing a Logo computer game of their own, when we ran out of time and had to pack up.

This shortage of time was unfortunately built into our Project Plan. Nearly all of our visits ended with children hurrying to finish a piece of work or disappointed because they could not, asking us when we were coming back, or when they could try using Logo again. We had decided early on that it was important to get round all the schemes and "spread the word" about Logo, so we had to accept this as a necessary evil. On the other hand it constantly reassured us that the children were genuinely interested in Logo, and would maintain this interest over a longer period if they had the chance.

The following two weeks were spent visiting Playcentres and holiday Playschemes, of which much more later, but in our last week, as I was on leave, Dave and Sall spent three days at the Redditch Holiday Computer Camp. Here they were able to try out a wider range of Logo techniques than can be covered in a single day. This Computer Camp has access to Logo on an IBM Personal Computer—a more powerful and sophisticated machine than our Commodores. IBM Logo could do a variety of things ours could not, such as "colouring in" any shape the children drew, in the colour of their choice. As it will only be a very short time before this amount of computing power, and indeed much more, comes within the reach of playworkers and children, it was apparent that Logo as a tool for learning will become even more powerful and exciting.

Over the weeks we spent at Computer Camps (15 day-visits covering nine separate venues) we concluded without doubt that Logo had a valuable role to play. However, the impact of Logo in these situations is not as great as it could be elsewhere. On a Computer Camp, most of the children are already involved in computing and are part of the prevailing computer sub-culture. They are usually learning BASIC as well, and for most of them real programming still equals BASIC, while Logo is just something interesting to play with for a change. It is difficult in this environment for the full benefits of Logo to unfold, as the distinctive Logo approach to computing does not always co-exist happily with the more usual approach embodied by BASIC.

It was easy to obtain proficient results quickly on a computer camp with already computer-literate children, and we could see throughout the project a great deal of thinking, talking and learning going on. This focused mainly on geometry, the mathematics of spatial relationships, shape and pattern, but involved other aspects of mathematics as well. This will be discussed in more detail at the end of this section. For all their rapid progress and competent results we doubted if these children really had most to gain from involvement with our Turtles.

We did find that we could work successfully with all age-groups in a variety of situations. What most affected the success of an individual session was not the facilities, but the enthusiasm and commitment of the staff. Our few disappointing days were at sites where the staff did not take the trouble to understand what we were trying to do and offered no encouragement to us or the children. On some camps (often the same ones) there was little attempt to discourage the children from game playing and for some this easy option with a quicker return for less effort, proved hard to resist.

On a well-run computer camp, with enthusiastic and well-briefed staff, Logo and the Turtle could not fail.

Logo on Playschemes

The most innovative and significant part of the PLAY-TRAIN Summer Logo Project was the work with children's holiday playschemes and playcentres. Unlike the Computer Camps, the children were largely new to computer programming. They had no preconceived ideas about computing and had not invested time and energy in learning BASIC. They tended to be younger; almost all in the five to twelve age group and not exceptionally able or mathematically inclined. It was in the ordinary inner-city playscheme that we hoped to see Papert's ideas about children, computing and learning through play come into their own.

The facilities we encountered were even more variable—a cramped playworker's office, a virtually derelict woodwork-shop, a garage and even a church—complete with organ and font! We learnt how they could all be adapted for our needs.

Our first playscheme, at Shard End, was, by coincidence, based in the same community centre that had housed the Shard End Computer Camp the previous week. This gave us an interesting opportunity to compare the two different events in the same environment. The playscheme atmosphere was informal, relaxed, even boisterous. The children had come to play, not (consciously) to learn something. The staff had a more fun-orientated approach so the Turtles and computers were seen as an exciting new play resource.

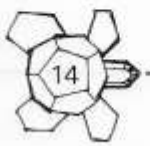
As if to reinforce this contrast, bad planning on the part of the playscheme organisers meant sharing a room with the scheme's ever-popular table-tennis table. This created a lot of noise and running in and out, but this was only the slightest of handicaps, and we quickly got started with a group of twelve 8-12 year olds, doing the introductory workshop we had developed and refined on the Computer Camps (see **Part Three** for a full description). We were delighted with the response. The children behaved differently: they were more talkative (no putting up hands before speaking), more excited and they laughed and joked a lot. They would sometimes rush off to see friends or do something else and new children would drift in. This would have caused problems, but the group settled down, and most of those who were with us at the start stayed the whole day. One of the strengths of Logo is that the learning process can and does take place successfully in free play environments.

Our group's progress followed a similar pattern to previous groups. Progress was slower and children needed more help getting to know the keyboard and remembering which keys to press. We spent more time playing Turtle games, to reinforce the children's understanding of the basic principles. In contrast to some of our previous sessions, none were afraid to "have a go". Getting the "wrong" answer held no stigma and ideas that did not work were often more fun than those that did.

At the end of the introductory session there was a mad rush for the computer; so we had to sort them into groups and arrange to take turns. As they started to work on their own ideas it was soon apparent that, although their technical competence was less than Computer Camp children, their creativitiy and the originality of their ideas was, if anything, even greater. This quality is impossible to measure, but we felt throughout the project that the playscheme children, without any previous expectations of computers, were more likely to come up with imaginative and original ideas for their Logo programs.

Our next Playscheme visit was a one-week "residency" at South Aston Play Centre, in inner-city Birmingham. Here was our only real opportunity to get to know the children we were working with, and more importantly, for them to get to know Logo over a period of time. The work tended to split into two Parts: there were such a lot of children eager to have a go, that much of our time was devoted to working at an introductory level with new groups. We had not intended this, but could not bring ourselves to exclude children who showed real enthusiasm and eagerness to learn. At the same time, one small group of 10-12 year old boys persisted right through the week with ever-increasing commitment and motivation, working on the computers every day whenever they could get the chance. They even turned up before the centre opened, to help set up the equipment and be first in line.

With this group we were able to move on, step by step, to more complex programming ideas. By Thursday afternoon they were using the Sprites to create their own interactive video-game. It was not surprising that the game involved dropping a bomb from an aeroplane on to a passing lorry, but it made us stop and think, as we were determined our approach to computing should be life-affirming and non-violent. There are already too many war games



for us to help them create new ones. On the other hand we had talked about a "free" play environment, so how could we, by imposing our own personal values, destroy all their hard work? The solution was eventually found. The children were persuaded, without difficulty, to change the bomb into a much more impressive parachute, and to drop supplies safely into the lorry.

We were astonished to be told at the end of the week that one of the children in this group, whom we knew to be a keen programmer and an able thinker, was known at the Playcentre as a "difficult" child and a slow learner. The same thing happened on another Playscheme, when we found that one of our most enthusiastic and highly-motivated participants was generally thought of as the biggest trouble-maker on the Playscheme. The implications for motivating children to learn are obvious and potentially important.

At the other end of the scale, I led a Turtle-games session on the last afternoon for a group of over thirty under-eights, since most of them had not had an opportunity to get involved before, and the Playcentre staff wanted no child to miss out. This session was more like a children's party than a computing workshop, and serious learning objectives were temporarily put aside. However, it demonstrated that the Turtle can be used in more ways than are immediately obvious.

Our conclusion from South Aston was that children remain interested and motivated by Logo over a period of time, and that as they progress they are always learning something new. By the end of the week, those who had been with us every day were reaching the stage where the world of creative Logo Programming was beginning to open up to them.

The next week found us at four new schemes, all in multi-racial, environmentally deprived inner-city areas; three in Birmingham, one in Coventry. All were successful, with the high level of interest and motivation, the concentration and creative thinking we had come to expect. Two require special mention:

At one the children were noticeably out of control. This was due to the lack of experience of the (mainly student) helpers rather than to any problem with the children. By this time we were confident and experienced enough to establish and control our own groups, but without this extra control, a Logo session would have been unproductive. It highlighted the importance for Logo, as for all successful playwork, of competent, well-trained staff. You do not necessarily need strict control, but rather a sound relationship of mutual respect between children and adults.

The other, Reaside Playscheme in Highgate, was exclusively for three to seven year olds, and this was a real challenge. We had children as young as six and tended to find it frustrating because we could not hope to achieve any programming skills in the time available. On this occasion we prepared a different approach. We accepted a slower pace, with more emphasis on Turtle games and no high expectations. We felt unready to work with under-fives so we concentrated on the five-to-sevens. Many needed help with left and right, with two and three-digit numbers and even with identifying the letters of the alphabet on the keyboard.

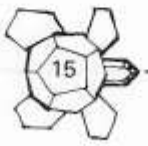
I simplified the Turtle commands to single letters (for example, F for FORWARD, B for BACK, U for PENUP, D for PENDOWN) which proved very helpful. We labelled the Turtle's flippers LEFT and RIGHT, used the floor Turtle all day, and were satisfied to have produced a few simple shapes by the end of the session. We did no programming, but the children had grasped the elementary concepts of Turtlegraphics and learnt a lot about lengths, angles and shapes, and identifying letters and numbers accurately. They would be ready to learn more as soon as the opportunity arose, and we had shown that the Turtle is a gateway to computing open to five-year-olds, and probably to those even younger.

That was our last day on the road. Our remaining tasks were to complete our records of the project, process the photographs and discuss the whole thing in detail to see if we had reached any conclusions.

Findings and Conclusions

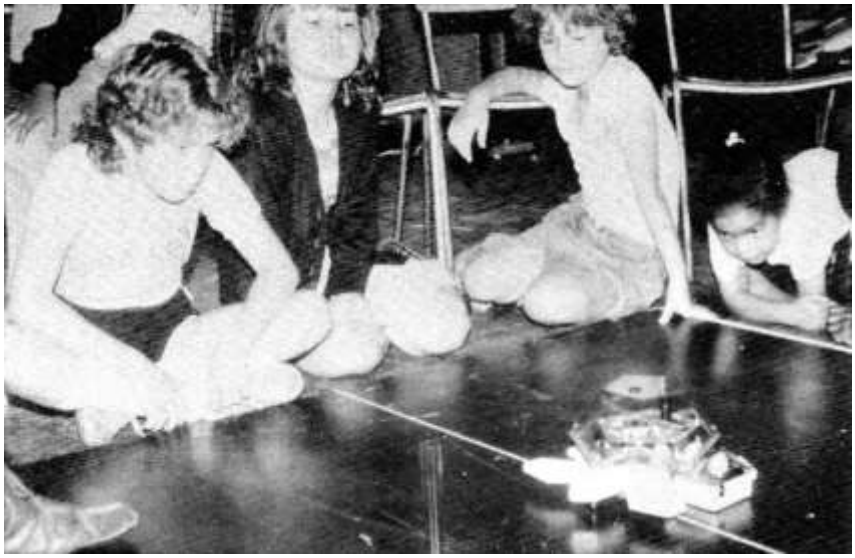
1. Logo and Turtle are a serious practical possibility on all kinds of children's play projects. The level of facilities is not important, as with a little thought and preparation most can be adapted to meet the Turtle's requirements. What is really important are competent, well-trained workers, who know what they are trying to do and how to go about it, and who have a sound relationship of trust and mutual respect with the children.

During the six weeks of our Summer Project no equipment was damaged or stolen; not even a



THE TURTLE IN ACTION

1. Watched by its programmers, the turtle negotiates an obstacle course.



2. A table-tennis table top forms a good surface for the turtle.

3. A sheet of paper with lines marked on it makes a track for “Shove-turtle”.

4. Keyboarding support from one of the project workers.

5. Help with understanding the on-screen information.

6. Concentration as children program the turtle.

felt-tip pen. Playschemes were chosen in response to invitations from playworkers. They were not specially selected in any way, and all were in inner-city areas with multiple problems. Children can, and do show respect for expensive and delicate equipment, if the situation warrants it, and if respect is shown for them in return. The very act of bringing our valuable equipment into the various centres and allowing them to use it freely, demonstrates they were respected, and makes it worth while their participating positively. If a particular centre is suffering from problems in the relationship between children and staff, the Logo Project should wait till this is resolved. Otherwise, there is no reason why any Play Project should not use Logo and Turtle in a successful and positive way.

We believe we have shown that children can and do learn Logo successfully through using the Turtle in a free play environment. Experienced adults are essential, particularly in the early stages, to facilitate learning, but the Turtle itself succeeds in catching the imagination, holding interest and attention, and motivating the children to learn more. It should be stressed once again that these children were not specially selected in any way (unlike the Computer Camp children who had selected themselves as having a specific interest in computers). Nor were they from any kind of privileged background—in fact, on our Project, very much the opposite, as we made a point of visiting deprived, inner-city, multi-racial areas. We discovered that some of our most successful participants were regarded as "problem" children, yet Logo had the power to involve and motivate them where other efforts had failed.

The strong positive response of children to Logo in these Play environments confirmed our belief that computers and Logo should be in the hands of Playworkers as a tool for creative playwork. This view is reinforced by the evidence we have gathered that, used in this way, Logo overcomes all the potential problems feared by those who are justifiably concerned about the involvement of children with computers.

First, there is the problem of computers as reinforcers of privilege and elitism: those who can use them succeed in life, while those who cannot fall by the wayside. Through the Turtle, Logo is accessible to all children—the non-academic and those with problems, as well as the gifted and mathematically able. Computers as a tool for children with special needs has not been gone into by PLAY-TRAIN so far, but they are widely recognised as a source of power and achievement for children with handicaps.

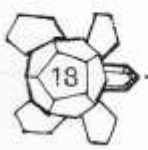
At present, children whose parents can afford to buy equipment have an undoubted advantage. Playworkers can help to overcome this problem by ensuring that their computers are available to children from the most disadvantaged sectors of the community. Areas with high unemployment, high ratios of single-parent families and large ethnic minority communities should have priority for investment in computers for playwork.

One of the biggest successes of our project was the realisation that we had found, in Logo, an approach to computing for children that could help to redress the computer culture's male bias. Girls were in a minority on the Computer Camps and, though less so, on the playschemes. This was expected for a variety of social and cultural reasons, but it concerned us nonetheless. From the start, and despite having no female worker, we noticed that the few girls present were particularly eager to get involved in Logo. Often they would be the ones who continued to work with us enthusiastically, when many of the boys had gone back to BASIC programming or playing computer-games. As the Project progressed, we noticed that it was the girls who often had the most creative and original ideas and produced the most interesting and imaginative drawings.

We can only speculate on the reasons for this. The current computer sub-culture involves only boys, so girls, because they are not enmeshed in this sub-culture, may be more open to the distinctively different Logo approach. It may be that girls in the age-group we worked with are more creative and imaginative and Logo brought this creative imagination into play more easily than other approaches to computing, hence its appeal. For many of the girls we worked with, this may have been the first time they were taken seriously as computer-users and given equal priority and attention. This alone might have been enough to secure their involvement and bring out untapped capabilities.

Whatever the reason, we believe that girl's work with Logo merits further attention. PLAY-TRAIN would encourage the establishment of girls' Logo Projects, or the use of Logo on Girls' Nights in play and youth-work, and await the results with interest. Women playworkers should learn about Logo and run these sessions, to provide a positive role model for girls in computing so that the existing bias need not be reinforced by an all-male group of "experts".

The violence and destruction pervading the video-games end of the computer sub-culture should be easy to eliminate from Logo, but vigilance and sensitivity are needed. We were



distressed to find children programming their own war-game, though we realised this was only to be expected as children tend to copy what they know. Dealing with this brings up the issue of censorship. Do we dictate what programs children may and may not write or do we try to influence them by reason and example, or by offering alternative ideas?

There is the claim that computers generate mechanistic thinking at the expense of creativity. Computers, Logo included, help to develop a logical, step-by-step approach to problems, but there is no reason to suppose this kind of problem-solving skill can only exist at the expense of other, more creative ways of thinking. One of the most attractive things about Logo is the scope offered for the use of imagination and creativity. We saw this in practice in the children's exploration of graphics, and it seems clear that, as programming skills improve, more and more creative possibilities open up. From the elementary graphics that our children produced, Logo could lead on to advanced computer-art, animation, music and creative writing. Fears of a generation of de-humanised computer-kids are surely misplaced with Logo.

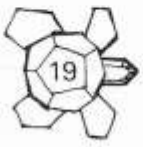
Another fear is that of the isolated and withdrawn computer addict. This is already becoming a well-documented syndrome amongst adult men, with records of broken marriages and abandoned families. What we found with Logo was very different. Hardly ever did we see a child work alone on an individual project. Nearly always there were two, three, four or more children around the computer, sharing the experience. Isolation may occur with the computer at home, and competition for good grades at school, but in the Playcentre co-operation and sharing are the natural way of working. Working with Logo encourages discussion, the sharing of ideas and collaboration towards communal goals. Our approach encouraged not only children to talk together, but also children and adults to talk constructively as they worked towards a goal that was often a genuine discovery for both.

Finally we come to look at the most important claim made for Logo by its advocates: that it enables children to learn powerful mathematical ideas through play, and can contribute significantly to their overall intellectual development.

The PLAY-TRAIN Logo Projec was too sma l to seek to prove this claim. The research element in our work was by no means scientifically rigorous, and we were unable to observe any individual children for more than a week at most. However, the issue of children's learning was always uppermost in our minds, and we observed carefully to see if we could find evidence of the development of new knowledge and understanding. We cannot quantify or define it, but we believe a great deal of learning took place; certainly far beyond what one could normally expect on a typical holiday playscheme. This involved awareness of spatial relationships, distance, rotation and angles, more complex geometrical concepts and theorems, questions of pattern and design, general mathematical ideas and structured programing skills. It is impossible to list what was learnt, since none of it was taught, but learnt independently by the children as they explored the world of the Turtle.

A more elaborate project and specialised research skills would be required to measure individual learning, but from observation and involvement with the children, we are convinced further research would support our belief in Logo as a learning tool.

The use of Logo in Playwork too needs further research. Observing children using Logo on Play Projects over a longer period of time will prove a fascinating and rewarding experience. The advantages and benefits will become clearer when children have been playing with Logo for months, rather than days. The Project provided the clearest proof yet of my conviction that children's play is about learning, growth and intellectual development, as well as fun, socialisation and enjoyment of life to the full.



PART THREE

USING LOGO IN PLAYWORK: A PRACTICAL GUIDE

This section assumes that, having read Parts One and Two, you want to use Logo in your own work with children, which means borrowing, hiring or buying suitable equipment.

Choosing Equipment

Hardware for Logo in Playwork

The amount of money needed depends on a variety of decisions. If you are a large project, or maybe part of an umbrella group, Resource Centre or management agency (e.g. a Local Authority Playwork service), it will be worth budgeting for computer equipment capable of running Logo and Turtles as an addition to your resources. Computer projects can be the subject of a grant application to a variety of potential funders, for example Urban Aid, Trusts and Charitable Foundations or maybe direct to an appropriate local authority department. For further advice see Play Board's Playdata Sheet *Finance for Play* **(Appendix 5).**

A small organisation may not find it practical, or necessary, to invest in equipment of its own if there is an umbrella group or Resource Centre through which equipment can be bought to share between several different groups. Several smaller Playschemes can get together and raise jointly the cash for Logo equipment. This makes good sense because equipment shared in this way would be used more intensively and represents a better investment.

The amount of money needed depends on:

- What computers and other equipment you decide to buy
- How many.

PLAY-TRAIN only has direct experience of our own system in use in practical playwork; that is, Commodore Logo, using the Commodore 64 computer and the Valient Turtle. Using this system, each complete set-up (computer, disk-drive, monitor, turtle and software) costs around £650. We can recommend this set-up, but there are others to choose from: Sinclair, BBC, Atari, Research Machines, Apple, Amstrad, IBM etc. The cheapest is probably the Sinclair Spectrum, on which you can get going with Logo and a Turtle for as little as £400, but it has drawbacks. The BBC has the advantage of being familiar in many schools, which makes sense for a general purpose playcentre computer. This could be a disadvantage for Logo, since you may want to encourage a creative approach to computing in play which is diametrically opposed to the way the thing is used in school.

Apart from the hardware differences, each manufacturer supplies their own version of Logo, and there is room for constant debate over the pros and cons of the different versions. In his recent book "Forward 100' **(Appendix 4)** Ray Hammond gives a detailed comparison of the different versions, which should help you to reach a decision. He strongly favours the Commodore version that we used.

There are now several different types of Turtles on the market. Of the two most common, the Edinburgh Turtle, made by Jessops, is dome-shaped and is connected to the computer by a cable. The Valiant Turtle, made by Valiant, looks like a turtle, albeit a rather futuristic high-tech variety, has its own batteries and infra-red remote control, and needs no connecting cable. Having tried both types, I would choose the Valiant for practical playwork, mainly because the connecting cable is a menace, and because the design of the Valiant Turtle is more appealing to children. We had two of the very first Valiant Turtles to be manufactured, and like many innovative designs, they had teething troubles. The company has already introduced design improvements for greater reliability.

Logo, as a computer language, functions perfectly well without the need for a robot Turtle to interpret its creations, but the Turtle is a vital part of the process of introducing children to Logo computing. It is less accurate and less reliable than the computer that controls it, and the children may "grow out of it" as they get seriously involved in computing, but without access to a Turtle, only the older and more able children will really understand what is happening.

How much equipment do you need? The minimum is one complete working system: computer, TV, disk-drive (or in some cases, cassette player), robot Turtle and Logo software. For maximum economy, you may be able to beg or borrow a suitable TV set, and, if you choose a cassette-based system like the Spectrum, you can economise by using a domestic cassette recorder.

For most groups, one set would be the obvious starting point, with more equipment being acquired if the response to the initial experience justifies it. If the equipment is only used by one Project, a single system may be sufficient as it can be set up regularly so that all the children who want to can get a go. If the equipment is going to several different projects or sites (like our Summer Project, for example), you may need more. As you expand, you may need several computers and TV screens, but can get by with one Turtle and one set of software. (However, agencies planning to lend or hire the equipment ought to think seriously about a second Turtle and spare software, to avoid disappointment in case of mechanical or disk breakdown).

Too much equipment is unlikely to be a problem, but consider the amount of space available and problems of supervision, storage and maintenance.

Borrowing Equipment

Two main sources: Play Resource Centres or local schools and colleges. (There may be other educational resource centes with Logo in use, but these will vary from area to area and you will need local contacts to find them out.) There is now a well-established network of Play Resource Centres covering most of the U.K. and over the next few years many of these will be acquiring computers and related equipment for local Play Projects. All Play Resource Centres try to respond to the needs of their own user groups, so if your nearest has no Logo yet, suggest it to them. Contact the NPFA Midlands Resource Centre (021-328 5557) for your nearest centre.

Schools and colleges have lots of computers, and many now have Logo and Turtles. Most is only used during term-time, and then only during school hours. Getting access to this equipment can be extremely difficult, but if you go carefully, and can find the right people to ask, it can be easier than you think. Computer Camps and holiday playschemes based in schools should find it easiest to get permission to use school computers. Getting them to allow you to take the stuff away may be more of a problem. Authority to allow the non-school use of school equipment will normally rest with head Teachers, but you can try a variety of approaches at all levels, such as via the teacher who has day-to-day responsibility for the school's computers, or perhaps a request through the PTA or Board of Governors. In the long run, perhaps the most effective approach would be to go straight to the Inspectorate, or Chief Education Officer. At this level general policy recommendations can be issued in relation to outside use of school equipment, which will have a strong influence on the response you get from individual schools when you approach them. If this fails, maybe you could work towards influencing, at the political level, your Local Authority's general policy on access to schools and school equipment. Everyone in the community will benefit from this.

Training and Preparation

To use Logo successfully in playwork, appropriate training for the workers/volunteers is essential. Everyone needs to feel reasonably confident with the equipment and, while not everyone needs to be an expert, it does help if someone is really familiar with the set-up. The same is true of Logo—not every adult involved needs to start out as an expert programmer. Indeed, the experience of adults and children exploring and learning together could prove more in tune with the Logo philosophy, and more effective than if the adults adopt a constant "know-all" teacher role. It is best if at least one person is really familiar with Logo programming, to answer questions and give occasional hints when necessary.

Equally important is a basic understanding of the philosophy behind Logo, and how children can and do learn important concepts through play in a Logo environment. Leaders and helpers should know what their role is so that they are prepared to facilitate learning through play, rather than trying to teach or entertain the children.

At the time of writing, this kind of training is extremely hard to come by. On the PLAY-TRAIN Summer Project all of us were self-taught. There was a one-day training workshop for Computer Camp workers, but we had to organise that ourselves as well! We tried to train ourselves first by reading, then by working with the computers as much as we could, and finally by talking to each other a great deal, continually discussing our work, picking out and examining issues as they arose, sharing ideas and comparing our different approaches.

Th s approach to training was forced on us by necessity—there was nothing else available at the time. A proper training course under expert guidance would have been much better. However, as the use of Logo in playwork was such a new idea, neither the experts, nor the training courses were available.

Since the Summer Project, PLAY-TRAIN has run occasional one and two-day training workshops on using Logo in Playwork, and gradually, as the idea catches on, other agencies will follow.

If you are about to start using Logo on your project, find out if there is any relevant training available in your area, or an agency able to organise something. If this fails, create your own training programme using whatever resources you can find. Take this part of the process seriously, taking the time to work together as a team if possible, reading, talking and, of course, computing till you feel ready.

Facilities

During our Summer Project, we worked in all kinds of conditions, and convinced ourselves that almost any area can be adapted as a venue for a Logo/Turtle session. However, plan to make the most of your facilities.

Be secluded from other noisy activities—computer programming requires concentration and children need to be free from distractions to get to grips with the new and often difficult concepts involved in Logo. Ideally, try to set aside a separate room for your Logo sessions and if this is impossible, find a way of dividing off part of your space to provide a fairly controlled environment. The only other things you need are some tables and chairs, and a power point.

To use the robot Turtle, you need a completely flat floor. If used on a table, it will eventually fall off and break. Vinyl floors are ideal, and good wooden floors may be OK. If your floor is rough or uneven, put something over it for the Turtle to run on. We got excellent results by putting half a table-tennis table top on the floor.

Getting Organised

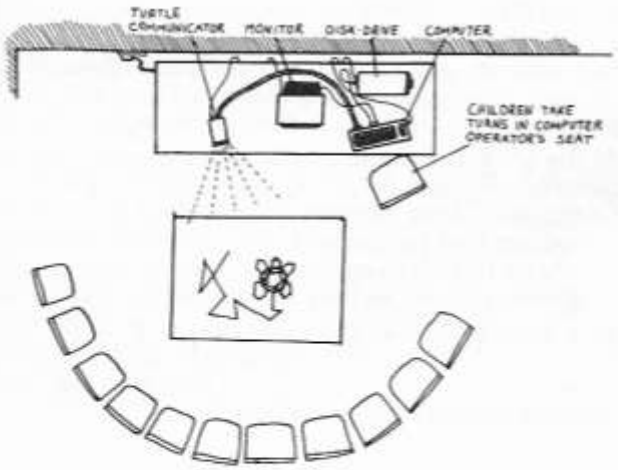
As with all playwork equipment, ensure you can get it set up and working properly in good time to avoid disappointment and frustration if a session has to be delayed or cancelled. Know how to set everything up correctly. If it is your first session do this before the children arrive, so as to have everything ready. When you are more familiar with the routine let the children help with setting up (and clearing away) as this will help them understand how everything fits together. The actual instructions for setting up will vary depending on what equipment is being used. Full instructions should come with the equipment, and it gets easier with practice.

If you are using a battery-powered turtle, double-check to ensure the batteries have been recharged. A Turtle with a flat battery will effectively ruin your session, and it's very easy to overlook.

Keep all leads and cables out of the way behind tables and equipment. Extension leads should not lie where someone may trip over them or pull them out accidentally.

If you are planning an introductory session with the robot turtle, perhaps involving a larger than usual number of children, the layout of the equipment and seating is important. As well as the Turtle on the floor, everyone has to be able to see the TV screen clearly, so position it so that the person typing in instructions does not obscure the screen. If you are using a remote-controlled Turtle ensure that no-one gets in the way of the signal beam from the communicator, as this will throw the Turtle off course or stop it altogether.

We tried to set things up like this:



You may have to select a small number of children from a larger group to participate in each session. Do this in whatever way is most appropriate for your project. Before you start, establish some agreed rules for the computing area to ensure the safety of the equipment, for example, no food or drink on the computer tables, no bats or balls in the room, no-one to open the disk-box or disk-drive without permission, etc.

So now the children are ready, the computer and the turtle are ready, you are ready: What next?

Using the Turtle with a group: Introducing Logo in a Playwork Context

This section contains ideas and suggestions for your first Logo sessions, where you are introducing the children to the Turtle for the first time. We have taken ideas from a variety of different sources and added some of our own. During the PLAY-TRAIN Summer Project we tried out different ideas and developed a basic formula which seemed effective. Our suggestions do not represent the sole right way to introduce Logo in playwork, but we have tested them over and over again and found they work.

We always started with the equipment set up as shown above, and aimed to begin with a group of six to twelve children and at least one adult in charge. We insisted on the children sitting down and paying attention to start with, but with a new and exciting experience like the Turtle, that should not prove difficult. (If the children do not want to sit down and pay attention, leave it to another time when they are more interested. Remember that no one is trying to force them to do anything. It is simply that the opportunity to play with Logo can only be available if they are willing to meet the requirements.)

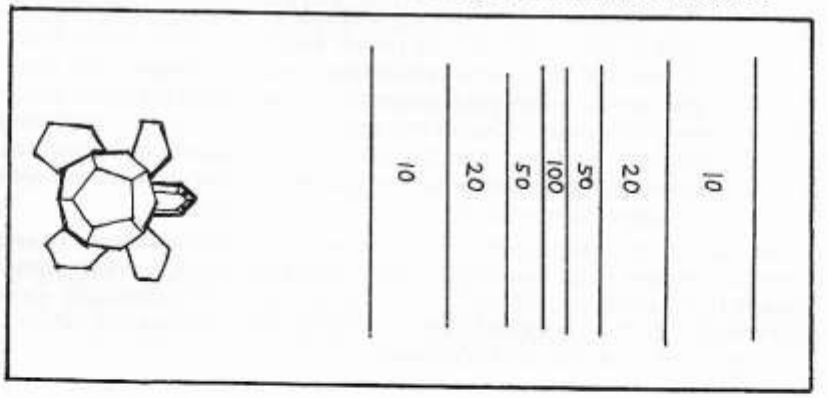
We used the same sequence of activities for all age groups of children altering only the rate at which we progressed, and, to some extent, the way we tried to explain things, to suit the abilities and understanding of different groups. The youngest children we worked with (five to seven year olds) could easily spend a whole day just playing games with the Turtle before even starting to draw pictures, whereas the older groups (15 and 16 year olds) would grasp the essentials of Turtlegraphics in an hour or so and be ready to move on to work on their own creations. The suggestions which follow, therefore, should be adaptable to suit the needs of your group. Bring in your own and the children's ideas as you go.

From the beginning we got the children to take turns at doing all the typing into the computer. Change the typist fairly often to start with, so everyone gets their hands on the computer as quickly as possible. Make sure the screen is on a text-only mode if possible, so that children can concentrate on the movements of the floor Turtle without the added distraction of pictures appearing on the screen.

The first experiment is to make the Turtle move forward and backwards by varying amounts. Get the children to type every command in full a few times before learning the abbreviations, so that they remember what each command stands for. You can now play a game of "Shove Turtle" which, as well as being good fun will quickly reinforce the younger children's understanding of how the distance the Turtle moves is determined by the commands entered on the computer.

Game 1: SHOVE TURTLE

This is, as the name suggests, related to shove-halfpenny. Use a big sheet of paper as a board and mark out scoring areas as shown below:



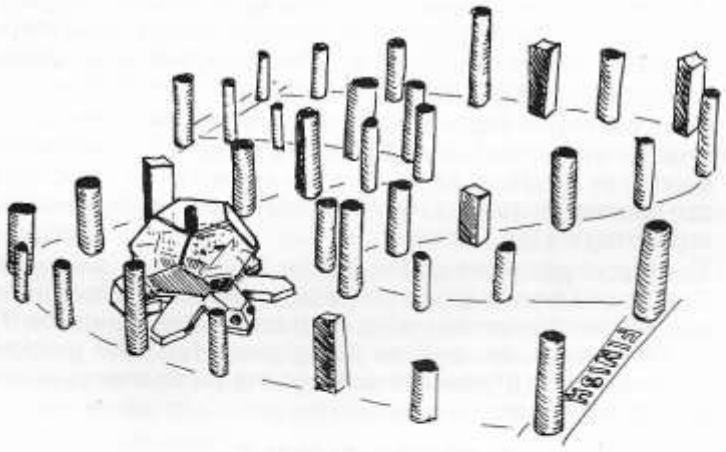
The Turtle is placed in its starting position and the players take it in turn to decide how far they want the Turtle to go. This is typed in to the computer as a "FORWARD" command, and the Turtle moves the specified distance. The aim is to get it to stop with its nose in the highest scoring area. You can keep cumulative scores or even play as teams, but we never found this necessary. Change the starting position frequently, or soon everyone will be getting the top score every time.

The next stage is to experiment with turning the Turtle left and right. Remember, it is unnecessary for children to know what a degree is before they start. They will soon learn, and this is an excellent way for children to grasp the concept of angles. After exploring the effects of different sizes of turn, why not try a game of "Demolition Turtle" in one of its many variations.

Game 2: DEMOLITION TURTLE

For this game, you need at least one, or preferably lots of objects that will stand up, but can be easily knocked over by the Turtle without causing any damage. Small cardboard tubes or plastic bottles are ideal. Place one on the floor—not in front of the Turtle, and the idea is to guess how much the Turtle has to turn in order to knock down the obstacle with a subsequent forward move. Keep score if you want, and create variations such as having a series of target objects with different scoring values. With the youngest children, we found it a good idea to have a complete circle of objects all around the Turtle, since their initial guesses were often completely wild, and the likelihood of knocking things down by pure luck helped to keep the excitement until they began to get the hang of it.

Game 3: OBSTACLE RACE



In this game the aim is the exact opposite—to steer the Turtle around a course without knocking down the obstacles. Using the same objects as for Demolition Turtle, set up a winding course, with obstacles on either side, so that if the Turtle is not given accurate commands it will knock them down. There are various ways to play: everyone can work together to complete the course as quickly as possible, or alternatively each player in turn has to give one command. Count the total number of commands needed to complete the course, and then see if you can do it again with less. Or you could have teams competing to see who can get to the finish with the fewest commands (and Penalty Points for obstacles knocked over).

This game brings together the ideas of distance (forward and back) and turning. It also introduces the important idea of the Turtle being able to follow a precisely defined path, which leads to an understanding of its drawing ability. Incidentally, several groups enjoyed this one so much that they suggested doing the course backwards, which is tricky, but helps children to understand how the Turtle moves.

Game 4: POST TURTLE

For younger children only: Children write secret messages to each other, then take turns to place their message (carefully) on top of the turtle, and attempt to direct it to its destination. You could allow for a reply to be sent as well. Best played in a circle on the floor.

Game 5: TARGET TURTLE

Mark a target on the floor. Take turns, individually or in groups, to see how close you can get the Turtle with a fixed number of commands. Check each attempt with a ruler, and after everyone's had a go, the closest wins.

More Games

Those are all the games I have used, but Turtles on Playschemes are a very new idea, and there are many variations and new Turtle games waiting to be discovered. As long as the children determine the commands and type them into the computer, the Turtle games cannot fail to be a learning experience, and help in the initial stages of understanding Logo in an exciting way.

Drawing

Sooner or later, it will be time to put a pen in the Turtle and start drawing. You will need plenty of VERY BIG paper (at least 1 metre square), so organise this in advance. Also make sure the Turtle comes equipped with the right kind of pens and have a choice of lots of colours, as this makes the designs more interesting and attractive.

You will need to introduce the PENUP and PENDOWN commands, and perhaps experiment with drawing a few random lines and angles. Then you are ready to try a shape. Nearly eveyone starts with a square, which is a good idea, as it is one of the simplest, and finding out how to make a right angle is a very important step. If anyone suggests drawing a circle, keep that idea for later and stick to straight lines to start with.

From this stage onwards, we usually let the children decide what to draw, and this varied from group to group. Some went on to create a variety of different polygons, others immediately wanted to attempt pictures. A simple house shape (a square with a triangle on top of it) was the favourite starting point.

Although the children were able to decide what to draw, we ensured new commands and concepts were introduced which would gradually extending their knowledge and understanding, and leading eventually to real Logo programming.

Important ideas to concentrate on are:

- how you can get the Turtle to REPEAT a command, or a series of commands, a specified number of times. This opens up wonderful possibilities for creating exciting patterns.
- how you can produce circles and curves by repeating short lines and small turns. Instead of telling the children how to do this, help them to work it out for themselves. The classic technique is to ask the child to pretend to be the Turtle, and see if she can walk in a circle.
- The most important step of all: How you can get the computer to memorise a series of instructions that produce a particular design, and reproduce it again and again at your command. This is best explained to the children in terms of teaching the turtle a new word, which will mean exactly what we wish it to mean. Then how you can use these stored procedures to build up new designs. This ability is what separates the Logo Turtle from ordinary electronic toys, and brings about the possibility of real computer programming, so it is vitally important that the children get the chance to understand it properly.

Depending on the age-groups you are working with, it may take you several sessions to get this far, but at some stage you will decide it is time to leave the floor Turtle aside for a while, and explore the quicker, more efficient world of Turtlegraphics on the small screen. Beware of taking this step too quickly. If the children do not really understand the Turtle and its ways, it is very easy for them to become lost and confused when they no longer have a "real" Turtle to relate to.

The next stage: Logo with the Screen Turtle

When you move on to screen graphics, it no longer makes sense to work with a large group. Two or three children on a computer at one time is ideal.

Four is just about possible but no more. If you have a lot of children interested, you either need several computers, or enough time for everyone to have a reasonable turn. It is part of the Logo philosophy that children learn through self-directed exploration and play, and gain new skills in their own time, so it is unfair to push them off too quickly if they are working on a project needing time and continued concentration.

We let the children decide how they wanted to proceed, and aimed to help, not by telling them what to do, but by answering questions, offering hints whan they got stuck, and introducing new concepts when appropriate. The role of the adult helper at this stage is to encourage creativity and learning, without taking control away from the children.

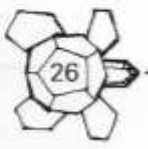
Children are likely to be enthralled by the floor Turtle, and may wish to concentrate on producing on screen a finished picture which they can then get the floor Turtle to draw. However, there are dangers in this approach. The floor Turtle although extraordinarily accurate, does have a small margin of error, which, in a complex drawing, is bound to accumulate. Some floor Turtle drawings are exciting and spectacular, but many can be spoilt by these limitations on its accuracy. We found that drawings prepared on the screen often turned out to be far too large for the floor Turtle to draw, even on the enormous rolls of paper we were using. Thay had to be drawn all over again on a smaller scale, or else abandoned.

After experiencing several disappointments with over-ambitious floor drawings, we realised that it was a mistake to think in terms of a finished product (i.e. a picture to take home), and went back to seeing the Turtle in its intended role—as a gateway to the world of Logo.

There are spectacular creative results to be achieved with the floor Turtle, but you have to be patient and familiar with it. Towards the end of our Summer Project we found that by the end of a day, the floor Turtle would be left aside as children explored with increasing excitement the potential of Logo itself.

Advanced Logo

Straight Turtlegraphics offers endless possibilities, and should keep most groups of children interested for several sessions. However, there is always more to explore. First, there is full-colour graphics; then, on most versions of Logo, there are sprites. These are commands that allow you to write "interactive" programmes, which means that, at a very early stage, you can start to design your own computer games. You can create music in Logo, and finally there is Logo's famous "list processing" capability which allows you to do all kinds of creative things with words and sentences. We have not been working with Logo long enough to report on how children may be able to develop these skills in play situations, but there will always be something new to try.



APPENDIX 1

Update: PLAY-TRAIN Logo since the Summer Project

Since the 1984 Summer Project, the equipment has remained in the care of PLAY-TRAIN as a resource for children's play in the West Midlands. With until recently only one permanent worker and no cash to spare, PLAY-TRAIN cannot provide the staff for continuing fieldwork sessions all year round. Our priority has been to train a number of Midlands Playworkers in the use of Logo and Turtles with children, so that they can then hire out the equipment and use it independently.

Since 1984 we have run four two-day courses for playworkers, called *"Computers in Children's Play—a creative approach with Logo"*. With up to twelve people on each course, we now have a nucleus of over 40 workers competent to use the equipment. We plan to increase this number with more courses from year to year.

Some dozen holiday playschemes have used the turtles over the past year and several projects have involved workers who participated in our training courses and several more play projects are currently preparing to introduce Logo on a regular basis.

We have monitored this work as closely as possible and provided support and advice to the workers concerned. For this we are grateful to Jan Blazak, who undertook the futher development of the Logo project while on placement with PLAY-TRAIN from the Community and Youth Work Course at Westhill College of Education, Birmingham.

Jan's work has confirmed and re-inforced many of the findings from the summer project described in this report. In his own report he emphasises the desirability of children having more access to Logo over longer periods if its full potential is to be revealed. One regret is that we have not been able to undertake the serious, more "scientific" research that might confirm our impression that children are gaining new skills and insights through the use of Logo in play. The playworkers who come into contact with our turtles, however, need no convincing!

We receive regular inquiries from outside the West Midlands region and are always willing to help other playwork agencies who are looking for the right way to introduce computers in children's play. We undertake occasional training workshops in other parts of the country, introducing playworkers to Logo and the turtles.

Logo has not been quick to catch on in playwork nationally. Many people have heard of it but the equipment is still very seldom seen outside schools. Apart from what PLAY-TRAIN is able to offer, there is little or no training available on the use of Logo and turtles in play, making it difficult to start any new project.

We hope this publication will help.

Finally, we can claim that, after nearly two years of regular use on play projects, all our original equipment is still in working order—nothing has been lost, stolen or damaged. Both our trust in the children, and our faith in the turtle as a tool for learning through play seem so far to be well founded.

March 1986

APPENDIX 2

The PLAY-TRAIN Summer Logo Project Schedule

Projects visited during the six weeks of the school holidays, 1984 (all are in Birmingham, except where indicated otherwise):

WEEK 1

Monday	23 July	Preparation at Resource Centre
Tuesday	24 July	Shard End Community Centre Computer Camp
Wednesday	25 July	Cockshut Hill School Computer Camp, Yardley
Thursday	26 July	The Ark Computer Camp, Rotton Park
Friday	27 July	Marsh Hill School Computer Camp, Erdington

WEEK 2

Monday	30 July	Primrose Hill Centre Computer Camp, Kings Norton
Tuesday	31 July	Shard End Community Centre Computer Camp (return)
Wednesday	1 August	Shenley Court Centre Computer Camp, Selly Oak
Thursday	2 August	Marsh Hill School Computer Camp (return)
Friday	3 August	Cockshut Hill School Computer Camp (return)

WEEK 3

Monday	6 August	Review and Preparation at Resource Centre
Tuesday	7 August	Shard End Community Centre Playscheme
Wednesday	8 August	Micro-electronic Technology Centre Computer Camp, Coundon Court School, Coventry
Thursday	9 August	Ark Computer Camp (return)
Friday	10 August	Holyhead Youth Centre Computer Camp, Handsworth

WEEK 4

Monday to Friday	13 August 17 August	South Aston Play Centre

WEEK 5

Monday	20 August	Balsall Heath Church Centre Playscheme
Tuesday	21 August	Edgwick Playcentre, Coventry
Wednesday	22 August	Lozells Recreation Group Playscheme
Thursday	23 August	Reaside Playscheme, Highgate
Friday	24 August	Work on Logo Project Photographs

WEEK 6

Monday	27 August	Bank Holiday
Tuesday to Thursday	28 August 30 August	Mighty Micro Computer Camp, Redditch, Worcs.
Friday	31 August	Debriefing and review at Resource Centre

APPENDIX 3

The Equipment used by the PLAY-TRAIN Summer Logo Project

The following equipment was bought by Community Computers U.K. with a National Playing Fields Association grant, and placed in the care of PLAY-TRAIN on permanent loan. Prices are always changing, but we show an approximate cost per item as a rough guide:

2 Commodore 64 Personal Computers	(£180 each)
2 Commodore 1541 Disk Drives	(£160 each)
1 Commodore MPS 801 Dot-matric Printer	(£150)
1 Commodore 1701 14" Colour Monitor	(£180)
1 Sanyo DM2112 12" Monochrome (green screen) Monitor	(£85)
2 Valiant Turtles (complete with adaptors, communicators, batteries and control software)	(£185 each)
2 Commodore Logo Software Packages	(£15 each)
1 Pack of 10 blank disks	(£20)

The total cost of this equipment was approximately £1,700 (now £1,500).

We also had the use of an additional Commodore 64 and disk-drive on short-term loan from Community Computers. We purchased several additional minor items:

Mains Plugs for all equipment
4-way mains adaptor/extensions
Berol felt-tip pens for Turtles
Disk storage cases
Printer paper
Cheap suitcases and foam, from which we made custom-built transit cases to hold the computers, disk-drives and accessories.

Our inventory was complete by an enormous (1 metre wide) roll of white paper—industrial waste scrounged by the Resource Centre—and a collection of plastic tubes to use as obstacles in Turtle games.

APPENDIX 4

References and Further Reading

Obviously essential reading is:

Papert, S.: *Mindstorms—Children, Computers and Powerful Ideas* (Harvester Press, 1980)

There are now quite a lot of other books about Logo, with more being published all the time, and often going over the same ground. Here are just a few:

Allan, Boris: *Introducing Logo* (Granada, 1984)

Gascoigne, Serafim: *Microchild; Learning Through Logo* (Macmillan, 1984)

Goodyear, Peter: *Logo, a Guide to Learning through Programming* (Ellis Horwood, 1984)

Hammond, Ray: *Forward 100* (Viking, 1984, now available in Penguin)

Ross, Peter: *Logo Programming* (Addison Wesley, 1983)

For a powerful critique of our computer culture and its potential harmful effects on children (although it doesn't mention Logo at all), read:

Weizenbaum, Joseph: *Computer Power and Human Reason* (USA, 1975 U.K. edition: Penguin, 1984)

The seminal lecture that first introduced the idea of Logo to the Playwork world is available in print:

Boden, Margaret: 'Are Computers Good Playmates?', in *Play Education '82* (PlayEducation, 97 Dale Street, Lancaster, 1982)

By far the most useful publication for us was the reference manual that came with the Logo software. Although it is not available separately we include details for completeness:

Grammer, V. C., Goldenberg, E. P. and Klotz, L. Jr.: *The Commodore 64 Logo Tutorial* (Commodore Business Machines, 1982)

If you wish to pursue the important development theories of Jean Piaget, which inspired the creation of Logo, you may find it useful to refer to a brief introductory guide, such as:

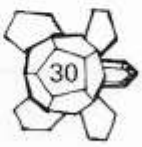
Boden, Margaret: *Piaget* (Fontana, 1980)

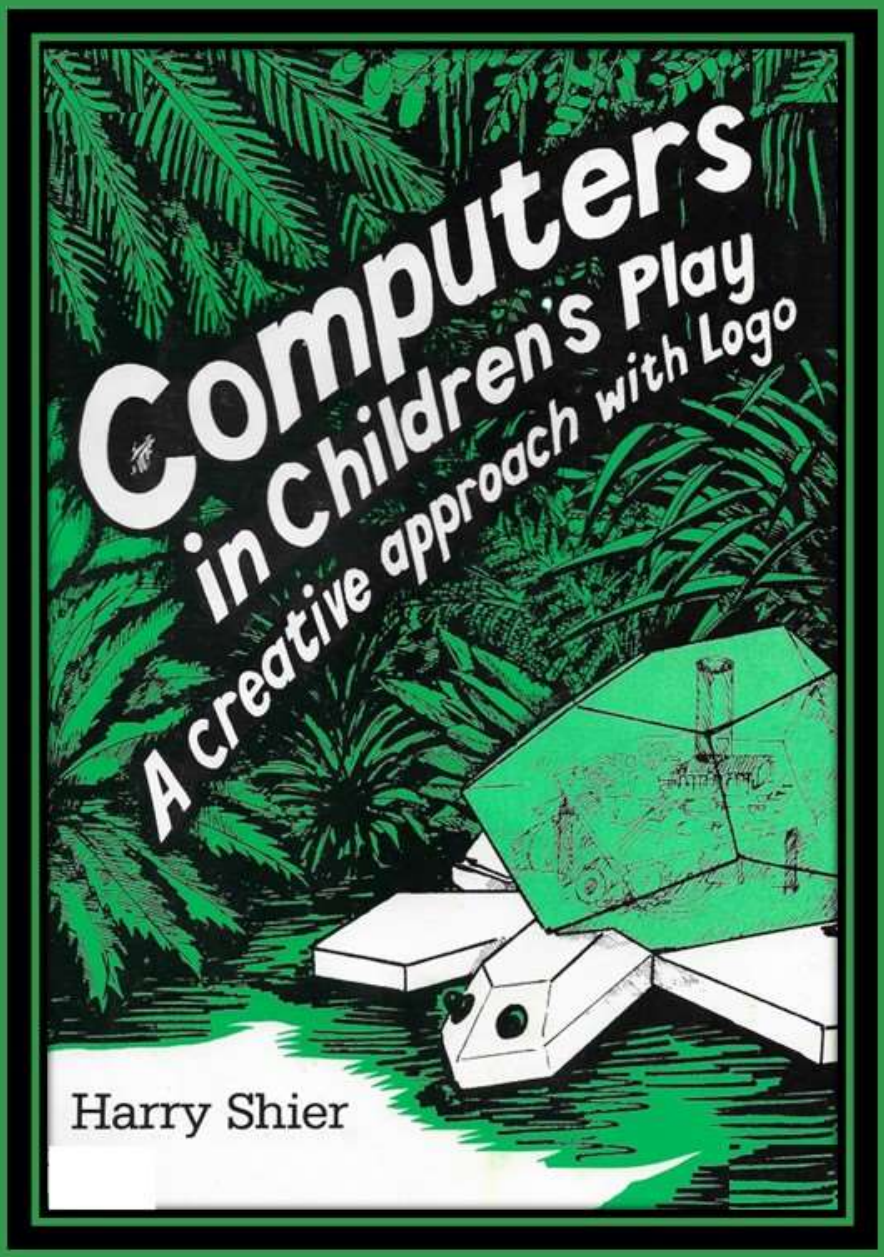
Donaldson, Margaret: *Children's Minds* (Fontana, 1978)

Either of these books will give you appropriate references to Piaget's own extensive and more demanding texts.

Finally, there are now a number of Logo books specifically for children. Among these are:

Beardon, Donna: *One, Two, Three My Computer and Me: A Logo Fun Book for Kids* (Reston, 1984)





This is a digitised scan of a book first published by the National Playing Fields Association in the UK in 1986, and now out of print.

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