CENTURY COMMUNICATIONS

COMPUTER ASSISTED LEARNING

Martyn Sibley

General Editor
Alex van Someren

The Library of Technical Information

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This book is dedicated to all those people who are struggling to keep up with today's trends in education. It is also dedicated to Lissa, without whose continuous support it would never have been written.

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Introduction

This book was written to give the reader an insight into the use of computers in an educational environment. The arguments about what are, or are not, the correct uses for computers in education are many and varied, and will probably never be resolved; but we hope that having read this book you will feel more able to take an active part in the formulation of these educational concepts.

In chapter one we will look at the way in which the British government have helped to provide the country's schools with computers and other associated equipment. We will also see how they were instrumental in setting up a body of people whose task it is to create software and hardware for use in schools. We will also be looking at some of the hardware that is now available to the computer user with the focus of attention being on the BBC microcomputer.

In chapter two we look at one of the many CAL oriented languages currently available for microcomputers: our specific example here is PILOT. In Chapter three we examine the most popular of all the CAL languages, LOGO. Chapter four is a breakdown of the BBC BASIC language, which is the language of a large proportion of today's CAL software. The reader should take note of the substantial differences between versions of BASIC; a number of the commands included in this chapter are available solely on the BBC microcomputer.

In chapter five we examine the work that has been carried out by the Microelectronics Education Programme

in the field of CAL software development. We will look at a number of examples of educational software ranging from the reasonably simple to the complex.

The final chapter of this book is intended as food for thought, and looks at the instructive uses to which computers are put outside the schools environment.

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Chapter 1

The government initiative

Since the advent of the microcomputer, rapidly developing technology has greatly enhanced the machines and made them far more accessible to the man in the street. Initially, the machines were unwieldy and very difficult to use, and their uses were limited. All this has changed and now the machines are very flexible in their applications.

It became obvious that the computer had evolved into a very powerful tool that could be manipulated by almost anyone. Although the study of computers and associated technologies had been going on in schools for some time, it was nearly always theory, with few opportunities to carry out practical work.

The British government took a first step on the road toward mass computer literacy by introducing a two-stage project to bring microcomputers into the educational environment. Firstly, they provided funding to the schools which would amount to half the cost of a microcomputer. Secondly, they funded the Microelectronics in Education Programme (MEP), which was to provide both software and hardware support for the educational sector.

The government recognised the need to set some form of standard in the machines that were purchased by the schools, to ensure that the maximum effort in development could be centred in one area. Three different machines were decided upon: The BBC microcomputer, designed and built by Acorn Computers; the Sinclair Spectrum and the Research Machines 380Z. Even with

these limitations the schools were still left with a choice of three machines, whose BASIC language and operation differed considerably. It was inevitable that one of the machines would become a favourite; the machine that appears to have come out on top is the BBC micro-computer.

At the same time that the MEP came into being, fourteen regional information centres, known as ITECs, were created. Their function was that of a central pool of information to which the teachers could turn for advice and help on both software and hardware.

One last proviso that the government included in the package was that of teacher training. It is obviously a waste of time providing machines to schools if they only sit and gather dust on a shelf. Each school was offered a 'starter pack' of software to use in class; but in order to obtain the software each school had to send two teachers on a training course, giving basic training in the use of their particular machine and examples of how it might be used in a school. One of the main aims of the training course was to take control of the computer away from the maths teacher and encourage other members of staff to make use of it.

The result of all this government activity was to make the manufacturers realise that building the machine was not sufficient. It became necessary for them to provide substantial support for their equipment, and to help in the development of software to enable it to be used effectively in the school environment. The need for a new breed of computer language, both powerful and simple to use, was required to enable even very young children to manipulate the machines. Although BASIC had a very valuable contribution to make, it was by no means user-friendly enough for use in primary schools or the lower end of secondary schools. Languages were required that would enable children to use familiar commands and get a quick, friendly response from the computer. From this line of thought several languages were brought into being which, although far from perfect, went a long way towards the goal of power with simplicity. In the following chapters we will examine two of the more prominent of these languages, and show how they can be used to great effect in the classroom.

Now we will take a short look at the equipment itself. The example we will use will be the BBC microcomputer, since it is probably the most popular of the three machines.

The BBC microcomputer

In the late 1970s the British Broadcasting Corporation decided that they should introduce a standard computer that could be used in schools in conjunction with their television programmes. This would enable them to concentrate on one machine when talking in depth about computers; this was becoming essential because of the large number of machines that were now available to the general public. It also allowed transmission of computer software that could be used in conjunction with the TV programmes along with the CEEFAX information service. The BBC provided a general specification for the type of machine they required and offered it to the various British manufacturers; the contract was given to Acorn Computers PLC, who are based in Cambridge.

General specifications The BBC microcomputer has at its heart a 6502 central processing unit, which is one of the two main 8 bit processors in general use in microcomputers. The memory of the BBC micro consists of 32K random access memory and 32K read only memory or 'ROM'; the 32K ROM is split into 16K BASIC language and 16K operating system. The computer has a typewriter style QWERTY keyboard with two-key roll-over and 10 user-definable function keys.

Interfaces

One of the most powerful features of the BBC micro is its number of external interfaces; these include:

Cassette port enables the user to attach a standard cassette recorder for storage of computer programs on cassettes.

UHF output makes it possible for the users to use a TV as the Visual Display Unit for the computer.

Composite video output allows the connection of a monochrome composite video monitor: desirable when word processing.

RGB output enables connection of a colour monitor to produce high quality colour graphics.

RS 423 interface allows the bi-directional transfer of serial data.

Analogue to digital converter facilitates the connection of a large number of devices such as joysticks or scientific apparatus.

Parallel printer port interface allows the connection of parallel printers using the centronics standard (these tend to be dot matrix printers).

User port a general purpose connection for external devices, i.e. turtles and buggies.

1MHz bus the BBC micro runs internally at a speed of 2MHz. This port allows the connection of low speed devices.

Tube interface this particular interface is a specific Acorn design that enables connection of a large variety of high speed devices.

All the above interfaces come as standard on the BBC micro model B. In addition to these Acorn provide at a cost three further interfaces; these are:

Disc interface allows the connection of 5¼ inch floppy disc drives, which provide fast data storage and retrieval. Maximum storage at present is 800K.

Econet interface allows the construction of a local area network with the BBC micro as user stations. (For more information see *Local Area Networks,* another book in the *Century Library of Technical Information.*

Speech interface provides the micro with the ability to speak (with an English accent!).

Peripherals

Having designed the machine itself, Acorn set about designing and building plug-in expansion options. The options on the market so far include:

Teletext acquisition unit allows the BBC micro to act in the same way as a television teletext system. It gives the user access to the BBC CEEFAX service and also the IBA ORACLE service. Perhaps more importantly, it also allows the computer to receive and use software that is transmitted by the BBC TV company.

Prestel receiver an auto dial MODEM with accompanying software. This, as its name suggests, allows the BBC micro user to connect to the Prestel database via the telephone network.

6502 second processor makes use of the TUBE interface, providing the user with a second 6502 central processing unit (running at 3 MHz) along with an extra 64K of RAM for the user's programs. This allows the size of user programs to expand greatly and can also mean a speed increase of as much as 50%.

Z80 second processor perhaps the most important of all the Acorn peripherals, providing the user with a Z80 central processing unit and a further 64K of user RAM. The reason for its importance is the wealth of previously incompatible software that this makes available.

IEEE 488 interface another answer to an incompatibility problem. Other computer manufacturers use this standard interface to allow their machines to use a variety of printers and other peripherals; the Acorn version allows the user to connect as many as 14 different devices simultaneously to the BBC micro.

With this range of peripherals and interfaces the BBC microcomputer is a very powerful and versatile machine

indeed. Acorn have plans for several other peripherals which will increase the machine's power even further; soon it will be time to re-think the descriptions MICRO and MINI computer.

This chapter has dealt with the initial introduction of the microcomputer into the school and has also shown the ever increasing wealth of equipment becoming available to the public in general. Don't forget that so far you have seen the developments of only one British company, and that only briefly; many other British companies have comparable equipment on the market which should not be disregarded. Equally, a large number of smaller companies produce third-party peripherals for the major microcomputers: everything from light pens through video digitisers to full word processors.

Next we will examine the main theme of this book: computer languages and software for use in the educational environment.