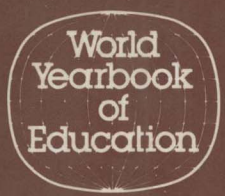
World Yearbook of Education 1982/83

COMPUTERS —AND— EDUCATION

Edited by
Jacquetta Megarry,
David R F Walker, Stanley Nisbet
and Eric Hoyle

Preface by
Roy Jenkins



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Computers and Education

Edited by **Jacquetta Megarry** *(Series Editor)*
David R F Walker *(Associate Editor)*
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and **Eric Hoyle** *(Consultant Editor)*

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Preface

Roy Jenkins

This *World Yearbook of Education* addresses an important theme. The impact of computers and microtechnology on our society is of pressing concern. Pundits and serious thinkers offer an endless variety of conflicting visions of the future. The education system has to do more than this; it must help to shape that future now, and provide for needs as yet unknown.

To the politician and to the interested citizen, concern must be two-fold. How can the education system best assist the nation as a whole to take advantage of the new technology to create greater prosperity and a more thriving economy? What should it offer young people (and adults) so that they may understand, rather than fear, the tools at their disposal, using them and the wealth they generate to organize a humane community? These questions have implications for the purposes, the content and the methodology of education. Some of them are of particular concern to professional educators, some to computer experts. They are discussed later in this book.

The prosperity of an individual country decreasingly depends upon natural resources and geographical situation. This is not to dismiss fortunate windfalls such as North Sea oil which, if carefully exploited, can bring substantial benefits. However, the growth industries of the future, perhaps especially those heavily dependent on microtechnology, will not be tied to coalfields, oil-wells or good harbours. They will be mobile, drawn to reservoirs of skilled labour and scientific expertise rather than to any natural commodity. It is the task of the education service to ensure that those human resources are developed and fruitfully applied.

The cultivation of such human resources is the most obvious of the services which education can yield to economic development. It has received much attention; in most developed countries, programmes of study designed to produce computer scientists and technologists are being mounted in universities, colleges and schools. There are, however, other types of study which must be promoted with equal urgency if the full economic gains are to be realized.

Automation through microtechnology increasingly becomes the key to efficient manufacturing. Such is the scale of the manpower savings involved that not even the most massive imaginable expansion of trade nor of the scale of production can hope to maintain the manufacturing labour force. A

successful search for new markets and an improvement in everyday clothing ensured that the Spinning Jenny and the Mule would ultimately expand and not reduce the textile work-force. No available new market and no further saturation of the world in consumer goods can similarly compensate for the effects of wholesale automation. The coming of the new manufacturing technology will surely destroy industrial employment – and those countries which fail to adapt will lose more through the extinction of whole industrial sectors than will those which succeed.

This is not to argue that automation must reduce overall job opportunities. The new jobs, however, will be in service industries, both public and private. The new technology can indeed create employment, but only at some remove from itself. This increasing separation of the wealth production from the points of employment of the great bulk of the labour force demands new and radical policies for the circulation of resources through the economic and social fabric. It also requires the assent of an electorate 'literate' both in economics and in computer science.

Even in the most advanced societies of the first industrial revolution, the connections between wealth creation and employment, between agriculture or manufacturing and the few simple services were clear and obvious. As the lines of communication become longer, the interdependence of the whole economic structure needs to be more fully and widely understood. The shares of the national wealth enjoyed by different interest groups – both those in employment and those dependent upon them – will become less a matter to be settled by relationship to the point of production of wealth and more a question of conscious social decision. The advance of microtechnology must be accompanied by the development of a new form of liberal education which can provide the consensus for a well-balanced modern society.

This need is further emphasized by the centralizing characteristics of advanced technology. A society where the extent of the economic interdependence is as apparent as is envisaged above is not necessarily a highly centralized one but there is a real danger that it might become so. Many people are rightly concerned that the growth of huge data banks will lead to the invasion of privacy and the concentration of decision-making in undesirably few hands.

Education has a vital role to play in bringing home the liberating and beneficial possibilities of information technology. If knowledge is power, then the computers, data banks and terminals which can allow the contents of all the world's great libraries to flow through every living room in the land must be potentially the most massive influence for personal development. This applies not only to the participation of the individual in government but also to small local units in large companies and trade unions.

Change always presents threat; continuing change permeating every aspect of life can appear so intimidating as to produce mass Luddism or resigned alienation. The only antidote to either is the self-confidence born of knowledge and familiarity. Schools, colleges and universities must produce qualified people able to design, organize and operate the new technology. They will be relatively few in number. The education system must also disseminate computer literacy in its widest sense and accord it as high a

priority as to the older forms of literacy. This is inevitably a complex task. It cannot be simply a matter of devoting a couple of hours a week to an arid study of 'the social implications of computers'; neither can it be simple programming for the uninitiated or playing 'Space Invaders' at public expense. No doubt the appropriate provision will vary very widely from place to place and person to person; sufficient practical experience to create familiarity and allay fear is an essential ingredient. To tackle such difficult and important tasks, it is wise to draw on international expertise. By reporting pioneering work from four continents, this book makes a significant contribution.

Rt Hon Roy Jenkins, PC, is a politician and statesman. He has been Chancellor of the Exchequer and Home Secretary. He was President of the European Commission from 1977 until 1981, when he co-founded Britain's Social Democratic Party. In 1982 he became Member of Parliament for Glasgow Hillhead and was elected Leader of the SDP.

Part 1:
Issues and problems

1. Thinking, learning and educating: the role of the computer

Jacquetta Megarry

Summary: The pace of technological change has outstripped the capacity of the educational system to react to it, let alone to influence it. Computers are powerful processors of information and rapidly becoming smaller, cheaper, and more 'intelligent'. None can yet pass the Turing test for machine intelligence, but this may be only a matter of time. The application of computers to aid human learning has so far made little use of the computer's ever-expanding capabilities and much so-called 'educational' software is of lamentable quality. It is a poor basis on which to judge the medium's long-term potential.

There is a debate about how far educational applications require teachers and their pupils to learn to program computers. The package approach makes computer use accessible to the majority, especially if the program is 'user-friendly' and well documented. Critics say that children should learn to program the computer, not vice versa. Large-scale production of 'black box' packages is uneconomic, over-centralized and tends to reinforce the spurious authority of the computer. The use of high-level languages like LOGO is helpful to promote rapid appreciation of the power of the computer, how to program it and how to debug those programs.

Computers will not merely affect methodology, however, but also the curriculum, possibly the distribution of educational facilities, and perhaps also the nature of its institutions. Knowledge is becoming rapidly obsolescent; today's generation needs information-processing skills and computer literacy. Evaluation studies which concentrate on futile comparative experiments have neglected important questions like the interaction between computers and values.

The reaction of the teaching profession is a key factor. Society must decide to will the means to help and support teachers to incorporate computer-based approaches. The cost of hardware is insignificant compared with the real costs of software development and teacher education. The convergence of technology has opened up such tremendous possibilities for education at a distance that the role and very existence of schools and colleges will be open to question. Teachers should concentrate on performing those tasks where they cannot easily be replaced by microcomputers.

Introduction

Only a hundred years ago, the very idea that a machine could be built to execute calculations was treated with ridicule and scorn. Charles Babbage – whose designs for the Analytical Engine and the Difference Engine were hopelessly ahead of their time – died in obscurity after a life of financial

struggle. Once the technology became available, progress in calculating machines was rapid and the computer* – as it came to be known – went from strength to strength as vacuum tubes gave way to transistors, only to be displaced in their turn by the ubiquitous silicon chip*. With *fifth* generation computers on the way before many people have come to terms with the capabilities of the first generation, the sheer pace and profundity of a truly revolutionary development is difficult to grasp or convey. Exponential increases are always harder to accommodate than linear ones. An analogy with motor cars may help, for the developed world is already familiar with the radical changes which motorized transport has wrought in the environment, the economy, town planning, methods of communication and even on patterns of life and work. But if the internal combustion engine had developed as rapidly as the central processing unit of the modern computer since 1945, a Rolls Royce would now have 45,000 brake horse power, cost £2 to buy, do three million miles to the gallon, and six could be parked on this full stop.

It is not surprising, then, that these developments have overtaken the capacity of the education system to react. Nor is there any sign of fall-off in the rate of change. Bubble memory, the £50 microcomputer*, flat-screen televisions, videodisc* linked to microcomputers, telesoftware* by telephone and broadcasting, combined microcomputer, screen, printer* and power supply in a briefcase – all these are already here, on the drawing board, or in the high street computer shop. There is no reason to suppose that a plateau has been reached in design progress as happened for the motor car in the 1920s.

It is already estimated that there are more video shops than book shops in Britain – how long before there are also more computer shops? The recent convergence of technologies means that equipment already common in homes in the developed world (or becoming so), like the domestic telephone, television, cassette player and video recorder can all easily be linked to a microcomputer and thus amplify its capacity to capture and process information – in Roy Jenkins' phrase to bring 'the contents of all the world's great libraries to flow through every living room in the land'.

Computers and thought

The term 'computer' is, of course, a misnomer. The average citizen has little use for the complex calculations which can be performed so quickly and accurately – helpful though they may be to those who have to land planes in fog, calculate stresses and strains in bridges or monitor production processes in chemical engineering. What makes the general-purpose electronic digital* computer such a significant development is its capacity to store, process and compress large bodies of information. *Whatever* the original form of the information – whether words, pictures, logical statements, music or even

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Explanation of this and other words will be found in the Glossary which starts on page 265.