Concerned Technology in Education Conference

Edinburgh
September 3-7 1984

Editor J G Morris

Published by the Department of Trade and Industry

Concerned Technology in Education:

The report of a Conference held in Edinburgh in September 1984

J G MORRIS – Editor

 ISBN 0 85605 308 2

Published by Department of Trade and Industry. London

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FOREWORD

The organisers of the Concerned Technology in Education Conference were suffering from Conference-Attending Fatigue (CAF) which made them determined to make this one different. They knew what they did not want and that was an endless succession of people reading papers to a restless audience supported by overhead transparencies unreadable beyond the third row. Every one wants inter-action but how do you get it?

Thus summaries of papers were requested from key-note speakers and they were put in touch with other speakers giving Cognate papers but no one was asked to submit a full text. If you write it you feel compelled to read it out.

We did expect technology to be used, and not merely described, and to this end made two bold, even foolhardy offers to speakers:

a Bring with you or request any form of technology and we can cope with it.

b Ask for real live children on the hoof on whom to demonstrate your material, that it does work, if you can cope with them. (Grateful thanks to Lothian Region for arranging for pupils to be present).

Some accepted both challenges; some took one; some took neither.

Finally we pleaded for stress on discussion as much as on exposition. Did it work? If you were there you have already made your own judgements.

If you need statistics then rather less than half the delegates contacted us by letter or by telephone after the conference to express appreciation. Only 4 looked back in anger. What about the Silent Majority? They are by definition supportive — but enough of this self-indulgence.

There has been considerable demand for a record of what was said. It is difficult to persuade people to write their papers after they have performed and in Skinnerian mode we did not do it.

Everyone was taped except those discussants who refused to come to terms with technology and scorned radio or trailing-lead mikes and believed that recording is done by angels.

The tapes were transcribed and edited into this book. Some needed major surgery and others merely a band-aid. It is hoped that delegates will find useful information readily available here and that their best points (as ever) have been omitted. The reason has been lack of insight rather than malice on the part of the editor.

J G Morris
(Editor)

Chapter 1

OPENING CEREMONY

Mr J Allan Stewart

I would like to welcome particularly my parliamentary colleague, Mr Kenneth Baker, Minister of State for Industry and Information Technology. His personal initiatives over the last few years have benefited beyond measure our programme in Scotland in micro-electronics and he has encouraged strong links between our Departments. I also welcome all the delegates and in particular our friends from other countries some of whom have travelled considerable distances to attend this conference to make their contribution. We value your participation very much indeed and I look forward to meeting you socially on Thursday evening at Edinburgh Castle. I hope, too, that by the time you come along to the Castle you will have been able to see some of our beautiful countryside here in Scotland and that as many of you as possible may be able to prolong your visit after the Conference.

Five years ago in Scotland we concluded that the key to introducing new technology in education was software, for it determined the need for essential particular hardware and in-service training for teachers which led naturally to changes in the curriculum. Thus a main feature in the remit to the Scottish Microelectronics Development Programme (SMDP) was the collection, production and dissemination of high quality software. SMDP has made a significant contribution to the development of new technologies but we are very much on the threshold and our visitors may be sure that the lessons to be learned at this conference will be to the benefit of all those with special needs.

I know, ladies and gentlemen, that this Conference and Exhibition will be a successful and satisfying experience for you. It now gives me very great pleasure, your Royal Highness, to invite you to open the Conference.

Her Royal Highness, The Princess Anne

Mr Stewart, Mr Chairman, thank you very much for your kind words of welcome. Mr Chairman, especially, thank you very much for your invitation to join you here today at the opening of this International Conference on Concerned Technology in Education. All of you here for this Conference already know the scope and range of possibilities that modern technology has to offer in all its sophisticated roles, in all types of manufacturing industry, commerce, administration and even farming, courtesy of the microprocessor. I, on the other hand, have only just got past the stage of trying, wholly unsuccessfully, to understand how, and indeed why, the simple computer works.

I have now decided that this is more or less irrelevant or rather unnecessary and that really all one needs to know is that on the whole, it does work and therefore our concern is what it does best and the best way to use it for a given job. Remember that it is a slave and unless you keep a firm grip on it, for example do what you want and not just what it is capable of, it will actually make more work rather than less.

Now that I have got my own natural suspicions out of the way, I can concentrate on what I, needless to say, feel is modern technology's greatest contribution and that is the exciting advances that are being made to assist in education at all levels and particularly for those with handicaps. I will not go into specifics, but it is indeed exciting even to a Philistine like me, to see what is possible through the achievements of science and engineering for people, who previously had found great difficulty in being taught, to teach themselves at their own speeds.

Also those who had great difficulty in being mobile can become more mobile and those who could not communicate at all can now communicate. Whatever the future for a child, the foundation of their lives and their ability to cope will be through education, and through their ability to gain information on a relative subject and communicate with their fellow human beings. It sounds simple; but sometimes the amount that is available for children to learn and indeed that interests them, clouds the fact that there are a few basic principles that are essential so that people of any age may take advantage of all the knowledge and advice that is around them.

For the able-bodied, technology has added interest and range to their normal work, but it also highlights the fact that the ability to read, write and count is just as important to the youngsters of today in order to make the best progress with the technology that they might need to use. For the disabled, it is even more important, especially for the real basics of education, that machines will go on doing the often boring and repetitive work until their user gets it right or perhaps gives up.

Modern technology has opened up new horizons for a complete range of mental and physical abilities. It has done so very rapidly, and it would be very easy to get carried away with what is possible instead of what is practical. The "something is better than nothing" syndrome is not always of much benefit in the long term and education is about the long term, the rest of somebody's life, in fact, although I do appreciate that the average youngster of any period in history has been rather more interested in the short term.

Needless to say, the technicians, engineers and educationists cannot expect much appreciation from those who are likely to benefit most from their efforts but those parents and teachers who are closest to the sharp end of education will no doubt be very grateful. I have a slight concern for the technology because, if my children are anything to go by, I am very glad I'm not a chip!

For the next four days, you will be discussing the problems of children with moderate learning difficulties, perceptual and motor impairment, life and social skills and training. That looks to me as if you will cover a lot of ground; you have a lot of scope there for the future use of software. I hope so because, if life is about the art of communication and education is a preparation for life, then conferences such as this must practice the art of communication for the benefit of the next generation. In declaring this Conference for the Concerned Technology in Education open, may I wish you all a talkative, attentive and fruitful week.

Dr Graham Hills Your Royal Highness, Ladies and Gentlemen, it is now my pleasure to introduce the third and final guest speaker at this afternoon's opening ceremony. As I said earlier, Mr Kenneth Baker is Her Majesty's Minister for Industry and Information Technology.He has made it his business to encourage the development of Information Technology (IT) throughout the United Kingdom and no man has done more to accelerate the country's awareness of IT and in so doing stimulate the modernisation of our industries.

Your Royal Highness, your Great, Great, Great Grandfather, Prince Albert, would have been well pleased with our Minister. Mr Baker has urged on our computer industries; he has urged on our universities; he has urged on schools, into the computer age and now he is urging us to place the microcomputer at the service of the physically handicapped. He believes, and I believe also, that modern technology is here to serve us, to extend our consciousness and our ability.

Your Royal Highness, Ladies and Gentlemen, it gives me great pleasure to ask Mr Kenneth Baker to give the first address of this Conference.

Mr Kenneth Baker Your Royal Highness, My Lord Provost, Your Grace, Ladies and Gentlemen, first, may I on behalf of all of us, thank Your Royal Highness for coming this afternoon to open this Conference. It shows her commitment through her public life of her long interest and devotion to the affairs of the handicapped, the immobile and the disabled and I thank her very much for coming.

Mr Chairman, thank you too for your kind words. It is the first time that the blessing of Prince Albert has been placed upon me, but certainly Prince Albert was concerned with technology and he was living at a time of the second stage of the industrial revolution which was concerned with the harnessing of power and mechanical engineering.

We are in a third phase of the industrial revolution, which started in America in the 1950s, concerned with the micro chip which involves a different type of technological change – communication. I am particularly glad to be here because of the uniqueness of that revolution. The title of this Conference "Concerned Technology" was deliberately chosen. I made a speech about a year ago about the compassionate face of technology because so many people feel that technology is neither concerned nor compassionate. They think of robots; they think of Star Wars; they think of those black and white films of the 1920s with heavy iron figures clumping around, but this technology is much more than that. It certainly involves robots; it certainly involves mechanical devices but the robot is concerned with efficiency and it is being used more and more in industry and will continue to be used more and more in industry. The technology behind the robot and the technologists, over which as Her Royal Highness so rightly said we have charge, and are the masters, does have a human face. It has a human face because it is concerned with communication which is the unique feature of this stage of the industrial revolution.

The involvement of this technology with communication, the other stages, the James Watt stages, and the great engineering achievements of the 19th Century were not specifically concerned with communication; they were concerned with harnessing power through engineering. The current concern is with communication and we are the lucky people, we who have all our faculties and senses and are not handicapped or disabled in any way. We are the lucky ones but we use microelectronics even so to do things more easily, more speedily, more cheaply and it is affecting all our lives, whether it is our children playing around with microcomputers or our secretaries using word processors or people keeping farm records.

The lives of elderly people are now made that little bit more convenient by having a convenient hand-held gadget for switching television channels. Ten years ago that was a rather remote idea; now it is sold with virtually every television set. It is an intrusive technology; it is a pervasive technology and it is going to affect all our lives even more and, as has been said, many people do not have much of an understanding of it.

This is a very professional audience where the general attitude is that it is a good thing and however little we may know about it yet our children will know much more.

So much for the lucky ones. For the disabled, these technologies could be a blessing and bring benefits which could not have been dreamt of a few years ago. That is why we can call it Concerned Technology. Information Technology is often for the very first time providing disabled people with the chance to lead normal lives. It can help the speech-impaired to talk, the deaf to hear through the written word, the blind to read and the paralysed to write. In short, it is beginning to remove from disabled people the very handicaps which would appear to separate them from the others around them as they are unable to communicate. Of course, for our children, it is opening up entirely new worlds and this applies to all children, not just those with special needs.

I am very proud that we in Britain can boast, and I believe that we are the only country who can yet do such, that we have a microcomputer in all our secondary schools and in 25,000 out of our 35,000 primary schools. It is not just one computer; the average is about eleven because as soon as the school has one then the appetite grows with feeding and the important thing about that is that the youngsters of today are being trained in the skills and techniques which will give them the jobs for tomorrow and of course this is also true for the disabled because for them technology can mean the ability to communicate with the outside world for the first time and also the ability to control their own environment. The computer keyboard provides for them not only the motivation to communicate, to learn and to achieve but also, in many cases, it provides for the first time as you will see in the Exhibition as you go round today, the actual physical environment through peripherals, within which the gadgetry works.

Also I would like to emphasise the motivation factor for children with special needs. All too easily young, disabled children can become withdrawn and conditioned to failure. The ability to succeed without outside help can have an enormously encouraging effect. It can increase that essential element, confidence. Sadly many handicapped or educationally less able children are written off by society as incapable of playing a full role. The implication is that it is not worth expending too much educational effort upon them. The computer is already proving how very far from the truth this attitude is. Given the infinite patience of the computer and the motivation of self-achievement at their own pace many children, previously regarded as slow, are proving that they can compete with the best.

The computer can help to penetrate the mists that cloud some children's minds and it can help overcome the disadvantages and frustrations which they experience by not sharing our fortune in possessing all the facilities that we, the lucky ones, take for granted. Through the microelectronics programme which operates in England and Wales and through the Scottish Microelectronics Development Programme, we have established a number of centres concerned with these problems to help and assist these children. These centres provide practical experience, teaching and advice in all the latest technologies for teachers in special education and they play a leading role in actually teaching the teachers. That is one of the problems that we have had in introducing computers into schools, that teachers too have to learn.

Through my own Department of Trade and Industry, we have supported a major programme to develop new products such as the Turtle and the Sound Bubble, which I think you will see later, for use in Special Schools and we have encouraged teachers themselves to influence future developments by placing new products in the schools at any early stage for assessment and comment. This is an experimental, free form stage. That is how it should be. We want ideas to come from the schools to us, rather than impose them from above. We have provided funds for a range of peripheral equipment to accompany the computers.

Many schools have set up joint school and community clubs where parents and children can explore the potential of the computer together and we have tried to encourage this. We have helped others by providing bursaries to send deprived or disadvantaged children to computer holiday camps during their school holidays. We have run exhibitions and demonstrations and tried to take them to the doorstep of the teachers and educationists who need to see them. We have also funded the development of educational software which is vital if the rest of these measures are to succeed.

Software is the key. Software is like music. The hardware is like the grand piano and we are issuing today a new suite of music as it were, 25 educational computer programs — The Microspecial Pack — developed here by the Scottish Microelectronics Development Programme with funding from my Department. Many of these programs were originally devised and designed by teachers in Special Schools throughout the country and we believe that they form a unique package which will introduce many more teachers to the best in computer teaching practice for children with special needs.

Children with Moderate Learning Difficulties: their Characteristics

The terms used for this group of children who are 'slow learners' has varied from time to time and from country to country. The method of identification has varied (whether partly or solely by intelligence testing) as has the cut-off point, and thus the exact proportion of children so identified, also the provision, whether in ordinary schools with support or in special schools or classes. Whatever the term used there are children within any system of compulsory education who are sufficiently delayed in their general progress to require additional help of some kind. The major identifying feature of these children is their general and increasing failure within the educational system not explicable in terms of absence, change of school or other handicapping conditions. Such children are not, however, exempt from these latter characteristics and many are indeed likely to have their progress even further limited by intermittent absence, possibly by changes of school and even by one or more handicaps, in some instances undetected, or not severe enough for them to be classified by these. Additionally this group of children, likely to form about 75 per cent of the children regarded as having special educational needs, is likely to come from so-called disadvantaged homes and thus to be found in greater proportions in certain areas and schools. The extent to which children do progress in education, and the proportion who master the basic skills with sufficient competence to use them for access to a wider curriculum, will clearly be related to the skills of the teachers, to the support of the homes and to the motivation of the children themselves.

The potential, and the limitations at the current level of development, of educational technology for children with moderate learning difficulties may be most effectively discussed within a framework which identifies some of their key characteristics and relates these to specific aspects of technology.

Characteristics of Children with Moderate Learning Difficulties in Relation to Technology

In a recently published booklet entitled, *Microcomputers and Special Educational Needs* (1984), Hogg lists eight features often associated with children with moderate learning difficulties as follows:

1) difficulty in making and extending associations
2) restricted ability to interpret abstractions
3) lack of intellectual curiosity
4) inability to generalise from observations
5) short attention span
6) poor retention of ideas in short term and long term memory
7) limited ability to transfer learning
8) impoverished sensory perceptions.

Not everyone would necessarily accept all of these points in relation to all children classified as having moderate learning difficulties: they do, however, give a more tangible representation of the nature of their limitations. To these I would wish to add two further aspects of relevance to the topic under discussion namely:

a) early experience of failure within education

b) limited ability in the basic skills (or at least limited understanding of print).

In what ways can technology assist such children and what features are necessary so that it can contribute to their education? It is possible to relate specific and positive features of educational technology to the eight points noted above and these are listed below (from Hogg 1984):

1) *pupil control* of the materials may reduce its 'distance'

2) *simulation* can be constructed which may visually bridge the gap between the concrete and the abstract

3) *interactive nature* of micro experience can promote curiosity

4) *personal involvement* which is possible may enhance the pupil's ability to generalise

5) *high level of interest* may encourage persistence of attention

6) *increased motivation* may help in the retention of concepts

7) *new confidence* may result in risk-taking in applying a variety of concepts

8) *modified keyboards,* graphics, music and arts, speech synthesisers may all compensate for 'impoverished' sensory perception.

The characteristics of the children referred to earlier and the feature of technology related to these quoted from Hogg (pp 15, 16), were extracted by him from a 'Schools Council' report published in 1982 on 'Microcomputers in Special Education'.

The points noted above reflect the potential of computers in education: it is equally important to consider the weaknesses and dangers in microcomputers, particularly at the present stage in their development and that of the related software. These may be even greater for the children with whom we are concerned in this paper who are likely to have limited vocabulary, limited reading skills – and limited outside experiences to which they can relate the materials they view on screen and the experiences that are 'simulated'. Before turning to this group of children it seems appropriate to consider briefly a number of points which apply generally to the application of technology in education, not merely in relation to children with learning difficulties, if technology is to *aid learning* and not to *direct* and *control* learning.

Computer Assisted Learning: its Strengths and Weaknesses

Computer Assisted Learning can facilitate learning by its potential flexibility, by its speed of information processing and its capacity for interaction.

It can for example provide an *interactive book* which through careful writing can be a more stimulating alternative to traditional reading (for some aspects).

It can *increase children's knowledge* and ability to handle ideas.

It can give *drill* and *practice* where needed (and with patience which is untiring, predictable and consistent).

It can open up *new areas of learning* which may be creative and exciting.

It can provide *learning packages* which are potentially *individualized* for speed and level of entry.

It can provide a *record of performance* and progress for teacher and child.

In short, it can give support to conventional teaching and help to develop new skills.

There are however, dangers that

- it may *result in the teacher becoming a frustrated computer supervisor,* copier of programs, learner of programming – or a rather limited technician (because of the lack of such resources on call within the classroom)

- it may *determine the curriculum* content and emphasis (because of the need to limit it to what is currently programmable)

- it may *determine the teaching style,* method of presentation and organisation of the classroom (especially while the computer resources are in short supply)

- it may *dominate teacher-training* and in-service courses (particularly as a technology with which teachers are unfamiliar and of which many are scared)

- it may result in a focus on *technical aspects* rather than issues

- it may adversely determine or *influence promotions* within education

- it will certainly *claim a disproportionate amount of the scarce resources* within schools even where capital is provided for initial purchases (this is inevitable in a new and rapidly developing area where initial purchases will quickly become obsolete)

- it may attract a *disproportionate amount of research funding* at the expense of other equally important areas and issues

- its development is currently dependent on the enthusiasm, time and skills of a limited number of committed teachers.

There are already four 'Es in educational technology: energy, enthusiasm, expertise and expenditure. Although necessary these are not sufficient conditions for the introduction of technology throughout education. It is important to bear in mind the following cautions:

a) The computer is not neutral

b) Certain types of activities are more easily placed on a program and these are likely to be of a drill and practice variety

c) Programs may necessitate that a child already possesses a certain degree of knowledge, practice in which the program may provide (a program may claim to be teaching which is in effect only testing)

d) Programs may require skills, knowledge and a background not indicated in accompanying notes (which may refer to keyboard skills rather than concepts)

e) Commercially produced programs which are increasingly becoming available will inevitably be backed by 'hardsell' techniques claiming they have been 'extensively researched, evaluated, are useful for a variety of age and ability levels' and for a variety of purposes

f) Programs may not be flexible and adaptable but produced in such a way that they dictate the approach, content and order of presentation

g) Programs may give extensive practice in skills not necessarily important themselves but claimed to be related to others (such as for example reading or spelling or mathematics) yet where evidence of the transferability has not been substantiated

h) Programs may not be adaptable to use with limited computer resources, or in a classroom, and with groups of children widely different in ability and entry skills

Finally

i) Programs may result in interaction, but with the computer. The novelty may wear off for some children who may find the experience not challenging, but limited and frustrating, and whose 'interaction' with the computer may be at the expense of interaction with others and the development of oral communication skills which are crucial for later social, and occupational, success.

While some of the cautions noted above are important for all teachers,some of the dangers are particularly relevant to those working with children who have moderate learning difficulties in view of the characteristics of such children referred to earlier. There are exciting new possibilities for such children within either current or future developments in educational technology, provided those involved with their education are cautious in their adoption of the new approaches, evaluating their potential for *their curriculum* and *their children.*

In the final section of this paper I would like to draw attention to some aspects which may be of particular relevance to those selecting educational software and related material for children with moderate learning difficulties.

Educational Software and Children with Moderate Learning Difficulties

'The Scottish Microelectronics Development Programme' has been responsible for a number of publications which seem to provide valuable guidelines for teachers involved in assessing, or developing computer software. One of these entitled, *Educational Computer Evaluation and Design* (Beveridge 1982) sets out a series of criteria to be considered including the educational objectives of the programs, their use in practice, their structure and design, the extent to which they are under 'learner control', their 'robustness', whether they are easily modifiable and as 'content free' as possible. To quote, 'We have so many good reasons for using computers that we do not need to drag them in for the sake of it' (Beveridge 1982, p 4). The importance of extensive testing of programs and of producing packages for education to agreed standards is stressed even if this means fewer programs. Within SMDP several publications have appeared which give guidelines for presentation standards to ensure that programs are 'reliable, robust and user-friendly', and to ensure consistency and continuity between different programs, also standards for program documentation.

A research project has also been undertaken in Scotland to produce a 'Micro special Starter-Pack' based on these guidelines. This 'pack' on life and social skills, intended for older children with moderate learning difficulties has been developed with the involvement of teachers of such children. Some of the programs have been devised within the research; others are modifications or simplifications of existing programs. A number of the programs have potential for use with younger children also, especially those programs which are 'content-free' and provide a framework within which the teacher can introduce appropriate content, or flexibility for modification by the teacher.

Brief reference will be made to a selection of the tasks represented in these programs which appear to have potential for extension of the curriculum for children with moderate learning difficulties, other versions of which may be or become available in commercially produced materials.

1 A program may provide flexible ways of presenting text which may be both inserted and revealed as felt appropriate by the teacher. The text may be varied in difficulty and content to encourage the children to read for understanding, to predict, and to appreciate the sequential probabilities in written text. Such programs may be used with individual children, or for small group discussion. With access to a printer the imaginative teacher can also produce a variety of resource materials for use away from the computer.

2 A program may provide access to a simple form of word processing thereby assisting the child with moderate learning difficulties to produce written communication which can be drafted and revised as appropriate. This also can be used either individually or with small groups co-operatively planning a written text. Initially the children's attention may be predominantly on the correction of surface features of the written language. The creative teacher can encourage children to extend the length of their written text, to improve its quality and extend the subjects on which they write. With the aid of a simple printer the children may have an opportunity to see their own written productions in a variety of layouts, thus stimulating them to further activity.

3 Programs in social arithmetic may provide both drill and practice and provide simulations of budgeting and banking activities. These may make possible the provision of a variety of tasks at varied levels of difficulty and with different materials to encourage generalisation. Such simulations must be related to 'real life' activities but they can at least take a step towards that by relating the development of the skills to social situations.

4 Programs involving the planning of routes, of map reading, may help in the development of ideas on direction. The possible abstractness of some of these ideas, even on a screen, must be borne in mind and the possibility that they may face the children with frustrations that they would not experience in the real life situation. The involvement of small groups of children, if carefully planned, may make such activities more stimulating as well as providing a more efficient utilization of the micro-computer.

5 Programs involving for example, a space journey and necessitating planning and execution of a series of activities both on and away from the computer may be stimulating and challenging. Related activities, involving for example access to a tape-recorded message, or written notes or illustrative materials, may both stimulate a group of children to compete with other groups towards solutions of related tasks and result in increased and educationally valuable oral communication between the children. There are commercially produced materials now being planned with time on and off the computer and with related language activities for groups of children.

6 Artistic programs may provide for the children opportunities to produce and develop their own graphics or music and thereby give new opportunities to children with relatively limited ability in motor co-ordination.

Conclusions

Teaching skill and organising ability are always important to success, and no less so when using a computer. It is essential that the computer should complement good teaching and not merely protect and computerize out-dated or traditional practices, protected from innovations by their transfer to software in the technological revolution. It is essential that the programs are designed with the children's needs and the aims of education in mind. This does not mean that teachers themselves should become programmers. The rudimentary programming skills which teachers in special education could acquire in the foreseeable future, might merely delay or prevent the development of the more exciting possibilities. What is crucial, is that the teachers, and their advisers, know enough to recognise a good program, to identify bad programs and to diagnose whether they are 'remedial'.

They must be able to enter into dialogue with programmers and to define their needs with sufficient precision that they can capitalize on the new technologies, yet retain control of the curriculum so that it is supported and extended in ways that are educationally desirable.

References

Beveridge, W T (1982) *Educational Computer Package:* evaluation and design, Scottish Microelectronics Development Programme.

Hogg, B (1984) *Microcomputers and Special Educational Needs:* A guide to good practice. National Council for Special Education (1 Wood Street, Stratford-upon-Avon CV37 6JE, England).

NB The booklet by Beveridge referred to above, other resources materials and information on the 'Microspecial Starter Pack'' may be obtained from:

Scottish Microelectronics
Development Programme
74 Victoria Crescent Road
Glasgow G12 9JN
Scotland
Tel: 041-357 0340

THE MICROSPECIAL PACK

David Walker
Director,
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Ladies and Gentlemen, normally we express gratitude to support teams at the end of a conference. This is my only formal presentation at the conference, so may I express my personal appreciation for all the efforts of my staff at SMDP in putting together the elements of this conference. If too many disasters occur this week then these are likely to be the only kind words my staff will hear from me! We will, of course, try to protect delegates from the problems and traumas of interactive disasters.

Yesterday was a difficult day, but within expected panic boundaries. This stadium was used for the Edinburgh Marathon which was scheduled to finish at 5 o'clock, but with a field of some 3000 runners it was inevitable that some stragglers came in rather late. Staff could not start to move in equipment, lay down power lines nor begin the erection of this platform until late in the evening, but we were able to open the conference on time.

This paper draws upon our experiences and changing perspectives in the development of the MicroSpecial pack.

During the past year we have lived in what can only be described as a total development environment. Although we have been involved with Special Education projects for many years, it is our experience of Microspecial which has finely tuned and focussed our activities towards what we consider now to be an optimum development model for software generation which can satisfy both educational content and economic production.

An intensive software development project within the Special Education sector may seem an unusual choice. Some would expect the project to have been centred in the secondary school sector or with groups of pupils with high academic potential. The secondary school sector has developed well-defined curriculum guidelines and limits and it would be difficult to respond readily to experimental demands for radical changes in educational methods and in the curriculum – which may have resulted from such a project. The curriculum limits and guidelines for children with special educational needs have greater flexibility and allow designs to reflect individual pupil's needs.

This environment may be the best one for evaluating the educational uses of information technology across all levels of education.

When I look back over the last few years I do so with a real feeling of embarrassment. I remember views and beliefs held by our team which we now condemn in others.

Today there are well-meaning but inexperienced agencies and institutions which believe that there are only well-defined and tangible requirements for children with special needs:

a) children with mental impairment require simplified, enlarged and slow progressing text with associated rewards, designed to maintain behavioural tranquillity rather than stimulate demands for knowledge;

b) children with impaired vision require only such text with no other design criteria than that colour may possibly play a part in presentation;

c) physically handicapped children are unlikely to obtain employment so all new technology should be focussed on their personal environmental control;

d) all children with impaired hearing will also have mental impairment and all teaching materials should be visual and childish in presentation;

e) all technological developments for the disabled can come from spin-offs from the more economic and domestic projects.

Such misguided perceptions determine that we cannot afford to have the development of educational media remain within the dominant control of well-meaning yet uninformed developers. Also relevant and valuable experience should not be constrained by regional, national or socio-political boundaries.

New technology will wait for no-one. It can often seem impersonal with its all-embracing scientific drive. If not monitored carefully, it may deviate from humanitarian principles.

Let me put the experience of producing Microspecial within the framework of Scotland and SMDP. In Scotland we have a population of approximately 5.2 million and a school population of approximately 1 million. Through SMDP activities, resources equivalent to £1 per school pupil are directed to educational information technology developments. Other resource inputs from local and central governments and other authorities raises this figure to between £5 and £6 per pupil. At present SMDP is devoting 20% of its resources towards projects for children with special educational needs.

Our figures could be multiplied by a scale factor of 10 to obtain an estimate of the UK's involvement in educational information technology. Please multiply only the financial and physical resource figures by 10, not the quality! In terms of quality we require a different scale factor.

We have an advantage in Scotland of a single Examination Board and a single Consultative Committee on the Curriculum. A further advantage, particularly with new technology, is that our Minister for Education is also Minister for Industry.

In August 1979 I was seconded from my College for two months to survey Scottish education and determine the state of the art in microcomputing and microelectronics. In October 1979 the first Phase of SMDP started, followed by an extension in 1980 giving our initiative an initial four year project life. From April 1984 SMDP became a permanent organisation as a Division of the Scottish Council for Educational Technology. Our Minister gave us this remit:

1) the development and maintenance of a national software library;

2) the development and maintenance of a national information service;

3) the design and implementation of a research and development strategy.

We have grown from a staff complement of one in August 1979 to a complement today in September 1984 of 63, which includes 35 programmers and analysts.

The Department of Trade and Industry has played a leading role in the development of a whole range of new technology devices for children with special needs, and we have worked closely with them. Last year, after many exhaustive hours of investigation and debate, with the inevitable weighing up of resources and priorities, we decided to go ahead with a joint project called "Microspecial".

Because of the relatively short shelf life of good educational software we endeavoured to develop techniques to accelerate the production and educational evaluation cycles without losing quality. This meant identifying consultants, teacher development teams and schools for field testing of materials, through a United Kingdom network, to harness all the valuable expertise.

A central Microspecial team was set up in Glasgow, headed by a Co-ordinator, with programming and administrative support. We have seen the emergence of a new category of persons whom we would define as educational programmers – as distinct from commercial programmers or educationists with programming ability. The emergence of the over-riding importance of software specification occurred at a very early stage of Microspecial development.

There emerged what we called the 5-day specification. After many hours of teacher working group discussions we found the first specifications required five working days from a programmer to produce the first model – not necessarily in a technically friendly state. After an early evaluation period, the teacher working groups, drawing on the experiences of staff presentations and pupil reactions, not only fine-tuned the presentations, but also re-defined

the specifications using the five-day model as the stepping stone between ill-defined group interpretations and individualised perception towards collectively agreed content and methodology. Once the final specification had been agreed, tuning continued by telephone or correspondence. This was particularly acceptable in Scotland with its dispersed population, yet the SMDP development team also travelled widely for final consultations with teacher groups.

From previous experience, and from this new experience we have defined what we consider to be the optimum software development team, reflecting the current top of the state of the art. The structure of the team is based on a throughput of some 50 to 60 software packages, similar to those of Microspecial. and includes:

a) an educational liaison function to interface with teacher working groups and to validate the software, documentation and teaching strategies;

b) a technical systems function for systems design and implementation, coding and technical quality control;

c) a development and production services function, staffed to cover the development of technical tools, sub-routines, standards and also the servicing functions of materials progress control and production.

Such a team, to obtain quality standards and output must be staffed and resourced to the highest standards. It will cost between £200,000 and £300,000, to produce top quality educational software and associated resource materials, with an average development cost per package of £4,000 to £5,000.

The team approach is essential as it brings together the specialised talents of the teacher and the talents of technical and programming staff with their increased sensitivity. For optimum and constructive interaction it has been essential to balance:

a) the correct educational input and direction;

b) the degree of new technology input and development;

c) the test group mixture.

The Microspecial development team were anxious to cover as wide a range of activities as possible without sacrificing curricular structure. They decided on a range covering personal and social activities and preparation for post-school. This involved more than 100 initial software specifications. Although our intention was to develop 25 packages for Microspecial, yet we required a ratio of four or five to one to allow for re-definition, educational acceptability and, even now, technical restraints.

As teachers in special education emphasise, in preparing children for post-school life rather than for academic certification, the last few stages may be more significant. Yet in pioneering work there are no guidelines, and, no case studies for evaluation, but we were able to adapt some materials designed for different children with different abilities.

The conceptual barriers of information technology, at the initial stages, are often hampered by inappropriate levels of subject matter. We now have a rich base of materials to help teachers within all school education.

Computers and computer software were initially viewed as number-crunching facilities. With more experience, even with newly formed groups the number-crunching role of the computer took on a less prominent role.

Drill and practice routines formed a natural development path.for the teacher development groups. Unfortunately, for some people these routines define the limits of computing and have a dominant application for children with learning difficulties. They are one of many tools of learning.

Drill and practice programs were once mainly alpha-numeric but the teacher groups progressed from "mundane" drill and practice, adding graphics, sound, and remedial loops.

Editor's Note

[This paper continued, supported by computer graphics suitably enlarged for group viewing. As yet, there is no system for reproducing such a medium in print. All the comments made related to the programs in the Microspecial Pack. The programs are now listed.]

The Microspecial team members worked within the three themes, agreed after many hours of discussion:

a) my ideal world;
b) a place of my own;
c) getting there.

Each team member, subconciously or otherwise, re-defined the themes during the fine design stages of the materials. We decided that a 25 program pack was adequate, at least initially. I have looked at these programs and have grouped them in a different order, in 9 themes:

1)	Recognition	3 units
2)	Educational tasks and games	3 units
3)	Educational investigation and problem solving	4 units
4)	Creative	2 units
5)	Outside interests	2 units
6)	Preparation	2 units
7)	Home and personal management	4 units
8)	Outside skills	3 units
9)	Outside requirements	2 units

Some units may be placed in a number of themes, where their relevance would be developed by the teacher. Good teachers can create an absorbing lesson using any number of ordinary devices, eg, a piece of string, a glass of water, or even a computer.

The main target group for Microspecial is 14–16 year old pupils with moderate learning difficulties. Much of the software is concerned with 'Life and Social Skills' and covers activities from dawn to dusk including:

a) "Rise and Shine" in the morning;

b) music;

c) investigative and creative problem solving;

d) a complete range of further materials related to future developments.

The perception of computer software and the logistics of software development production have passed through many phases since the late 1970's yet to the technically inexperienced teacher,information technology can still be considered as uncharted territory. The process of introducing information technology to teachers of pupils with special educational needs did not differ significantly compared with other teachers, but they were more aware of the need for carefully designed and educationally acceptable graphic presentation, balanced text and the rewards of creative role-playing activities.

The modules of the Microspecial pack add to our resource base of teacher training materials related to distinct stages of development, although not representing a linear progression towards an ultimate or optimum technique. The identified stages allow for a natural progression of teacher awareness and understanding, leading to an overview of current techniques and educational arguments.

This concept based on our observations of teachers' reactions and expectations of progressive stage development is useful.

The stages of awareness are clearly identified through presentation techniques which, at present, include:

1) number crunching
2) drill and practice
3) the computer blackboard
4) the inter-active blackboard
5) creative techniques
6) word processing
7) databases
8) role-playing
9) post-school activities
10) post-school responsibilities.

1 RECOGNITION

Shapes: Allows pupils to create complex pictures using simple building blocks (squares, triangles).

Coins: Gives pupils practice with coins and simple money problems. Uses 7 coins from 1p to £1.

Clocks: Gives pupils practice with clockfaces and telling the time. Uses both digital and written descriptions; introduces 24-hour time.

2 EDUCATIONAL TASKS AND GAMES

Paper round: Pupils must choose the shortest route around a simulated "paper round". The map is displayed on the screen. The teacher can vary the degree of difficulty.

Classmates: Builds up a "tree" of information about members of a class. Pupils are encouraged to consider qualities possessed by their classmates through YES/NO questions.

Operation Konlee: Pupils are encouraged to carry out various exercises within the context of a space adventure.

5 OUTSIDE INTERESTS

Weather: Pupils are encouraged to measure aspects about the weather and compare with the local newspaper. Data are entered into the computer and presented in graphical or tabular form.

Summer holidays: This is a simulated travel agency. Pupils can book package holidays at a variety of European resorts.

6 PREPARATION

Rise and shine: Pupils must make decisions about getting up and going to school.

Timetables: Pupils must help Lenny to decide which bus to catch, and then leave home in time to catch it. Introduces "Limited Stop" and "Saturday Only" features.

7 HOME AND PERSONAL MANAGEMENT

Food for the family: Pupils shop for a week within a limited budget. An assessment of the nutritional value of the chosen foods is optional.

Eating for health: Helps pupils to appreciate the food value of various foodstuffs. Pupils must plan a day's eating to achieve "healthy" targets.

Survive: A decision-making game testing the pupil's ability to budget on a given weekly income.

Safety: Pupils must identify unsafe features in a scene displayed on the screen.

8 OUTSIDE SKILLS

Keyboard skills: A series of games (exercises) which require knowledge of key positions on the keyboard as well as a degree of dexterity.

Colourword: A large-character word processor to introduce pupils to the concept of processing text. Has an associated dictionary containing "known" words for each pupil.

Datafile: A simplified database system.

9 OUTSIDE REQUIREMENTS

Bike insurance: A simulation program which indicates the issues involved in taking out an insurance policy.

Bank: Offers a simulated bank account facility for pupils. Pupils may deposit cash, write cheques and use a cashcard.

I hope that in the months to come we may increase both the themes and units of the themes through cooperation – nationally, internationally and intellectually.

LANGUAGE

Heather Govier
I T Unit,
Davidson Centre,
Croydon.

Mrs Govier stressed that she wished to have an inter-active group with discussion and interruptions but accepted that it was too large a group for seminar-type work.

She chose 6 programs from the MicroSpecial Pack as it was the focal point of the Conference. Other programs would have been equally appropriate. Her own experience was with pupils in ordinary schools and with their learning processes. Many pupils have a history of failure. The micro-computer and programs of the type demonstrated provided new motivation, rather more for boys than for girls, because of the content.

She saw computers as a focal point for group teaching and not isolating features as some had envisaged. They did encourage talk and better than that, communication. "Classmates" and "Operation Konlee" were used as examples. They encouraged communication. She saw little value in a pupil working alone at a microcomputer. Groups could take on roles.

"Findword" and "Reveal" were also used as examples. Some criticism was that the amount of written instruction was too great. She contrasted them unfavourably with "Granny's Garden" in this respect.

Comment from the audience that much of what was done could be done equally well with an overhead projector was not accepted as it was less flexible in use.

Mrs Govier described her experience at a Conference where practitioners and workers in Artificial Intelligence were present. There was little communication between groups. Her view was that the actions of teachers in using micros were as valid in reaching conclusions about pupil learning as was the work of researchers.

Two other programs, "Context" and "Colourword" were then considered for their use in word-processing as a learning technique. The latter had useful facilities and was designed for use with a Concept Keyboard which was a further advantage. Word-processor programs encouraged pupils in writing as their mistakes could be rectified quickly.

The question of intelligent guessing in programs with missing words was considered and the group had mixed feelings about the educational value of this.

Mrs Govier praised the type of programs which encourages writing, such as "Reveal", and finished with a description of "TRAY" from her Croydon project which she found particularly advantageous in use.

NUMBERS

Brian Fitzsimons, Northern Ireland Council for Educational Development

One of the features of the Conference was that presenters had the option of using pupils when demonstrating micro programs. Lothian Region were good enough to make arrangements to have school pupils of appropriate age and ability present. Mr Fitzsimons chose to use them in his demonstrations of programs for teaching Number.

One program used was "Weather". It involved collection and inputting of data, manipulating it, changing it, storing it and adding to it at different times.

The audience response was critical in that the Screen was too cluttered. A further point was that the data could have been used equally well on wall charts. This led to discussion of the most appropriate use of the computer. Agreement was reached that computers should only be used if they had a distinct added value to the learning . A second program called "Bank" was shown and it was considered more appropriate as it was a simulation of using a bank account via an Autoteller. It is not the function of a program to show the versatility of a machine but to provide good quality learning material.

Subsequently a block of programs was used to bring out mathematical concepts. They allowed flexibility to the teacher to set varying levels of difficulty. Also they attempted to match the interest level of pupils with their ability level, something which was often a problem with pupils with moderate learning difficulties. All the programs had aspects of life and social skills within them. It was the job of the teacher to use these effectively as well as to enable pupils to work with numerical information.

Programs used were Coins, Clocks, Paper round, Timetables. The first had real coins and two-dimensional representation of coins. Interfacing was eased by using a Concept Keyboard to enable responses to be single point entry, a feature useful for physically handicapped pupils. The program had a sound option available. Reaction was mixed as to its value but it was considered beneficial to be able to turn it off.

The battle-scarred teachers in the audience tested the limits of reliability of the apparatus by pressing the same square on the concept keyboard over 400 times in succession. It still worked.

"Routes" had more options and thus its level of difficulty could be much more varied. The problems could be formulated as multi-step ones. It was important to identify clearly start and finish points as parameters. Planning

in advance was seen to be difficult as it required a mental rather than a practical response. Also pupils tended to be constrained by trying to find one continuous route without doubling back. Every junction was a decision point. It was felt that many problems leading to failure by pupils could be eased by a paving-stones technique.

Clocks was demonstrated and the fact that the overlap for the concept keyboard could be changed to vary the level of difficulty was commended. The introduction of performance against a time-scale was also appreciated.

Timetables related the ability to tell the time with the ability to use it to plan activities and to judge lapsed time when following a route with a mixed form of locomotion (walking, riding in a bus) and an end objective for a specific time. Social aspects were included related to the importance of the objective whether work, meeting a peer, meeting an adult.

The graphics were much appreciated and the idea of activities taking place although no-one was looking at them and the ultimate effect of this would have pleased a theosopher.

Some of the discussion involved reference to other programs (unseen) which may have done the educational job better but the majority view was that this was a suite of programs and thus more useful than a discrete set.

LIFE AND SOCIAL SKILLS

Dr Victoria Nash: Co-ordinator of Micro-Special. SMDP

As the Project Co-ordinating Officer for the Microspecial Starter Pack, to give it its full title, I have been responsible for its overall production, from conception to delivery. The whole project has taken nine months. It has not been the easiest of births, but time may prove that it was well worth it. If I can continue the analogy, someone once called me 'Mother Microspecial'. I am not saying who the father is. Like any proud mother I know the baby best, so if you have any questions about the pack please ask me. I can not promise to answer them all myself, but I can at least point you in the right direction.

This morning David Walker spoke about the rationale behind the development of the pack and detailed some of the processes involved. I want to demonstrate some of the programs to you, Heather Govier and Brian Fitzsimons will show others. The breakdown is Heather showing programs concerned with 'Language', Brian with 'Numbers' and myself with 'Life and Social Skills'. Dividing up the twenty-five programs in this way was no easy task, and perhaps some programs which you see in one session will be applicable in another session. On Thursday morning you will have a further opportunity to see the pupils here and the pupils in Brian's session using the programs in an informal session.

Let me introduce Mrs Davies and Miss Walker from Pilrig Park School in Edinburgh. They and their six pupils will demonstrate some of the programs.

The development of Microspecial was closely linked to the curriculum followed by the target group, that is 14 – 16 year old pupils with moderate learning difficulties. The whole range of experiences that we offer the pupils should be influenced by realistic appreciation of their future. What are we preparing them for? There is no short answer. Very little is known about what happens to these pupils when they leave school. Corrie and Zakulkiewicz of Scottish Council for Research in Education are researching this area.

In many schools in the United Kingdom especially those in Scotland, there is a particular effort in the final year to prepare pupils for the transition into the adult world. It is this final year curriculum or Leavers' Programme, as it is known in Scotland, which guided the development of the Microspecial Pack, although because of their flexibility many of the programs can be used with younger pupils. Consumer education is a prominent feature of the curriculum, and in particular, budgeting. The program 'Survive' was specified by a group of teachers from Wales. It offers pupils the opportunity to extend their experience of budgeting within the constraints of a realistic weekly income, some of which is already ear-marked for regular commit-

ments. The object of the program is to encourage pupils to think about what they should buy, or what leisure pursuits they can afford, to keep a record of their spending and keep out of debt.

James (a pupil) is working through this program with the aid of a calculator, and a worksheet. He has been given £30 to spend and he has to survive over a two week period. You can hear the sounds coming from James's machine. This is a teacher option, yet I have never been into a school yet, where they have turned the sound off.

James's weekly bills are for home, magazines, youth club and bus fares. The program asks 'How much money are you going to give your parents?'. He responds and the computer also responds with an appropriate sum. James has to check what is on the screen and what is on his worksheet, including the other expenses. Using his calculator and his worksheet he makes the calculation. He has then to calculate how much money he has left to spend, and copy that figure into his worksheet. He decides to spend it on fun, and his options are Leisure World, football, and video hire. These are under the teacher's control and can be changed. They may have to budget for anything from one to four weeks.

The worksheets which accompanying this program, and all programs in the pack, provide further extension work for the pupil. The documentation includes teachers' notes, which is a vital part of every package. Discussion and evaluation of the consequences of the choices made can take place at each stage of the program. The program allows pupils to try out different spending strategies and see the effects without suffering the real consequences. It offers them the opportunity to practise their budgeting skills, adding, subtracting and planning in a realistic and inventive and adult framework.

Careful and inventive use of graphics, animation, sound and screen transform what is essentially an arithmetical task into a motivating game holding the pupils' often short attention span, increasing interest, motivation and confidence. Many people think that much primary software is appropriate for Special Education. It may be intellectually appropriate but is usually not emotionally appropriate, so we have tried to provide something which is both intellectually and emotionally appropriate.

The program Survive is more than just about budgeting for the pupil. There is a hidden assessment element by which the teacher can monitor the pupil's use of the program, decisions made and time taken.

Home Economics teaching in the curriculum includes preparation of simple meals, both buying and cooking, and the appreciation of basic diet and nutrition. The program 'Food for the Family' which originated from St Andrew's College of Education in Glasgow, gives pupils the opportunity to make decisions about the amount of money to be spent on food, by a family of whatever size in one week, and plan how that money should be spent. It can lead to group discussion about the relative requirements of

different individuals, and to methods of cooking and their effect on diet and health. The documentation suggests an appropriate teaching plan and presentation and follow up, and the activities of the program can be extended through the use of the worksheets.

The program 'Eating for Health' raises awareness of the relative nutritional value of a number of common foods, and encourages pupils to think about diet by analysing a whole day's intake of food. The program uses the concept keyboard and a set of overlays. The pupil selects whether he wants to role play or to try out, or select a day's food perhaps, for a workman, or a teacher, or an old person or even for himself.

The targets which are specified on the overlays are body builders, energy givers, fibre and body protectors. So the effect of the pupil's choice is shown on the bar charts immediately. This is a vital contribution from the micro-computer, giving concrete experience for effective learning.

One of the concerns of the project was to effect curriculum relevance over the four countries involved in Microspecial. There were very few differences in the curriculum across the four countries, at least in Special Education, in the 14 – 16 age group, but 'Food for the Family' was one. In England they talk about 'lunch' and 'dinner', in Scotland we talk about 'dinner' and 'tea', so the program includes a little editor, by which the teacher can choose the title of the meal. We cater for every foible.

Home Economics also makes a contribution to Health and Social Education as many adolescent pupils with moderate learning difficulties have problems with self concept, how they feel about themselves, and how they think other people feel about them.

The program 'Rise and Shine' provides a focus for discussion related to choices about how to start the day, and raises consciousness about a number of issues, such as getting up on time; when to wash; whether to eat breakfast, and so on. Scoring scales are 'How you feel' and 'Nice to know'. A complete list of the choices made is collected and used for discussion. If the pupil is honest in his choices then the computer is a silent critic, not an irate parent or teacher. It is possible to cheat, but this in itself can lead to a discussion of the consequences of being bad or an exploration of the effects of being good. These in turn could result in a short story or play entitled 'My Best Day' or 'My Worst Day' with role playing and reflection on the consequences of one's behaviour. The format could be readily adapted to other situations, such as preparing and attending an interview, visiting a friend or relative, and in each case discussing the appropriate preparations for the activity concerned.

Safety in the home is a well established feature of the school curriculum. The program 'Safety' is designed to aid teaching in this area, by testing the ability of pupils to identify common danger points in the home, their causes and ways in which they can be remedied. The pupil moves the cursor to the point in the picture which he thinks is dangerous and presses 'X'. He

will be told if it is a safe area or not. If it is an unsafe area he will be asked the reason why and the appropriate remedy. The interactive nature of the program, whereby the pupils have to identify and select the main cause of the danger and the appropriate remedy promotes participation and active learning.

Follow up work is suggested in the documentation and might comprise a class survey of the school or a survey of their own homes looking for danger points. They may collect and make a resource file of published material, on safety awareness, such as from the Gas and Electricity Boards.

We have tried in all of the documentation for the programs to indicate the cross-curricular references, because we are trying to encourage teachers to see the microcomputer not just as a one-off resource, but to see how it can be embedded within their existing teaching plan.

The Pack contains a wide variety of programs, simulations, games and two drill-and-practice programs. There does appear to be a need for some good drill-and-practice programs in Special Education. Rehearsal and repetition of basic skills such as adding and subtracting in the context of money is common in many activities. We have tried to provide a pack of useful software, some of which is undoubtedly more progressive in its approach, but if teachers identify a need for a particular type of program, who are we to refuse? Many of the programs can be used by two or more pupils, and the discussions thus provoked are one of the most valuable objectives. All of the programs were evaluated in schools throughout the United Kingdom to ensure curriculum relevance and the differences do seem negligible, but different programs were more favoured in different places.

There has been considerable interest in the Pack from people outwith the world of Special Education, such as Social Workers and those involved in Adult Basic Education and many of the programs are appropriate and applicable beyond the group for which they were designed.

LOGO

Paul Brna: SMDP
Murielle Froger:
Universite du Maine,
France

The history of Logo is that its originator thought of designing a computer language around the idea of children rather than data processing. An American research and development firm, undertook to implement Logo based on a language known as Lisp, a list-processing language which I would say that most people find a difficult language to grasp quickly. The Massachussetts Institute of Technology (MIT) Artificial Intelligence Department became very interested in developing Logo in relation to general education for children. They have used Logo for children from three years of age to university level effectively.

In the early 1970's Edinburgh University became interested in developing Logo in Britain and produced their own versions on different machines and started to explore the possibility of using Logo within the curriculum. In the 1980's, MIT are working on another programming language, which children might use but, as yet it is not a commercial product. They have also tried to extend Logo. In the early 1980's after a great deal of work approaching eighteen or twenty man years, the first Logo implementations began to arrive in Britain from MIT designed for American Machines such as Apple, a machine not much in use in Britain, for education.

Edinburgh University developed Logo which is derivative of the MIT version of Logo offering the same opportunities for development and application and research. The second implementation in Britain is on the Sinclair Spectrum. BBC Micro will soon have several versions of Logo. In Britain therefore, we are in a convenient position to use Logo in schools rather than do research with it, as every popular Micro supported by the Department of Trade and Industry will be able to run Logo.

Although the Logo's that are coming into production now are reasonable and sophisticated computing languages yet information technology moves on, and some of the versions released are already out of date. The basic ideas are, first that giving children a computing language is worthwhile. Second, that the introduction to the language should be very simple and allow children to acquire skills gradually without complex problems. Third, children need a language such as Logo in which it is possible to represent their aims and intentions which they are trying to express. Logo offers that possibility. Fourth, the environment should permit a wide range of beneficial activities such as problem solving, problem decomposition, generalisation from special cases, linguistic skills and such skills as debugging which has been introduced into the information technology world through computer programming.

Papert was very interested in working from children's knowledge structures to extend them rather than have teachers impose their knowledge structures on children. A more child-centred curriculum is needed to foster Logo. Its utility for educational purposes is sometimes questioned, based on whether the design criteria for the development of Logo have been achieved, so that the language permits the application of the ideas of Logo to children and also children in special schools.

Basic was designed as an introduction to a more sophisticated and complex computer language. It was not designed for use in ordinary schools.

References were made in the previous section to the Turtle. The one on the screen is the floor Turtle. It carries a single pen that can be raised or lowered to leave a trail behind it. When Papert added a graphics package to Logo he was particularly interested in making Logo and graphics easy for children. Logo has 'turtle graphics'. On a computer screen there is an imaginary Turtle that moves around in a very similar way to the floor Turtle. Children are introduced to graphics in a way which they can understand, avoiding the complications of co-ordinates. The idea behind the use of the Turtle, particularly the floor Turtle is body-centred motion to which children can relate. They can play at being the Turtle. This introduces some remarkably powerful concepts.

Editor's Note: The Turtle was demonstrated on the screen and reference made to the use of concept keyboards which eliminated much of the typing input. Examples of developing the concept of reversability and conservation were shown.

Most educational work with Logo has been with 11 year olds. Some applications have also been undertaken to explore relationships. MIT has explored the use of the 'Dinah turtle' which is a turtle in continuous motion, with a position on the floor and a velocity, so children have to manipulate the Dinah turtle in a different context. This has unearthed rather a large number of problems that children have with ordinary concepts such as force and velocity.

Autism has also been treated in some cases, using the Turtle as a reference for the attention of the autistic child. In one or two cases autistic children spontaneously communicated with people in a natural way. Also Sylvia Weir at MIT has been involved successfully with children suffering from cerebral palsy using the floor Turtle and screen Turtle. Often with special cases it is necessary to invent methods of inputting information into the computer.

Another form of input is known as iconic. There is research on the possibility of inventing a simplified form of Logo based entirely on symbols, in schools in Edinburgh with some success. This requires no formal reading skills but does require translation of the symbols into some graphics pattern on the screen.

Work with the partially deaf or the partially sighted, has also shown some success. There does seem to be a linguistic application too, in that one has to be able to distinguish eventually between objects, and actions and the relationship between the possible actions and the consequences.

New entities called Sprites have been introduced to Logo. These sprites move around the screen like the Dinah turtle. They are independent objects which are set in motion and you can then do something else, as they have a life of their own. Most programming by school children has been very much linear and sequential. An application of Logo in the future is to encourage children to see problems as a set of events occurring in parallel.

New Logos are appearing with these extra features. One example is a robot arm; the language being used to drive it is a variant of Logo with tremendous possibilities. There is an example on an exhibition stand. This is a programming development which enables control of mechanisms to be undertaken at a wide range of levels of sophistication, but it also has applications for very young children because it can be made to do very simple things, even being in a mode where it is learning the commands that it is given, and being driven by a single keypress.

Editor's Note: This was a joint presentation with Murielle Froger of Universite du Maine where the demonstrations and micro programs were used in common. Subsequent discussion was lively. The audience split into two groups, either supporting Logo and Papert and his book 'Mind Storms' or resisting it on two counts, one that it was easy to begin with the Turtle but difficult to develop from it and second that it was not appropriate for pupils with special educational needs. There was a demand for empirical evidence about the value of LOGO and resistance to the length of time it took for developments to reach the classroom.

The majority view was that where a need could be defined with children in special education it could be satisfied by LOGO.

THE USE OF DEDICATED DEVICES TO ALLEVIATE PERCEPTUAL/MOTOR PROBLEMS

Jim Sandhu
Director of Handicapped Persons Research Unit
Newcastle-on-Tyne

My talk is primarily a personal position statement. It is by no means an exhaustive exposition on the whole range of Dedicated Devices currently available. Given the pace of developments, it would be foolish to make such claims. If anything it is primarily about needs and how we tackled them – irrespective of high or low technology.

The educational potential of microcomputers in special education is immense, particularly in the areas of communication, drill and practice exercises, assessment, therapy and training. Although developments are fast we still have to rely on suitable software to effect educational goals. Suitable software, is in short supply. The potential of microelectronic dedicated devices is less well known, mainly because major government efforts are geared to the microcomputer. I would guesstimate that for every government £100 spent on microcomputers in education there is under 50p spent on dedicated devices. Consequently, these either emanate from impoverished individuals tinkering away in their garages or from high-powered foreign commercial firms.

If you ignore the technological imperatives and the general prejudice of whiz kids to low level microelectronic aids and concentrate on real needs of specific children then dedicated devices come into their own. Dedicated devices can be microprocessor-based, or made up of simple electronic components and circuits. They are usually portable, hand-held and pre-programmed or dedicated for specific tasks. In certain cases they can be reprogrammed both to meet individual needs and to extend their range.

My interest in dedicated devices was partly due to "happenstance" and partly to the realisation that most software and computer-based systems do not cater to a wide range of staff/pupil needs. When I took charge of HPRU we were carrying out two projects concerned with developing discrete educational goals and hierarchical scales for severely mentally retarded children. Both these projects like many better efforts before them endorse the importance of *grounding work* in the area of child development. This has been succinctly described by Haring and Bricker: (1)

> "The model which currently holds the greatest promise for building and implementing a comprehensive approach to profoundly handicapped persons is the developmental model which accepts three basic tenets. First, growth or changes in behaviour follow a developmental hierarchy . . . secondly, behaviour acquisition moves from simple to more complex responses. Thirdly, more complex behaviour is the result of co-ordinating or modifying simpler component response forms."

I am fully aware that this model acquires a fuzzy outline when translated to the day-to-day reality of the classroom, but it provides a good frame of reference.

As a researcher, I still believe in concentrating on young Moderately Mentally Handicapped and profoundly handicapped children, not only because the early years are critical from the developmental point of view but also because profoundly handicapped children highlight some of the most fundamental issues and problems in human development and education. These groups can provide the basic framework for the real needs of other children. The fundamental difference is that of degree. This emphasis becomes even more important when you consider the child/staff/ microelectronics interface and the haphazard way computers have been introduced into the classroom.

The important problems can be summarised as follows:

1 The jargon which tends to increase the mystique of computers and still mystifies many teachers.

2 Programmes allegedly designed for Profoundly Mentally Handicapped or even Moderately Mentally Handicapped children usually turn out to be for higher grade children. Very often the complexity of tasks required to operate these programmes demands skills beyond the ability of teachers and children. Often one comes across programmes which pre-suppose the child already knows the alphabet and can operate a QWERTY keyboard with ease. Many arithmetric programmes pre-suppose familiarity with number concepts – just as many language programmes pre-suppose letter, or word recognition.

3 Too many 'educational' programmes are based on banal and stultifying computer games instead of ones with clear cut goals.

4 Despite the fact that there are programmes geared to developing perceptual skills through video displays there is little tangible research into the effectiveness of VDU imaging, problems of figure/ground, print legibility and two-dimensional object recognition.

5 There is an overall assumption that teachers are familiar with computing or computer languages and have considerable free time to indulge in this activity.

Dedicated devices do not require any technical knowledge from users. They are easy to set up, often requiring nothing more than switching on. As they are invariably tangible or three-dimensional it is easier for certain children to respond to them directly, ie without any intervening or distracting features such as keyboards or VDUs. We have also found dedicated devices to be useful intermediate tools to break down any fears teachers may have of high technology aids.

The problems of children I am interested in have been variously described as:

lack of responsiveness

slow utilisation of stimuli

insufficient powers of discrimination

impairment of acquisition

inability to focus attention on relevant stimulus features

low mobility

low kinesthetic feedback

low recall

low verbal ability

In Piagetian terms most of these would fall into the sensory-motor and pre-conceptual phases. In other words our efforts were mainly geared to perceptual motor development. These efforts, as we are mainly externally funded, are very often dictated and circumscribed.

Despite that there is a broad hierarchical element to our developments which should not be ignored. This aspect and a number of our other dedicated devices have been described in much greater detail in my report, "The Use of Microelectronics in the Education of ESN Children" which is available from our Stand, at the Exhibition.

By far the biggest problem encountered by us with all our developments is that of individualisation and standardisation. How far can one standardise all the multifarious needs of these children? The only answer lies in generalising a design concept in such a way as to cater to as great a range of needs as possible.

Finally, these aids should not be seen as substitutes for human involvement with these children – but rather as aids to involvement: a means of setting the stage for more fruitful interaction with their teachers, peers, and parents.

Sound Bubbles

Our Sound Bubbles have been around for about three years and have been widely publicised. We have a range of six different types – only two of which are commercially available. Each Bubble is slightly different – in terms of shape, colour sounds, sensors, sensor arrangements, and in one case light output.

The basic design consists of cheap plastic bowls mounted upside down on plywood bases. A number of round-headed, chrome-plated mirror screws or sensors are fixed to the surfaces of these bowls in a variety of arrangements. All the electronic circuitry and components including the batteries are housed within the Bubbles.

When a person touches the sensors with any part of the hand a range of sounds is emitted – squeaks, blips, cymbals, bongo drums.

The Bubbles were designed to encourage:

manipulative skills

hand/eye co-ordination

attention

sensory-channel integration

play

In 1982 we sent out 105 free Bubbles to special schools under sponsorship of the DTI. Although we had carried out our own *in situ* evaluation our aim was to obtain broader feedback on the Bubble's usefulness. This particular version has the additional features of the Sound Carpet which will be described later. This means that in addition to the sensors there are six jack-sockets into which you can plug six pressure mats which act in the same way as the sensors.

We received fifty detailed reports from the recipients of our free Bubble after about 3½ months of trials.

1 On the whole more Profoundly Mentally Handicapped schools appreciated the unit than Moderately Mentally Handicapped.

2 Most respondents found it attractive, robust and easy to use. By far the biggest complaint was the pressure pads which many found to be too insensitive, especially when hand-operated. Whenever they were used under carpets as originally intended, they worked adequately.

3 Beyond these broad agreements most of the other comments were contradictory. Some would have preferred brighter Bubbles, brighter pressure pads, more realistic and louder everyday sounds. Others wanted more muted colours, softer musical notes, vibrations. (Vibrations are easy to introduce using small DC motors attached to the surface)

There were six detailed reports where the Bubble was accepted for what it was. The staff had spent considerable time and effort incorporating it into their daily routine. A page from one such report has been distributed among you as an example. I believe the concept allows considerable scope for improvisation.

Eccentric Discs

Colourful discs, each pivoted off centre and counter-balanced, are mounted on a board. Each disc has a magnet embedded at the back so that when it is turned it describes an eccentric circle and in doing so activates a number of reed switches which trigger a variety of 'organ' sounds from a loudspeaker. The movement of the discs is fascinating to watch and encourages the child to make fine hand and wrist movements.

Wall Mobiles

These are of varying sizes, made of wood and perspex and can be fixed within seconds at any height along a "Unistrut" channel. The large ones encourage whole arm movement and the smaller mainly fine hand co-ordination when a child plays with them. Apart from incorporating colour and lights (triggered by reed switches) which we have done, we hope to include electronic sounds as further inducement to interaction.

Tracking Boards

As the title indicates this interactive board encourages hand/eye co-ordination and visual tracking at the same time. It can be used on the floor, desk or mounted to a "Unistrut" channel, and consists of a gradually curving slit routed through a melamine board. The handle which glides along this slit has a magnet embedded in it so that when it is moved it triggers a series of reed switches at the back of the board. The switches light up timed coloured LEDs adjacent to the handle so that the child gets an immediate visual feedback of this action. The lights left 'behind' begin to go off one at a time encouraging him to track them even after he has stopped the handle.

Sound Carpet

It consists of any ordinary carpet with six pressure pads placed underneath and linked to the same type of electronic circuitry incorporated in the Sound Bubbles. Once again each mat triggers a different sound as a child steps, or rolls or wheelchairs across it. It can be used both for individual or group activities or structured in whichever way suits the teacher or therapist, eg by taping the pads to a desk and using cards with pictures, numbers, colours to teach discrimination. One advantage with this unit is that it has volume control.

In terms of specifics the Sound Carpet Kit can be used to achieve the following goals:

Gross Motor:	balance movement pattern trunk co-ordination laterality/directionality
Position in Space:	body image orientation

Spatial Realtions
Play
Group Activity
Cause/Effect
Sensory Channel Integration

Computer Game

The programme was devised by Ian Ritchey of the Royal Grammar School, Newcastle in collaboration with the School of Electronic Engineering, Newcastle Polytechnic, and HPRU. The game is primarily intended for disabled children who can control a cursor on the monitor screen by using an on/off switch, a joystick or pressure pads. The switches help the child to exercise different parts of his body, encourage hand/eye co-ordination, while the game itself encourages the understanding of concepts associated with directionality. In this case the child plays against himself and the score, which is the actual time taken to complete the game, appears on the monitor.

Multi-Activity Board The Multi-Activity Board has been one of our spectacular failures in that teachers never used it as intended, ie a specific panel for a specific child, and for a specific duration. Instead all the panels were used at random thereby elimating the Board's novelty value.

Number Board This device is particularly geared to young physically handicapped children with poor motor control of their upper limbs who are beginning to get to grips with numbers. (As always with electronic devices the range and permutations on this version could be endless in terms of incorporating letters and figures). In this case the numbers are made up of metal strips. The child 'sets' the device by touching the two longer bars at the base which brings the LED display in the centre to zero. By running his finger along a selected number he not only registers that number of the LED display but also triggers a series of blips which are graded in pitch to match up with that number. For instance, the blips for nine have the highest pitch. If a child were to 'describe' the number seven the blips begin with the pitch of one, then two, up to seven. The basic principles of the device are sound but certain factors still have to be sorted out. The LED display is too stylised and the sounds too limited in range. We hope to develop other versions to cater for a wider range of children including the Blind. The Number Board is intended for the following goals:

fine motor control
hand/eye co-ordination
numbers
attention
cause/effect
play

Smiling Suzy 'Suzy' is really an off-shoot of the Multi-Activity Board, primarily designed to encourage vocalisation. It responds to two levels of sound. At one level only the eyes light up. At a higher level the eyes, ears and mouth light up. It has been fairly successful.

Pelican Crossing This is an exact pictorial representation of a Pelican Crossing enclosed in a neat wooden frame. When the child presses the button to activate the crossing a "WAIT" sign lights up followed by all the relevant light and sound signals. This is a useful aid for children as it can help them to practise road drill through fun and enjoyment. Because of the considerable interest shown by various police forces and road safety officials we hope to develop a range of similar types of devices covering other aspects of road safety.

Programmable Console Developed on a small grant from the Microelectronics in Education Programme, it consists of a CPU and an analogue board housed in an ergonomically designed box which can be tipped to present two 'working angles'. As illustrated a range of interactive boards each geared to teaching specific skills can be plugged into the Console. Variability is achieved through a reprogrammable chip.

a) Visual Tracking Board – with LEDs arranged in a circle and a cross. When switched on a LED lights up for a second, then the next LED lights up – describing a random path.

b) Touch Board – various common shapes in metal each one producing a fascinating *distinct* sound when touched.

c) Touch/Tracking Board – combines the above two in an interesting way. It consists of ten LEDs surrounded by metal eyelets. When switched on one LED lights up at random. If a child touches an unlit LED the lighted one flashes to draw attention. Once the child touches this, distinct ascending/descending musical notes are produced which last for about five seconds. This is accompanied by the LEDs lighting up in quick sequence. After five seconds another LED lights up at random to repeat the programme.

d) Sound Board – consists of ten sockets. Pressure pads or other sensors improvised by the teacher/therapist can be plugged into the board for a range of activities. When the child interacts with the sensors a range of distinct sounds (different from any of the above) is produced.

Musical Numbers

Forms an integral part of a continuum of HPRU devices which start with simple interactive aids for motor training to systematically more complex aids that encourage pre-conceptual skills. This console combines some features of the previously described items. Brass number plates fixed to a board have a LED above each one of them. When switched, on two random LEDs start to flash. After the two numbers are touched a popular tune is played followed by two more random LEDs starting to flash.

(1) HARING N G & BROWN L J. Teaching the Severely Handicapped Vol 1. Grune and Stratton 1976

Chapter 3

PERCEPTUAL AND MOTOR IMPAIRMENT

Bob Fawcus – Director, Centre for Clinical Communication Studies, City University London

The people who are the focus of all the papers today comprise those with sensory-motor problems and one of the major effects of these problems is on their ability to communicate. This limits their Social and Educational Development. Any of the problems that we shall discuss may occur in isolation or in various combinations.

There is first in the developmental area, delay in linguistic and phonological skills, something of which we are all aware. Anyone who has observed children will have seen the different rates at which language develops. The most obvious is not the linguistic difference but the phonological, the way in which some children learn the phonetic structure of their first language accurately and others who appear to go on for quite a long period, continuing to be unintelligible or to have idiosyncratic ways of pronouncing their own language. There is also a large group of children who find the whole process of using language, and of communicating a slow and difficult process.

These are, to some extent the group that Margaret Clark was talking about yesterday, who often in addition to their educational problems, will tend to show up with phonological and language problems. I think she was quite right in saying that it was a healthy move to start to talk about children with moderate learning difficulties in this type of context. It is very easy to think of the application of microelectronics in this field where communication problems are very great, where a whole range of control problems cry out for some radical support. People with very obvious motor impairment or sensory impairment have similar problems of moderate learning difficulties in different areas as I shall show. I apologise for the terms like dysarthria, dyspraxia and dysphasia. You will hear much more about them at Pam Enderby's session later today.

Speech Therapists are blamed for using such terms but they pick up terms from all the many disciplines with whom they work.

1 Dysarthria is the problem that an individual has if he has a breakdown in motor control because of damage to the brain or other parts of the nervous system. It involves an inco-ordination of movement, slowness of speech and generally unintelligibility. It is usually associated with paralysis or a breakdown in normal vegetative function. It is usually related to his difficulties with much more basic activities like eating, swallowing, saliva control and even facial expression. Dysarthria can occur in congenital conditions such as cerebral palsy, or can be a problem acquired through accident or disease. We make clear differentiation between dysarthria, where there is observable paralysis or neuro-muscular dysfunction, and dyspraxia, where there is *no* observable neuro-muscular or paretic problem.

2 In dyspraxia, the muscles move normally for feeding and other natural, automatic functions. A child can even make certain sounds quite clearly or, if we are talking about an adult or an older child who has had head injury, the individual has no observable problem until he begins to try to bring his phonological system under conscious control and to put sounds together. Then the whole motor planning process breaks down. One of my cases was 9 years old in a psychiatric ward after having had something like 5 years of regular attendance at psychiatric Child Guidance. His mother was beginning to be frantic about all the appointments. He was totally unintelligible, bright, alert and a speech therapist's nightmare. I was seeking basic contact and asked 'What do you like doing best at school?' 'fofash.' 'When do you do that; can you do it in the classroom; can you do it outside; what do you use when you are doing it?' 'Sosopop.' 'Fofash' when we got working on it, turned out to be 'woodwork'. The whole of his motor programming processes were distorted and although he had no paralysis the speech and language system was malfunctioning.

3 The third group is the problem of Dysphasia, where at a higher level you have a child who has brain damage which affects the whole system of language processing. He has either a receptive problem so that he does not understand the language of the people in his community or when he tries to speak he produces sequences and sounds that are very limited and unintelligble. He may have a problem both with comprehension and expression.

It is common, furthermore, for dysphasia to occur along with dysarthria, or along with dyspraxia. This compounds the severity of the resulting communication disorder, and its implications for intervention techniques.

These are the three groups which can occur either in a developmental form probably due to some form of ante-natal or birth injury problem, or through later head injury. Road traffic accidents can produce the same kind of symptoms in a child who has already acquired language. They can be related to the type of problems which Margaret Clark was talking about yesterday. All of them may also be linked to perceptual disorders of different kinds. Very often there is a risk of physical impairment and a sensory-motor dysfunction.

I believe that the use of the microprocessor in our work can not only help us to offer some solutions, meagre though they may be, but also help in terms of assessing the problem. Yet much assessment can be done without microprocessors. We have already discussed expensive ways of substituting for pencil and paper. Speech therapists manage to get through a great deal of their work with nothing but pencil and paper, Picture Lotto and a few games. Things are changing but one of the most common complaints is re-inventing the wheel or the pencil with a few other bits on it.

[A video tape presentation was used here – editor]

A young man called Peter was referred to us at the end of his educational experience. He was said to be ESN; he was clearly physically handicapped; he had no useful speech; he was spastic and had great walking difficulties. Most people had told his parents that nothing could be done for him. His ability to cope with some Bliss symbols was his limit. What we found about Peter in the first session was that at a physical level he could operate switches. He concentrated but from time to time he'd look at his watch. He was hungry and wanted to get off home yet he worked right through the session. He had been virtually imprisoned within his own motor system unable to make responses. If you have difficulty in controlling your facial muscles you can look stupid and it is extremely difficult to put yourself over.

Kor Klazes emphasises the same point. It is why we stress at City University the idea of communication, rather than of speech therapy. It is not just the noises that emerge from your oral tract that matter to people in our field who are working with communication problems. We are interested in the whole range: speaking, writing, hearing, understanding and the use of augmenting equipment.

On the perceptual problems, we are reminded every day here of the difficulty of the Deaf in a lecture situation and this is what our 'sign' interpreter is overcoming. Many of the people for whom the interpreter is working at the moment would have a good chance of following me (even with my whiskers) by lip reading but at this distance and speaking speed the interpreter is essential. One of the important things about both hearing and visual impairment is the wide range of both sensitivity problems and the variety of difficulties. I want to stress the importance of kinesthetic function. It tends to be our own field to some extent. We know about it from individuals like Jack Ashley who has lost his hearing completely, but is able to communicate, and make people understand because he had learned all the linguistic rules. Most of the output that I'm producing at the moment is not dependent on my auditory feedback but on internal muscular or sensory-motor pathways which can ignore hearing. If somebody put white noise in my ears so that I could not hear what I was saying I could still carry on and talk. It is very difficult to stop speech therapists talking under most conditions, but all of us would find it easy to continue to talk. Our speech would get louder and might show changes in voice quality but we could cope without that auditory feedback. Kinesthetic feedback was very exciting in the early days of electronics, although primitive. Now we have microprocessors which will enable us to do more sophisticated analyses. The problem is that it still isn't moving into the schools in any significant way. The tactile side involved, particulary in speech, but in other movement characteristics is also important. One fundamental rule of paediatrics is that if you identify a disorder in one modality, you are likely to have another problem in other modalities. One girl of fourteen was unintelligible. She had been diagnosed as having high frequency hearing loss, and was placed in a school for the Deaf. She had normal hearing but her speech output was very distorted. We used an analysis technique by a device placed in the mouth which can detect contact points and monitor

where the tongue is. We found that she could say a word in isolation but with sentences her speech would collapse. She had very little tactile awareness, and when she was talking her tongue would retract away from the front of the mouth and she was producing speech with her tongue virtually immobile. By being able to feed back to her the performance on the screen so that she could see through a system of lights where her tongue was making contact, she learned in a matter of days how to produce sounds at speed. That happens very rarely in speech therapy. Most work in speech therapy tends to be very slow and not very dramatic, but it is fun.

Another impairment is Ataxia which is associated with damage to the cerebellum at the back of the brain. In ataxia your co-ordination deteriorates. You are unable to make movements. Your walking begins to slip and roll. In writing your movement is ill-organised, there is tremor, and you can finally get there but the whole process of hand eye-co-ordination is affected. Now imagine what that means in an ataxic individual who has to make hundreds of very fine, very rapid movements when talking. The musculature does not achieve what is expected. Athetosis is another situation with slow, gross movement. Instead of hand-eye co-ordination being affected or tongue- palate co-ordination you have to consider either the slow writing movement that you see in athetoids where hand control, eye control and all muscular control is disordered or in chorea where another part of the brain is damaged and you get another type of problem with jerky rapid movements. Nature and accidents are not tidy and the way in which disorders occur in children rarely fall into categories like a text book.

SPEECH AND COMMUNICATION PROBLEMS

Pam Enderby
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I am used to speaking to Speech Therapists, not to teachers and what has impressed me over the last few days is how vociferous an audience you are and I stand here with some trepidation. I wish to present to you not only special education micros and the speech therapists' role with those but also to tie them in to how we as speech therapists work and how we hope that they are going to assist us in our work.

There is a great danger of looking at microcomputers without looking at the needs and the challenges and the assistance that they can give us. If my presentation is to be functional, I have got to show the context of the speech and language disorders with which we come in contact daily. Bob Fawcus gave you some idea earlier of the types of speech and language problems we have. Let me briefly identify the different types of speech and language problems.

A child comes to talk to you and it is very difficult to know whether to guess what he is saying according to the context or to get the child to repeat or get someone to try to interpret. You are faced with that decision daily, and perhaps that is a completely different talk altogether, how you cope with this person whom you can't understand?

Why may we not be able to understand that child? Let us consider how we think normally. I am going to give you a very simplified view of speech. First we have to be able to hear in order to be able to learn the sounds that we are going to replicate and usually once we have heard a sound it is reinforced by the response of parents, but hearing is only one aspect of the input. There is a great deal of difference between hearing and listening. Many of the children we see have been tested and their hearing is fine but we still feel that there is a problem with the message going in. They might have a listening problem. They actually cannot tune in to one thing as compared to another. I am at the beginning of my talk so I hope that you are listening to what I am saying although you can hear the hum of this slide projector. Later on in my talk you may find the slide projector much more interesting and you might tune in to it, and my voice will fade into a sort of hum at the back although you can still hear it. This ability for us to filter out, and be very specific is absolutely essential in the speech therapy process. Unfortunately many of our children who have an acquired problem, who have had a road traffic accident or an infection might have specific problems with listening.

If we are able to hear and able to listen, the next thing that happens is we have to learn to retain the information long enough for it to be decoded. The ability to retain, we are talking about milliseconds, is very important. When we are trying to speak in a foreign language we often assist ourselves in this retention exercise by repeating what we say again, while we decode it.

Unfortunately, many of the children we see are unable to retain it for long enough and they might only be able to retain a bit of the message. They are the kind of child who is competent enough to do one part of what you said but not always the second part or the third part because they can only retain little elements which can break down the whole communication process and have an effect on the output of speech. If the person has been able to hear, listen and retain, the next thing that is required is the ability to decode those noises. The speech that I am using now is just noises. The French just use different noises. All speech is essentially noises that we agree, within an environment, represent certain concepts.

It is amazing that we are able to retain that link between the noise and what it represents and it surprises me that 3 year olds can retain such an enormous association between a series of noises and their meaning. When children are learning, they often get the series of noises in the wrong combination. When they are told something about the red lorry, they might actually think that the red lorry is a lorry and they might then say 'red lorry' instead of the word lorry. They have of course retained it and decoded it incorrectly. With many children we see, they are unable to decode, unable to link that noise with that concept or that word. They can get nouns quite well but concepts are difficult and prepositions are difficult. We do see children where it is the other way round, where they can get concepts but they can't get the concrete, which is absolutely extraordinary and quite bizarre.

There has been some research done that looked at the effect of language development on the thought process and it compared deaf children who had very poorly developed language with normal children who had good language and gave them a practical task to resolve. The language-able children were able to do practical problems very quickly when compared with language-disabled children. They do just the sort of thing that you and I do every day; they use language as an aid to their thought process. We can think without language, and there are many examples of that happening, but language does assist us in the thought process.

In the expressive mode the first thing we have to be able to do is to choose the right word for the circumstance. It is quite interesting that we have an enormous word store and that we are able on the whole to pick out the right word for the circumstance with alacrity. If my mother is around and I drop something on my toe I use "Oh blow!" whereas, if she were not around, I might actually use a different, more expressive form to show my feelings in that situation. We can immediately change according to the environment, according to whom we are with, according to not only the exact meaning but also the subtle meaning. So the word "No" can be said in lots of different ways according to the intonation and the circumstance.

Having got the right language, and of course a lot of our children have neither the words nor the subtleties of expression which are so essential for social integration, they must co-ordinate their muscles into some organised fashion We have to help them to be co-ordinated. As I am speaking I am exaggerating my breathing to show that I actually have to get ready for the next length of utterance by taking in so much breath. There is a programming of muscle movements, not only in our tongue and our lips but in our respiration, and in our soft palate. Some of our children cannot reach that state of readiness; they cannot get their motor plan co-ordinated so that when they speak their muscles are not where they should be for speech. Their soft palate instead of being half way up is right down so it has to do a great big movement before the word comes out.

If they have got that right, what else can go wrong? The actual movement itself can go wrong in that the muscle control might be affected by a tightening and shortening of the muscles where the actual muscles cannot make the full range of movement, or might not control the timing of the movement. Again you might not get enough power, which will result in quietness. There are many ways in which muscles can be affected.

The next consideration is the difference between disorders of articulation, ie the sound, and disorders of language, ie the vocabulary and the ability to understand. How do micros or technology help disorders of articulation and disorders of language?

Now someone with dysphasia (difficulty in speaking or understanding words) trying to talk about a cup will not be able to remember the name or the context so he will search and he might actually avoid it and have very limited speech where he cannot get the word. The dysphasic child has words missing from his store.

The dyspraxic child will know the word and the name; he will even have the right muscle movement but he will not remember the sound for that word at the right time. He will make sounds that sound like English but are not.

He has not got the right sound because the muscles are producing wrong movement. It doesn't sound like English sounds. That is a very brief way of describing them.

What is Speech Therapy? Many of you will work with speech therapists but I do not think many of you will be able to answer that question, which is a reflection on the lack of integration of our professions. One of our most vital roles is to assess the level of the problem of a child and microcomputers assist us in this area. You can document a child excessively but what you do with the assessment results is another matter. This is where microprocessors help. I spend a lot of my time assessing muscle structure and the vocabulary of a child. Having done tests which might take an hour I then have to decide if there is an area for treatment. Can I gauge if I do something how much improvement he has made? What happens in Speech Therapy is that we test, and assess, and use checklist after checklist. What we do not do, is use the

information well. Microcomputers really come into the system as we can feed the results of a number of assessments into them, particularly the Apple computer, which is favoured in our department at the moment, and it can highlight factors which provide diagnostic information. Also it can highlight areas of language deficit which are very difficult to identify by looking at a child. We use a microcomputer to help us to do something we do already, but helping us to do our work better, not necessarily doing different things.

The next area is getting accurate assessment which enables us to treat a pupil then measure the change or the lack of change. The micro gives help with regard to assessing some of our programs which are not evaluated.

The next aspect is the use of communication aids. What is a communication aid? I am speaking specifically about people who have very severe speech problems. There are two forms of such aids. There are ones that are an alternative to speech, where the person is unable to speak clearly and is unlikely to be able to speak in a way that would be understood. The other is where people need an additional means of communication, something that helps clarify their speech or an amplifier, ie an additional means of communication. Giving an amplifier to a child who needs one may assist with his language development. One reason is that the child is speaking with more confidence and the computer is responding to him. Thus he is more likely to develop his language. Unfortunately, many children with speech problems get language problems because their speech is not being reinforced as it always fails and they are not being stretched. One factor causes the other.

Some pupils have speech intelligible to their parent but not intelligible in a noisy classroom. They may require an aid for such situations. There are aids for stammerers which aid fluency. Whether they work or not is a major debate but there are several devices available which improve fluency. Again it might be extremely useful for a child in circumstances where confidence has been lost leading to additional speech problems.

Let us move from the "additional" to the "alternative". A person is unable to speak at all and has to use something to identify his basic needs. There are 3 types of communication aids, the direct select, the scanning aid and the coding aid. "Direct select" is when you push a button which produces something or you touch a word which is the word you want. It is quickest at present and we try to provide direct select if possible. The second choice where there are additional problems is scanning aids. They have to be looked at with discretion. It is marvellous that somebody can get a word out every 3 minutes but whether that will ever be functionally satisfactory from the user's or the listener's point of view is doubtful. Microprocessors have led to the development of better scanning techniques. You do not have to scan through 50 different choices. You can say "down in the bottom 5".

Coding aids have become much more popular recently. They are better at cognitively aiding a child. You have to remember a code to represent a message. The message may be a simple one such as, "I want to go to the loo", or it might be a large complex message. We usually talk in "chunks" and we all have our pet repertoires. If you can get a child to code "chunks" of speech and make a code for "I want to go to the loo" he won't have to expend so much effort and, it is much quicker.

In summary "Direct Select" is best for the physically more able; 'Scanning" aids are for the more physically disabled, and "Coding" aids are for the cognitively able.

One scanning aid is where the pointer goes over a membrane. You can change the layout according to the cognitive or lexical skills of the user, and activate a switch when you reach the word or phrase you require.

We meet some anti-social utterances early on when introducing an aid to a child. They are frustrated, and have had no say in what has been done to them and being able to express negative feelings is a positive way of getting a person to use an aid. We usually have some expectation of what people are going to say to us and usually we are wrong.

The problems of the receiver of communication, especially synthesised speech have fascinated me for some time. Why are aids not used? They do not have the effect that we would like. It could be that the user has problems but it might be that the receiver gives negative reinforcement to the user.

People get anxious if someone comes up to them and speaks in an artificial voice and it's well worthwhile going round with a communication aid and accosting people in the street and seeing how they react. It is not always done either with patience or civility. One lady was put off a bus when she asked for a ticket using a communication aid.

We need to teach our user to educate the public. The user has to become familiar with the bad reaction and know how to deal with it. Another problem, common in hospitals, is, "I haven't got the time". We have to teach our user to improve the speed of communication even with poor grammar and telegraphic messages with meaning.

One thing we are learning is that technology is only a part and we have said "Let's get the hardware right; let's get the switches right". Now we find that much of the hardware is not doing what it should do because we have not got our therapy right.

Finally let me mention synthesised speech as it is an area of considerable involvement. Many people find it too artificial, but one advantage is that eye contact can be maintained while the message is being spoken. This transfers the nuances of meaning which is a social aspect. Another thing which is important in any conversation is the ability to interrupt. In many conversations people never finish sentences. With a lot of aids you can't take turns so fluently or so well as you can with Synthesised speech. It gives fluency and aids communication.

Editor's Note: The remainder of the session dealt with case studies. The conclusions from them were:

Try to help those with communication problems as early as possible and do not give up hope. Any functioning part of the body can activate a switch.

Speech recognition by machine is improving but the commonest voice is the American Male. The computer will accept anything if there is consistency.

Work on the handicapped; harnessing technology for them often widens into a practical commercially viable product.

There was a plea for microcomputers for Speech Therapy Units from government funding. If microelectronics can give independence to a person with communication problems this in itself saves money.

VISUALLY HANDICAPPED

Tom Vincent, Senior Lecturer in Information Technology. Open University

My talk is in 3 parts. Is there a problem? What are the problems in this area? Our recent experiences.

Is there a problem? At the end of 1979 Bob, a blind student said that he had a problem. He was on a technology foundation course and could not deal with calculations. He began on a social science course thinking he could not deal with science and technology. Since that time, blind people have come to me and said "I have a problem". Here are some of them.

David had a problem in writing essays, and letters. He depended totally on his wife to whom he would dictate letters and essays. He wished to program in BASIC, to write for himself.

Bob preferred to do his undergraduate work in braille. He would use a Perkins Brailler and that represented a problem for him in a distance teaching organisation like the Open University, where the responses had to be printed material. He was writing an essay, then sitting down at a typewriter and literally blindly typing his essay again, not educationally very good.

Braille text in an examination situation where a pupil uses a Perkins Brailler has to be transcribed into printed text to go to the examiners who could only handle printed or hand written materials.

A teacher in Manchester had some young children who were difficult to motivate, and supervise at the early stages of learning Braille. They asked me "Could technology help?"

Undergraduates in chemistry wished to do experiments involving handling data and the collection of results. A blind researcher always used someone else to complete the process of getting his thoughts on to paper. A blind phsysiotherapist had difficulty in keeping records of his patients and communicating that information to his sighted colleagues. He needed a dual system of braille and print.

These are typical of problems which have come my way.

Editor's Summary

Communication is important. Many methods are used to overcome the block, depending on technology. We had people proficient in Braille and others proficient in word-processing. The aim was to input text to a computer so that it would reproduce Braille. Optical character recognition was one possibility.

Another technological solution to the problems of the blind has been OPTACON. A tactile representation of printed text is given to the reader. Some 10,000 such machines are in use world-wide. The Kurtzweil reading machine is another development based on the principle of optical character recognition.

A difficulty with blind persons studying is being able to comprehend diagrams. The solution here is a photo-embosser. Text is easy. Use a cassette. It is important to link the old well-known technology such as a Perkin's Brailler to any new technology which is being produced. There is an electronics version of Perkins with ability to reproduce very quickly. This is best supported by programs in machine code.

The Versabrailler gives electronic input and paperless output. In time wider usage will bring down the price. Our computers are designed for visual applications. The printer is even more difficult but synthetic speech will replace the visual output with a spoken one.

There is a compromise between size of vocabulary and quality of speech in speech synthesisers, but better and lower cost ones are coming which translate text to phonemes and phonemes to speech. The blind will accept crude speech as a prop though not as a talking book, just as the sighted will accept rough pictures or rough drafts of text.

Access to software is best done orally so let us assume that computers talk and devise techniques accordingly. This is not commercially sound but does provide a work environment such as the Work Station demonstrated here which was developed by Tom Vincent. We must try to avoid having to modify standard hardware or it isolates the blind worker. Also we have to have software easily acceptable to the 6 year old and the 60 year old.

A device used elsewhere is that of the program Menu on the screen. It can be spoken in code, eg N for New Text to keep speech to a minimum but get audio confirmation that the correct key was depressed.

A film was shown of a blind physiotherapist working using a talking computer for case notes and records. The Concept Keyboard with up to 128 touch sensitive squares is also valuable for re-training the blind of all ages. It can also provide the light relief of accompanying music.

Examples of wide ranging usage of computer technology with blind persons were shown on film, including music and art.

Finally one benefit to the whole research project is that a blind person is working with the team to ensure that what will not work is identified at the early stages of its development.

PROBLEMS OF THE DEAF

Editor's Note:

There was a session for Deaf delegates and workers with the Deaf led by Chris Jones and Alan Newall. Here the requirements were:

Recognition that office work using new technology was possible for the Deaf but they must get experience of teletext, video recorders and equipment which transferred communication to the visual medium. Basic electronics courses were vital.

Most emphasis was placed on teaching British Sign Language to deaf children, their first language, which would lead to English as their second language. It was essential to help them to learn by inter-acting with their environment, especially using video. Graphics supported by colour-coding for concepts of present, past, future and for active/passive voice were demonstrated.

Alan Newall: Professor of Micro Computing, Dundee University

Early on in the organisation of the Conference, a group of hearing and hearing-impaired people decided that a long session would look at education of the hearing-impaired and another session look at communication.

Early, in my professional career, I produced what I called 'A Talking Brooch'. It was a Communication Aid based on a keyboard and a visual display screen. It was intended as an aid for the speech impaired and it was suggested that it could be used by the hearing impaired, and I began to consider the problem of speech transcription for the deaf. The Keyboard that I was using was too slow, so we developed, when I was at Southampton, a system based on a Palantype short-hand machine which you might see used in Law Courts. The most famous user is Jack Ashley.

His Palan-typist listens to what is being said, and he reads it on a television screen. A micro-computer – its a micro-computer like everything else in this Exhibition – takes the output from the shorthand machine and converts it into written speech. It's not a universal solution because it needs a trained operator, but DTI have given us a grant to train more operators. In USA a similar system is being used successfully in a technical school which has deaf pupils.

Another area of work is concerned with sub-titling for the hearing impaired for Television, including designing sub-title systems – low cost ones – for schools. What can technology do to provide a brighter future for the hearing impaired?

What I want to do is try to distinguish between needs and wants. 'I need a form of transport', but I actually want a red Rolls Royce, or if we are north of the Tweed – 'I need a drink'. What I want is a Glenfiddich. The Prime Minister said, you didn't solve problems by throwing money at them. Neither do you solve problems by throwing computers at them. The result can often be a solution, but not a particularly appropriate solution. Bob Fawcus has talked about re-inventing the pencil, a remark that I shall treasure for a long time. There is no point in every school having a micro-computer if there is no software. In the mid-nineteenth century they provided capital expenditure for blackboards, but I assume that they also had a grant for chalk. We have been very fortunate this morning to see exceptional software. The other important thing is actually to define the problem before you go about solving it. Microcomputers can be used as a way of avoiding trying to think about the problem. I will finish with an illustration. When I was in Canada recently, I came across a wheelchair that had been designed by some young engineers in California. They were not asked to design a wheelchair for a handicapped person; they were asked to design a wheelchair for themselves, and that's what they produced, and it's the first time I've wished I'd been handicapped! It was the sort of wheelchair that I wanted. It was really fun! They were trying to design something that somebody would want to have, not that somebody would need to have because their legs did not work. So often we find that disabled people are fobbed off with what they need and little concern is paid to what they actually might want, even if they are ever asked.

Chris Jones, Research Psychologist, Donaldsons School for the Deaf, Edinburgh

I am here as what? – as a deaf consumer and user of the deaf telephone. Tony Boyes said, 'When Alexander Graham Bell tried to create a hearing aid for his wife over a hundred years ago, he found he had invented the telephone which ended up as our greatest enemy!' For deaf people it is our greatest barrier to integrating into the hearing world.

The Visicom Project uses a special device called Vistel. This is a visual telephone and enables us to use the telephone if the people at the other end have the same machine. What was the importance of having a Project like this? DTI, and other bodies like British Telecom have contributed to it and we now have PSS for the Mail System, Prestel for the frames and Telecom Gold for the mail boxes and the computer industry for the terminals. The project lasted one year. There were 48 deaf people and some hearing people, with about 78 people all told. The deaf people were randomly selected through the Breakthrough Trust, who were appointed to oversee the administration, financing and monitoring. There was a range of people at various intellectual levels, employment skills, and literacy levels, with a geographical spread throughout Britain. Some had telephone experience; some did not. Those who used it in their offices had a view-data system with a keyboard at home, connected to their television. We used back-to-back communication directly and as well indirectly through electronic mail. The main conclusions after 1 year were:

1 Direct communication was preferred by the majority of deaf people but in its present form it is not good enough. It had only a display with 22 characters, and the typed letters moved off the side from left to right, ie from how we read. Further, we need a printer, and mass storage on tape or disc. There are other devices from USA like this but the equipment is not compatible and we have different protocols.

2 The indirect method, eg electronic mail.

a this was very successful, especially in situations where there were group activities with a big organisation like the British Deaf Association or the Breakthrough Trust. They need quick forms of contact with many members and this is really a one-to-one conversation through the mailbox. You can send copies to many other people and this is the strength of the electronic mail system, but a typed conversation takes six times as long as the equivalent voice communication, and results in expensive phone bills. We have to look into alternative electronic mail box systems, because Telecom Gold is very expensive, being designed for business people;

b if I ring a deaf person and we can see each other's face we can sign as quickly as one can speak. This is a better solution.

That was a useful contribution. It allowed finance to rear it's ugly head and in a commercial democracy money must have its place. The hearing-impaired do have a commercial voice. In America television sub-titling for the deaf is supported by advertisers who pay for their adverts to be sub-titled, because believe it or not, hearing-impaired people eat chocolate, and use paint. In America this is recognised and that's a way of getting funds.

Comment from Mike Martin, Technical Director RNID

The Visicom Project succeeded very well in demonstrating the application of one form of the technology but you have to define the problem, and hearing impaired people go right across the range, from moderate losses to those who are profoundly deaf with good speech and to those who are prelingually deaf with very limited speech and language, and each of these categories needs a different solution. There is no general solution. We have come to the decision that there will be no equipment for deaf people unless there is a commercial application. Vistel was a pioneering effort, with some limitations. There is nothing to replace it which will provide back-to-back communication. One manufacturer has equipment which will do this, but he will not produce it unless he can see some orders, and where is the money coming from? It isn't there.

Again, I will come back to Alan with his Palantype Machine. It was promoted widely for use in education, but at £20,000 a time! How many schools are going to have one? What is needed is a much simpler unit. So, I'm afraid that in my view the technology is there, but it is being mis-applied and we have not got our problems clearly defined; we are not lining up our solutions with the problems.

Comment from Rob Baker

I am the guide (and speaker) still working on the television subtitling project. 'I'd like to try and sign for myself', (applause) but if you are not following me, please stop me and then I shall ask for help. I would like to talk a little bit about the work that I'm doing now. As Alan said, I have worked for about 4/5 years on TV sub-titling methods for ITV. Now we are trying to design and build sub-titling equipment for use in schools for deaf children. Last year I had about 30 phone calls from teachers of the deaf asking if they could have sub-titling equipment and I had to say 'NO'. There are three reasons for this.

1 Teachers would like to add sub-titles to programmes that do not already have sub-titles and especially programmes they make themselves in the school.

2 Teachers would like to be able to choose the language that they use in the sub-titles very carefully and introduce new words and new grammatical structures in a controlled way suited to the needs and the abilities of the children and also the educational goals of the teachers.

3 The most exciting aspect would be to provide the children themselves with a way of adding their own words to videotape programmes.

Response from Alan

There are two factors. First of all the equipment has to be cheap. At the moment the best sub-title preparation equipment is that designed at Southampton University for ITV. It is about £43,000 per unit and most other systems are about the same price. Our aim is to reduce the cost to something like £1,000 and base the design on the BBC Micro everywhere. The second problem is that the system has to be easy for teachers to use, as teachers have little time for preparation work, and they may not be very technically minded. We have made one prototype system and we are taking it out to schools to begin the process of evaluating and modifying the software. There are also organisational questions. We had to think about the resources that schools have. We have two different ways of educating deaf chidren through special schools or through units, and these two methods are provided with very different resources in quantity and quality. I have just done a survey of all the schools and the units in this Country and the resources do vary a great deal in different units and in different schools and that is worrying. Perhaps some schools for the deaf would be able to produce sub-titles within the school and circulate them recorded on video tape to other organisations. We are also thinking about the use of the devices Clark Denmark was talking about, using electronic mail as a means of sharing sub-titles in data form and sending them to different schools. The second question is again teacher time. If we want to use our resources wisely, we do not want to have teachers sitting around typing at keyboards all day. Teachers' skills are in teaching. We need people working in the schools as school sub-titlists. That may sound Utopian, but I know one school which has received money from Manpower Services Commission to employ a person as a sub-titler.

Finally, there is the question of copyright. It is against the law for schools to record any programmes that are not school broadcasting. There are two ways of changing; one is reform and the other is revolution. It is possible to change the law, eg, by putting a levy on video-tape, but people resist that. My personal preference is for revolution. I think that some group has to stand up and show the world that they are going against the law, preferably, some big important Charity, and demonstrate why it is necessary to be able to break the letter of the law of copyright.

PERSONS WITHOUT MOVEMENT

Graham Creasey,
Senior Registrar,
Edenhall Hospital,
Edinburgh

The title is 'Persons without Movement' but that is not strictly correct, because nobody has no movement. If a person is alive, then he must be at least breathing, and even the breath can be used to control devices that might be of use to him. People such as a man who is paralysed from the neck down still have many facilities available to them. Most people can move their eyes. Many people can move their eyebrows and their other facial muscles. They may be able to open their mouths and so use their chins to operate switches and their tongue within their mouth. They may be able to move their head and neck so as to operate devices as well. Even a person with a severe disability has quite a variety of possible movements left to him all of which can be used to interact with computers, even if unable to use a keyboard.

The kinds of patients we are talking about are those who have been paralysed by a neurological disease such as muscular dystrophy, multiple sclerosis, spinal cord injury as in paraplegia and tetraplegia and to some extent, people who have had head injuries, although they may have at the same time a mental handicap or difficulties with cognition.

One of the major distinctions to make is whether these people can speak or not. The person who is vocal obviously has a wealth of communication possibilities which the person who cannot speak, and has minimum movement, does not have. We distinguish between devices for people who cannot move much nor speak, and persons who can at least speak normally. If a person has restricted movements, first, this just limits his mobility in getting around physically from place to place – going to school or university, living there, and getting from bedroom to lectures. Lack of movement of the individual limbs is what hampers their ability to read, although there are devices for that, but also particularly their ability to write. If you cannot write then you can scarcely be educated. In relation to education, the important thing for this group of patients is to write, or produce written text in some form, whether it be notes, essays, or homework.

Spoken communication is a whole new field which will be discussed in another lecture, so I will concentrate more on written communication. This is not just in order to be able to write, although that is valuable, but our abilities with the written word are now amplified via microelectronics and this type of technology in using word processing. If we can give a person computer access as well as the ability to write, we are potentially providing him with quite a powerful set of tools. How can we give a person written communication and computer access? Let us concentrate on his abilities rather than his disabilities and we need to pick up any residual movements with various devices.

We will talk about these as simple inputs to start with and I am sure you will follow me. Some of this will be familiar to those of you who work in the field, but I will concentrate on the principles. Devices that this person can operate fall into two main groups, on/off switches operated by movements of the head or the chin or the breath, by sucking or blowing down a tube. Movements of any part of the body can operate a switch and you will see on stands in the exhibition the variety of switches that is available. A great deal of engineering goes into matching these to a person's abilities.

The second main category used in domestic equipment such as hi-fi has volume controls and knobs which are analogue as opposed to digital. Some all-or-more switches are all-or-none; some switches give you a variable amount of movement. An example in this context is joysticks, to give you movement – up, down, left and right. There are two kinds of joystick; one that an aircraft pilot uses gives him a proportional control for climbing and banking, and that is like the joystick on a BBC computer. You can move things up and down the screen by the joystick.

The Atari type joystick looks the same but is electrically different and is a set of four switches, up, down, left and right, with possibly a 'fire' button. These belong to the first category of switches rather than to analogue devices. Therefore, when we pick up movement in a patient and feed it into a computer, we want to select what we are going to do with it, perhaps performing some action like switching on lights or the television in the case of environmental control.

In written communication then we want him to select letters, words, phrases or pictures. We would have to select from the alphabet, from numbers, or from longer items of text all the way up to paragraphs and pages, as in word processing. There are three main ways in which this is attacked. The simplest is direct selection, which we use from the keyboard. We go directly to the letter that we want and press that switch. The keyboard is simply a collection of 70 or 80 switches. It is fairly quick if everyone can do it, but not all people can reach such a variety of switches and obviously you will have to have a number of switches if you want to have one for every letter of the alphabet and punctuation.

The second way in which we can operate things is by using some sort of code, such as Morse Code. There are now better ones developed for the handicapped where by operating a switch they can send codes into the computer which are recognised as letters or represent other things. This again requires simple switches only.

The third method is that of scanning. You can see it at the exhibition on various stands. You present the person with an array of things to choose from, such as letters of the alphabet and then with a switch or two they can select the line they want or the column they want, and that identifies which item they want to select. There may be a timer which stands itself and you stop it when you want to, or you can move it a step at a time yourself. You can scan up and down, left and right, depending on how

many switches you can use. This is very often the slowest method because you have to limit yourself to relatively few switches, but it is a method which is open to almost everybody however small a movement they have left.

If you use it with people who are more able, then you are restricting them unnecessarily and there may be an advantage in giving them a more powerful method rather than tying them down to a slow scanning method. These have been around for some time in mechanical forms, and we are developing them into electronic or computer format. The ability to send codes can be readily interpreted and put into a computer by a single or double switch. By sucking or blowing down a tube you can put the codes directly into the computer, or the letters as if they came from that computer's keyboard. It is a rapid way of inputting. This device itself can have an output that comes from its side into a commercial microcomputer creating letters and words and also activating direct selection device.

A light pen which picks up the light from the television screen can move a dot left, right, up or down. This would be more useful for someone paralysed if he wore it on a part of the body he could move.

The principle is really a two-axis proportional control – a proportional joystick. It requires no physical contact and can be operated by attaching to any part of the body. We can use that input most speedily on a direct type of selection of letters on the screen. You can see the advantages of direct selection and proportional control, giving you potentially quite a rapid selection of the items that you want. What do we do with those letters when we have them. In the past they would be transferred via a typewriter to paper. Computer facilities enable us to do more using a computer screen, or a computer printer, or floppy discs.

There are various acceleration techniques to make the computer more powerful with a little extra processing. On a system such as this, if I select 'Word' I can get a menu of vocabularies which I can select from, and if I want to talk about the weather, I put the dot over 'Weather' and that loads the floppy disc with a series of words relating to weather. If we want to say that it is 'fine', the word 'fine' is selected and put on to a red strip.

We may want to do some processing with the words and characters that we have selected. We could write some word processing into this device. If I want to read what I have written, I select the word 'read'. There is a brief time delay on what you select. You can build in further processing capacities into the system by writing special software, but the system gets increasingly complicated, and expensive to write and produce and sell to a very small market of people with not much money and so it becomes uneconomic to try to create for them complete systems to allow them to do their word processing, their accounting and use their database with a special system like this.

We must give them access to standard equipment and programs. If they try to operate on the same computer that is doing all these other functions we have created, how can they operate a word processing program or an accounting program? You have to think about two processors for the two processes and possibly two screens. It sounds extravagant to talk about every disabled person having two computers.

The hardware is getting cheaper all the time and so a second microprocessor is not a very great problem. A second screen is complicated if you wish to have two VDUs, but liquid crystal displays and flat screens operated by battery to be portable allow a person to use commercial software. This way we do not keep disabled people in the ghetto and only using their own programs. So that is why we can now talk from one system to the other. With an input device we can put in letters as if they came from the keyboard and I can put my word processing program that I bought in town into this system and run it from my input device just like an able-bodied person. At work and in school I could use the same computer as other people.

A commercial computer receives its input from the keyboard and our input devices need to input in the same way. We need to emulate the keyboard. Therefore we need to know how and where to plug into the computer. It is done by an interfacing board and plug but unfortunately it varies for different commercial microcomputers. These little adapters are now available for the BBC micro, the Apple, the IBM PC.

There is confusion about the terminology. We could say that whatever device we use is a keyboard emulator. The little board strictly speaking is a keyboard emulator interface – so it is the little inferface device that is made commercially for the microcomputer. We want to have a variety of input devices talking to a variety of microcomputers without each one having to be specially wired.

COMMUNICATION AIDS AND ROBOTICS

Bruce Gans,
Chairman,
Department of Rehabilitation Medicine,
Tufts University,
Boston, Mass.

The title "Communication Aids and Robotics" is deceptive. I will discuss our current approaches and uses of technologies half as the engineer and half as the clinician. I shall start by talking about the kinds of equipment and devices that we recommend and use with severely disabled children and adults. The clinical perspective is how you make a decision to solve a problem, implement it and check whether it was the right decision. There are basic principles but the technology will change rapidly.

The place to start is with definition. What is the individual child's problem? We consider a relocation perspective, as you do from an educational perspective. What are the limitations: what doesn't work well; what are the deficiencies; what are the continuing abilities and skills that the child does have which you can utilise to allow the child to be more functional? What are the needs?

We are a referral centre and receive requests for evaluations for individuals from all over New England and even beyond. What we do is try to acquire as much information about the individual as possible from those people who have been working with him – those professionals, educators, physicians – the past medical history, the functional history, the abilities, the things that have been tried that may have worked, may not have worked and tried to figure out what the people who are making the referral are hoping to achieve. What do they want to solve? What are the problems? Within a range a day-long evaluation I will have the opportunity to look at the child from a medical perspective to make sure that everything that can be changed about the child has been. It is amazing how many times we find that we may be able to improve spasticity or motor control. We may be able to make some meaningful changes in postural control and performance. We may be able to make some medical interventions which are helpful from a functional perspective. Our physical therapists will evaluate the children from the perspective of their motor abilities, their positioning, seating and mobility states. Our occupational therapists will review a child's abilities to achieve fine motor control. Our speech and language pathologist will review the linguistic abilities of the child, what their receptive language is and try to understand what has been done before in terms of achieving improved communication.

We then do the most important thing in the assessment. After assessing the child as individual professionals, we sit down together with the child, with the family, and with as many of the professionals as are available. We brain-storm and problem-solve together and take it to the next step of developing a mechanism of implementing. We follow up to where the money is coming from, and how we are going to know if we achieve our aim successfully.

I have yet to find a disabled person who does not have at least three to thirty different people involved in his or her case in some way. You have to be careful not to suggest a solution which creates a new problem.

The first problem is where to find the money for the proposed action and ask "Is this problem medical?" Invariably the answer is "yes" but is the solution medically warranted? If the solution is a communication device, to improve this child's ability to participate in the classroom and achieve a higher level of learning, any medical payment source that hears the words – "work, educational" – will say, "Well wonderful – we've got an out. We don't have to pay for this one. It's somebody else's problem."

So we try to distinguish between the objectives as "Is this device necessary for the individuals to achieve their basic ability to communicate, to express their health care needs, to express their state of emotional health, Is this necessary to allow that particular individual to communicate with others, to control other people, to provide this care for them." Ultimately other people are the primary tools of the severely disabled, so at least in the USA the medical model of payment and support becomes appropriate. There is a big hazard in letting an educational system purchase a dedicated aid for an individual, because the device belongs to the school system rather than to the individual.

We have a vocational rehabilitation system in the States that looks at individuals. In many cases, communication and transportation are principal barriers to being competitively employable and the vocational rehabilitation system becomes very important.

There are charitable agencies that are very disease-specific and other charitable groups simply interested in helping people with problems. These can be very important resource groups for funding.

Lastly we look at an individual's private financial resources. We as health professionals always try to protect the resources of our individual clients. There are banks that will give out loans for a powered wheelchair similar to a loan for an automobile purchase. There are also tax advantages. Our policy is to buy equipment rather than make it.

Once purchased you need a system for regular maintenance and support as well as a system for checking its effectiveness. It needs technologically up-dated, and continuing reassessment of whether the previous problems are still present when the new ones have evolved, and whether the solutions are still adequate.

Frequently we find we have to solve one problem with technology merely as a prerequisite to solving a different problem. For example, we need to solve the speaking and mobility problem of the individual to allow us to start tackling the communication problem. Our objective is to maintain the independence of the individual.

With children, we consider appropriate development. When the child should be sitting up, we try to provide the device that will allow that. When the child should be experiencing standing, we allow that. When children should be experiencing mobility through space, if they haven't got their own gross-motor abilities, there are ways of providing that through technology.

I am now going to show specific examples of technology. Everything I show you is commercially available in the United States, although not widely used, because some of the technology is very intimidating.

There is a growing group both adult and child from a variety of diseases and traumas who are intellectually normal but are dependent upon respirators for their breath-to-breath survival.

One of the kinds of technology that is clinically available now is called the Frenic Air Stimulator system where we can surgically instal electrical electrodes on the nerves that make the diaphragm work, and, using a radio frequency transmitter which passes the radio frequency energy across the skin stimulate the diaphragm to contract so that breathing is restored, so that instead of a positive pressure breathing machine forcing the air into the lungs through a tracheotomy we have the diaphragms functioning on an automatic basis. A system like this costs $10,000. This system is much simpler than a respirator and eliminates the need to have tubing and an open airwave at the neck so that normal speech can be re-established.

Somebody who is respiration dependent has potential medical problem great significance. Is his respiration adequate and are his blood gases effici A former painful process of doing blood evaluations is now controlled b microprocessor device that measures the oxygen saturation by shining little light through the earlobes. This and other technology serves as a physiological monitor of his health status. A brand new device from the States called a Ventivoice costing £800, (I am not selling anything, but giving you a perspective) has a little capacitor that is inserted in the nose and just hangs behind the uvula. The machinery on the outside sends a constant tone into the oral cavity and you can articulate around that constantly with your own tongue. One of the critical factors of being able to operate an electric larynx is to be able to stop and start the tone critically with the voicing that you are trying to achieve. This device has an eyebrow wrinkle switch so that even if you only have your eyebrow movement, you can get fluent control of the starting and stopping sound, and you have adequate speech.

Editor's Note

Dr Gans then showed a large number of slides of specific persons with technological aids with a rapid fire commentary. He was at pains to stress that UK and Europe also had a wide range of high-tech equipment for the handicapped. Some basic features were:

1 Non-technology such as blocks of foam or resin moulds, using card-board as a template in the former and air in the latter, provided controlled seating for home and work. Commercial custom-built moulds were expensive. Clinical physiotherapists are probably best at designing moulds, considering size, shape and density of the foam.

2 The Mulholland wheelchair has every conceivable part separately adjustable – at a price. Few severely handicapped persons can handle such complexity.

3 Standing is important psychologically and sociologically but not a medical necessity. It gives eye contact. Some devices have pivotal joints allowing the patient to lean back, forward and to the side.

4 Mobility means many things. It gives independence but is usually related to others. Children outgrow a device and the parent cannot cope with that. Mobility devices that fit into cars as seats can be dangerous.

The tricycle is socially acceptable but often needs to be power-driven. Here it is likely to have a battery. This requires a battery-charge indicator to avoid being stranded. We must merge powered mobility with public community transport.

5 A plea was made for those with upper-body malfunction to have wheel-chairs,two-foot-operated.

6 Reaching for things at a height is a neglected aspect of mobility. To-date technology has not helped.

7 Robotics will revolutionise environmental manipulation. There is the mouth stick, often powered but many other features, some of which neglect social aspects. There are devices which give the technical capacity to feed oneself with spoon, fork and knife, but the person loses out on the one-to-one contact of being fed and is not socially acceptable when feeding with normal people. Some excellent Art has been produced by powered-stick users.

8 Another environmental manipulator is a Telemetry System with a wide range of buttons which can cause many electrical gadgets to function by remote control and even be a help signal in emergency.

9 Interaction between people and machines requires to be researched. At Tufts, monkeys were taught to help the disabled. It failed as the disabled did not like it and preferred machines.

10 Provision of gadgetry early for children is helpful to their development. It begins as a toy and often produces ecstacies of triumphant achievement. Now the move is to make the subsequent performance socially acceptable, eg making it safe for someone to be completely alone or speaking at a "normal" rate such as 200 words a minute rather than 30 words a minute.

Chapter 4

LIFE AND SOCIAL SKILLS

Kor Klazes,
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Many years ago, at an international conference in Amersfoort, Holland, I made the aquaintance of Mr Morris, the co-ordinator of this conference, in which you and I are now taking part.

I could not have imagined that as a consequence of this meeting, I should be standing before you now, philosophizing on the subject of "Life and Social Skills" as a result of my experience in a school for physically handicapped children in Arnhem, Holland, I celebrated 25 years as headmaster there only last week. During a free evening at that conference in Amersfoort I extended an invitation to Mr Morris and a Swedish delegate to visit my school and I told them during this visit something about the approach of our pupils, especially in preparing them in their confrontation with, and their function in, tomorrow's society.

To my surprise, Mr Morris found that the impression he had of the visit was an adequate reason to invite me to speak today. Too late I realised that the good impression he still had, may have been the result of a few glasses of Rhine wine, which we drank on a Rhine terrace in Arnhem that night after visiting the school.

I mentioned earlier that I have been connected with the education of handicapped children for 25 years. If one looks back over these same 25 years, one sees that there have been many changes. Naturally these changes have a great deal to do with new technical possibilities, but apart from that there is still much else that has been changed.

I don't know what the situation was like in Scotland 25 years ago, but at that time in Holland the very existence of Special Education was based on an economic principle. The reasoning was, to invest money and energy in the education of children in order that, as adults, even if in a limited way, they may take part in a work-process and not be for the rest of their lives dependent on, and a burden to the community. Many of us, wittingly or unwittingly let ourselves be led by this principle. Our school syllabus was set up with the idea of instilling into the children as much knowledge and as many skills as possible in the hope that this would ease their entry into the world at large. This worked sometimes, but not always.

A colleague of mine, head of a school for mentally retarded children, did an investigation in that time into the cause of some children not being able to hold their own, even in a fairly modest way in a work-situation.

He gave a questionnaire to employers who had taken on a number of these mentally retarded children after they left school, but after a time were sacked because they could not fit in. He asked about the background and the cause of their failure. He made a list of possible reasons which could be ticked or deleted by the employers. This list was not classified, as to whether it referred to intellectual, motor or social shortcomings.

After receiving the replies (about 100 of them) he classified them and it became apparent that in the majority of cases (about 70%) the failures of these young people lay not in their intellectual shortcomings, which could have been expected, nor in their motor-handicap, but came under what one could call social factors; difficulties with colleagues; inadequate reactions to correction; untidy use of tools.

There were also problems caused by intellectual and motor shortcomings, but these problems could often be solved, whereas the social problems could not, and were often the cause of the dismissal. These facts were an indication for my colleagues and me to make more time available in our school programme for social education than had been normal for physically handicapped children in school. It was still justified by the above-mentioned economic principle.

Meanwhile events in society were changing and the possibility and willingness of employers to take on handicapped workers was lessening, not only because of the failure of handicapped people socially. Routine jobs, manual work, as well as brain-work, were being automated because of computers, or were being taken over by cheap unskilled foreign labour and the chances for the handicapped to obtain work became fewer. At this time many handicapped were placed in sheltered workshops, but the economic principle on which this help was based initially, became less in demand. All the special services, which were necessary (I am thinking of special transport and special skilled overseeing) were expensive and gave back so little in return, that it was more economical to provide good social security grants. These social changes were no reason for us to alter the principles on which our educational programme was based. We fitted our motivation to the social developments. We found that there were fewer changes for our school leavers to play an active part in the working world of production.

Our view was, "The producer can only exist by the grace of the consumer. Production only makes sense if there is a demand for the product". Where the role of producers becomes for the future of our pupils more and more doubtful, let us educate them to be conscious and responsible consumers, taking part in the community in that way. It speaks for itself that the word "consumer" in this context is used very loosely. We did not stimulate competition to see who could eat the most potatoes, but we tried during the school curriculum, to make the pupils aware of, and sensitive to, all kinds of manifestations of society, especially on a cultural level.

We taught, and are still teaching the pupils how to go to the theatre, library and concert-hall, and we try to bring this "being a consumer" out of the passive state by putting them in touch with actors, writers and musicians. In Holland nowadays the idea of integration is of central importance where care of the handicapped is concerned. I imagine this is the same in other countries.

I think that we are testing, wittingly or unwittingly, again and again, our educational approach against social criteria and we try to explain our actions through the principles of the integration-philosophy now. It is becoming clearer that where integration is concerned, nothing can be taken for granted and that much depends on the social concern of society as well as on the handicapped, if integration is to become a reality and not just a fashionable word. It is certainly not only a change in the attitude of society, but also the attitude of the handicapped person himself or herself, which decides whether he or she will obtain an integrated place in society. Handicapped people must have at their disposal the social skills, which will further such integration. Schools for handicapped children, can contribute by ensuring, that such skills are developed, and are highly valued in our schools. In the last 25 years society has changed, the motivation of one's actions has been altered and the starting-philosophy has a new emphasis but still a well directed social education has been recognised as vital for all pupils, especially for handicapped ones.

In my introduction I outlined how over the years we came to give more time to the acquisition of social skills. Now I will describe our methods and give a warning. There is a danger in an educational approach, in which social education is stipulated so clearly. Everyone, who works in education with physically handicapped children knows that the problem of learning disabilities is considerable. By laying more emphasis on social aspects than on intellectual education, we may be tempted to undervalue the importance of the intellectual side. The alibi is, "What does it matter if he does not reach a certain intellectual level as long as he manages to fit happily into his surroundings?" It is not a matter of one or the other, as a certain amount of knowledge and an easy use of certain intellectual skills, can have a positive influence on the quality of one's social functioning.

We believe that the best way of giving concrete help to our pupils is to try to accustom them to the "psychology of the so called non-handicapped" and to teach them to adapt their attitudes and behaviour accordingly. Yet good and happy functioning of the handicapped person in society, must be two-way traffic. Society must learn to become more handicap-minded, and grow accustomed to the idea that – as with traffic, everyone, lorry driver and pedestrian has the same right to use the road. So it is with social intercourse where there is a right to the use of life's road for everyone, whether handicapped or not.

In a 2-way traffic system the handicapped person must take an active role. Sometimes we meet handicapped people with a dreary reproachful attitude to society such as, "They don't know what it is to be handicapped; it is all very well for them to talk. They have to read first that book about the psychology of handicap, volumes 1, 2, 3 and 4 and then talk again". Often the basic, equal right to the use of the road by everyone, is literally and figuratively interpreted by the handicapped person as the right to ride in his wheelchair on the motorway, and to be surprised when something goes wrong.

There are handicapped people who find it perfectly normal that someone who is colour-blind may not become an engine driver, but who, if there own colour-blindness comes into question, demand that the signal system should be altered. Is it then so strange that where the handicapped (and in this case I'm fully aware of the fact that I am speaking about the handicapped) use such a double standard, society finds the principle of equality difficult?

The handicapped person can make an important contribution to helping the public become "handicap-minded" but first he must learn to understand more about the reaction which his handicap causes among the non-handicapped.

In connection with the idea of integration, and it is probably similar everywhere,Special Schools stand in a bad light: Why put all the handicapped together in one school? Why not place them in ordinary schools, where they would be integrated in any case? I do not agree with that. There is a learning process for society, and for the handicapped person who must be convinced of the fact, that it is to a great extent his own behaviour, which determines the reactions of society. Although I also have reservations about the concentration of handicapped children in one school, yet I am fortunate that the children in my school are all faced with one and the same problem and it becomes possible to prepare for the difficult tasks they have now and will have in their future.

I hope I have now made it clear to you that the subject of the psychology of the non-handicapped is one of the most important subjects in our school. I do not mean that it is timetabled like mathematics, but it runs like a length of red cotton through the whole curriculum. Our programme always allows time for discussions of such matters and the opportunity to have relevant experiences. In every class, throughout the school time is made every day for class-discussion. This has more than one purpose. It helps with the development of speech and the use of language, both speaking and listening to others. It widens the child's interest. It takes emotionally important subjects, especially experiences, children have had in their confrontation with their environment.

The role of the teacher is to ensure that the inadequate reactions of those who come into contact with our pupils and their handicap is not dismissed with: "They (the non-handicapped) don't understand anything about it", but is analysed. The question of what would have been the best reaction is discussed and we often conclude that it is a lack of knowledge and a certain kind of fear rather than hostility, which makes people react so inadequately, and that it is the handicapped person himself, who has to stretch out a hand to remove this lack of knowledge. In this connection, one can also consciously give a class such an experience. Our school lies away from the centre of Arnhem. Whether the isolation was deliberate about 30 years ago – I do not know. Because of this isolated situation, we still sometimes go "into the world" by school bus to the town centre for a shopping spree.

In a shop, how do people react? What do we do? How would it be, if another time we were to go in pairs? Would going alone be more difficult? Why did it all go right? Why did it go wrong? Are you conscious of the fact that your appearance, your speech, your voice and your uncontrolled movements can shock people, and that they react unreasonably to get rid of the cause of the shock?

Do you realise, that such a reaction by a stranger can be influenced by you if you wish? If your handicap is obvious, you can ease the confrontation with a stranger, who perhaps for the first time is coming into contact with a handicapped person by the way you dress and by careful attention to your hair, and general appearance. The phrase "if you wish" is important. Each one has an equal right to the use of the road, the handicapped person can seek his way in life with punk hair and cut-off jeans, but it can increase the shock to the person who meets him for the first time. Much of life consists of first-time meetings. We encourage self reliance and independence from managing money, to preparing a simple meal, we also teach them where and how they can obtain help; where their abilities fall short, and what is irresponsible behaviour.

During their time at school, we try to give the pupils experience which will be useful post-school, so that they can learn independence. Encouraging them to do voluntary work helps. One aspect of social skills for the handicapped is to be able to explain to a stranger what their disability is, without embarrassment.

Also we teach the older children, irrespective of their learning ability, a little English and German and reasonable proficiency in draughts, chess and cards as well as some sports. Hobbies are a futher option and there is a daily newspaper. There are discussions about sexuality, where responsibility for the other person is the main point, and maintenance of one's own wheelchair is a social skill, as it encourages one not to ask for more help than is necessary. Good manners are a further social skill.

The theme of the conference is "Technology" so I must mention it! Electric wheelchairs have been invaluable for our seriously handicapped pupils. They make participation in sports possible, where with ordinary wheelchairs the handicapped person was dependent and even learned to reject contact with others. The electric and now electronic typewriter, today has been a great boon, but we took a long time to learn how to use it.

On the introduction of computers in education, developments in the Netherlands are still in their infancy. I hope to learn here how best to use them. I am also impressed by development of the sound-transformer, which can give sound-colour to the monotone speech of the deaf, and I see the importance of the mini-typewriter, with which a non-speaking child can make his wishes known. I can even agree that Social Skills and a Master's degree in the psychology of the non-handicapped is useless without a system of communicating. On Social Skills, I still advocate the principle that in skills which aid social intercourse, it is always "the other" who has to have a central place in one's mind. He has to be supported in his uncertainties.

There are technical aids within our reach to help us achieve this. If there is to be real integration, then both handicapped and non-handicapped must be convinced of each other's right to the use of the road, and technology by itself cannot do this. Rather handicapped and non-handicapped should want to meet each other with mutual respect.

I may have given the appearance of putting the onus for the success of integration unequally on the handicapped themselves. This is not my purpose. It is also a responsibility for society. The subject of my lecture however is: teaching and stimulating the interest of handicapped children in Social Skills, and hence my emphasis. Integration can take place only in an equal encounter. Equality cannot be achieved by making statements or shouting slogans to each other, but only by losing oneself in the interest of the other. For too long , this has been a one-sided process, from society's side, where society was prepared to help the handicapped and the handicapped had to be handicapped (and grateful). In the equal-level-encounter about which I am talking, there is no longer need to talk about handicapped people, but about handicaps, which concern to some extent all of us.

BANKING AND INSURANCE

Gordon Rankine, Managing Director, RAANND Systems, Scotland

Our Group specialises in the development of leading edge technology for application in financial institutions or similar areas. Other specific areas of interest to RAANND, are medical instrumentation and military machines.

Technology is a tool with many faces, not the least being the means of ameliorating the quality of life for all parts of the community, and, in particular, areas where individuals are less fortunate than the majority, those persons with handicaps. A major function of any service industry is the identification of social needs, and the optimisation of the service to meet the skills of the appropriate sectors. Accordingly, the address is oriented to the endeavours of the institutions to service the community, and areas of technology which are not necessarily recognised, where there are benefits to be accrued.

Banking and Insurance are service industries whose aim is to serve the public. Equally, retail outlets serve that purpose, as does the executive element of the Civil Service. Most aspects of daily life rely heavily on service industries to make life pleasurable, or at least, bearable.

The breadth of handicap is enormous. I shall be selective and focus on blindness, deafness, confinement to wheelchairs, and home confinement.

One difficulty associated with the application of technology in areas outwith the knowledge of the responsible person, is the ignorance and thoughtlessness of the typical engineer and perhaps the marketing bodies. As an engineer, let me draw on my own experience. My company has been producing equipment for many years that contains one or more keyboards, with each key virtually identical to all others. On our most recent product, a specially shaped '5' key was specified by our marketing organisation to assist persons with poor or no sight to locate the centre of a pin-pad. (A pin-pad is the small keyboard, fixed or wandering, that is used, generally within banking, for the entry of a Personal Identification Number. This number is the secret number issued with the popular credit cards). When brought to our attention, it was obvious and desirable. However, it had never struck us before.

The moral is obvious. Caring individuals are in themselves insufficient to use the power of technology to best advantage. Feedback from the different areas of society is mandatory, some of the areas being less obvious than others.

In order to illustrate the areas of interest in banking and finance, a simple scenario will be outlined. This reflects a bank transaction, but it could equally be a post office or similar event.

Friday lunchtime. The weekend arriving, at last! A night out with friends; perhaps a visit to a cinema; perhaps a meal. A quick look in the purse; a rattle of the pockets; a squint in the wallet; a treasury reflecting the activities of the past week. Banking hours being what they are, the individual concerned has two choices. The first is to rush round to the bank during the lunch break, effect the necessary transaction, and return suitably enriched. The alternative is to wait until evening, stop off at an Autoteller (ATM) and extract some money.

Assuming the bank is local, the individual walks or drives to the bank, waits in a queue, tenders cash or card, punches in PIN or provides other identification, receives cash, and returns by the same means.

How does the individual know that there is money in the account?

How does the individual reach the bank or Autoteller?

How does the individual wait for the queue to advance?

How is the important documentation passed to the cashier or inserted into the Autoteller?

How does the individual know that the money is available?

These are simple, basic questions, but not so trivial when viewed by a handicapped person.

The handicapped individual could ask help from a friend but may resent imposing on friends. Most people have friends or acquaintances where a selfless relative, typically a daughter, has given up her life for an infirm parent or near relative. Society has a duty to reduce the impact of circumstance on everyone, the handicapped individuals and their friends and relations. At last, technology comes to the rescue, not on a shining white horse, but a small pony – good intentions on a limited budget.

The scenario painted above could be any transaction; the purchase of goods, paying rates, collecting a pension. All share the need and the circumstances. It may seem somewhat laboured, even contrived, but it is fundamental to the problem.

Most of these areas are already the subject of considerable attention by the bank and the other major financial institutions. Despite being commercial organisations, with specific duties to their shareholders, the organisations are run by men and women who take their duties seriously, and are caring individuals, whose aims in life do extend beyond 'making a buck'.

Any references made to organisations are all intended to be complimentary, and to highlight certain areas for future interest by the audience. The absence of a mention does NOT imply the absence of work by the parties concerned. Indeed, the amount of research by all the institutions is substantial, though by no means entirely altruistic. Banking and finance is very competitive. Accordingly, any sector of the public is fair game for growth.

In Banking and Financial circles, technology has been seen simply as a means of improving internal procedures, tightening administration and controls, cutting overheads, and fighting the battle against paper.

A problem with an easy solution is the Statement of Account. The information is normally imparted by a printed statement on a bi-monthly or monthly basis. As it is produced on a computer, the output may be directed readily to a braille printer or typewriter. Even in the absence of a direct link to the computer, a service may be offered which manually transcribes the statement to braille. However, a statistic which surprised me is that only some 10% of the registered blind population is able to read braille.

A simple alternative is the production of a tape with the account details read by a trained speaker. This can both use a different sensory mode and even a different language. Examples in use are toys with synthesised speech, ostensibly educational, though some merely sell more dolls with enhanced realism. Speech synthesis is more than adequate for recognition, though the sound does tend to be somewhat metallic and highly reminiscent of the Daleks.

Each solution is commonly executed in its basic forms. The extension of modern technology could easily produce automatic generation of the same information. Thus, using technology such as a Word Processor, all correspondence could be handled. The output is generally 'printer proof' quality. Accordingly, Braille or, perhaps more usefully, speech forms, even with a metallic accent could be provided for a relatively small investment. Even optical character recognition by machine, a relatively complex operation, may be used to render text directly into an audible form.

The audio solution can be produced on a small re-usable cassette, and a small cassette tape recorder is cheap and could be loaned or rented by the organisation. The ability to write the tape requires a machine, considerably more expensive, but only one per branch, and therefore not outwith the budget of successful institutions.

In Japan, the MITSUI Bank has an Audio Answering Unit. This is dialled up by the customer, who receives a statement of account automatically, digitally converted from the computer to sound by a bank processor. These and similar responses represent 80% of all balance enquiries in MITSUI Bank, and are all answered automatically.

Again, in Japan, the typical ATM delivers instructions in audio form, which may include the statement of account after an account enquiry. This feature is not yet present on those ATMs currently in use in Britain.

Another possibility is using the telephone. As a computer can readily produce audio output, it can also dial up a client automatically, and deliver the message. Admittedly, there is no 'hard copy', but this could be an option.

Transport for handicapped individuals does not appear to have progressed greatly. Those dreadful three-wheeler cars, replacing the tricycle, have passed into history. The modern equivalent is a conventional car, with assisted steering and controls.

Currently, there is no personal alternative, though walking and public transport are practical in the right circumstances. However, whilst suitable in the urban centres of population, these rapidly become inadequate in rural environments and new towns, as distances are greater.

Technology has not advanced sufficiently to offer much assistance in this area, though a few aids have been introduced. In Japan, many major crossings in cities have audio signals or music to indicate to the blind when it is safe to cross roads. There are a few such crossings in Edinburgh. There are also 'braille'-style markings on the roads and pavements, and at railway stations which significantly ease the problems of mobility. Nevertheless, these are still aimed at the mobile individual.

Banks, post offices, and similar bodies always have queues. The customer is obliged to wait, stand in line, and amuse him/herself as best he/she can. The visibly handicapped are actually at an advantage in these circumstances. Other customers, bank officials or whatever, will automatically assist, permitting these individuals to wait at a more convenient point without losing their place. Frequently, they will be ushered to the top of the queue, their needs serviced, concluding their business rapidly. Curiously, it is those individuals who have mastered their disability who are likely to be the more inconvenienced. Their state may not be obvious, and hence they are unable to reap one of the few advantages of their condition.

The solution, of course, has nothing to do with technology. In many cases, these individuals wish to be seen to be no different from any other customer, though by identifying themselves, could easily be aided without resentment.

When the customer reaches the teller point, the counter is at a height suitable for the average person to lean on the counter, either to converse with the operator, or to complete the documentation associated with the transaction. The counter height is generally inconvenient to the smaller individuals or to persons confined to wheelchairs. Whilst the speaker has never been in a bank or post office or similar institution with a specially prepared teller site, there are probably countless examples where this service is provided.

The matter is further complicated by the wholesale adoption of security screens in these buildings. Communicating even the simplest requests can frequently be difficult, and only achieved by leaning close to the speech slot and shouting.

Entering the necessary information to the bank forms may pose problems for a number of reasons. First, the forms can seem complicated, and even though well within the capability of the individual, the individual may wish assistance. The act of writing the form may be difficult because of limb problems. Even reading the form may be beyond the scope of some individuals.

In the pursuit of improved banking and transaction processing, the plastic card has appeared with substantial benefits to customer and institution alike.

In particular, the CLYDESDALE bank has a card which is used for the majority of its transactions within the branch, as well as at ATMs and retail outlets. The presentation of the card to the operator and the entry of the PIN, represent the only tasks required from the customer. There is never any need to fill in any forms, with the occasional signature the sole requirement of written material. This practice is spreading rapidly.

This is a feature available in one's own bank, but it is not available at a 'strange' bank. Even the use of the card is not sufficient for everyone. The mute cannot readily communicate the transaction type.

Lobby banking (customer operated machines in the banking halls), automatic banking (customer operated transactions in unstaffed sites), and general machine-assisted banking has much to offer. The handicaps outlined above are all capable of being serviced well by a machine. Simple menu instructions, audio messages, a 'user-friendly' interface, can remove the fears that many people have with the use of machines. The rapid growth of the ATM has made automatic banking processes practical and socially acceptable.

Although the machines may be expensive initially, they never require tea-breaks and lunch. Accordingly, a 24-hour service, with every 'teller-site' occupied, substantially reduces waiting and the banking hours become 'user-friendly'. The height of the machines requires consideration, to ensure that wheel-chairs or smaller individuals may reach the necessary controls effortlessly. This is either achieved by ramping or multiple position machines. Selected machines could be regulated by a simple hydraulic system customer-controlled to achieve the same end.

Although this address is aimed at handicapped persons, the benefits apply equally to more fortunate individuals. A requirement for cash is constant. Generally, salaries are paid directly to a bank or building society. It may not be inconvenient for a healthy individual to visit a bank; it may still be a nuisance.

Building societies have always offered substantially better 'banking hours', but, despite this tangible benefit, have also moved to ATMs. Even the ATM is a mixed blessing when the weather is grim, or mobility is a problem.

Mobile banks tend not to offer the elegant practices of plastic card, as there is not a communications link between the mobile bank and the head-office computers. Modern technology, using simple radio-phones, or even satellite transmissions can achieve this. It is practical for rural communities, factories, and similar largish bodies by special arrangement, but is not generally suitable for the private citizen.

The advent of PRESTEL, VIEWDATA, and its many foreign equivalents, showed the way forward. Either using television or telephone, elaborate communications systems, "receive only" or "interactive" have indicated a means of communicating intelligently with most homes. In a number of experiments, a service has been offered between house and bank for direct customer access and account manipulation.

Lobby banking currently implies an ATM-type machine, similar to that which is located in an outside wall. However, by virtue of the security inherent by being on the bank premises, the lobby ATM is much cheaper than its secure external brother. For example, NCR in Dundee manufacture internal and external ATMs, the lobby ATM costing as little as £9,300, compared to its more secure version at £21,000.

Lobby banking is extending from simple cash dispensers to elaborate account manipulations. The principle advantage is the tailoring of the lobby machines to suit a wide range of customers, with varying disabilities. Mobility is essentially all that is required. These same machines may be used within large shops or malls, where there is a high level of overall security.

HOME BANKING implies the ability to transact business from one's home, made possible by the rapid growth of personal computers. Great Britain now has more personal computers per capita than any other country in the world. It is predicted that by 1990, the USA will have 20–40 million homes with a personal computer. CHEMICAL Bank, the sixth largest in the USA conceived the idea of PRONTO, which was launched in New York, last autumn. This is a system whereby any account holder with an approved personal computer may join the network. CHEMICAL Bank furnishes a modem or link and a disk with the appropriate software. This scheme is still in its infancy, but offers the home user most of the banking facilities that currently may only be performed on bank premises. Thus, the user may with his menu driven system, check all accounts, current, deposit, savings, and mortgage and switch funds from one to another. All credit card

accounts are also available, plus hire purchase and rental agreements. Merchant bills can be paid directly, coupled with a link to the merchant for the order of goods. Most American stores, even the smallest grocery shops, offer a delivery service.

SEARS, one of the largest retail chains, is active within this area, and a tie-up is anticipated which will make the operations outlined above common-place. CHEMICAL Bank is marketing its solution to other banks, and has successfully signed up nine more banks to join the network. CHEMICAL supports the idea that the video-tex network must be controlled by the banks.

A second system, VIDEO-FINANCIAL SERVICES, VFS, is also available in Florida, being jointly owned by seven banks, and having signed up eleven Florida banks. This scheme is being launched nationwide, and is attracting major interest from Europe and South Africa. Curiously, is it considerably more expensive to join and maintain, with special video terminals costing 600 dollars or more, compared to the 60 dollar ATARI that may be used on the PRONTO network. Unlike Great Britain, there is no teletype or video-tex service currently available, hence existing systems and proposals rely on purpose-built networks. IBM, SEARS, and CBS are joining forces to produce a national video-tex system, which will act as the catalyst for a major advance in home banking within the USA. Each is a major force in its own field. Furthermore, IBM always tends to be able to turn an idea into a standard, and hence dominate the field. CHEMICAL Bank, who have spent some 20 million dollars to date, must be concerned at this forthcoming plan.

What is on offer in Great Britain and the rest of Europe? There are only two schemes in Europe, each being run by small financial institutions, using the national viewdata system, The VERBRAUCHER Bank in Hamburg and the NOTTINGHAM BUILDING SOCIETY in Nottingham, with a tie-up to the BANK OF SCOTLAND. Of the two schemes, the NOTTINGHAM is the more advanced.

Users may perform their shopping activities through the television, and perform all their banking activities via HOMELINK. By virtue of the limitations imposed on building societies by law, a tie-up with the BANK OF SCOTLAND permits the use of VISA credit cards, cheque-books and ATM access.

DEUTSCHE Bank, again using BILDSCHIRM, the national viewdata system, is running a pilot. In France, courtesy of the French national TELETEL system, a facility to support home banking is in place. This is being considered by CREDIT COMMERCIAL de FRANCE and the BANQUE NATIONAL de PARIS. A scheme in Metz is due to be launched shortly by the BANQUE POPULAIRE de LORRAINE.

In Britain, BANK OF SCOTLAND, CLYDESDALE, NAT-WEST, and the TRUSTEES SAVINGS Bank have all spent time considering the system and have schemes under development. It appears that the climate in Britain is

not as suitable for home banking as it might appear. PRESTEL, the window by which home banking could be implemented, has been, at best, a limited success. Despite the vast numbers of personal computers in Britain, there has been no rush to join the PRESTEL network, there being only some 40,000 subscribers after three years. Thus, until some major grouping takes the plunge, and unless there is a lobby sufficiently powerful, nothing is likely to happen.

In Japan, where banking techniques, particularly inter-bank and bank-company transfers are among the most sophisticated in the world, the law prevented any electronic authorisation of payment until 1983, and only subsequently permitted off-line authorisation. Given that Japanese families are among the thriftiest in the world, and pay very careful attention to the management of their funds, home banking is likely to be a winner in Japan. A new service, 'PAY-BY-PHONE' has been launched by five banks, including the MITSUI Bank, which enables customers to transfer funds from current accounts and ordinary deposit accounts to time deposit accounts by means of a touch-tone telephone. (A time deposit account is an account where cash is present for a specified time, usually to act as collateral). Other banks are planning a service based on this when the NIPPON TELEPHONE COROPORATION, the national Telecom body, completes its vocal response system.

Irrespective of the current state of home banking, the advantages are virtually self-evident. One of the major problems of handicapped individuals is the reliance on others for the simple day to day operations. Mobility, in itself, is still frequently insufficient. Accordingly, the advent of home computing, with banking, building society, credit card, and shopping activities offers a greater freedom for such persons. Irrespective of the handicap, provided the intellect to handle a computer is present, the required operation may be performed. Modern programming techniques have reached a stage of sophistication such that very young children are capable of using computers usefully. The barrier to use is only at the lowest levels, where it is likely that there will be some form of assistance available. Also any particular disability could be accommodated by a special terminal.

Limb deformities may be handled by wands attached to other parts of the body, or by light/infra-red guided by head. More limited handicaps are generally suited for keyboard use, which, with sophisticated software, reduces the amount of effort to achieve a particular action.

The deaf may communicate with the mute by virtue of a computer communications path and display. Similarly, communications and hence access to the world become trivial. Even more local actions may be readily incorporated, such as opening and closing curtains, switching lights on and off and even summoning assistance. Funding of machines beyond the basic forms envisaged for banking delivery systems is a problem but once a machine is resident within a home, it also offers scope for employment. In many cases, the presence of the machine will liberate its owners in many directions, and help towards self-sufficiency.

All the problems of the scenario outlined earlier apply equally to making a purchase, or worse, when returning goods, as this trip is resented because it shouldn't be necessary.

Home banking and its consequences illustrated the use of the same tool to perform 'tele-shopping'. Yet shopping is generally pleasurable, and should be made as pleasurable for handicapped individuals too.

Most modern stores have introduced ramps and lifts for wheelchairs and prams to have ready access between floors. Less effort has been spent on means of improving the act of purchase.

Retailers, ever mindful of their customers, have been examining mechanisms whereby transactions may take place faster than has been possible in the past. The cheque is filled out at the till and the cheque card number entered by the operator. This is tedious enough, but, should the sum be greater than the unrealistic £50, a supervisor must be summoned to assist.

Alternatively, a credit card is presented. Some stores are better than others, but, at least for large items, the slip is filled in, a signature sought, a pen found – it doesn't work – another pen found. Having completed the form, the assistant leaves the till position and telephones the credit card authority for an authorisation code, and, of course, confirmation that the card is not 'hot'. After several attemps, a code is duly provided, the assistant returns, and the purchases are wrapped up.

This will change through EFTPOS – Electronic Funds Transfer at Point of Sale. Whenever a vehicle other than cash is used to pay for goods, a plastic card is presented. This card is 'swiped' by the operator/assistant, and, during the entry of amount and codes, the customer enters the PIN. A message is sent, automatically, to the credit authority, with the appropriate authorisation code or message returned within seconds. This process is generally so fast that it does not impinge on the customer-assistant action, so that overall speed of transaction becomes entirely dominated by the two individuals concerned. The queues do not disappear, but they are shorter. Many of these systems also dispense cash to the user as well as the payment of goods.

Pilot schemes of this nature are being run world-wide, with two notable experiments in Britain proving to be a tremendous success. In particular, a scheme associated with the dispensing of petrol and also cash has been run by CLYDESDALE bank in conjunection with BP in Aberdeen. This scheme involved the CLYDESDALE card mentioned above. However, a further variant, known as PINPOINT, and being organised under the auspices of VISA permits the credit card – VISA – to be inserted at the pump, and the fuel dispensed, without requiring the individual to move far from the car. Obviously, the day of the drive-in garage is not far away, provided that the petrol cap is located in a position suitable for remote control or action

without leaving the car seat. When 24–hour un-manned petrol stations start to dominate, it will become increasingly difficult for individuals to receive assistance for refuelling their cars.

An integral part of the fabric of a market economy is the movement of shares. Two services are available currently which offer remote manipulation of shares and portfolios, both using PRESTEL.

Hoare Govett offer a facility to a limited number of suitably creditworthy individuals to buy shares, with an ultimate intention to integrate the use of the credit card for payment. There are security problems, which is one of the reasons why selling shares is still not a service offered. A second firm of stockbrokers, de Zoete and Bevan, offer a similar scheme known as SHARELINE, though this only acts as an information system.

A Europe-wide service by satellite with a personal computer and its own dish called TRENDSETTER is available as a delivery service for information on foreign exchange, commodities, gilts and other money markets. Each service is geared at present to the wealthy members of the community, such as stockbrokers, accountants, lawyers, and other intermediaries, but the ideas of remote, home/office, interaction, are developing in all areas of finance.

The application of technology continues unabated. It offers a wide and far-ranging series of benefits. Many will benefit the less fortunate. However, it is still true to say that these benefits tend to be spin-off benefits, and, generally, do not represent a basic thrust by the industries concerned. This is not a criticism of the industries; it is merely an inevitable state of affairs arising from the majority being more fortunate than the small handicapped community. Nevertheless, these industries are all populated by individuals who care for their fellow man, and who only need guidance to ensure that the benefits are maximised for all parties.

Technology has liberated the normal family. It is now being used to liberate the others in society. The impetus requires guidance to ensure a fuller life for the common man.

PERSONAL ENVIRONMENTAL CONTROL

John McCann: Department of Trade and Industry, London

There are many conferences for the handicapped and disabled where the same people come and give the same speech they gave last year. We wanted this one to be different where the theoretical opinions are supported by relevant demonstrations to show that what is advocated can be done.

An early aspect of environmental control was seen some 20 years ago in Stoke Mandeville Hospital where a paraplegic patient attracted the attention of the nurses by blowing a football referee's whistle. A doctor realised that the only power source of this person was sucking and blowing. He decided to convert it into switching control. We see the results of this in some of the equipment on the POSSUM Stand at the Exhibition.

In time this switching became a major system handling many devices but one difficulty was in communication as we know it – writing letters, or even a book. The computer has made even this possible and DTI has provided mobile work stations (trolleys) for some students in Further Education. They can use them for work by day and play Space Invaders at night if they wish!

This led to a decision that we would take work to the disabled if the disabled could not get to work, and so the Remote Work Units Scheme began. These are real jobs at competitive rates.

Any electrical appliance can be remotely controlled, so for the severely disabled person who cannot hit a keyboard, or even use a joystick on an electric wheelchair, something we take for granted, mobility, communication, independence is now on offer. We can also eliminate the problem of having different devices doing different functions, by having one main device which enables the user to add on all those other functions at will. It may be that someone only needs communication; later they need mobility and later they need environmental control. Here is a way of providing these either in stages or at once depending on what disability the person has.

Demonstration of operating appliances

This shows how to use the eyes to control a cursor movement round the screen. The subject is just looking at the screen and moving his eyeballs to left and right to operate electronic switches.

This system of environmental control does not need to have wires trailing from each appliance to the main system. It sends a coded message through the mains wiring in the building to a little receiving device which then responds by turning on/off whatever appliance is required.

We are creating a climate in the UK which will develop the best kind of eye movement control. In St John's Hospital there is a focus for experiment and evaluation of the best system. We start with the needs of the individual and not with technological aids as a solution looking for a problem. The possibilities are dependent on the imagination of the creator. The kind of switch you apply is not important. The really important thing is to let people achieve independence whether its in the home environment, their educational environment, or their employment environment. They can write a letter, or open the front door. There are fantastic possibilities. In the Exhibition we have another environmental control communication system which will operate purely on speech recognition. I said 'speech recognition', but understood speech is enough and guttural sounds are sufficient if those sounds are consistent as far as the machine is concerned.

Question: What this means is that any handicap, no matter how severe can be overcome by using the switch plan with eye movement control glasses. What is required of the handicapped person?

Answer: The technologist can help the handicapped person who wishes help. He creates a world of independence and the things which have made them disabled are being overcome. Simple and complicated activities can now be tackled. Technology has got to the stage where cheapness, reduction in size of hardware and elimination of the more tedious aspects are being considered.

Question: I've got a patient and you appear to have the technology. Honestly, give me a clue. Is it really all as down to earth as you say?

Answer: Yes indeed. As far as I'm concerned I am a commercial organisation. I cannot function without someone paying me. You have the money. I shall have to supply you with the goods.

Question: If I haven't got the money . . . .?

Answer: I'm sorry, but I can't afford to give things away. If I do things charitably I'm not going to survive.

Question: A system like the one you are sitting on must be expensive.

Answer: For the wheelchair system like this the cost is about £2,500. It is a personalized system with everything that particular person needs. The wheelchair itself is a further £1.500 although any electrical chair will do. It doesn't really matter.

Question: Have you actually tried it out on (a named chair)?

Answer: Yes, that was the first chair we used. It was totally unsuitable as far as the particular patient was concerned and he said 'I'm not sitting in that again', so he had to go back to this one. It belongs to a 32 year old who had an industrial accident in which he was gassed 2 years ago. He

has no movement other than left and right movement of his head, with no hearing or speech and a degree of tunnel vision. Last June I spoke to him at a party about how he was getting on with his equipment. He told me that there are not enough hours in the day to do the things that he wants or is able to do. This is his only means of communication, both initiating and receiving. He controls his TV set and uses sub-titles as he is deaf. He can also programme any commercially available software for the Spectrum computer and he has total control over it. All this is done from one machine. He is very lucky. His intellectual abilities are still present but he is a total physical wreck yet by using two switches he can do all that he needs in living and in socialising, yet he has only had his chair for two weeks. He now has all those facilities and with his wheelchair he has total mobility. In Further Education we have found that students have had to leave equipment behind in school and not take it with them because it had been bought by the school and was the school's property. We need a system of continuity as you reach a new phase in your life, with the necessary equipment and adaptations for your changing needs.

I am very grateful to you, John, for taking this theme as it was originally proposed or actually demonstrated because some of us need re-inforcement in different ways more than just listening, but seeing all this equipment being used. It has been very exciting.

Response: I wish we had the answers to all your questions.

COMMUNICATIONS THROUGH HOME WORK STATIONS

Kenny Mathieson
School Computer Programs Co-ordinator, Western Isles, Scotland.
Introduction:
Frits Janssen,
Managing Director,
I T World, London.

Good afternoon. Welcome to the session on Home Work Stations. It is my pleasure to introduce Kenny Mathieson who is going to speak of his personal experiences of one. May I take a few minutes to introduce the general subject of how they operate. Technology in a number of areas provides tremendous opportunities to improve the life of disabled people. We have seen software in education: communication aids: items in the Exhibition on health. Whether we are able-bodied or disabled we seek satisfaction and computers are providing for the disabled a new opportunity. The brochures which have been distributed entitled 'IT and Work' are part of the Department of Trade and Industry initiators for Information Technology year (1982) to look at the benefits and perhaps the disadvantages of remote working as an opportunity for disabled people. One of the first Remote Work Units to be set up was Beverley Ashton, who has a brittle bone disease. Beverley, a university graduate, heard that the Government (DTI) was running an experimental pilot study of six units to evaluate six effective case studies where employers would pay a real salary, employ an individual who wanted the job and a Computer Technologist to provide the job description and match the equipment specification. After 9 months it was clearly successful and had expanded to 10 units. The Minister, Kenneth Baker, announced that he would fund sixty units. These have now been set up and Kenny is going to talk about his personal experience as a worker with a Home Work Station.

Editor's Note: [Slides of individuals operating such Units were shown and discussed. Examples were, running a chemical data-base, production of software for higher education and accountancy.]

Kenny Mathieson

It is a new experience for me talking to an international audience. I hope it will be an experience from which we shall have mutual benefit. Let me explain to you how I got involved in Remote Work Stations, computers and Information Technology, and examine the environment in which somebody like me, with severe mobility problems can work effectively.

Five years ago I was a Primary School Teacher, teaching in my first school in the Western Isles. I was a fit young man with not enough hours in the day to allow me to do what my job and social interests demanded. One evening in May 1980 I had an accident in a swimming pool, which resulted in a spinal injury. I then spent 11 months in the Spinal Injury Ward in Philipshill Hospital, Glasgow. I got home in a wheelchair and for the next 12 months, I was still a young man trying to adapt and accept that I would probably spend the remainder of my life in a wheelchair. Now I had all the time in the world but nothing constructive to do. Yet I had a number of

reasons for feeling thankful, one of them being that my previous employer was showing a keen interest in my efforts at rehabilitation. I was also fortunate that I had friends and former colleagues who were determined that I would not fail in my efforts. Yet I had come to the conclusion that there were few options now open to me, and I could not return to my former profession, because of my acute mobility problems. I was aware of one other option, advances in the use of Micro Computers in the Secondary Schools in my local authority. I was interested, and wanted to explore this option as I felt that there was a potential for useful employment in this new field, if I could gain some training. I was also aware of the DTI 'Micros in Schools' scheme and decided that now was the time to approach my former employers to seek their advice.

From one phone call I was able to borrow a monitor, and a BBC Micro Computer to determine whether I could physically operate them. If I could I would begin to learn Basic and programming principles and skills. I was also put in touch with Callum Hunter of the Nicolson Institute computer unit at the main secondary school on Lewis. Callum provided invaluable help and guidance personally and by telephone. He is sitting in front here and if it was not for him I would not be here this afternoon.

So in summary, after one year in hospital and another year at home considering the options and a further six months in which many of my friends and family thought I was definitely cracked, I was now the master of the computer. I had acquired a new skill that could be utilized. All the Primary Schools in the Western Isles were to be given a microcomputer, and I would prepare the Software. I was also accepted for a three months' intensive computer programming course at the Queen Elizabeth Training College in Surrey. Subsequently I was approached by the Education Authority who pointed out that this scheme had definite possibilities for me if they were to consider me as a member of the Specialist Support Service they wished to provide for Primary teachers using microcomputers.

Then a DTI consultant, visited me and wrote a feasibility report for the job that recommended the configuration that you now see beside me on the desk. Within three months with this new equipment at home, I was working as a fully paid member of the Education Department of the Western Isles Council. My job title is, Computer Resources Coordinator, for schools. The dream is now a reality. I am thrilled and take great pleasure in my new job. It is a demanding job, but I can call on my previous training skills and experience in Education to help my colleagues come to grips with information technology at work in our community.

Essentially I perform a Co-ordinating role for 58 Primary Schools and 16 Secondary Schools and further Education Institutions. I provide by telephone, guidance on (a) Equipment Operation, (b) Software Support and Up-Date and (c) Software Availability. I can be visited at home by teachers, who can discuss with me their suggestions and how they would like to implement computer programs on the use of microcomputers in

their classroom. I can also arrange to meet larger groups of teachers for in-service training at the local School or Centre. Information technology has allowed us to make use of microcomputers in enabling our schools to access at any time my new Database on the Torch, for Software information, downloading programs and educational information. The database provides a similar service to British Telecom's UK Prestel service, and in Gaelic the first language of the people of the Highland and Westerns Isles of Scotland, it is BRUE. The village in which I stay is also called BRUE, a word of Norse origin which means "bridge". Although neither Callum or I thought of that name, it is apt for my work bridges the many different fields of education both within our Region and from our Region to mainland databases and beyond. This makes financial sense, by saving teachers' time and the local authority unnecessary long-distance telephone charges. Let me demonstrate the 'BRUETEL' database. What equipment is required for a school to access BRUETEL? They all have, a monitor, a BBC micro, a disc drive and a telephone. They require a Modem to connect their computer to the telephone and they can then access my database, for information about computer programs and then decide which program they wish to down-load to their own computer in school and save it on disc for a future lesson. This system is capable of handling 15 users simultaneously. There is other information such as the school calendars and events and dates within the Region. We have a message exchange system, and hope to have mail box facilities by the end of this year.

Schools are also involved in building up information about their own areas in preparing information about their village in relation to the rest of the Western Isles. There is also a section on art, drama, and sport where schools build up their own information. The latest option was a suggestion from a primary school teacher to prepare frames which she could store in her own computer at school as the resource provider for GAELIC.

In summary this is a full time job and I get great pleasure from this work. It is ideal for me.

Chapter 4

HANDICAPPED LEARNERS AND THE MICRO

Jurgen Hansen
Superintendent,
Ministry of Education,
Special Education
Section, Denmark

I am happy to have this opportunity to speak to you about this subject to-day. As the Chairman told you, my background is not a technical one so you will not see me use many technical aids.

I was a teacher for many years and subsequently a psychologist. This colours my view of the new technologies in education which for five years have been forcing radical changes on our system. Today, I shall try to suggest what role new information technology can play in social skills for handicapped people.

We must welcome new technology and apply it to the training and education of the handicapped, but 'Who are they?' Are we speaking about people with severe functional impairment such as those we have seen at this Conference or are we talking about the handicapped in a broader sense, those with behavioural problems? I have chosen the latter for my paper.

With the handicapped we have for many years tried to diminish the handicap, to reduce it or remove it, by training and educating but a handicap is not only a problem to the person but also a problem for society. My definition of a handicap is a situation where a person is in some conflict with his surroundings, and is unable to fulfil the demands, the norms in his society. We change society just as we change the person but our present day society may be creating handicaps.

Computers are part of the educational process and can help to reduce a person's handicap. Special education is justified because we try to develop a person functionally and as a whole person in an arranged environment. There are six different functions to be considered in trying to have an individual function as a whole person. The functional difficulties which cause impairment in general and lead to educational difficulties in particular have been divided in terms of these six areas, and one or usually several of these areas function at a lower level than that desired given the demands usually made of human functional ability in the educational system. Special education should be planned to develop the whole personality including the impaired functions by improving the functions which are not impaired or impaired only slightly. Thus the system must be planned on an individual basis.

Individualised teaching is one of the few common features of special education whether the organisation is segregated or integrated. It requires good learning techniques, efficient teaching and tailor-made contents for each pupil. Effective individual teaching material should be characterised by the following:

1 Motivate the pupil to begin work in sequence and maintain it until the sequence is complete.

2 Attractive presentation.

3 An optimal relationship between the pupil's current potential and the demand level of the learning situation.

4 Perception resulting from as many different sensory inputs as the pupil has.

5 The learning situation must have regard to emotional balance, personal security and span of attention of the pupil so that learning becomes a harmonic element in his development.

6 Despite their individualised starting points, they should be able to fit into the whole educational plan of the class group so that their social development is influenced.

7 Finally, learning activities should require an active response from the pupil.

The computer does not occupy a superior position as an educational tool above all other educational material. It may confront the pupil with programmed learning sequences and a series of questions with a reward for a correct answer or a correction for a wrong answer. In this way it helps to meet the 7 points above.

With regard to motivation for handicapped pupils the possibilities are fewer and the risks greater that the pupil might quickly and perhaps permanently lose interest in the teaching. Children referred for special education from elementary school usually have a low educational level, perhaps with added psychological, congitive, social and emotional problems. The handicapped pupil is not the only one to blame for poor motivation as the school system may not have stimulated him, and may have a low expectation of him. The school intensifies a handicap so that pupils with low potential grow even less interested in trying to develop their potential.

Perhaps the reason is that the instruction in the basic school allows for only limited individual consideration. Thus these pupils will frequently feel a sense of failure and rarely experience success. In addition, most failures are consciously or unconsciously associated with traditional learning materials such as text books. It is understandable that they gradually lose the motivating effect. A self-instructing tool like a computer can be adapted

to the potential of the pupil and it is a change from books. With slow learners, pupils with reading retardation or behavioural problems, have increased their motivation. This is also true of pupils with physical or sensory handicaps. It is not enough that the child is motivated. I have seen programs here that may motivate but the child is not going to learn anything.

Teaching pupils with cognitive difficulties, whether in special classes or integrated into ordinary classes, which is increasingly common in most European countries, demands that the teacher's efforts are supplemented by individual educational material, so that the pupil gets continuous feed back. In this area, the computer has great potential. In all well-defined subjects, like the Mother tongue and arithmetic, you can produce individual programs with feedback and varying levels of difficulty but with slow learners there is little suitable educational material available corresponding to that which children with ordinary conceptual problems in understanding quantities, sizes, and communications have.

Impaired vision and auditory impairment does not in itself require special teaching materials. Blind and deaf pupils are able to acquire knowledge and skills at the same level as other pupils. Of course, people with sensory handicaps often suffer from psychological problems as well, thus necessitating individual educational presentation. However, a sensory handicap always presents a communication problem and I leave it to others to speak about the computer as a communication aid.

People with emotional problems are often handicapped in the educational system by their behaviour such as lack of self-confidence, variable achievement level, or bizarre behaviour in pyschotic or autistic behavioural traits. In the case of some pupils who conceal their knowledge or refuse to communicate with others, such as teachers, it has proved possible to initiate contact between the pupil and a computer. Supplementary computer assisted learning can boost self-confidence as the pupil is relieved of constantly having to share his achievement with others. Physically handicapped persons have been able to limit or shift their inferiority complexes through computer aided learning whereas traditional learning methods continually confront them with their handicaps.

Inability to adapt to conditions in the surroundings is often handicapping in our heavily group-orientated educational system. Social difficulties are frequently accompanied by or manifested in the lack of ability to concentrate, low motivation to achieve anything, disruptive behaviour. Pupils with social adjustment problems present great difficulties in the basic school. They disrupt the instruction of other pupils and schools often have to resort to measures such as sedation, observation in special schools or 24–hour institutions for maladjusted children. A common feature of these measures is that they benefit the other pupils and have only a limited socialising effect on the pupil with the problem. The best measure is

undoubtedly to keep the pupil in the class environment where the conflict occurs. Here strongly motivating, interesting personal teaching has proved positive. The computer has several obvious advantages over traditional educational material precisely in this area. There is little doubt that in such a situation it can help keep certain pupils in the classroom and help integrate them into the group environment. Of course, the computer is also valuable in cases where maladjusted children have been segregated and where the specialised level should be maintained or raised with a view to admitting the pupil back into an ordinary class.

Motor disfunction creates a large and varying handicap with both impressive and expressive linguistic difficulties, with co-ordination and manipulation problems in a complex interplay to a greater or lesser degree. In the case of simple movement impairment where, for instance, the wheelchair is the most important complication, the handicapped pupil does not present any special teaching problem but where problems relate mainly to muscular co-ordination affecting the ability to speak and write, special training for the impaired functions is needed. The computer has already made its mark in this area and in sustained development it will no doubt become a useful and supplementary tool for the speech therapist and physiotherapist.

On the basis of what I have seen and heard around Europe, to date about the reputation of the computer as a learning tool, I feel able to draw some conclusions. It is also possible to make assumptions on the analogy of the many years of development work done in the area of teaching aids for special education purposes. In all probability, these assumptions will be confirmed by future research and development work. I will mention some of this experience and assumptions.

First, the computer is well-suited to serve as a basis for individual instruction. Second, the pupil seems to be optimally motivated in the computer-aided learning situation. Third, there are satisfactory technical possibilities for preparing educational programs to give to pupils in order to have them maximise their potential.

Computer-aided teaching gives personal satisfaction by constantly briefing the pupil in the quality of his or her achievements. In a computer-learning situation, the pupil himself decides the working tempo, thus eliminating the stress often experienced by slow learners in group-orientated instruction. The pupil's self-confidence is enhanced by the use of the computer, as is his sense of status in relation to his generally better functioning classmates. The computer makes an exciting alternative to the textbook which slow learners often associated with failure and a feeling of inferiority. The computer frees the teacher from work with some pupils to enable her to concentrate on others.

As an adjunct to these features, some caution should also be exercised that the computer should never become more than a time-limited support for the rest of the instruction. Pupils should not be taught at the computer for more than 10 or 15 minutes at a time. Therefore, the computer should be integrated into the children's classroom situation so that it is one of many pedagogical aids, with general pedagogical considerations.

It is important that the computer is where the pupil is. Thus, it should be possible for the handicapped child to use the computer in his ordinary classroom. Conversely, the computer should form a link in the chain of measures developed to eliminate the need to segregate handicapped children from other learners. Teaching programs should avoid stereotyped or out-dated methods and in general programs should avoid monotonous routines and contribute to active learning. In this connection, programming languages that give the pupils optimal self-control and self-activity in the learning situation should be developed. LOGO is such a language. Computer requirements for processing input and output text must be modified for reading-retarded pupils by adding non-text based responses to the keyboard.

It is necessary to develop strategies and software that complement and co-ordinate the daily working routine of the ordinary special teacher.

Finally, local advice and guidance must be expanded to encompass the use of the computer in special education. Special education continues to be the task of the teacher above all.

It is an indisputable fact that over the last 20 or 30 years the ordinary education in Europe in primary schools has become more and more intolerant of pupils with below normal learning potential. It is my firm belief that the new information technology will enable us to further a society which is more flexible and more respectful of individuals including an educational system which creates fewer deviants but I am just as firmly convinced that the computer society can result in increased social degrading. The direction of the development will depend on how we decide to use the technology. Already there are many examples of use of technology which does not make it easier for the handicapped but fortunately there are many examples where information technology has been used to reduce the handicapping effects of functional disability.

We are here to discuss whether and how the computer can support optimal development of handicapped persons but at the same time thousands of computer experts, politicians and civil servants, are at other conferences discussing how information technology can support the quality, the effectiveness and competitive power of respective societies in a world where the race for economic growth is considered much more important than consideration for the well-being of the individual. Europe is heavily involved in unlimited investment in new technology with the aim of overcoming the superiority of the United States and Japan in this field. As special education teachers or educators or psychologists, we must keep this paradox in mind, a paradox which, by the way, is not a recent phenomenon and

which to an increasing extent has characterised the growth of society over the past 100 years. We have brought in still more and still better resources to improve the lot of the handicapped and at the same time the number of handicapped persons has continued to increase in the sense that more and more citizens have found it increasingly difficult to cope with the demands of society. These reflections may seem pessimistic and may stimulate the inarticulate voices who intermittently proclaim that you might as well give up special education as it is without any effect but the truth is that if we had not intensified special education during this period of development towards more and more technologised and communicative societies, the difference between the well-functioning and the less well-functioning citizens would have been much greater. Indeed, the simple fact is that in order to look after the interests of the handicapped we in the special educational sector must involve the new technology even more intensely than the other educational sectors.

Already to date, around Europe mentally retarded children are manipulating computers as if they have never done anything else. In a few years, ignorance of information technology will be a handicap in itself. If this is emphasised so strongly it is to warn against the risk that this area of special education is neglected. In several European countries, computing has been introduced as an optional subject in the upper forms and the result may be that it is not offered to special schools.

Finally, a common feature of all primary schools is that regardless of the philosophical aims, all pupils should learn the same and preferably equal portions of it so that they can leave primary school at the same level. This tendency towards normality represents a considerable challenge to teachers and pupils. There is a lot to be learned in a relatively short time. There is no time for creative legislation for the effectiveness relates to the hard facts of the subject – knowledge and skill. School demands of its pupils that they know about everything under the sun. The primary schools of certain countries have as many as 35 different subjects. The acquisition of knowledge or information takes place by means of communication, not one way communication as in the old days when the pupils were required to sit passively while trying to pick up as much as possible from the teacher but active participation in the process in which the pupil's ability to respond is vital.

Communication and thereby the close interaction between pupil and teacher and between the pupils themselves reveals mercilessly the good and the bad points of the individual. Aesthetic appearance, in the widest possible sense which has always been an important social value, does not become less important in a school and in society. A set of normative demands and expectations creates conflict which is unpleasant and disturbing to the school system which is still geared to classical teaching. The pupils who cannot handle the challenges are placed in a special group after which the problem can be placed outside an ordinary school system.

It is now possible to see that a handicap is always a problem. Whether we are speaking about the school system or society the handicap is always a problem.

ROBOTICS

Introduction
Peter Avis,
Director,
Humberside
Regional Centre,
MEP

Robots come in a variety of forms and there are developments with functional robots and robots which do various things for people. My subject is slightly smaller robots which are useful in learning, things like the device, pipe-a-mouse, and BBC Buggy and Bigtrak. My experience has been in secondary school and comprehensive schools, but the ideas I shall present can be taken and used in the special needs area.

I shall use the robot as a naive learner. The little robot is being told what to do as a sensible and useful educational experience. The pupil is actually trying to jump over a chasm when learning and it is nice when he has a success, but often he fails. He may learn a lot by failing, but may also lose motivation. The teacher's job is to help narrow the gap to the appropriate level, where success is possible.

To continue the analogy, the computer can come into this situation not necessarily by changing the gaps so that it is so small that it presents no motivation but to increase the power of the machine being used to jump the gap. I shall demonstrate this with this little device, which responds to the sound of a whistle and the motors come on. I blow again and they stop. They have a sequence so that if I blow it again it would turn to the left; then blow it again and it would turn to the right. It goes through a sequence of events and by determining the time interval you can control where it goes. We are starting to control a remote object. If you bring in the computer the pupil has more control and more power over what he is trying to do.

The BBC Buggy is a similar kind of device. Two motors allow it to move around. It has sensors on it to detect various things. It is slightly more sophisticated and is controlled by a microcomputer so it needs a program to direct it.

If I load in the right program which is a form of LOGO – LOGO graphics – called DART – it can drive the Buggy. I could have illustrated this with the Turtle, but decided to use LOGO as this is Edinburgh! The LOGO is called 'Goal'. You could set that kind of task to children to solve a problem.

Pupils can sympathise with the Buggy. They see themselves as operating a robot and it's a friendly environment and if it makes a mistake it is not them making a mistake.

Now I shall demonstrate a program called 'Sunseek' which needs a light to tell it its 'goal'. If it comes across an obstacle which pushes on its bumpers it tries to manoeuvre around it and once it has reached its target which it knows by measuring the light intensity it has completed its job. The light sensor at the front is measuring the light intensity. We are going to tell it to find 'the sun' and it goes around looking for 'the sun'. It is doing a search looking for the highest light intensity. It probably thinks it is at the door and will head for that. It has some reasonable intelligence as to where it is actually heading. Its next problem is it comes across an object. It has to manoeuvre around any object in its path, by using a simple algorithm of bumping into something, moving along a bit and trying again.

If you've got a computer involved, what you have is an interface between the computer and the outside world, and you can vary its responses. If you are a user and the keyboard is difficult for you to use then an interface, just a simple switch device will give you control.

I have also a black box which is an interface, a general purpose one, able to take eight signals in and eight signals out and thus control what you want. The BBC Buggy one is less sophisticated as it does the job for the BBC Buggy only.

In this new demonstration, I have loaded in a control language, a bit like LOGO in that it allows you to build up procedures. The program I devised is called ROBOT. If I say 'LOAD ROBOT' it will load that.

It's like LOGO but it does not do screen graphics or list processing. The program I've got is 'SET FOUR' and 'SETSIX' which switches two motors on. Within that little language I have commands like 'IF TEST 0 = 0 THEN RIGHT'. All it is doing is testing connection 0 and it ought to turn right. 'IF TEST 1 = 0 THEN LEFT'. 'IF TEST 2 = 0 it should stop. Right, Left and Stop are little procedures which just do those particular things, which I have to load into the computer. You do not need a professional programmer to write your program to control your little robot. Children can do that kind of activity and write little programs to switch things on and off.

That program was trying to emulate LOGO, but a lot of activity in schools involves programming in BASIC. We want to make control easier in BASIC so we have put an insert into BASIC, really to add extra commands into BASIC. This saves you having to use machine code for the computer to control things. It saves you having to use funny squiggles and ampersands which are in COMAL. It is unnecessary to make pupils remember hexa-decimal numbers.

So the idea is to add commands into the BASIC. If I illustrate that, I now load that control into BASIC and it comes up with CONTROL BASIC so you can write any program in BASIC and it will work normally. You can do what I did in control LOGO using BASIC.

Control LOGO and control BASIC are just software tools which make control of the robotics easier.

The next more complicated demonstration is the Buggy with a grab arm in front. The program which runs it is called 'NEW GRAB'. It has been written to allow control of the grab and has three light sensors on it and two lights, that is three eyes. We can see on a computer screen, what the Buggy is seeing. There are commands which allow the grab to close and open, lift and lower.

It is reporting back to you what it sees out there. If I put an object in the way and drive up to it the left one goes off the screen because the light reflected from the object comes back to the light sensor.

It also has a facility with the middle light sensor – which can detect when the object is in between the two arms. So I can turn it around, and it starts to get the pattern of light from the two sensors showing again on the screen. It goes up and down and in the middle where the two cross, that is where the object is. You can then grab it, lift it up, bring it back, and release it.

Question: At what age can pupils use Control LOGO?

Answer: It was designed mainly for secondary schools but has been used in primary schools as well at about 9 years of age.

There is an increasing tendency, particularly with younger children, to diminish the boundaries between subjects and so this might be used in any subject in primary school.

Question: When and in what form will this facility be available?

Answer: It is essentially a program on disc and MEP hasn't decided yet who will publish it. Our centre could publish it cheaply for about £7.00 with the instruction book.

SOCIAL SKILLS AND THE DEAF

Abstract
Francine Bonnier, Gadbois School, Catholic Schools Commission, Montreal, Canada

In this paper I describe observations made on deaf children aged 5 to 12, using LOGO on computers.

Four main fields of social development are considered: 1) Autonomy: the ability to work by oneself; the ability to ask for help when needed; the ability to reject unnecessary help. An eight year old severely handicapped little girl, had no autonomy at all when she first started working on the computer; eventually she could type a full LOGO instruction by herself. The second example is of a 12 year old boy who needed an adult very close by to function; he gained confidence in himself and could, by the end of the year, work completely by himself for a one or two hour computer session. 2) Relation with peers: the ability to share discoveries and knowledge, to show interest in other children's work, and to collaborate by sharing tasks, negotiating, planning. A group of 7 girls aged 8 to 11 presented none of these positive social interactions at the beginning of their work, but developed these behaviours in a LOGO environment. 3) Relation with adults: working with LOGO and computers enables the adult to become an animateur, a learning-supporter, a learning –'facilitator'. The adult can withdraw from instructing and controlling the child. New types of interactions with children take place in this learning environment. Adult-child relations are more and more based upon support, encouragement, collaboration and sharing, even with the young child. 4) Communication: for the deaf, the computer is a communication tool. Computers and LOGO create a purpose for communication among deaf persons and also between hearing and deaf people. To illustrate this, we present three situations where deaf children share their knowledge with hearing children and hearing adults, showing them how they work with LOGO on a computer.

Topics for discussion: In education, if we want the child to control the computer, social skills may be more important than we think. To gain control over this new technology, the child must have autonomy and self-confidence, be able to relate to other children and adults, share, give and get information, communicate easily and effectively. A LOGO environment favours acquiring these skills. If one of our main goals is to control new technology and not be controlled by it, we must focus on social skills. A computer environment does not by itself guarantee the development of social skills. The educator's role in creating a proper environment is crucial. New attitudes toward the children and new types of relations with the learners must be considered.

Editor's Note: This was an extra paper, delivered in French. The abstract outlined the aims and was supported by slides. It was followed by this question and answer session.

Question: Is it easy to introduce LOGO?

Answer: When you start working with LOGO it is rather frustrating as you are in a great hurry for pupils to use it. Often people say to us, children will not learn if we do not show them first how to do something. I believe in Papert and am so pleased that he has created a tool for us to use with children.

The teacher with whom I was working in the fifth grade told me at the end of the year she almost resigned as she could not see what the children were learning, but suddenly it became apparent to her. Do not think it is easy with LOGO to see results quickly. Many experiments are short term and you say, 'They have not learned very much LOGO'. It is always the same square, the same star, the same this, the same that. What do they really create?

LOGO helps us to see other points of view and that is what maturity is. It helps teachers to see children's points of view, but it helps children to co-operate in other fields too. It is an amazing social integrator.

LOGO helps with words. With a deaf child I said, 'You choose the word you want and its name'. He looked at me, 'That's impossible. All things have names and adults tell me the name'. He could not give a name. I had to give any kind of name to show that the name wasn't important. Things have names because someone has given the name to them.

Question: This is the same experience that I have had with deaf children in Donaldson's school. Have you considered any other social skills, for example, working with older children? If I give them a problem of a very complicated shape, which they find difficult, I say, 'You must now break it down into smaller manageable units'. This is important to learn.

Answer: Yes, this has been my experience too.

Question: In Germany we have a very large training school for the deaf. If you have to teach deaf people, the vocabulary must be small and the syntax simple. Also there must be only one meaning for a word, but in German there are several meanings for the same word. This is where LOGO is helpful with names for things and ideas.

Comment:

If you are interested in informatics and you make a program, not as a child but as the teacher, you have to structure your program and we teach our pupils the structure and structure symbols. If you make a drawing of the structure for every lesson, such as biology, mathematics and languages, you all work with the same symbols for structuring your problems. It is a very great help.

Answer: I have been working with normal children with learning difficulties and without learning difficulties and I have been working with the deaf. The more I work with the deaf the less I find them different from the normal children. They are capable of the same things but we do not see it. With LOGO, you see it. When you work with LOGO, you can see the deaf child think. I have never been able to do that with any other system.

Chapter 5

TRAINING AND THE OPEN TECH

David Tinsley,
Director, Open Tech.
MSC Sheffield, UK

Although only in post as director of the Manpower Services Commision's Open Tech programme for 33 days, I am going to try to describe the range of this programme which is inherently helping those for whom previous systems of training and education have been difficult. We must first consider what Open Learning is, and in the Manpower Services Commission, we define it as learning which enables people to learn at the time, the place and the pace which satisfies their circumstances and requirements..

This puts the customer first. The customer may be the employer, the individual or the local community, and they require access to the learning opportunities that they seek which will be attractive, will engage him or her and will be available at a price that the customer can pay. In the Manpower Services Commission, Open Learning for people of all ages is a key to business growth. This is why we are so concerned to invest in the development of Open Learning because it is the key to the creation of new jobs and new work opportunities. It strives to make vocational education and training a continuous process throughout life.

Last week in Britain, the National Economic Development Council and the Manpower Services Commission jointly published a document entitled 'Competence and Competition'. It is the result of a study by the Institute of Manpower Studies of the nature, scale and direction of vocational education and training provision in Germany, the United States and Japan, and our interest is that these three countries were chosen because they are our major competitors in world markets.

The Manpower Services Commission and the National Economic Development Council believe that this report is one of the most important documents of recent years, required reading for every British company chairman, chief executive, board member, leading politician of whatever party and every chief education officer of whichever authority.

What emerges from this document is that our major overseas competitors have seen a clear link between investment in education and training and competitive success in developing new products, materials and new jobs. Compared with our overseas competitors, we in the UK are under-educated, under-trained, under-motivated, inflexible and an under-productive work force.

The second unpalatable fact is that for most people in this country, vocational education and training are unattractive and not readily available. They do not engage or enthuse people and do not bring the rewards that

they should. In the realms of competition, another unpalatable fact is that the technologies in which people invest – the plant, the machinery, and the equipment – are the same the whole world over. The difference in a competitive world is the results that people can produce with those technologies. It is the exception rather than the rule for a firm in this country to treat investment in people as equally important with investment in technology and plant or machinery. An employer investing in technology, plant or machinery will ensure that he has a plan and allocates resources to meet it.

First, there must be a clear specification of the standards of performance expected and acceptable. Next, there must be a period of commissioning and running in. Third, there must be careful, systematic, regular and high quality maintenance, and finally, the enhancement of performance, if opportunity presents whether by upgrading or by adding on or modifying in some way.

The trouble is, we do not do the same with people. There is rarely a clear specification of the standards expected, on which providers of education and training can operate. The Government's Youth Training Scheme (YTS) has addressed the question of training for young people aged 16 in a systematic way and is the start of a major revolution in training and education for young people. Yet, we still continue as if vocational education and training was a once-in-a-lifetime experience sufficient to secure a passport to development, performance and prosperity for the next forty years. We do not maintain our workforce as we should. We do not seek the opportunities to enhance, upgrade or extend skills, and we leave this aspect of our affairs to the personnel or training function in a company when it should be a central accountability for every line manager.

Time is not on our side. Our competitors are not standing still. They are still drawing away from us. This is why the Government is investing in the training process, and one medium is the Open Tech programme.

Open Learning tackles the key requirements. Also it is attractive and not academic. With Open Learning, we sustain standards of competence and thus produce reliable results. You have to establish competence at every stage in the sequence. This even reduces the costs of the updating process, which encourages a partnership betwen the trainer and industry and commerce.

Open Learning is one of our main hopes because what is needed is effort on a vast scale – training for all, and repeated training. No group of people has been faced with more barriers to access to training than those who are disabled, and we believe that none stand to benefit more from the flexibility offered by Open Learning than they do.

My job is to look after a funding investment this year and next of some £14 million through the Open Tech programme to provide pump-priming for 100 projects across the country to help organisations outside the Man-

power Services Commission to develop and run collaborative projects which will make Open Learning materials and facilities more widely available. By 1987, nearly £50 million will have been spent on these projects and at a conservative estimate, at that time at least 50,000 people will be benefitting.

Over the last twenty years people have talked about Open Learning, theories have been propounded, organisations have come and gone, but unfortunately the concept has not been fundamental in the learning process. With this investment in the workplace for employed people in industry and commerce, focussing on the supervisory and management training areas, we can provide exemplars of good practice and can develop a new strategy for adult training.

In September 1983, the Commission endorsed proposals to establish five main thrusts for the programme. The first is national programmes to support new technology. Secondly, we shall develop Practical Training Facilities where the traditional resources which may have been used within colleges during the day, five days a week during term time (a mere 32 weeks in a year) are opened up as valuable resources to companies throughout the year. The third aspect is to use educational technology to support Open Learning. The fourth is to support supervisory and management training in industry. Finally, the last is to go into partnership with the traditional education services in projects which will open up access to learning to more people at more times and in more ways than has been the case.

A striking feature of our programme, we believe, is the wide variety of subjects being offered in technician and supervisory training. We have projects addressing the problems of technological updating, robotics, computer engineering, computer-aided engineering, microelectronics, computing, and information technology. Other projects are addressing in new ways long-standing but important problems, such as site supervision in the construction industry, hotel management, inn-keeping, and quality assurance. A few projects, for example, are addressing specific training needs in management areas like export marketing.

Also impressive is the range of organisations involved in the programme. Our Chairman has expressed his own interest in TAYTEC, a company for producing and marketing Distance Learning materials at Gardyne Rd, Dundee, supported by a consortium of educational institutions. There is a range of other institutions such as major employers wishing to make their training systems more flexible, more cost effective and efficient and colleges and polytechnics, working in collaboration with local employers. Yesterday I was at the launch of the SouthTec project which combines a polytechnic, three local education authorities, nine further education colleges and leading companies in the area in a common thrust towards the production of sixty individualised learning packages with an investment from the Government of £1.35 million. You may have ways in which you can do this elsewhere, but it is new to us to see people coming together in this way. It shows that we are willing to work in partnership to develop something new. It is expensive, but we believe, well worth the investment.

You may think that the Open Tech program would use the highest technology in the actual methods of work. This is not necessarily the case. I am always impressed by the simplicity of the overhead projector. What about the simplicity of audio tape and slide packages, which are fully portable and can be used at home or at work? Take the question of new materials used on building sites. A technician might forget the sequence in which they apply the various materials to the job and if you are working on the fiftieth floor of a tower block, it is to be hoped that you have got it right when you are fixing that panel. Training takes place at the workplace as a continuous process.

Of course, we are looking at other methods – the use of video, the use of text, the use of computer-based training, and microcomputer tele-conferencing. There are many media but the message is the most important feature and we are quite frankly sick of projects which are looking to use the technology rather than trying to find which technology is appropriate for the purpose. This is neither new, nor advanced educational thinking, but the programme is, as it is addressing a fundamental question of updating in adult training and with that as the catalyst, we are bringing together enthusiasts who, for many years, have wanted to move in this flexible way but unfortunately have not had the resources nor the target to aim at.

We are encouraging all our projects to use the most appropriate technology to solve a given training problem, but with handicapped people, often their main hope of continued employment is through the imaginative use of new technology. What we hope is that all of our projects will be encouraged to consider the needs of the disabled to bear them in mind knowing that we have this new avenue through which we can reach their needs.

One of our new projects of relevance to this conference is known in the jargon as 'embedded computer-based training'. Wherever there is a computer used in the workplace for word-processing, or financial management, or organisational matters, we believe that that system should, from the outset, be designed with training in mind.

If we could get systems designers whose main aim is to use their equipment in some imaginative way, for the hardware specialists, to consider also the people who will use that system, we could incorporate training. In word-processing, there are packages which train you in how to use the package as part of the system itself. Other packages require you to go on extensive training programmes and when you have just been on one, you have to go back for more.

In Scotland the response of the education and training system to the challenge of the Open Tech programme has been magnificent. By the end of this year, almost every Region in the country will be involved in Open Tech activity.

The Microelectronics Education Development Centre at Paisley is developing a microprocessor kit for home use to learn about fault-finding. It can also be used for fault finding on the job. The project helps to meet the growing shortage of skilled people in the microprocessor servicing area. I am sure that is a key area where disabled people should look for future employment possibilities.

The Glenrothes and Buckhaven Technical College is responsive to local manpower needs and has good links with local industry to establish training requirements. These were practical training at technician level for updating and re-training which was not being met by existing college provision and the 'Practical Training Facility' will expand that opportunity. Another one is the Scottish Tourist Board which is one of the big industries of Scotland. Through SCOTBEC, one of our accreditation organisations, STB will be helping many small businesses, boarding houses, craft workshops, wildlife parks and the like to acquire the necessary skills to ensure the success of their businesses.

There are also two support projects to help with the development of the Open Tech programme. First we have materials and resources information system known as MARIS, and the version North of the Border is called SCOTMARIS! In SCOTMARIS we have on record now about 10,000 indexed items which follow the Open Learning style and anything on that particular data base is available to individuals in the Open Learning mode. Not all of the 10,000 items are Open Tech because Open Learning has been with us for many years. It is vital that people do not re-invent the wheel, and projects starting up are able to trawl through to find out what is already available for use or modification.

Second, we have an Open Tech training and support unit based at Dundee. This teaches people who want to be Open Learning trainers how to be such by Open Learning – almost a 'physician, heal thyself' project. Many people only believe in Open Learning when they have been through the process themselves. The traditions in this country are not Open Learning oriented but if you get the leaders of the community such as chief education officers and certainly the Further Education officers, and possibly their children, exposed to Open Learning which leads to success, then you can start the cascade which will lead to this being the normal form of training.

The fifth thrust of Open Tech in Scotland is well illustrated by the Highlands & Islands Region joint project. The newly established local authority projects are very dear to my own heart, because last November I was bidding for Open Tech money myself and look where it got me! These projects are primarily the setting up of delivery systems to meet the needs of industry and commerce in the community within the local authority boundary. They get Open Learning materials from those early projects which are concerned more with the development of materials and providing the support, the training and the service to the student or trainee in their area, and also for ensuring that all the support services such as counselling, information and tutoring are available.

In two important respects they are different from other Open Tech projects. They are not normally funded to produce materials and they are focussing on local delivery rather than on national delivery, and the role that the local authority projects are being given means that they will be building business relationships and opening up markets with other Open Tech projects.

The rest of Britain will learn a great deal from the experience of the Highlands & Islands project. It is here that the real problems of learning at a distance will be explored and tackled, using a wide range of materials and methods to service the training needs of individuals in sparsely populated areas where access to traditional centres of learning is either impossible or prohibitively expensive.

Open learning offers the opportunity to proceed at whatever pace – fast or slow – suits the needs of the learners. The new technologies can be infinitely patient. Also the materials produced by projects are divided into small self-contained modules. Taken together, these will lead to a recognised qualification but learners are free to take modules in whatever order suits their, or their employer's, training needs. This emphasis of Open Learning in tailoring opportunities to meet needs should make it ideal for people with various types of disability. Disabled people who have found conventional training practically impossible find that the new and flexible opportunities offered by the projects within our programme enable them for the first time to obtain the skills they need to succeed in employment. We can use text sent by post, their own home computer, video and audio tapes, and flexible telephone access to tutors. They can train in microprocessor servicing or information technology, or computer-aided design and manufacture, or robotics, or indeed any other subject. We have not yet found a project that cannot be geared to the needs of the disabled.

Our programme is not primarily about disabled people, but recognising, as we did, that what we were developing had the potential to help, we were and are determined to make sure that disabled people are informed about the programme and the opportunities it offers.

Conferences such as this are important in getting the message across and I hope that delegates will help me in what I am trying to do in encouraging projects to consider all people and their problems and needs.

We have contacted various organisations including the National Bureau for Handicapped Students, the RNIB, the RNID, and MENCAP, and we intend to make more contacts, but we have also advised our projects of the importance of reaching disabled people and have been encouraged to find that most of them are already doing this effectively.

In the near future, we hope to facilitate and extend this process of providing disabled people with information on and access to the Open Tech opportunities through the establishment of a consultancy unit based in a college with recognised expertise in this field. The intention of the unit will

be to publicise Open Tech widely among disabled people and their organisations, and to advise Open Tech projects on how to reach disabled people, and how to modify their training materials or systems to make them more accessible.

In these ways, we hope to make the programme of real benefit to disabled people, not only directly through projects and their flexibility, but also by pointing the way to what can be achieved in the training of disabled people through the use of Open Learning.

Questions

Question: This is very interesting, especially for the deaf, but with distance learning – how can deaf people cope? They need to rely on Sign Language. Have you ever considered the use of sign language interpretation on interactive videos?

Answer: We are not moving precisely in this area but we would like to work with organisations who can take the modular approach that we have started and develop in these new ways if they are thought to be appropriate for a particular need. Over the last few years, Professor Crawford of Aston University has introduced what is known as television video instruction with a facility to record the lectures and demonstrations so that the students can have access on an individual basis. This may help the deaf.

Question: Have you ever considered including Special Further Education Departments?

Answer: I think that it is inherent in the way in which we are developing our partnership with the local education authorities because the Open Tech programme is pump-priming the collaborative efforts of the local authorities who can be encouraged to develop in whatever way they think important. We hope to bring together fifteen local authorities who have been funded through the Open Tech programme during the course of the last few months where they will discuss the ways in which they would like to shape their own programmes.

Question: There were some areas where MSC projects had problems. People would not allow sign language interpreters into the meetings but I am very pleased with the Concerned Technology in Education Conference for allowing us in and encouraging us to have interpreters on the platform. I hope others will remember that in the future.

Answer: I think that speaks for itself!

Question: During the past few years, there have been many training opportunities programmes organised by the Manpower Services Commission where they have run courses in programming and computer technology. The problem with those courses has been the insufficient number of people to run them adequately. How would you be able to overcome the same problem in Open Tech without having sufficient trainers and people to create the courses?

Answer: It is technical in terms of what MSC can do. The adult training initiative of the Manpower Services Commission is currently looking at the way in which Training Opportunities Courses are organised and managed throughout the country and there are new schemes coming in to try to improve the responsiveness and flexibility of the adult programmes. The difficulty with supporting TOPS programmes can be resolved through Open Learning approaches because it overcomes the problem of the student getting access to high technology training within his immediate neighbourhood. All have to have a commitment, the trainee, the organisation, the company and the authorities. Government Agencies such as MSC, have country-wide rules which may seem restrictive but the local area manager can interpret the rules.

Question: Obviously a lot of the problems that the Open Tech will be facing are novel, but a lot of them have already been faced by the Open University. Can I ask what level of collaboration you have there?

Answer: Clearly in the development of materials to meet a distance learning need, there are similarities. These involve the design of learning materials, the relationship between author, editor and development team, and methods of publication, of reaching the individual through television or radio or through the printed material. In that we are very similar.

The Open Tech programme is different in its focus. It is focussing on employed people who need updating in skills that do not necessarily lead to a qualification. The Open University is a degree level institution and so the Open Tech is reaching parts which the Open University would never reach! We can learn from the OU and we do. I mentioned the Dundee Support Unit which is teaching people to develop Open Learning materials. The Council for Educational Technology and The Scottish Council for Educational Technology together within their numbers of consultants have a great deal of experience drawn from the Open University over the last 10 or 20 years and this is given freely to projects as they start.

It comes, if you like, with the pay and rations. All projects get access to MARIS, the resources that are already in existence and the support unit so that you can get a consultant in, well versed in the design of Open Learning materials. But Open Tech has to focus on a specific training target or we cannot release funds to the programme.

Comment: My name is Derek Childs, Adviser on Disabled Students at the Open University. May I add to what David said. We have had discussions and liaison with Open Tech which I hope will continue. As providers of higher education, we probably lead the world in that we are currently supporting some 2,500 students with varying degrees of handicap. One of my concerns would be that Open Tech continues to support its work in this area for disabled students with central funding because as soon as one looks at special needs it has considerable resource implications.

DT: Thank you for that.

AN ASPECT OF THE WORK OF AN ITEC

Andrew Gaffney
Staff Instructor
West Lothian ITEC
Scotland

There are 140 ITEC's in the UK, 19 of them in Scotland. They are training centres mainly for the 16 to 18 year olds who have not entered full time education or training post school. They get a year's work experience as part of the Youth Training Scheme, and over the year there are four basic skills of numeracy, problem-solving, planning and communication, which they learn. These skills are applicable to any job and not just to work in Information Technology.

The West Lothian centre also provides short modular courses of appreciation of basic computing and microelectronics. We also run training schemes for industry, for voluntary organisations and anybody who wants to know more about Information Technology.

Parents come in the evening to learn about writing simple Basic programs, and about electronics. We also teach about peripherals for computers and control systems.

Our computer department has a range of computers, a BBC model B, Sinclair QL, Tandy, Commodore 64, IBM PC and the Torch communications and viewdata system. We provide a local viewdata information service for Livingston to give people information on Rent and Rates rebates, bus service timetables and other local matters.

Our business computing department has multi-user terminals. Our electronics department makes boxes with hands on them for the use of handicapped children. Our Art and Graphics department helps to produce circuit boards. With a simple adaptation the circuits come out of the processor. You can see them floating about in that that tray there. If you look closely you can see the traps on the board. The exposed copper is left on the board and the tracks connect the components together.

We have a program that can convert musical manuscript into an electronic guitar. We use that in the Music Box to store information to play 20 complete Nursery Tunes. The Music Boxes help to train handicapped children. A handicapped child needs some encouragement to reach out and touch; it needs something that is easy to do yet provides a big reward. The Music Box is a touch sensor; that is its reward system. Obviously a single touch is an advantage where you want to encourage a child to reach out and touch, but perhaps the child has not yet appreciated what an object is.

A boy in Edinburgh paralysed from the neck down, can only move his eyebrows. He wears spectacles with a micro switch on his eyebrow, connected to this Box and he can actually do something. It encourages him. There is the 18 year old who is unemployed and needs something practical to do. He helps handicapped children who need a reward system to encourage them. These two areas of special need help each other.

Editor's Notes

Slides were shown of the ITEC.

A demonstration of the Music Box was given showing how people holding hands linked to the box would complete the circuit and produce a response (music).

DISABLED LEARNERS IN HIGHER EDUCATION

Richard Stowell
Director,
National Bureau for Handicapped Students.
London

The National Bureau for Handicapped Students is a voluntary organisation and I do not know whether it is significant but I think I am the first sepaker *not* to use any Information Technology and also the first speaker of a voluntary organisation who cannot afford Information Technology. We are a voluntary organisation comprised mainly of college teaching staff – further education colleges and higher education colleges – educational administrators, specialist advisers and officers, who are representatives of voluntary organisations, and student unions and individually handicapped people. Thus we are a multi-disciplinary group.

Our range of concerns is post 16, post compulsory education and training – whether it is physical or sensory or mental handicap. We are concerned with higher education, also of further education colleges and also the Manpower Services Commission Scheme including the Youth Training Scheme. In that sense our work with higher education students is a minority interest because we are talking about a very small minority, if we confine it to disabled learners in higher education. Our role in the National Bureau we see as threefold. First, offering an information and advice service to handicapped people and their parents and to college staff. It is a measure of the gaps in statutory services that our information service is so overloaded at present. Second, supporting college staff who are teaching handicapped students, primarily by the formation of what we've called lecturer-support groups – particularly relevant to further education lecturers who are working with students with moderate or severe learning difficulties where there is a job of curriculum development to be done. The third role is in trying to promote essential local government improvements in provision – this includes research and currently we are undertaking a research project for the EEC for the Bureau for Action in favour of Disabled People which is looking at provision for disabled people in the Member States. I shall make some reference to provision in other countries but our research is only in the mid-stages.

I am conscious that there is a parallel session going on about the disabled learners in further education. I know that like myself many would have wished to attend it. I want to show what is distinctive about higher education as regards the disabled student and obviously as the theme for the conference is Concerned Technology I want to concentrate on that particular issue although I will broaden it out.

Let me answer four questions. First, what is higher education? Second, who are disabled learners in higher education? Third, where are they and how many are there? And fourth, what are their needs?

First, what is higher education? It is seen in the work of universities, polytechnics and institutions of higher education, in their advanced work, mainly at degree level. I distinguish it from the colleges of higher education some of which are doing work with mentally handicapped young people.

Second, who are disabled learners in higher education? I could list people with specific learning difficulties – dyslexia, those with physical handicap, sensory handicap, and a group that has been neglected in this conference – those with some degree of mental illness. This is to use the medical model of disability. I do not wish to talk in those terms as they are inappropriate today in education, particularly higher education.

One of the chief research reports carried out on the disabled student in higher education in the United Kingdom was carried out in 1976 by Derek Child who is present and is the adviser to disabled students at the Open University. He concluded in that research study that handicap may lie in the eye of the beholder and the definition he employed was explicitly confined to a condition characterised by physical or sensory impairment which could produce educational disadvantage, in the tertiary sector. I quote "For physical or sensory impairment to become academically or vocationally significant someone must perceive conditions of departure from physical or sensory norms, must encapsulate that perception, must report it to others, negotiate the acceptance of this definition and obtain a response that conforms to it. Once these requirements are met the individuals designated handicapped, become special persons, are evaluated relative to others not deemed handicapped, and have modes of activity and conduct prescribed for them. Thus, just as a medical problem is founded upon certain assessments and routines so judgement is passed by the tertiary sector according to its own array of criteria." That is what he meant by handicap lying in the eye of the beholder. It was this judgement passed by the tertiary education sector to which Derek directed his attention to explain some of the reasons why handicapped students were currently in higher education.

So where are the disabled learners in higher education and how many are there? The immediate problem is of coming up with definitions of disabled learners, and therefore quantifying it. The first effective study in 1974 by the National Innovation Centre reported 554 disabled students in universities and polytechnics, or 2 per 1000. A few years earlier a National Survey of Disability showed that in the student age group – 16–30 age group – there were roughly 9 persons impaired per 1000. This is the measure of the under-representation of disabled learners.

The second survey was carried out by Dr Alexander Gunn of Reading University Health Centre. It was in UK Universities where he located 258 disabled students in 34 universities, working out at exactly 1 in every 513 in universities, again almost exactly 2 per 1000. Work that I have been doing in the Netherlands and in Germany, has produced similar figures of 2 per 1000 as the number of disabled learners in higher education.

The reasons for this under-representation are numerous but the main one is the sheltered, uncompetitive nature of many special schools and the limited curriculum within those special schools and the lack of opportunities in further education for the disabled learner to catch up on education he has missed. Further Education opportunities have expanded rapidly in the last few years, however.

The British obsession with age which I can find nowhere else in Europe, that things must be done at a certain age, that you go on to the next stage of your education at a certain age, have the effect that once you miss that age you get problems connected with entry and with grants. The entry qualifications – the barriers in terms of entry – that we place in further education and in higher education are certainly not confined to Britain. Holland and Germany are examples of countries which are far worse in creating entry barriers to further and higher education. Yet in the UK it is still a serious problem. Grades at Advanced level study required to get into universities in this country have increased yet again. The barrier is getting ever higher for disabled students.

We have begun to move in the direction of open access at the other end with mature students, and some disabled students, gaining entry to univsities, particularly Sussex University. The barriers elsewhere are strong and high. Nothing in this country matches the legislation in the United States which opens up the possibilities in further and higher education for disabled learners. We have argued strongly in recent years for such legislation in the UK and many of us were heartily disappointed when Robert Waring's bill was talked out in Parliament last year. Having said all that, we should remember that we are talking about people who have secondary learning difficulties. These prevent us from having the same proportion of disabled students in Higher Education as the proportion of disabled in the Community. Cerebral Palsy and Spina Bifida really do place a limit on the academic performance of many disabled young people and therefore on entry into higher education. One group that does significantly better than the average handicapped student is the blind and partially sighted. In 1978 Mike Butler, a student adviser with the Royal National Institute for the Blind, reported 382 students enrolled over a period of 9 years on degree or professional courses, and the RNIB records showed that every university in England and Wales had accepted at least one seriously visually handicapped student.

DISABLED LEARNERS IN FURTHER EDUCATION

Philip Gartshore, School of Architecture, Portsmouth Polytechnic, England

I wanted to give my own view of how technology can help disabled learners in further education, without being too idealistic. I started with a clean slate when I first thought about how Concerned Technology could help in Further Education and an extremely wide canvas, believing that Concerned Technology should not be sufficient in itself but should be seen in the context of the college structure. Technology is not just a gadget or interesting toy. It must also relate to the curriculum and the individual. Technology is a facility that can help bridge gaps which prevent people from reaching their potential. When I talk about disabled learners, I am talking about the whole range of physical handicap, and learning difficulties. These students want to use further education to move on to higher levels of academic achievement but also have a fulfilled life.

An important factor is the way in which technology can help to overcome impairment, by assisting in better physical functioning, or providing better communication together with any social and educational disadvantage which the individual faces. An idea which is gaining ground now is independent living, making personal decisions which affect the individuals' future and Further Education helps people to decide what they want to do and to live as independent a life as possible. Another factor, is the one of making sure that the quality of the learning environment is as rich as possible so technology should help integrate the disabled learner into college life. The final factor is that of learning about the new technology itself preferably by using it, to enhance job opportunities, and leisure activities.

During the course of this week I have seen some encouraging steps towards overcoming impairment, eg, a robotic prosthetic arm used to assist a severely physically handicapped individual to eat. That is a basic level of life.

A disabled person should be able to do all the things that his peers can do such as switch lights on and off, and use TV and cassette and audio visual materials. My particular background is scientific and there are many ways in which computer modelling, and computer analysis can overcome many of the problems which prevent a disabled person becoming involved in laboratory work because of safety hazards. It is not enough to think of technology replacing learning schemes. It must provide different schemes; that of interactive video and disc control, is an example, as it cuts down the need for physical moving about. Thus physical limitations do not get in the way of access to an educational need. It is easy for a disabled learner to feel isolated in the college situation, and not be part of the education community. A local network of community news, course details, job opportunities, and through that some kind of counselling service would lessen this.

Technology has the ability to link many functions at one site. Ken Mathieson's concept of a home work-station, is an example. A work-station, in a college ought to be somewhere which is socially acceptable and at the same time able to give some special functions. Ability to type, to know about office practice and the ability to take notes, are all valuable. Communication has been mentioned often this week

The use of learning packages, the creation of computer-managed learning, individualised learning packages are essential and should be available to all students not just the individual. We need a mixture of meeting special need and integrating the individual into activities offered to other students.

Then there is environmental control. The electronic notepad, like a Micro-writer, or the calculator, information management, all help one control one's environment. Computer programming could be an aid to employment or perhaps just a hobby. There has to be thought given to the way in which an individual interacts with the system.

How do we go about designing a concerned system which includes the educational needs and the technological possibilities? In common with all design work, the feature has to be robust both physically and also in programming style. It needs to be easy for an individual to use and have the latest ideas in technology. Secondly the system has to be designed round a particular individual or be a system that adapts itself to a disabled learner. Technology must not just provide a function but change the way education is seen for the disabled learner. Because their needs go hand in hand, education on the one hand and technology on the other, co-operation is vital and it is the main contributor to that concerned design, not just concerned technology but concerned design of technological systems and how that fits in with course work. It has to include the technologist, the educator and those in the college framework who decide, in terms of managerial function, what changes are needed, what facilities will be provided and to what extent. The learners themselves have to be part of this design process in the sense that they should be consulted as to how they see the usefulness of a particular technological aid or a particular learning package. The practical difficulties of the disabled are paramount and neat administrative systems will not solve that.

THE YOUTH TRAINING SCHEME AND HANDICAPPED YOUNG PEOPLE

Paul Wheeler and Sandra Brown
Specialist Careers Officers,
Lothian Region, Scotland

Some of the greatest superstars that this country has produced in recent years have the competence and the confidence that success in their chosen field brings. These people are successful because of high quality training. This applies to all endeavours, but particularly when making the break between school and working life.

For those leaving school at 16, there is a new scheme available which has been designed to give young people a good start. It is called the YOUTH TRAINING SCHEME. It is open to all 16 year old school leavers, whether they already have a job or not, to help them bridge the gap from school to work. The whole scheme has been designed for them to make them more attractive to the country's employers, better skilled and more confident.

Such an important task takes time. Each complete scheme will last about 12 months and on that scheme people learn a wide variety of skills, related to a range of schemes. They differ from area to area but the local Careers Office and Job Centre are there to help young people get what they want. The students get experience of different kinds of working but in one area, training skills, and a certificate related to their work. This written record of their performance is a passport to more training or further education. There is training off the job of at least 13 weeks. Those on the Youth Training Scheme who have a job, will get paid a wage. The others will get a training grant tax free and with no National Insurance requirement. Comments from trainees are:

"The training is far better than I thought it would be. It is very varied and you cover almost all aspects of the business. The scheme I would recommend to anybody because the scheme really is what you make of it; if you are going to put a lot into it, you will get a lot out of it."

"The scheme helps you to get experience if you want to go and get a job somewhere else, or it is training, so if you go for a job you can tell them that you've got experience."

"I came on the training scheme because I was looking around for a job. All the jobs needed experience and I thought this would be a chance to find it".

"My opinion is that I think it is not cheap labour because I am learning quite a fair amount of stuff compared to the person who is on the dole".

When asked to speak here and relate YTS to disabled people Sandra and I were a bit nonplussed because there is not a tremendous amount of Concerned Technology or New Technology in the Youth Training Scheme, but we have selected four areas. First, careers services are beginning to use computers for matching young people with places on the Youth Training Scheme. The problem with computers is that they handle facts, not people. They do not identify a sympathetic employer, or a helpful employer. We temper our computer information by giving young people advice based on our opinions and our experience in the job. If you ask an employer "Can a person with one leg do this job?" he will say "No, certainly not." If you ask "Has a person with one leg ever done this job?" you get a different response.

As all MSC schemes now advocate computer literacy and information technology, we ensure that young persons get a short period of time during their year on the Youth Training Scheme on these.

Information Technology Centres provide specific training and education in computers and in information technology and various related aspects. Some are geared to young people who are disabled in some way or another and the one which Sandra will be discussing this morning deals specifically with deaf people.

The final point about new technology and the Youth Training Scheme is that some schemes do provide exposure and training in new technology. Sight & Sound in Edinburgh, and Keyboard Scotland Ltd, are examples.

One of my fears is that the Manpower Services Commission over the past 12 months has begun to play down the social aspects of the programme. They are redefining the basis upon which guidance is given and dwelling more on vocational training aspects.

While all ability levels are catered for within the Youth Training Scheme, the scheme is principally employer borne, principally by the private sector and so employers are selective.

Recruitment is open to all young people equally, but there are more places that are more attractive to boys. We have been trying positive discrimination to encourage girls, but girls do not seem to be interested in joining information technology programmes.

Many argue that all the programmes were designed principally to reduce youth unemployment, but this programme is a training programme. The reduction of involvement from the local authorities and the voluntary sector is regretted as they have been more innovative than private sector employers who cannot risk innovation. The system of certification of trainee achievement is recorded in the form of a profile showing what each youngster has done during the course. It is issued on completion of the scheme. Some employers have issued certificates after youngsters have been with them for a very short time, tending to pay lip service to the standardisation and quality control that is envisaged. If people get certificates merely by attending, this devalues the certificates for others.

AN OVERVIEW

Patrick Daunt, Head of Bureau for Action in Favour of Disabled People. Commission of the European Communities, Brussels

I am going to give quite a short presentation. Nobody wants a long speech at this stage of the conference, but it does have certain implications; it does mean that what I say cannot possibly be a summary of everything that has happened here. I do want it to be, however, a genuine authentic reaction and response, albeit a somewhat personal one to the conference. I had not formed any thoughts about it until fairly late last night and indeed I was still forming some of my ideas this morning. I have planned the paper in three sections, starting with a general reaction. Second, I want to identify five specific themes of key issues. This will be a personal selection and, will not be definitive. Third, I want to say what contribution the European Community is making and can make to the problems and the aspirations which have preoccupied us here.

First the general reaction regarding the new information technologies and the education of disabled people. My broad conclusion is that it is an encouraging one as well as a challenging one, in spite of all the obvious problems, and that the positive factors outweigh the negative ones. On the material side, concerning the new technologies themselves, I think that we have seen and heard here ample proof that the new technologies have a major contribution to make to all, or virtually all, kinds of disability and certainly to all those with sensory or motor disabilities and to those too with intellectural impairment. New technology is relevant to the needs of all aspects and phases of life, to the basic functioning; to education and training; to daily living; especially through environmental control and communication aids and of course to employment, whether in the normal work situation or in remote or home work-stations.

On the human side, there seems to me to be a new sense of acceptance of the need for innovation. There are apprehensions; there are perhaps some signs of prejudice. Yet, there is, I believe, a new consensus and I believe it is more broadly based, less partisan, less frantic, more self critical, than the kind of approach to innovation that many of us experienced in the educational field in the 60s. Together with this there is lively enthusiasm, an eagerness to communicate, an openness to new ideas and a determination to reduce national barriers. It is for these reasons, material and human, therefore, that I believe we can look forward to the future, in spite of the problems, with a certain sense of encouragement.

Now let me look at some of the key issues underlying the discussions during the conference. There is a need for increased co-operation and co-ordination between all the concerned agencies and services at all levels and if that is going to happen, instead of just being talked about, there is a need for ever growing networks or specialised centres of information and consultation to mobilise this activity.

Here I hope the European Community may be making a contribution in two ways. It is an intention, as we develop the Handinet project, that is the European Community's project to establish a computerised information system in Europe on disability questions, to stimulate the creation of regional centres of information and consultation focussing on new technologies. These would focus on all the needs of disabled people and increasingly this idea of regional centres will be able to develop as a European-wide network. We hope we shall be able to make a contribution by means of the sixteen district projects, locally based projects to promote the social integration of disabled people which we have recently launched.

There are one or two projects in all of the Community countries whereby we are promoting the notion of improved co-ordination and co-operation between local services, agencies, public, private, employers, trade unions, and disabled people themselves to bring about independent living for disabled people.

A second key issue which relates closely to this is the need to increase the active participation of disabled people. It is a wide and general need, relevant to all problems of disability, but I think very specially relevant to the problems we have been considering at this Conference. This Conference has made a contribution. It is not so long ago, and it could still be true sometimes in the future, in our European Conferences, that there would not be a ramp to the platform; there would not be a dog there in the aisle; and there would not be a signing interpreter for the deaf. We are taking steps forward, but we need to be self-critical on this issue. We still have a very long way to go.

Now, the particular relevance to the new technologies is surely that we must take bold steps forward in the involvement of disabled people themselves in the design, in the development, and in the evaluation of technical aids, including those which use new technologies and this is an increasingly important need. Where we fail to do that we shall suffer highly undesirable consequences, disappointment and wastage of investment.

Investment brings me to the third critical issue. We are all faced with very serious economic problems in this field. In spite of the positive statements I made earlier on, this is a deep problem and the economic difficulties may lead to disappointments. It is a challenge to politicians, to administrators, to professionals, to those who work in voluntary organisations and to the commercial world. There are, I would suggest, two useful lines to follow; this is rather tentative because I think we have to do more work and think more about the problem. I believe it is reasonable to suppose that improved, really well-designed systems, themselves using the new information technologies, like the Community's Handinet Project, will help to reduce redundant or incompatible activity and promote more viable and therefore better markets for consumers and for producers.

Second, and this is one theme that has been coming through quite strongly in this Conference, costs can be reduced by linking special interfaces to standard equipment rather than the production of specialised apparatus. If we expect the politicians and governments to help us financially, we have a responsibility to do everything we can in our different professional or personal situations to ensure that our activity is as cost effective as possible.

The fourth special issue is the need to review constantly the whole question of the access for disabled people to educational and training provision. This involves the whole question of balance and articulation. Some modification of the balance between integrated and specialised educational and training establishments is needed. This is a new priority theme for work at European Community level. It has just been adopted by Council of Education Ministers in June of this year, much to the delight of the European Commission, because we have been trying to get an agreement to work in this field for years. I hope, therefore, that the Community will be able to make a contribution but one must stress the importance of increasing flexibility. In that context I was particularly interested in what David Tinsley had to say this morning about the idea of the Open Tech.

My fifth key issue, is obvious. It underlines what we have been talking about at the Conference, training. There are prejudices. There are apprehensions in the teaching and training professions as far as the new technologies are concerned. There are also, dangers of the misunderstanding or misuse of new technologies in education. The European Community must make a contribution to these problems. Study visits for educational administrators, are now being opened up for those particularly concerned with the education of disabled people and a new study visit programme which will be particularly devised for teacher trainers working in the field of the new technologies.

I hope there will be a European Community contribution but there will be a need for radical action at national level too if we are going to grasp this rather intransigent problem of how to mobilise forms or modifications or innovations both in pre-service training and in in-service training of teachers and trainers to face quickly-changing realities.

Now I will say a bit more about the contribution of the European Community. I mentioned one or two instances in passing, but now I will mention the general nature. What can the European Commission do to help? One needs to understand the difference between a European Community fund and European Community programme. Failure to do so has caused, is causing, and, may cause in the future, a good deal of misunderstanding, disappointment, frustration, or even bitterness.

A fund is a large sum of money which is available to give direct grants to the real capital or operational costs of an activity in a Member State. A fund is a lot of money, but it is a narrow thing. It operates under narrow, strict and severe criteria.

A programme is exactly the opposite of that. A programme is a small budget promotional activity which will have rather broad terms of reference and all kinds of flexibility to develop new priorities and be sensitive to changes in needs.

The fund that matters to us, as far as this conference is concerned, is, the European Social Fund. It is a big sum of money. It does, for eligible projects, deliver 50% of the operational costs, not the capital costs, of real activities in the Member States. There are limits and we must understand them as they will not change. The fund will only support vocational training programmes or job-adaptation programmes. It will not intervene in general or basic education and it will not intervene in many of the other areas we would like it to if it was an ideal world – access problems, daily living problems, information consultation centre problems. That other 50% has to come from public sources in the Member State concerned. With its limitations, the fund has an enormous amount to offer in the training area. Disabled people are still one of the top priorities as far as the fund is concerned and new technology is one of the new priorities.

The projects which are concerned with training or job creation for disabled people involving the new technologies, provided they are eligible in other ways and are well-designed projects, have a good chance of support from the fund. Most of the innovatory projects which have come forward in this first year of the new fund concerning disabled people, have involved the new technologies in training, either as means or as ends. They have only come from two countries so far – I expect you to guess which those two countries are – they are Beatrice and Benedict of the European Community. We could have good applications from other countries too. In spite of the fund's limitations I would like to invite everybody here to take an interest in it, to explore its relevance, either for you personally or for other people with whom you are working in the training field – colleagues, collaborators, in the training field for disabled people.

As to programmes, two of these are relevant to this conference. There is a programme for which I am personally responsible in my bureau, to promote the social integration and independent living of disabled people and there is the education programme where new technologies is one of the main elements of work. Programmes are promotional activities. Programmes make it possible to undertake studies and seminars; to set up schemes for study visits or other exchanges; to develop information systems and to facilitate or actually initiate development of policy and in fact you can say that my programme has three objectives. One is to facilitate and initiate, where I can affect policy development; the second is to set up an information system, the Handinet project; and the third is to promote innovation, the exchange of experience, and the dissemination of good practice.

In the short time available I want to point to one or two specific actions concerning new technologies and the education and training of the disabled. We undertook, as some of you know, the first study which has been done in the European Community on this theme. It was prepared for us by Jurgen Hansen who is a delegate from the Ministry of Education in Denmark at this conference. That gives us a basic theory, and terms of reference as to what education and new technologies for the young disabled and disabled students is all about. This report of Jurgen Hansen's was discussed at a seminar which was held in Denmark this May and also supported by the budget available to my Bureau and the final report of that seminar will be available soon and we shall be doing our best to help with its dissemination. We have also had the privilege of being able to make a contribution, albeit a modest contribution to this conference too, and we regard that as another important step in the carrying forward of the whole European and International debate. We shall be organising in Manchester in June of next year a major European Commission Conference for which the Commission will be directly responsible, to bring together all the thinking and experience which has been developed and has grown so far with the hope that we will be able to undertake a specific policy initiative at the community level on the theme of new technologies and disabled people including the education and training of disabled people.

Finally, I believe that this conference and the splendid exhibition which has gone with it have well demonstrated to us the notion of the concerned face of information technology. I believe, that this conference has made a major contribution to European and international exchange on this theme, and I hope it will lead us to want to make sure that the means for that exchange will be strengthened in the future. With that last thought, I will finish by congratulating the organisers for their great success with this conference and by thanking them for the invitation to attend here, and for the chance to address the conference in this way.

A MICROELECTRONICS LEARNING DEVICE

Stathis Triantafillou, Supervisor of Learning Laboratories, Institution "THEOTOKOS", Atlikis, Greece

I returned to Greece from Canada to find the economic situation at the hospital where I work such that there was not the equipment and not the will to develop the computer for learning. I developed a device which I will explain by using.

The whole idea involves the computer, a screen and slides which we project on to the responding board which the child uses. We used Skinnerian principles including motivation. When a child starts learning he turns on two prestimuli lights, and enjoys his new toy. In the first sessions, we let the child turn on and off the lights. He is then presented with a task at the centre of the screen and when he answers correctly, the response is a light and a buzzer. We place the child in an alien situation and he receives the light or the sound after he has accomplished the learning task. We want the child to develop a direct relationship with the device and hence the reinforcement through it. We determine our methods based on the behavioural make up of the child. The child, even from baseline, as we call the first session, tells us that he wants more, and we provide it. If the child does not want anything we just give him the learning tasks and nothing else.

This device involves many learning tasks. The child is confronted with programs like basic concepts, numbers, coins as a way on to reading and writing. It is not writing. It is punching, as we use a simple typewriter in front of the screen. The child punches out the letters and writes the word that is projected. Then he takes the paper to his desk and writes the word out by hand.

Subtraction and Addition, are more complicated and we use cartoons, with Drachmas, WOLFMAN and Mickey Mouse as the main characters. We use a Commodore 64, with a tape recorder and a printer. We use games as reinforcement at the end of a training session. We hope that some children can advance from this to doing simple work with Mainframe computers in Government Offices. We also use video cassettes for such things as, basic toilet training or taking care of one's room. Then we use questionnaires for the nurses to determine the effect of the viewing. The device has a transitory role. While using it we analyse their behaviour and potential before introducing our computerised programs. We sometimes use children with sufficient intelligence to train others. The methodology of the whole system is that the children themselves tell us what they want. We look out for transfer of learning, as the danger in audio-visual learning or even in computerised learning is mechanistic learning, where the child keeps trying instead of thinking. Whereas in other forms of learning the child tries to think and not continue to try if something is wrong.

In Summars, in Greece for audio-visual training and computerised learning, we look very carefully at the overall make up of the child. The behaviour of the child is the guideline for us. We are not doing what we think may work but what the child chooses.

Chairman: Dr Graham Hills, Principal, University of Strathclyde

The Minister responsible for Industry and Education, Mr Allan Stewart, is behind me; he opened the Conference on Monday and is now going to close it. For people who are not Scottish, let me say that education in Scotland is different significantly from education in England and is said by those of us who live here to be slightly superior! Its aims and objects are broader and, in my not very humble opinion, more civilised and we are glad that our neighbour is going to be following suit. So I wouldn't like you to think it is entirely homogeneous or, to put it more baldly, monolithic in this country. The second point is that because Scotland is a small country, all those responsible for these important matters are very directly accessible to us. The fact that I know the Minister well and can contact him easily is something that is only possible in small countries. Certainly England, which is not a large country, would make it very much more difficult for that to happen. So another of the pecularities, if I may say so, of the Scottish scene is the accessibility of the Scottish Office in Edinburgh and of the Scottish Education Department of that office. The man who runs that is Allan Stewart. He is a good friend of education and of its modernisation and its reform and we are very pleased that he could come from the Office now to close formally this conference. Mr Stewart.

J Allan Stewart, Minister for Industry and Education, Scottish Office

Thank you, Chairman, for that excellent commercial for Scottish education which saves me from doing one. I would like to take as my theme for a few moments in closing the Conference the word CO-OPERATION. I think in carrying forward the momentum clearly generated by you over the last few days that this is the key. I mean co-operation at different levels – at international level, national level, regional level and whatever sub-division of local organisation that there is within your individual countries. This Conference emphasises once again that progress can be made by good organisation. There is a common denominator in the education of the young – engage their attention, educate them in the ways of learning, demonstrate life and social skills and train for employment.

The education of the handicapped is no different but it is more difficult. It is more difficult because the term handicapped can cover a wide variety of disabilities. This immediately reduces the number of children in each specialist group and in turn the number of teachers and other persons who educate those groups. We encounter, therefore, the classic economic problems of making the most effective use of scarce resources. So, if ever there was an area where co-operation at all levels was an absolute necessity, it is in the education and training of the handicapped.

Before I develop that theme a little, let me just concentrate for a few moments on the Conference itself. First, I must mention the very impressive exhibition. I am sure, Ladies and Gentlemen, that you will join with me in thanking all the exhibitors for coming along to Meadowbank and assembling such an impressive array of equipment and aids. I think it has been helpful to have that impressive exhibition alongside the Conference here and I hope that as well as being a focus for information and advice, it will be a resounding commercial success. Turning to the Conference itself, I think what struck me most forcefully when I looked at the programme for it was that the term handicapped covered such a wide range of disabilities, ranging from the mildly mentally handicapped, which was possibly the largest group, through children with communication and movement problems, with all the various sub-divisions in these two categories. The second thing was the range of speakers; coming from all parts of the United Kingdom, from the United States, Canada, France, Netherlands, Greece and Denmark. We had our last speaker, a Rapporteur from the Community, bringing, appropriately, the various threads together. Now I know from my colleagues who have attended the working sessions and, indeed, from my own informal discussions with delegates that the main objective of the Conference has been achieved, namely a productive, fruitful mingling of people from many countries, discussing common problems. I believe even professionals who thought they knew everyone in their specialised field have been meeting here at the Conference new people, new contacts with the same interests. I hope you have enjoyed our hospitality programme which was designed to afford relaxation so that you could come fresh each day to the working groups and main tasks of the Conference.

To return to the theme of co-operation, I am happy to hear that already emerging from the informal discussions at the Conference has been the suggestion of the formation of an international working group to develop a strategy for co-operation. Nothing which is worthwhile in any field is ever easy but the first step in the right direction is the most important one; it is almost half the battle. I would therefore commend the idea of working on such a strategy and perhaps this is something where the Commission of the European Community in Brussels could, in the first instance, advise on the most appropriate forum.

Moving from international to the national level, may I offer some ideas from the United Kingdom. Already we have started to build a network of the kind of co-operative units I am talking about. In the other three parts of the United Kingdom, England, Wales and Northern Ireland, a chain of resource centres has been organised to give advice in the use of micro-electronics within Special Education. Here in Scotland, we have the Interactive Viewdata Network in Glasgow which will link with all special schools in Scotland. We have also established 3 Development Centres in special schools which are intended to be Centres of Good Practice, providing advice to neighbouring special schools and there is the CALL centre at Edinburgh University which is our resource centre for the physically and sensory handicapped.

Further evidence for co-operation in the United Kingdom has been the way in which the four countries have come together to organise this Conference and to co-ordinate the preparation of the Microspecial Pack. Co-operation, effective co-operation, needs organisation. I am happy to say that the progress we have made in the development of microelectronics in education in Scotland has come from the conjunction of these two factors. There is central co-ordination from a committee representative of all sectors of education, a committee deliberately dominated by curriculum and local authority interests. Already we are beginning to see a flow of well-considered and authoritative advice on hardware, software, teacher training, buildings, maintenance, computer languages and ideas for further research and development.

Ladies and Gentlemen, in drawing this Conference to a close it is only right that, as one of the few people who did not do any of the work, I should end by asking you to express your appreciation of the very hard work done over a considerable period of time in preparing for the Conference by various groups of people. Our thanks are offered therefore to the members of the organising committee, to the officials here at Meadowbank Stadium and others on Edinburgh District Council who helped, and, of course to SMDP and the other staff who kept the organisation of the Conference running smoothly with a great deal of enthusiasm. We also appreciate the financial assistance from several sources, notably from the Department of Trade and Industry and the European Community, from IBM and from the Gannochy Trust.

We thank you, Mr Chairman, and your co-Chairmen for chairing the sessions and thank the speakers who took such trouble to prepare and to deliver their papers. Finally, may I thank you, the delegates for coming here and taking part in this Conference. We hope that we shall see those from other countries in Scotland again. It is your verdict, Ladies and Gentlemen, which will count and I hope that your verdict is that it has all been worthwhile.

ENDPIECE

J G Morris

If I were reviewing this book, I would say that the papers varied in length and in quality. This is true, and intentional and inevitable. Speakers and delegates were selected and invited so that they represented a range of persons and of views, from the field of the Disabled.

Some papers are full of factual material and will serve as a reference point for a few years until overtaken by yet newer technology. Some papers give the view from the grass-roots, and are all the better for that. Some papers express caution and even doubt, on educational, on administrative, on practical and on financial grounds.

There are two major areas, that of prosthetics, including robotics, as compensating devices for certain handicaps, and that of educational material aimed at living and learning so that work and leisure in satisfying form are aspects of that living. Sub-sets of these are the devices for communication aids and those to counter sensory deprivation. The neglected area, as always, and gently pointed out by two speakers, is that of mental illness.

Closing speakers suggested an international forum, supported by organised national groups in individual countries. The framework is already there, but the level of purposeful activity varies, and all interests are not held in common. However, wider contacts have been made through the Conference.

If you are disabled and have a plan which will help yourself and those in a similar position, then find the common ground, explain and cost your proposal and contact national and international bodies. There is a fund of goodwill towards the handicapped in the community at large, but it has to be topped up by the ideas and enthusiasms of the disabled themselves, as there is in all of us the ability to emulate the Levite, and pass by on the other side.

Steady but controlled pressure from the disabled on the national and international bodies, will get action for specific projects, and they could do worse than adopt the slogan of the Scottish Health Education Group,

BE ALL YOU CAN BE