Unit 7
Accessing technology

Inclusive Consultancy & Training Syndicate

ICTS
lead organization: Inclusive Technology Ltd

Syndicate Members
ACE Centre Advisory Trust
ACE Centre North
CALL Centre, Edinburgh University
CENMAC
Cwmni Cynnal
Down Syndrome Association
Inclusive Technology
Manchester Metropolitan University
Royal National Institute for the Blind
The Advisory Unit: Computers in Education

Authors: ACE Centre Advisory Trust
Editors: Trish Hornsey, Simon Melhuish

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Terminology

This Unit has been written for teachers and others working in all countries within the UK. There are differences in the legislation, terminology and structure of the educational systems in Scotland, Northern Ireland, and England and Wales and we have tried to reflect these in the document. In some specific Scenarios illustrating the use of ICT by individual pupils, we have given references to a scheme which is only applicable to one country – for example, the Literacy Hour in England and Wales – because it is necessary to make sense of the story.

For fuller information on terminology relating to each country, please see the section **Curriculum and Terminology in the UK**. This can be found at the back of your ICTS ring binder. You may well be corresponding with colleagues working in another part of the UK, and it will always be useful to have a common understanding of the language of education.

Throughout this Unit we have endeavoured to use the preferred spellings used by Oxford University Press and Cambridge University Press, as found in the current edition of the Oxford English Dictionary.

Contents

Introduction

The main reason for a pupil to use a computer within an educational context is to enhance their learning. It is important, then, that careful consideration is given to how a pupil is expected physically to control the computer, before thought is given to what they are going to use it for. The physical access must be as easy as possible, to enable a pupil to put their mind to the cognitive task in hand and achieve success. Unless this is addressed, there will always be doubt as to whether the pupil's difficulty within a task is due to physical or cognitive causes.

For most people, the accepted way to control computer technology is still through a keyboard and mouse. However, for pupils with physical and / or learning difficulties, these methods of control may not be easy or, in many cases, impossible.

There are, thankfully, many ways to make the control of a computer easier for these pupils. This Unit aims to provide an overview of the equipment, methods and techniques available.

Children with complex physical difficulties might be dependent on technology, not just for accessing and recording their school work, but also for giving them access to a speaking voice and to aid their mobility. In some cases the same access method can be used for all three areas. For example a switch might be used not only to control a computer, but also for their communication aid and with scanning directional controls for their mobility. However, in another case a joystick might be used for mobility and a switch for computer and communication aid.

Expected outcomes

By the end of this Unit, participants will have…

- knowledge of the equipment available for pupils with physical and learning difficulties that can give them control of computer technology
- knowledge of useful techniques for the introduction of computer access to facilitate successful control by their pupils
- confidence to begin to identify which control methods are most appropriate for their pupils
- ideas of which software may be suitable for assessment and training in the use of different devices
- knowledge of where to get the appropriate equipment and further help.

Key skills covered in this Unit

Analysis and selection of the position of the pupil and the computer equipment

Understand the importance of correct seating of the pupil, and correct positioning of the equipment for effective use of the technology.

See Scenario 1

Find an alternative means of control for the computer

Understand, and be able to make use of, alternatives to the mouse and keyboard for controlling the computer.

See Scenarios 2, 3, 4, 5, and 6

Use of a word predictor for speeding-up output

Use software to speed up text input for a pupil whose typing is slow and laborious.

See scenario 2, example 2a; Scenario 3 – supportive word processing

Use an overlay / membrane keyboard

Use an overlay keyboard to provide an alternative means of access to the keyboard or mouse.

See scenario 2, example 2d; Scenario 3, example 3c

Use Accessibility Options of the PC or Universal Access (previously called Easy Access) on the Macintosh

Understand how to make use of Accessibility Options and Control Panels to enhance control of the computer for pupils who require adjustments.

See Scenario 2, examples 2c, 2f; Scenario 3, examples 3a, 3b, 3d

Make a tactile overlay for a membrane keyboard

Enhance access for a pupil with visual difficulties by providing tactile information.

See Scenario 3, example 3c

Use an on-screen grid program and set up different grids.

Understand the use of on-screen grids to provide access to learning and recording learning.

See Scenario 2, example 2a; Scenario 3, example 3d; Scenario 6

Use the speech options in software to support emerging literacy

Provide pupils with speech output from the computer, so they can hear the text they have entered.

See Scenario 3, example 3d

Set up a touch screen for appropriate access by an individual pupil

Understand when and how the use of touch is useful and appropriate. Consider how to encourage pupils to be able to access through touch.

See Scenario 4

Select relevant software to use with the touch screen (this need not only be software written for the touch screen)

Understand how to select suitable software for use by particular pupils through touch.

See Scenario 4, example 4a

Identify and set up the most appropriate type of voice recognition software

Understand how voice recognition software works, and in what circumstances it may benefit particular pupils.

See Scenario 5

Scenarios

This section is intended to give you lots of ideas about how to incorporate ICT into your teaching. Whilst this Unit is not the place to provide detailed technical instructions on the use of specific applications or equipment – you will need to consult the manuals for such information – we have identified a number of key skills that are required to carry out activities similar to those described below. It is assumed that you are familiar with the operating system your computer uses and can manage basic tasks such as starting up programs, simple word-processing, saving and printing work. The key skills and the type of equipment will be listed at the end of each example. These will be linked to the activities, which you will find at the end of this section.

In many cases, in order to give your pupils effective access to the technology, you must liaise with colleagues – other professionals involved with your pupils, outside agencies etc. You will also need to communicate information to others involved with the pupils. When your pupil is achieving success, it is important that all those in contact with the pupil know what works for that pupil.

Scenario 1 – Seating and positioning

Before considering the range of devices and techniques available to facilitate successful computer control for pupils with physical and learning difficulties, it is important to spend time considering seating and positioning issues. No matter how good your choice of device for a pupil, and however much care you take in the introduction of it to them, there is a chance that they will not achieve optimal control unless their seating / positioning has been considered first.

Liaise closely with occupational and physiotherapists to ensure that each pupil has the appropriate postural support necessary for them to gain optimal physical function. For pupils with severe physical difficulties, this support may need to be considerable. However, even for pupils who have minimal physical difficulties, the provision of a chair that enables them to support their feet can facilitate better concentration and attention to the task.

a stylized example of good seating

Not only is the seat important but the height of the table surface and the monitor will also have a significant bearing, in some cases, on the success or otherwise of trying alternative access methods. The monitor should be positioned at eye level and centrally (except where the pupil has a visual problem requiring positioning to one side).

Example 1 – Pupil incorrectly seated for working at the computer

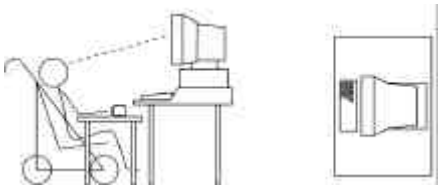
A seven-year-old girl with spastic cerebral palsy was seated in a Buggy seat for work with switches at the computer. The switches were placed on a table in front of her and she was encouraged to access them by hand. The computer was on a computer trolley placed behind the table on which the switches were mounted. The computer trolley had a surface for the computer and keyboard and a raised shelf for the monitor.

There are a number of issues related to this scenario:

Problem 1 – Buggy seat

This will place the pupil at a slightly reclined angle. This will in turn affect two important elements -the visual field and the control of her arms.

- **visual field**: Try tipping your head back slightly and note the difference this makes to what you can see. You probably have a good view of the ceiling, but not much below elbow level. However, as the monitor is quite high in relation to the pupil's head, in this instance she can at least see the screen.



- **control of the arms**: Have you seen a pupil whose arms tend to bend at the elbow and the hands are positioned at shoulder level? This was the case with this pupil. When she was tilted backwards, as is the case in a buggy, it accentuated this position of her arms and made it more difficult for her to bring her arms down to press the switches.

Solution

By altering the pupil's seating so that she was placed in a slightly forward-leaning position she was able to

- see what was going on around her better and have a more normal view of the world;
- bring her hands down to the switches more easily because gravity assisted her.

If you have a pupil who you feel is incorrectly seated, discuss this with the pupil's occupational therapist or physiotherapist. Responsibility for seating varies between the professions in different parts of the United Kingdom. Having consulted with the therapists, teachers / carers will be able to implement the recommendations in day to day practise.

When the pupil was placed in a more upright position she needed a lap strap to keep her bottom back in the seat; her foot rest needed adjusting to the correct height; and she needed a jacket to help her maintain an upright posture of her trunk.

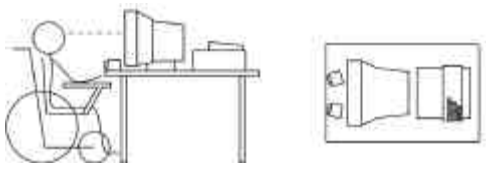
Problem 2 – The height and position of the monitor

The girl was now able to reach her switches, but seeing the monitor was a problem as she had to tip her head right back to see it.

Solution

To overcome this problem the monitor was moved off the trolley and onto the table that the pupil had been using.

The pupil was then moved to the other side of the table. The switches were placed in front of her, the monitor was positioned behind the switches on the table and the computer and keyboard (used by the teacher to set things up) was placed behind the monitor.



In this way the monitor was at eye level, the switches were within reach and an extra piece of furniture was removed from the classroom.

Key skills and equipment

The key skill for the above example is

- analysis of the position of the pupil and the computer equipment

The key equipment

- computer trolley – in this instance not needed!

You will find further references to the importance of seating and positioning in **Unit 4 – Identifying individual needs** and **Unit 8 – The development of switching skills**.

Scenario 2 – Computer screen pointer control

There is no doubt that the ability to navigate a pointer around a computer screen is a valuable skill. Much of today's fun, motivating, educational software is controlled by 'pointing and clicking'. Using a computer mouse is a physically and cognitively demanding task. The pupil has to have the physical control to move the pointer to an appropriate place, as well as the cognitive and spatial ability to relate pointer movement to mouse movement, not to mention the physical and cognitive understanding of 'clicking', 'double clicking' and 'dragging'.

Sometimes a pupil may have the cognitive potential, but not the physical means to make effective use of a mouse. It is tempting to think that if a pupil is not able to use a mouse, then the wide range of good software is not accessible to them. This is not so! There is a range of equipment which can make pointer control achievable. There are also some techniques which can help.

Mouse alternatives (see Appendix 3 for product list)

Rollerballs

A rollerball is essentially an 'upside down mouse'! Instead of having a ball in the base, the rollerball sits on the desk, and you manipulate the ball on the top of the device.

Rollerballs are now used by many people as a mouse alternative and a range can be found in office supply shops and catalogues. These tend to be ergonomically designed and need small, controlled movements to use them efficiently. There is also a range of rollerballs more suitable for pupils with special needs, some of which have extra facilities such as pointer speed control, drag lock and sockets for switches to replace the mouse buttons (see Appendix 3).

a range of rollerballs suitable for pupils with special needs

Most pupils with learning difficulties and many with mild to moderate physical difficulties will find using a rollerball easier than a mouse, particularly if used in conjunction with techniques such as slowing down the pointer speed, as described below. Those with more severe physical difficulties may still have difficulty and need to try other devices.

Some pupils find that they can use a rollerball to locate an item on the screen, but when it comes to making a selection they accidentally knock the ball when reaching for the button. In such a case it is a good idea to connect an external switch. In the case of the Penny and Giles Roller Plus there is a little additional switch box that can be attached. It is possible to buy adapted Microspeed rollerballs from a range of suppliers. These have sockets for switches to be plugged in to supplement the button actions of the rollerball.

Example 2a – A thirteen-year-old boy with Duchennes muscular dystrophy using a rollerball to access all his computer work

Problem

Gordon was finding it increasingly difficult to manage a small keyboard. He found it difficult to get from one side to the other. The effort of pressing the keys sometimes required him to use the weight of his second hand to enable him to press down a letter key. However, he was keen to follow the school curriculum and he was finding that he was relying increasingly on the computer to occupy his leisure time. It was felt that the time was right to find an alternative means of accessing the computer.

Solution

Choice and positioning of devices

It was decided that an on-screen keyboard would be easier for Gordon to access than the small keyboard he had been using. Gordon found that with his elbows supported on the arms of his powered wheelchair he could get his hands to the middle of the tray. The arm rests needed adjusting so that his shoulders were not pushed up. He required a padded wrist rest to provide a firm base to support his wrists.

Gordon needed a rollerball with a fairly light, freely rotating ball in the centre. Unfortunately, when Gordon moved the cursor to the correct spot, he sometimes knocked the ball and jogged the cursor as he reached over the ball to the button. To over come this the Microspeed rollerball with switch sockets was used. A very light action Tash Microlight switch was used to replace the left rollerball button. This was mounted at the side of the rollerball so that a movement away from the ball was required to activate it.

Choice of software

For recording his written work Gordon used an on-screen frequency letter grid which had the most frequently used letters in the centre and those less often used away from the centre. This minimized the amount the ball needed to be rolled, thus conserving energy. The letter grid incorporated a word predictor, so that as Gordon started to spell out a word the program would predict possible words starting with the letters typed. If the word Gordon was writing was predicted he could easily select it and so avoid having to find all the individual letters to complete it. Gordon used *SAW* with *Prophet*. However, there are other programs such as *WiViK*, *Hands Off*, *EZKeys*, or *Clicker* with *Penfriend* that will give similar facilities. For recording his maths work Gordon, used the *AccessMaths* program. For graphics he liked using *KidPix* which enabled him to draw freehand as well as providing him with some 'stamps' (small pictures) that he could place anywhere on his drawing.

Choice of activities

Gordon is using the computer for most of his recording. He has a laptop computer that he takes home from school to home to enable him to keep up with his home work.

Key skills and equipment

The key skills for the above example are the ability to:

- find an alternative means of control for the computer, in this case a rollerball
- adapt a rollerball to switch instead of button access
- an understanding of the different on-screen keyboard layouts
- use of a word predictor for speeding-up output

The key equipment for the above example is:

- rollerball
- switch
- predictive software
- wrist rest
- on-screen letter grid

Joysticks

Joysticks are another mouse alternative which can be useful for pupils with physical and / or learning difficulties.

The joysticks discussed here act as a direct alternative to a mouse and should not be confused with 'games' joysticks, which plug into a different computer port and perform a very different function, or switch joysticks which are used for scanning some communication aids and controlling some wheelchairs.

Penny & Giles
Joystick Plus

Controlling a joystick uses very different physical skills from those required to use a mouse or rollerball. Consequently, pupils who have not achieved accurate pointer control via a mouse or rollerball make be able to use a joystick well.

It is often assumed that a pupil must have the ability to grip the joystick handle to use the device. This is not the case. Many children with severe physical difficulties achieve accurate control by pushing the joystick from all directions with their hand or arm.

As with any access device, the positioning of a joystick can make a considerable difference to how well it is used. For some pupils, placing the joystick flat on the desk in front of them may be sufficient. For other pupils, a little more imagination may be required. Pupils with learning difficulties may understand pointer control more easily if the joystick is stood on its end, so creating a direct link between the movement of the joystick and the movement of the screen pointer.

Pupils with physical difficulties may be helped by the provision of a large sponge or t-bar grip, which are optional extras for the joysticks currently available.

Example 2b – An eight-year-old girl with difficulties caused by head injury

Problem

Susan's head injury left her with severe learning difficulties and mild physical difficulties (she gets a tremor in her hands when she attempts any manual activity). Her teacher felt that Susan could benefit from using the computer for simple, motivating activities.

Susan's attempts to use a mouse and a rollerball to explore a CD-ROM were not successful. This was not wholly due to a physical difficulty in controlling the devices, although her tremor was a slight nuisance. The main problem was that Susan did not make the connection that what she was doing with her hands was linked in any way to what was happening on the computer screen!

Solution

Choice and positioning of device

Susan was introduced to a Joystick Plus. The joystick was positioned vertically (on its end) directly below the computer monitor. This created the situation whereby, if Susan pushed the joystick up, then the screen pointer moved up; if she pushed the joystick down, the pointer moved down, and so on. The Joystick Plus has a speed control, which meant that whatever Susan was controlling could be slowed down. This enabled her to focus on and track the movements on the screen more easily.

positioning the joystick for Susan

As well as there being a direct link between the movement of the joystick and the screen pointer, the positioning of the joystick meant that it was in close proximity to the screen. If Susan looked at the joystick as she used it, her attention was automatically attracted by what was happening on the screen.

Choice of software

Careful thought was given to the software used when Susan was first introduced to the joystick. The Honey Bee game within *Touch Games 1* software was used. This is an activity which involves pointing and clicking at a large, brightly-coloured bee. This picks the bee up and the user uses their pointing device to make him fly to a large, brightly-coloured flower. If this is achieved, the flower flashes and music plays. This was appropriate software to use with Susan for the following reasons:

- it presented a screen which was not too visually complex
- it gave a high level of visual and auditory feedback throughout the activity to attract (and hopefully keep!) her attention
- Susan could potentially achieve some success after only a very short period of concentration

Introduction to the activity

Susan was introduced to the activity after the bee had been picked up. Her teacher explained and demonstrated the activity initially, while Susan watched. Having shown interest, Susan was helped to use the joystick (hand over hand). Susan's teacher gradually withdrew her help as Susan became more confident.

Susan gained great enjoyment from this activity and was very soon completing the activity independently. Her teacher has since introduced other similar activities and is hoping that her control of the joystick can be used across an increasingly wide range of educational software.

Key skills and equipment

The key skills for the above example are the ability to:

- be able to correctly position equipment
- introduce a task at the correct level

The key equipment is:

- Joystick Plus
- *Touch Games* software used for joystick training

MouseKeys

Some children have movement patterns that prevent them for being able to control a mouse, joystick or rollerball. However, these same children can, in some instances, lock an arm into extension and then use their fingers to press the keys on the number pad of their keyboard to control the movement of the pointer. With the ***Accessibility Options*** component of Windows installed and ***MouseKeys*** activated the keypad (with ***number lock*** on) is transformed into a mouse pointer director; where the '8' key moves the cursor up, '2' moves down, '4' moves left and '6' moves right. Pressing the ***Enter*** key produces a double-click. All mouse functions are accessible in this mode.
(***MouseKeys*** can be found on a Macintosh in ***Control Panel > Easy Access***)

For more information see **Unit B – *Organizing your resources***.

Example 2c – A fourteen-year-old boy with athetoid cerebral palsy using MouseKeys for maths and art work

Problem

This pupil was very able intellectually and enjoyed designing things in CDT classes. As a result of his athetoid cerebral palsy, if he tried to use his arms to hold a pencil or control a mouse the athetosis caused him to make a series of uncontrolled and repeated movements that resulted in an untidy and meaningless pattern. In his CDT classes his learning support assistant would draw lines where she was instructed. This was a difficult process at the best of times (try dictating to someone how to draw a cube) and was not aided by the pupil's very indistinct speech (dysarthria). In art classes, which again the pupil was keen to take part in, a paintbrush was placed in the pupil's mouth and he could create crude pictures where he had control of the colour and general shape (far better than anything he attempted by hand). However, as the pupil had a severe startle reflex, triggered by sudden noise near him or the bell for the end of lessons, he was fortunate not to injure himself with the paintbrush held in his teeth.

Solution

Choice and positioning of the device

As the pupil had good finger control, providing his arm was fully extended and his wrist fixed on a table surface, he used the number pad with a keyguard on his computer as an alternative to the mouse. It was essential to have the keyboard in exactly the right place with respect to its distance from the pupil and allowing for a place for him to rest his wrist, thus allowing him to position his fingers correctly.

Choice of software

MouseKeys was used with adaptations from within the ***Accessibility Options*** of the Windows ***Control Panel***. He would press the '8' key to move the pointer up (or in the 'northerly' direction) and the '9' key to move the pointer in a 'NE' direction, the '5' key to act as a drag button etc. With MouseKeys and the *AccessMaths* program which also functions from the arrow keys but does not require MouseKeys to be activated, he was able to produce drawings such as this.

sophisticated drawing using MouseKeys and AccessMaths

Introduction to the activity

The pupil was a very intelligent boy, and although he had been given the *AccessMaths* program to enable him to participate in the maths curriculum and produce geometric drawings to scale, he chose to use the program as an art package.

Key skills and equipment

The key skills for the above example are the ability to:

- set up and use MouseKeys
- position equipment appropriately

The key equipment is

- Accessibility Options (Easy Access on Mac), component for MouseKeys
- keyguard
- *AccessMaths* or a drawing package

Membrane keyboards with directional overlays

It is possible to use a Concept Keyboard, Don Johnston switch interface or IntelliKeys with MouseKeys and a suitable overlay. This will give the pupil who is keen to use his / her hands the ability to move the pointer about the screen, despite movements that are too gross to enable this to be done by a pointing device, or the number pad.

Example 2d – A twelve-year-old child with moderate learning difficulties and a severe tremor using an overlay keyboard for pointer control

Problem

This pupil used the keyboard for writing. She needed a keyguard and a repeat delay to enable her to produce letters and build up words. Her tremor prevented her from using a mouse or joystick. She had tried using a rollerball, but this too had been problematic because of her tremor.

Solution

The pupil used a membrane keyboard with an overlay showing directional arrows and click facilities.

Choice and positioning of device

The membrane keyboard was placed at an angle, sloping up from the table to the base of the monitor. This made it easy for the pupil to watch the pointer on the screen and see what her hand was doing at the bottom of her visual field.

Choice of software

The pupil used *My World* with a range of screens such as 'Alien'. *My World* is an illustration program with curriculum-based screens with icons that the user can move around to make a complete picture. It requires the user to

1. move the pointer to the target icon
2. click once with the left mouse button (or in the case of this pupil the appropriate square on the overlay) – this picks-up the icon
3. move the mouse (or in this case the directional arrow) – the picked-up icon is dragged to a new position
4. click again with the left mouse button (or square on the overlay) – this drops the icon in the chosen place

Introduction to the activity

Initially the pupil used the screen where she built up the face of an alien by placing eyes and antennae on the head outline. As there is no absolute right and wrong about making an alien face, accuracy was not a problem. The pupil enjoyed the activity and got great pleasure from her creations. She was then able to move on to a human face from 'Face It' on the CD Extra disc. The teacher had previously made decisions about which features were to be given to the pupil and had placed them round the edge of the screen. Eventually the pupil was given the unprepared screen and she had to make decisions about which features were needed and rotate them herself.

The pupil has had pleasure; success increased her skills and developed her self confidence and body awareness as a result of using the program in this way.

Key skills and equipment

The key skills for the above example are the ability to:

- position equipment
- use an overlay / membrane keyboard

The key equipment is:

- an overlay / membrane keyboard
- the *My world* program and CD Extra disc

Head controlled devices

Some children who have severe physical difficulties can gain good controlled movement of their head, with or without the help of additional head support. Such pupils may be able to gain accurate control of the screen pointer through head controlled devices such as the HeadMouse System. The HeadMouse involves the pupil wearing a small reflective sticker on their forehead. Head movements are read by a unit placed on the computer monitor, which receives reflections from the small disc. It then uses these signals to translate the head movements into movement of the screen pointer. The ***mouse click*** function is carried out either by a switch or by ***dwell select*** – pausing the pointer within a defined limited area for a set time. Quite a high level of understanding is required to use this system. It can also be very tiring to use and the distance from the monitor and size of the screen can have a bearing on the ease and comfort of the user.

There are other head controlled devices available, such as the Headway and Head Operated Mouse which work in a similar way.

Example 2e – An eleven-year-old boy, paralysed as the result of jumping off a high wall, who uses a HeadMouse

Problem

As a result of his accident the pupil lost the use of his lower and upper limbs, with the exception of some shoulder movement in his right shoulder. He was able to breathe independently. The pupil's cognitive skills were unimpaired but handwriting and the use of a mouse or joysticks etc, was beyond his control.

Solution

Choice and positioning of device

The pupil used voice recognition for most of his written work, but he found this very frustrating for drawing and using reference CD-ROMs. On these occasions he used the HeadMouse. To use the HeadMouse a small reflective spot is placed on the forehead. A receiver is set above the monitor and relays the head movements to the screen pointer. The correct positioning of the monitor is vital: the further the monitor is from the user the larger the head movements he / she has to make. It is also important to have the monitor at eye level and below for comfort of head movement. Some thought was given as to whether the pupil could use a switch; but it was decided that in fact having a dwell select was a more appropriate solution in his case. This involved setting up *Dragger* software.

Choice of software

The pupil used a drawing program and various reference CD-ROMs.

Introduction to the activity

As his intellectual ability was intact, it took the pupil very little time to master the device. After a while the calibration of the central point of the screen starts to slip. To rectify this the pupil needed to be shown how to 'push' the pointer against the side of the screen using the HeadMouse. Initially the dwell time was set to 1 second; as he became used to using the system this reduced to 0.5 seconds.

Key skills and equipment

The key skills for the above example are the ability to:

- set up the HeadMouse
- setting the select dwell time
- position equipment

The key equipment is:

- HeadMouse and *Dragger*

Other mouse devices

All laptop computers come with some sort of built-in pointing device, such as Glidepads or Trackpoints (mini joysticks). These can be notoriously difficult for pupils with physical difficulties to control. However, a plug-in version of the glidepad has proved useful for pupils with muscular weakness.

If you have a pupil who has good control of a computer keyboard, it is possible for them to use the numeric keypad to control the screen pointer (see Scenario 3).

Fixing of devices

Whichever device is appropriate for a particular pupil, thought must always be given to how it is going to be positioned and fixed in place. There are several non-permanent adhesive products (e.g. Blu-tack, Dycem, Ultrastick – see Appendix 3) which may be useful for keeping a device in place. For pupils with more severe physical difficulties, more specialist fixing systems such as a Maxess tray, with industrial Velcro, provides secure fixing, whilst maintaining the ability to move the device according to pupils varying needs.

Techniques to simplify pointer control for pupils with physical and learning difficulties

Making the pointer more visible

The standard pointer installed on most computers is quite small. There is a selection of slightly larger pointers available (look in ***Control Panel*** › ***Mouse*** › ***Pointers*** to see what is available on your computer). See **Unit B – *Organizing your resources*** for more detail.

Pupils with visual difficulties may need a higher visibility pointer, in which case specialist software such as *Biggy*, which provides a wider range, will be necessary. IntelliPoint software (see **Slowing down the pointer speed** below) also offers a range of larger pointers as well as other features that can increase pointer visibility (see Appendix 3).

Making the activity meaningful

For pupils who have learning difficulties, the act of moving a pointer around a computer screen may not be meaningful. If this is the case, their motivation to participate in the task will be low. There is software (e.g. *My World*) which is based around clicking on objects, which can then be moved around the screen. Being introduced to the concept of pointer control by putting some sunglasses on Teddy, or putting furniture in a house, then printing out your picture, is much more understandable… and much more fun!

Slowing down the pointer speed

This technique is arguably the most significant in enabling pupils who have physical and / or learning difficulties to successfully access pointer controlled computer software. Slowing down the speed at which the pointer moves around the screen is helpful for pupils with learning difficulties, as it provides time for them to focus on what is happening on the screen, thereby aiding their understanding. For pupils with physical difficulties, it helps them to control the pointer and achieve accuracy in their targeting. In addition, some pupils may have difficulty with visual tracking and visual perception. Slowing down the pointer speed can be achieved in either of two ways:

- Most computers offers a pointer speed control (see ***Mouse*** controls within your computer ***Control Panel***). However, to achieve enough control to make a significant difference to pupils with physical or learning difficulties, additional software is required (for example, IntelliPoint software which is provided free with a range of Microsoft IntelliMice and rollerballs).
- use a device which has an in-built speed control facility. Currently, the Roller and Joystick Plus devices offer this facility (see Appendix 3). The advantages of this method of speed control are that:

  The user may be able to control the speed themselves, according to their need. Other users of the same computer can use various pointer speeds without having to know how (or take the time) to access the Mouse controls.

  If careful thought is given to the choice of device and techniques, as described, pupils with physical and learning difficulties can often successfully control a wide range of software to support and enhance their access to the curriculum.

Example 2f – A pupil with cerebral palsy who varied the speed of the rollerball when he was using Talking Books

Problem

This boy was unable to use a mouse due to poor hand coordination. He tried a joystick but had difficulty in withdrawing his hand when he had reached a target and so overshot it and spent a lot of the time with the pointer off the edge of the screen. Things were not helped by the fact that he had difficulty seeing the normal pointer.

Solution

He had more success with a Roller Plus but again, because his movements tended to be gross and exaggerated, he needed it slowed down considerably if he was to avoid overshooting his target.

He needed a larger pointer on the screen. Using the mouse options (pointer) under the Windows Control Panel the ***llarrow*** pointer was selected, which doubled the pointer size, made it black, instead of a white pointer with thin black edging on a white background, and inverted the colours on other backgrounds.

Choice of software

The pupil loved working with paints and would spend a lot of time watching children who could create recognizable pictures and then have a go himself and get quickly frustrated. It was decided to use a painting program that just required the user to fill in the colours, a bit like a colouring book. There are several such programs, e.g. *Paintbook* from LäraMera and *Colour Magic* on the *TouchGames 2* disc. Once the pupil had successfully created a few 'coloured-in' pictures which were printed out, sent home and stuck on the fridge, he could move on to a drawing package, such as *Kidpix* and *Young Artist* that included free drawing and some ready-made stamps.

colouring in using Paintbook from Learn More Through Games

Introduction to the activity

Initially, the pupil used the *Paintbook* with the rollerball slowed down to its slowest speed. Using the *Colour Magic* game in the *TouchGames 2* disc he enjoyed using the rollerball set at its slowest speed to go to different areas of the picture and click on the button to fill in with colour. In this program the user has no control over the colours and after a while the pupil was ready to move on to *Paintbook* by LäraMera.

Here there is a colour bar, or palette, along the bottom of the screen. The pupil had to move the pointer down to the bottom of the screen each time he wanted to change colour. To start with he just painted the whole screen the same colour; then he began to change colours. As it took him some time to get from the top to the bottom of the screen he started to change the speed control button himself: fast to get down the screen to the bar, and then slow to move along the bar to get the right colour.

Finally the pupil moved on to a drawing package that let him free-draw to create backgrounds, a line approximately across the middle of the screen to create a horizon with blue above and green below, with stamps positioned on the background to make a more detailed picture. By now the pupil was adept at changing the speed of the rollerball when he needed to either move a larger distance quickly or to slow it down to be more exact.

Key skills and equipment

The key skills for the above example are the ability to:

- find an alternative means of control for the computer, in this case, a rollerball
- vary the speed on such a device

The key equipment is:

- Roller Plus
- colouring-in software such as *Colour Magic* and *Paintbook*, and assisted drawing packages such as *KidPix* and *Young Artist*

Software for the development of computer screen pointer control skills

For children who cannot move themselves through space and for those with visual spatial difficulties, understanding directions and how to control a pointer on a screen takes teaching and practice. It is useful to bear the following points in mind when selecting appropriate software:

- choose screens that are not too visually complex
- have a short, achievable task that is fun and motivating
- make sure the pointer or object being moved is large enough for the user to see it clearly

Some examples are: *Touch Games*, *Paintbook*, *My World*, *Complete the Picture*, *Facepaint*, *Living Books*, *Dazzle*, *Katy Caterpillar*, and *On the Farm*

Scenario 3 – Accessing the keyboard

The keyboard is still the most common means of computer control because it provides the most direct way of entering text. For many pupils, a keyboard provides an appropriate means of control for some classroom activities, given some support. There are various ways to make keyboard use easier for pupils who have physical and / or learning difficulties.

Adaptations to a standard keyboard

Lower case keys and colour coding

For pupils with learning difficulties, a keyboard with lower case letters can help with letter recognition.

lower case, coloured stickers on a standard keyboard

Lower case keyboards are commercially available, as are lower case stickers for use on standard keyboards (see Appendix 2). High contrast stickers are helpful for pupils who have visual difficulties. A further idea for helping pupils locate letters is to colour-code the keyboard (i.e. use keyboard stickers and colour the backgrounds). This not only acts as an additional memory aid for the pupil (e.g. 'I remember that letter was red'), but it also facilitates verbal prompting from a helper. This can be done in a variety of ways, depending on the needs of the pupil (e.g. different colour for each line of letters, colour-coded vowels).

Keyguards

Some pupils who have physical difficulties have the potential to use a keyboard, but find it difficult to be accurate in their key-pressing, due to uncoordinated movement or tremor. The provision of a keyguard (i.e. a metal or perspex keyboard cover with a hole for each key) can help such pupils accurately target keys. Pupils with more severe involuntary movement may find a keyguard also enables them to stabilize their movements (e.g. rest their wrist on the keyguard while using their finger to target a key). Care needs to be taken when fitting a keyguard as the guard itself can prevent the user clearly seeing the key. The person fitting the keyguard needs to put their head on a level with the user to check the visibility of the keys.
(See Appendix 2)

a keyguard

Wrist rest

These are used by many computer users and are widely available from computer and office suppliers. Pupils with physical difficulties may find them useful for improving their ability to use a keyboard.

Positioning of the keyboard

Sometimes, pupils with physical difficulties find they can use a keyboard more accurately if it is angled towards them. Some children with severe physical difficulties like the keyboard positioned vertically. Angling the keyboard can also help pupils with visual difficulties to see the keys more clearly.

The height of the surface on which a keyboard is placed can make a big difference to how accurately and efficiently a pupil with physical difficulties can use it. Surface height also affects how much energy is expended in the process. If the keyboard is too high, a pupil may waste a lot of muscle power lifting their shoulders and arms. Alternatively, another pupil may prefer the work surface higher to provide stability for their upper body and arms. Adjustable-height tables make the optimum positioning of a keyboard (and other access devices) possible for a range of pupils. (see Appendix 2)

standard keyboard mounted at an angle

Keyboard controls

It is possible to alter the way a computer keyboard responds through the use of software. Again we turn to the ***Accessibility Options*** Control Panel (either double click on ***My Computer***, or go to ***Start*** then ***Settings*** to find it). You will find more information about Control Panels in **Unit B – *Organizing your resources***.

There are various options which can make a big difference to the typing accuracy of a pupil, and therefore also to their frustration levels and motivation. The facilities within Accessibility Options which apply specifically to keyboard use are:

- ***StickyKeys*** – enables pupils who are only able to use one finger (or a head stick or toe) to access facilities which usually require the holding down of a second key (shift, alt or ctrl) e.g. when a capital letter is required. StickyKeys will operate the command through one press. Press the modifier key (shift, alt or ctrl) twice to lock this facility.
- ***FilterKeys*** – provides a number of functions (through 'settings'):
  - ***Ignore quick key strokes*** allows you to set a delay time for subsequent key presses of a specific key i.e. ignores further key presses until the specified time has passed. This is useful for when a key is repeatedly hit e.g. for pupils with a tremor. (Sometimes called 'debounce'.)
  - ***Ignore quick keystrokes and slow down the repeat rate***
    - ***No keyboard repeat*** - when a key is held down, only one letter will be printed on the screen however long the key remains pressed.
    - ***Slow down keyboard repeat rates*** - allows you to vary the length of time before a second letter is printed on the screen when a key is held down.
    - ***Slow keys*** - lets you set the keyboard to ignore quick accidental key presses. The key needs to be held down for the set specified time. (Sometimes called 'pre-acceptance delay'.)
- ***ToggleKeys*** – provides auditory feedback when certain keys are pressed.
- ***MouseKeys*** – enables the computer screen pointer to be controlled via the numeric keypad on the keyboard. This is a useful feature for pupils who have good control of the keyboard but who are unable to control a mouse or alternative pointing device (see Scenario 2).

- ***Screen Magnifier*** – This is only available in Windows 98. It displays a magnified copy of a portion of the screen, which moves with the cursor. This is intended to help people with visual difficulties to see detail better but in many cases the option to change the display to high contrast with larger fonts, through Accessibility Options may be sufficient.

On the Macintosh computer, ***Universal Access*** does the same things. They are available on the system CD and there are facilities for magnification of the screen, mouse keys, sticky keys, slow keys and talking alerts.

Careful use of these controls can make the difference between a pupil with physical difficulties successfully using a keyboard or not. Often, a very subtle adjustment can cause a significant improvement in a pupil's achievement.

Example 3a – A fourteen-year-old boy with athetoid cerebral palsy who was keen to use the keyboard

Problem

This pupil was very keen to use the keyboard. However, his difficulty was hitting the right key and then, having got to the right key, tending to get double letters because he would hit the key a second time while lifting his finger off it.

Solution

A keyguard was fitted to prevent him pressing too many wrong letters en route to the target letter. He could rest his hand on the keyguard without pressing down on keys unintentionally. However, this did not prevent him from sometimes putting his finger into the wrong hole. The SlowKeys element of the FilterKeys option in the Accessibility Options was used. This was set so that the pupil had to hold his finger on the key for 0.7 seconds before the key would register. He found it difficult to hold his finger down for any longer than that, but as it took him time to lift his finger off an incorrect key there had to be more that a mere 0.1 seconds.

Introduction to the activity

After his keyboard was adjusted this pupil was not interested in any of the other things the computer could do for him; for the first week he just wanted to write at every opportunity.

Key skills and equipment

The key skill for the above example is the ability to:

- use Windows ***Accessibility Options*** of the PC or ***Universal Access*** (previously called ***Easy Access***) on the Macintosh

The key equipment is

- ***Accessibility Options*** on the PC or ***Universal Access*** on the Macintosh

Touch enabling devices (dibbers)

Some pupils have sufficient physical control of their arms and hands to use a keyboard, but are unable to isolate a finger to press individual keys. Such pupils are sometimes able to make use of an implement (an unsharpened pencil, for example) to press the keys.

Splash guards for keyboards

Some keyboards get subjected to a degree of saliva when the pupil is looking at the keys. It is possible to get splash guards to protect the keyguard and the user.

a selection of keyboard gloves, or splash guards

Alternative keyboards (see Appendix 2 for product list)

Small (mini) keyboards

different keyboards

For some pupils, a standard-sized keyboard makes access difficult. Pupils who are only able to use one hand, or pupils with more severe physical difficulties, may find the distance they have to travel to reach the whole keyboard restrictive. Such pupils may find that a more compact keyboard makes typing easier and less tiring for them.

When some individuals go to make a large movement (such as might be required to get from one side of a standard keyboard to the other) their movement is expanded further involuntarily. These people can sometimes cover the smaller surface without difficulty. Compact keyboards can also be easier to position because of their smaller size.

Laptop computer keyboards are more compact than standard desktop keyboards. However, if a smaller keyboard is needed for use with a desktop computer, there are several available commercially (see Appendix 2).

Example 3b – *A five-year-old boy with severe physical difficulties caused by cerebral palsy*

Jack is unable to walk and needs supportive seating to enable him to gain any functional control of his arm and hands. He is a cognitively able boy who is going to be dependent on computer technology for the recording of his work and for curriculum access throughout his education. His speech, although unclear, is beginning to develop but it is possible that he will need to use a speech output device to support his speech at some time in the future.

Jack is currently attending a school for children with physical difficulties. His teacher is keen for him to achieve good access to the computer as soon as possible to enhance his access to the curriculum. As Jack is only five, it was felt that the biggest priority was to give him the means to drive pointer-controlled software so that he could benefit from the wide range of early years multimedia software available. It was also recognized that Jack is beginning to develop some early literacy skills and would soon reach the stage where he would want to begin to record text.

Choice and positioning of devices

Jack's physical difficulties prevented him from gaining accurate control over a mouse or rollerball, so he was introduced to a Joystick Plus. He chose to use his right hand, so the device was secured on the tray of his chair, in line with his right shoulder. The provision of a sponge grip enabled him to keep his hand on the joystick more easily. The pointer speed was slowed to improve his ability to track the pointer and his accuracy on small targets.

Jack found he could use the joystick well, although it was quite hard work and tiring. He did, however, have a problem in isolating a finger to access the 'click' button on the joystick. This was solved through the provision of the switch adaptor box which is available for this particular joystick. A switch was plugged in to act as the 'button click'. It was positioned to the left of the joystick and Jack was able to use his left hand to activate it when required.

Jack showed great interest in the computer keyboard when other people were using it. It was decided to investigate whether he could use one successfully, as this would provide a quicker and more direct way for him to participate in text-based activities and record text. A standard keyboard was tried but, as Jack was only using his right hand, he found it difficult to reach to the keys at the left and top of the keyboard. The provision of a compact keyboard, with a keyguard, enabled him to reach all the keys without making accidental presses on the way. The keyboard controls within ***FilterKeys*** in ***Accessibility Options*** were useful for Jack as he tended to keep a key pressed for some time.

Choice of activities

Jack has achieved good access to the computer, but it is difficult for him and he gets very tired. Consequently, his teacher gives careful thought to what the computer is used for throughout his day. She always chooses short, achievable activities such as:

- writing a short piece of work with a *Clicker* grid and the joystick and switch
- writing the date or his name with the keyboard and keyguard
- using the joystick and switch for exploring and reading the *Oxford Reading Tree* books
- using the joystick and switch for making pictures with *My World* screens

She chooses activities which it would be difficult or impossible for Jack do by other means. This ensures that that he gains full benefit from his time at the computer.

Key skills and equipment

The key skills for the above example are the ability to:

- position equipment
- use the Joystick Plus with an external switch
- use ***FilterKeys*** in the ***Accessibility Options***

The key equipment is:

- Joystick Plus
- switch
- ***Accessibility Options***

Large (expanded) keyboards

Just as a more compact keyboard may suit some users, others find that larger keyboards with larger, more widely spaced keys make access easier. This may be from a physical, cognitive or sensory point of view. Again, care must be taken if a keyguard is necessary (see Appendix 2 for commercially available large keyboards).

Overlay (membrane) keyboards

These are flat boards onto which self-selected paper overlays can be placed. The overlays may contain letters (i.e. a standard 'QWERTY' or alphabetical layout), or be designed for simplified writing activities, such as sentence-building from whole words or phrases. Software is used to then send the content of the overlay to the computer (usually word-processing software).

a range of membrane overlay keyboards

Overlay keyboards can be very useful for pupils with learning difficulties as they enable the use of graphics to support any text used. They provide a very direct and motivating way for a pupil to record. Pupils with autistic tendencies also often respond well to accessing the computer in this way. It is possible to have tactile overlays as well for those with visual impairments.

Overlay keyboards should, however, be used with care with pupils who have physical difficulties. The IntelliKeys keyboard provides controls similar to those provided within Accessibility Options (see above) and also has keyguards. IntelliKeys also has a wide range of prepared resources. There are other overlay keyboards: the Concept Informatrix 2 A3 keyboard is useful for creating irregular overlays. However, it is difficult to use irregular overlays with keyguards.

Example 3c – A seven-year-old boy with visual difficulties using an overlay keyboard in a school for children with learning difficulties

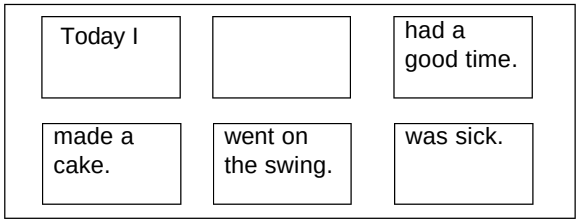
This pupil, Fred, was unable to walk, needed supportive seating and could not see or talk. The school used objects of reference with him to help him understand his environment and make some choices. He had a communication book with objects of references on each page. He needed help in learning to explore his environment. People were keen for him to have a speech output device but wanted proof that he would be able to use one.

Choice and positioning of device

It was agreed to try the pupil with an IntelliKeys keyboard with a keyguard to give him tactile guides as to where to move over the board. The board was placed on Fred's wheelchair tray. The arms of his wheelchair were padded up so that Fred could rest his elbows on the raised armrests, bringing his hands above the keyboard without resting heavily on it. Care had to be taken not to raise the arm rests so much that Fred was sitting with his shoulders hunched.

Choice of software

Overlay Maker was used by the teacher to create overlays with six squares that could be used with the six-hole keyguard. As Fred could not see the squares, symbols were not incorporated but text was entered. Where there were objects of reference for the activities, these were attached to the overlay. Care had to be taken that the objects of reference fitted inside the squares and that when the keyguard was placed over them they did not press down on the overlay and cause the phrase to be selected unintentionally.



Fred's IntelliKeys with keyguard, mounted at an angle

Straws were attached to the keyguard to help Fred find his way around the board with a blob of cotton wool for the start point and ridged arrow shape at a point where he had to make a choice.

Introduction to the activity

Fred was taught to feel for the cotton wool blob at the left side of the keyguard. He was then encouraged to follow the drinking straw until he came to a ridged arrow shape; he then followed the arrow and pressed the squares above to hear what they had to say. He was encouraged to explore the whole overlay in this way before starting to write. All the writing that he had generated during the exploration process was erased by his learning support assistant. Then Fred was encouraged to produce a properly sequenced utterance. He could hear his complete sentences as they were automatically spoken out loud when the full stop was selected. While it was printing out, the learning support assistant ensured that small pieces of textured materials, associated with the objects of reference, were stuck on to the printout so that Fred could feel the sequence, as well as hearing it read out loud by those he showed it to.

Key skills and equipment

The key skill for the above example is the ability to:

- make a tactile overlay for a membrane keyboard

The key equipment is:

- a membrane keyboard and an overlay maker e.g. IntelliKeys and *Overlay Maker*

Specialized keyboards

All the keyboards discussed so far have been alike, in that they use (or have the potential to use) the standard 'QWERTY' layout of keys. There are some keyboards available which are ergonomically designed for a specific difficulty (e.g. one-handed users). These keyboards have their keys arranged differently for maximum typing speed and efficiency. The implications of using a system so very different from the standard should be carefully considered from a cognitive, physical and visual perspective. Such keyboards are designed for adult-sized hands.

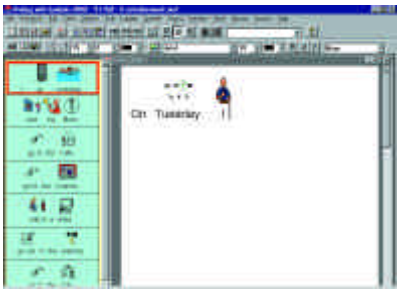
Some teachers of younger children favour using an alphabetic keyboard where the letters occur in alphabetic order. While the advantages can be appreciated, there will come a time when the child will have to progress from the alphabetic to the 'QWERTY' layout, if they are to be able to use standard equipment.

On-screen keyboards

Pupils who do not have the physical skills to use a manual keyboard, but who are able to achieve control of the computer screen pointer, or use switches, can have access to an on-screen keyboard for word-processing, if appropriate. A range of software is available to provide a keyboard on the screen and keys are selected by 'pointing and clicking' (see Appendix 3).

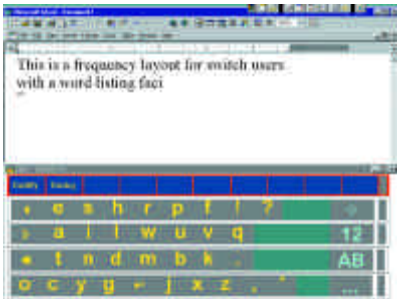
The grids are very different in appearance, depending on how they are being accessed. For example, a pupil might be using a grid with whole words and symbol support, that they are accessing with a joystick, or touch screen.

This same child might then progress to a 'QWERTY' on-screen keyboard, because although he / she is using a joystick / rollerball at present, there is a likelihood that he / she will progress to a keyboard later.



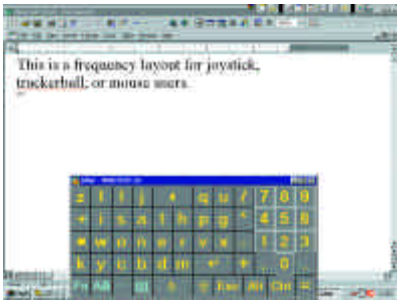
using Writing with symbols 2000

If however, the pupil is never likely to be using a standard keyboard then a frequency-of-use grid, with the most frequently used letters near the centre to minimize the effort and distance required to move the pointer, is more appropriate.



using SAW with a frequency-of-use grid – common letters in the centre

If the pupil is at the stage when he / she is writing with a combination of letters and whole words (either predicted or from a word list) but uses a switch, then a frequency-of-use grid is best. Here the most commonly used letters are at the left side of the screen where the scan starts.



using SAW with a frequency-of-use grid – common letters at the left

Example 3d – A pupil using an on-screen keyboard to record written work

Problem

This pupil, aged seven years, was in a mainstream setting. He had poor control of the limbs down the right side of his body. He was ambulant with a rollator but had great difficulty with fine hand control and hand-eye coordination. His hand control was such that he could not write legibly, but he was encouraged to use a pencil for some work sheet activities. When using the keyboard on the computer, he could peck at the letters with one hand, but had difficulty in reorienting himself looking from the keyboard to the screen. He could recognize some words and was attempting to write some simple words phonetically.

Solution

This pupil had good control of a mouse, having played with a 'Game Boy' machine at home. He used the mouse to access the words in an on-screen grid.

Choice and positioning of device

The pupil had the monitor placed directly in front of him at eye level. The keyboard was put to one side, as he did not use it. The mouse mat was placed to the left of his mid-line. When he used the program he just looked directly at the screen; both the letters and the text he was producing were all presented in the same (vertical) plane so he did not have to constantly re-orientate himself. The normal click mouse button was changed from the left to the right side using the Windows Control Panel (***Mouse*** › ***Buttons***).

Choice of software

Clicker was chosen for this boy, because he needed pictorial support when he first used the program. He liked being able to check out the sound of the words by listening with the less frequently used button (in his case the left one) prior to selecting them (auditory fishing).

Introduction to the activity

Initially the pupil used *Clicker* with whole words and pictures to support them, plus the auditory fishing option. When his literacy had improved, the auditory support was switched off. In time he progressed to the letter grids linked to whole word lists.

Key skills and equipment

The key skills for the above example are the ability to:

- use an on-screen gird program and set up different grids.
- use the speech options of such a program to support emerging literacy
- swap the mouse buttons using the Control Panel, ***Mouse*** options

Key equipment:

- programs with on-screen facilities, e.g. *Clicker*, *Writing with Symbols 2000*, *Inclusive Writer*

Ideas for simple keyboard activities

As with all classroom activities, it is important carefully to consider the needs and abilities of the pupil before starting any computer work. Think about the aim of the activity and ensure that the access method and software you have chosen are the best way for the pupil to achieve that aim.

Initial letter and letter recognition activities

Rhyming activities

Cloze procedure exercises

Spelling activities

Early number work

Writing a simple letter

Entries in a diary accompanied by digital photos

Pattern poems such as SSS

N

A

K

E

Principles

- the activities should be short, achievable, motivating and fun
- joint activities – with another child or a learning support assistant
- the activities should have a purpose and an outcome – a printout that can be stuck in the child's book, or on the notice board, or be sent home with the child
- even play writing (just experimenting with the keyboard and producing random key presses) has a place initially

Supportive word-processing software

You will find more information on this topic in **Unit 2 – Using ICT to support literacy across the curriculum**.

It is possible that a child's physical difficulties slow down their rate of text production. The child works very hard, concentrates and has the cognitive ability to produce pages of text. However, due to physical limitations the quantity of text produced independently by the child is limited. There are certain types of software that can be of assistance here.

Whole word input

Here, programs with grids of whole words can be used such as *Clicker*, *Inclusive Writer* and *Writing with Symbols 2000*. The child enters text a word at a time.

Word listing programs

These enable a child to have the equivalent of a word book used by hand-writing children; such programs are *Word Aid*, *Writer* and *Wordbar*.

Predictive typing systems

Here the computer will anticipate a word once the initial, or a number of letters have been entered. For those who are adept at typing such a system can slow them down. The user needs to have sufficiently developed literacy skills before using a predictive system, as there tends to be an extensive vocabulary to choose from. Care needs to be taken as to whether the system is set to learn new words as they are typed. If the user is a poor speller then incorrectly spelt words will be learned. Examples of such programs are *Prophet*, *Penfriend* and *WiViK*.

Auditory support

Some children need the support of hearing the text they are writing spoken out loud. There are talking word processors such as *Write:OutLoud* and *Talking First Word*. Some of the programs mentioned above have auditory support as well.

Scenario 4 – Direct control through touch

Touch screens

It is possible to control computer software by directly touching the screen. The equipment required for this is either a Touch Monitor, with built-in touch facility, or a window (Touch Screen) to attach to a standard computer monitor. An add-on window is cheaper but does not provide the robustness or reliability of response of a Touch Monitor. Whichever system is chosen, special driver software (provided with the device) is needed to calibrate the systems. It is possible to set the systems up to activate when touched or when the finger is withdrawn, depending on the needs of the user.

A range of point-and-click programs can be used with touch screens, going from simple cause-and-effect *SwitchIt!* and *Touch Games*, to more complex programs such as the *Living Books*. The great advantage of touch screens for pupils with severe learning difficulties is that things happen immediately; nothing comes between the child and what happens.

Example 4a – A pupil with severe learning difficulties using a touch screen

Problem

This pupil is in a school for pupils with severe learning difficulties. She likes music. When approached by helpers and teachers she tended to close her eyes and curl up. Offering a switch for her to press to turn on a cassette recorder was ignored or pushed away.

Solution

Leaving the pupil close to a computer with a Touch Monitor with the *RAD Sounds* CD for musical reward.

Choice and positioning of device
A Touch Monitor, set to respond when touched, was placed in front of the pupil at eye level.

Choice of software
RAD Sounds was used initially as it gave a musical response and had dancing figures, both of which evoked a positive response from the pupil. In time she enjoyed making the faces change on *Smart Alex;* she then worked her way through the *Touch Games* discs.

Introduction to the activity
Initially the pupil was positioned so that she could watch another pupil using the computer and the program. She was interested but responded badly when offered a turn. The next day the software was set up and the pupil wheeled up to the table. The helper touched the screen a few times and then left the pupil, to help someone else. In time, the pupil tried to push the monitor away and got the response from the program. No reaction was made by anyone in the room the first day this happened. The pupil continued to explore in a half-hearted way. In time the helper responded to the pupils actions and offered to load another program; this time *Smart Alex*. The pupil used this a little and made a fuss. The helper changed back to the *RAD Sounds* and the pupil seemed pleased.

In time the pupil used not only software written for the touch screen, but also software accessed by point-and-click such as *Living Books* and *My World*.

Key skills and equipment

The key skills for the above example are the ability to:

- set up a touch screen for appropriate access by an individual pupil.
- select relevant software to use with the touch screen

Key equipment

- a touch screen
- touch screen software

There is no doubt that this method of controlling the computer has its place for certain pupils and for certain activities. It is particularly appropriate for those who have learning difficulties but minimal physical difficulties. These pupils often respond well to the very direct input and immediacy of response. It is also appropriate for 'cause-and-effect' type activities, where precise accuracy of touch is not necessary.

Use of a touch screen should, however, be viewed with caution for pupils who have physical difficulties. Accuracy of touch requires good fine motor control, unless it is just to be used as a cause-and-effect instrument.

A question which is often raised about the use of touch screens is that a pupil uses them well for cause-and-effect activities, but then what? In order to move on to more cognitively demanding tasks, some other method of control must be found. Programs that use mouse control such as *My World* or on screen pointer controlled grids such as *Clicker* or *Writing With Symbols 2000* can be useful here. There is an argument that time would have been better spent in finding an alternative control method from the start. The debate continues!

One idea to lead the pupil on can be to attach a switch to the edge of the monitor once they have established cause-and-effect with the touch screen and are developing hand-eye coordination. The pupil is then encouraged to press the switch, instead of the screen; the close proximity of the two assists the generalization process. It may then be possible slowly to move the switch away from the monitor.

switches attached to the touch monitor

Not all touch screens are attached to conventional computers; some speech output devices with dynamic displays (see **Unit 3**) have a touch screen as an alternative input method. Here the user has to be able to point accurately to a particular symbol if he / she is going to get the right message across.

Care must be taken to consider:

- the appropriate size of each symbol
- the space between symbols
- whether the device will be activated when a symbol is first touched or instead when the finger is removed from the device
- if the user tends to need to slide the fingers over the touch screen, they will need a delay before a selection takes place

Scenario 5 – Direct control through voice

Voice recognition systems

For a number of children with physical or specific learning difficulties, accessing the computer can be tiring or frustrating. For the highly literate and physically able pupil, voice recognition provides an interesting alternative to mouse and keyboard access. However, for some pupils with physical difficulties, the use of voice recognition is critical to their success or failure at school and beyond.

The system can be very useful for pupils who are literate and able to notice if the system misinterprets a word, have clear speech (although this is not necessarily vital, reproducible speech is necessary) and are not able to use a keyboard. The system is being used with some success with pupils who have dyslexia when it is used in combination with a system that will read back what has been written.

Achieving success with users with special needs requires more than installing software and putting on a headset. There must be planning, training and extensive support.

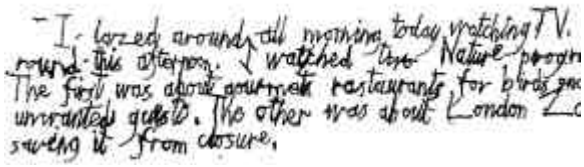
Things to consider before embarking on the use of such a system are:

- Can someone support the user intensively in the initial period while the training is taking place? This will be for a number of sessions.
- How well developed are the pupil's literacy skills? It is important that the pupil can identify a misunderstanding on the behalf of the system either through reading or hearing the mistake.
- What sort of microphone do you have? The quality and positioning of this can be crucial to success.
- Has this pupil been using amanuenses? Are they comfortable about dictating in public, or would they find it easier to use the system for homework?
- Would they be better advised to use a discrete word-at-a-time system or a continuous speech recognition system? The answer to this is not always clear. For pupils with speech difficulties the discrete word-at-a-time system works better.
- Is the pupil's vision good enough to read the small prompt text or will they need auditory feedback? They might need auditory feedback for other reasons, such as a pupil with dyslexia needing auditory support to check what they have written.
- What computer will be used to run this system? Does it have adequate processor speed, RAM and a suitable sound card?

Example 5a – A fifteen-year-old with dyspraxia and specific learning difficulties, using voice recognition

Problem

This pupil was bright and articulate, and had dyspraxia and specific learning difficulties. His handwriting was slow and untidy; because of his specific learning difficulties he would often lose the thread of his written work, resulting in poor language structure and spelling. At the age of eleven, he was provided with a portable writing aid. The use of a keyboard eliminated the problem of letter formation, but unfortunately the aid did nothing to address his other difficulties. An assessment by an Educational Psychologist indicated that it was the pupil's lack of fine motor control, combined with his specific difficulties in coding, sequencing and digit span, which made his writing so poor. The assessment also revealed that the pupil's IQ was well into the superior range.



Solution

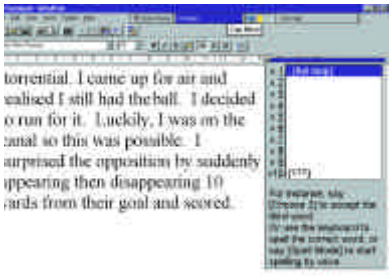
Having been assessed for a range of supportive software, it was decided that for writing, voice recognition was the most useful as it capitalized on his strengths i.e. spoken language and reading ability.

Choice and positioning of device

The pupil needed a laptop computer with an 'active noise cancellation' microphone headset. Using the headset enabled the microphone to be positioned optimally, approximately 3 cm to the front to one side of the mouth so as not to catch the breath.

Choice of software

In this instance the pupil was able to use continuous speech software with a standard word processor.



using voice recognition software

Introduction to the activity

The pupil needed a couple of sessions to train the software. As he was both mature enough and able to use a keyboard himself he could type in any corrections needed. The pupil found that he was soon able to produce written work with no misspellings and excellent language structure. He was at last able to show what he could achieve, through the use of appropriate technology.

Key skills and equipment

The key skills for the above example are the ability to:

- identify most appropriate type of voice recognition software and set it up
- correct placement of microphone

The key equipment is:

- voice recognition software
- microphone headset

If Voice Recognition is of particular interest, please refer to Appendix 4 – Further Reading.

Scenario 6 – Control through switches

If a pupil is unable to achieve control of technology by any of the methods already discussed, they are likely to be able to achieve some control through the use of switches. The subject of switch access to technology is the subject of another of the training Units and so will not be covered in depth here. Suffice to say that there is much that a pupil who needs to use switches can achieve, given the opportunities.

If this area is of interest, you should study **Unit 8 – The development of switching skills**.

Switches can be used in different ways:

- To establish cause and effect: attaching the switch to simple environmental controls such as battery operated toys, food mixers, hairdryers, fans, etc. can help a user appreciate that pressing a switch has an impact on them.
- To make simple choices: in this instance the pupil has access to two switches, each one attached to a different activity (e.g. music or toy car) or different messages on two simple communication devices such as One Step Communicators .
- To make selections from a wider range of choices (letters or symbols in a *Clicker* grid): in this instance an understanding of scanning is essential. When starting to use scanning it is helpful to set up the program for use with two switches. The pupil can then control the scan himself with one switch, and make a selection by pressing the second switch. Once the pupil understands the concept of scanning, and if they have adequate physical control, they might be able to use just one switch with a computer-generated scan.
- To control powered mobility: there are some pupils who cannot use a joystick, but who may be able to control a powered wheelchair if adapted to work with switches.
- To access communication in the form of a voice output communication device: these range from BIGmack to DynaVox or Lightwriter, depending on the ability of the pupil.

There are a wide range of switches the pupil could use. As important as the choice of switch is the siting and mounting of the switch. For switch use to be meaningful, the switch has to be placed so that only voluntary movements of the pupil access it.

Using a switch to produce written output is a slow process. It often involves considerable physical effort on the pupil's behalf and makes cognitive demands on the pupil as well as requiring concentration. It is a good idea to try out whatever you are asking a pupil to do. If you expect them to write a page of work, have a go yourself; you might be surprised how tiring it is, physically and mentally.

Practical teaching activities

Please choose and complete one or more of the following activities:

1. Use of the keyboard

   Identify a pupil for whom letter by letter writing activities are appropriate. Consider how their use of a keyboard can be made easier for them.

2. Accessibility Options

   Spend some time investigating the Accessibility Options within Microsoft Windows software or on a Macintosh. Record the various facilities you find there and identify what type of difficulty each might be helpful for. Use one or more pupils as examples, if possible.

3. Learning to control a computer screen pointer

   Think of one of your pupils who has, to date, not achieved successful pointer control. Identify devices, software and techniques which will enable them to learn this skill.

4. Using a touch screen

   Identify a pupil for whom a touch screen is an appropriate device to enable them to control the computer. Explain your choice and think of five ways that their access to the curriculum could be enhanced through its use.

5. Using an overlay keyboard

   Choose a pupil for whom an overlay keyboard is appropriate. Design three overlays which would be appropriate for the pupil to use to support his / her developing literacy.

6. Rollerball versus mouse

   Explain what a rollerball is and why it may be easier for some pupils to use than a mouse. What can you do if a pupil is unable to use the mouse or rollerball buttons? What adjustments might you make if a pupil finds it difficult to reach a target successfully? Illustrate your answer with reference to a pupil you have worked with.

7. Software to speed up writing

   What software have you used with children you work with to help them speed up their written output? Explain how you have used this and list the advantages and disadvantages of the programs you have selected in a practical situation.

8. Helping a child with spatial difficulties

   What input devices and programs might you use with a child who has spatial difficulties? Describe a child you work with who has these difficulties. How do they effect his / her daily life? What results did you get when using the hardware and software? Explain these.

9. Planning to use voice recognition software

   Identify a pupil for whom you think voice recognition software might be appropriate. Would they find discrete word-by-word or continuous speech more appropriate? Contact a supplier and find out what specification of computer is needed and the cost of the system. Arrange for a demonstration with the pupil. Plan time in the timetable for introducing and supporting this innovation.

10. Positioning of equipment

    Take a 'before' photo (digital if you can) of a pupil whom you teach, who seems to be uncomfortable and badly positioned. Watch the pupil working at the computer and consider

    * the way the pupil is seated
    * the height and position of the table and the monitor
    * the placement of the access device

    Can altering any of these make things easier for the pupil? Take an 'after' photo and describe any change in performance you have noted as a result of these alterations.

Appendix 1 – Suppliers' addresses

Andrea Electronics
Unit 14, Distribution Centre
Shannon Industrial Estate
Shannon, Co Clare
Ireland
Tel. 0800 969 988
Web: www.andreaelectronics.com

Atkinson Vari-Tech Ltd
Unit 4, Sett End Road
Shadsworth, Blackburn
Lancashire BB1 2PT
Tel. 01254 678777

Cambridge Adaptive Communication (Possum Controls Ltd)
8 Farmborough Close
Aylesbury Vale Industrial Park
Stocklake, Aylesbury HP20 1DQ
Tel. 01296 719736
Web: www.cameleon-web.com

Crick Software
35 Chartergate
Quarry Park Close, Moulton Park
Northampton NN3 6QB
Tel. 01604 671691
Web: www.cricksoft.com
www.clickergrids.com

Don Johnston Special Needs
18 Clarendon Court
Calver Road, Winwick Quay
Warrington WA2 8QP
Tel. 01925 241642
Web: www.donjohnston.com

Iansyst
The White House
72 Fen Road
Cambridge CB4 1UN
Tel. 01223 420101
Web: www.dyslexic.com

Inclusive Technology Ltd
Gatehead Business Park
Delph, Oldham OL3 5BX
Tel. 01457 819790
Web: www.inclusive.co.uk

James Leckey Design Ltd
Design House
Kilwee Ind. Estate, Dunmurry
N Ireland BT17 0HD
Tel. 028 9060 2277
Web: http://www.leckey.com

KeyTools
PO Box 700
Southampton SO17 1LQ
Tel. 023 8058 4314
Web: www.keytools.com

Liberator Ltd
Whitegates, Swinstead
Lincolnshire NG33 4PA
Tel. 01476 550391
Web: www.liberator.co.uk

REM (Rickitt Educational Media)
Great Western House, Langport
Somerset TA10 9YU
Tel. 01458 253636
Web: www.r-e-m.co.uk

Semerc
Granada Learning Ltd
Granada Television, Quay St
Manchester M60 9EA
Tel. 0161 827 2966
Web: www.semerc.com

Special Access Systems
4 Benson Place
Oxford OX2 6QH
Tel. 01608 811909
Web:
www.specialaccesssystems.co.uk

Techcess Ltd
Unit 12 Willow Park Estate
Upton Lane
Stoke Golding
Nuneaton
Warwickshire CV13 6EU
Tel. 01455 213708
Web. www.techcess.co.uk

Texthelp Systems Ltd
Enkalon Business Centre
25 Randalstown Road
Antrim
Co Antrim BT41 4LJ
Tel. 02894 428105
Web: www.texthelp.com

Widgit Software
26 Queen Street
Cubbington
Leamington Spa CV32 7NA
Tel. 01926 885303
Web: www.widgit.com

Appendix 2 – Alternative keyboards and keyboard accessories

Compact Keyboard – a 'laptop-sized' keyboard (also known as Cherry keyboard). Has an optional keyguard. No numeric keypad. (Inclusive Technology, Special Access Systems)

Little Fingers – a small keyboard with built-in rollerball. No keyguard currently available. (Semerc)

Tash WinMini – a very compact keyboard which has a membrane surface rather than individual keys. A very specialized (therefore expensive!) keyboard. (Cambridge Adaptive Communication)

BigKeys Plus – a simplified, larger-than-standard keyboard with optional keyguard. One-inch square keys. Comes in 'QWERTY' (almost – the 'm' is in the wrong place!) or alphabetic layout. Does not have a conventional shift key (uses the space bar + key) and so cannot be used with sticky keys for one finger use. Punctuation keys are not easily accessed. (KCS, Inclusive Technology, Semerc)

Tash WinKing – a larger-than-standard keyboard with 1.25-inch, slightly recessed keys. Like the WinMini, it is a very specialized and expensive keyboard. (Cambridge Adaptive Communication)

IntelliKeys – an overlay keyboard with additional 'access' facilities. A range of optional keyguards available. Has a wide range of prepared resources. (Inclusive Technology, KCS, Semerc)

Concept (overlay) keyboards – come in A5, A4 and A3 sizes and with software to enable you to design and make overlays. (Semerc)

Maltron Range – a range of ergonomically designed keyboards. Very specialized and therefore expensive. (Enabling Computer Supplies [ECS], KCS)

Lower case keyboards – standard keyboards but with lower case letters on the keys. (Research Machines [RM], Inclusive Technology, Semerc)

Keyguards – a reasonable range available but not for every keyboard. From Special Access Systems, Semerc or as an optional extra when you purchase some keyboards (e.g. BigKeys, Compact keyboard, etc).

Keyboard stickers – to make your existing keyboard keys lower case, high visibility. (KCS, Inclusive Technology, Semerc)

Adjustable height tables – useful to ensure the optimal positioning of keyboards and other access devices for individual pupils. (Techcess, Inclusive Technology, Varitech, James Leckey, amongst many others)

Appendix 3 – Mouse alternatives

Kidsball – a simple rollerball with a large yellow ball. Software supplied with it enables the screen pointer speed to be controlled. (Semerc, KCS)

Penny & Giles Roller – a large balled rollerball with guarded ball and buttons. Has an additional 'drag lock' button. (Inclusive Technology, Semerc)

Penny & Giles Joystick – joystick version of the Semerc Roller. Optional large sponge or t-bar grip. PS/2, serial or USB connection. (Inclusive Technology, Semerc)

Penny & Giles Roller Plus – similar to the Roller but with extra 'double click' and 'speed control' facilities. Optional switch adaptor box which enables button facilities to be activated by a switch press. PS/2, serial or USB connection (Inclusive Technology, Semerc)

Penny & Giles Joystick Plus – joystick version of the Roller Plus. Optional switch adaptor box which enables button facilities to be activated by a switch press. Optional large sponge or t-bar grip. PS/2, serial or USB connection (Inclusive Technology, Semerc)

Head controlled systems – HeadMouse (Don Johnston Special Needs), Head Operated Mouse (Semerc) and Headway (Inclusive Technology, Semerc) are the main three. See suppliers for details.

Glidepad – 'plug-in' version of a device usually found built in to laptop computers (from Inpace)

Biggy software – provides a wide range of alternative pointers. Much wider variety of size and visibility than is available through standard Microsoft software. (Liberator)

Microspeed KidTrac – standard rollerball with three buttons and latching drag. (Inclusive Technology)

Microspeed PCTrac – standard rollerball with three buttons and latching drag. (Inclusive Technology)

Appendix 4 – Some useful Web sites and further reading

ACE Centre – www.ace-centre.org.uk
Independent assessment, information and software

ACE Centre-North – www.ace-north.org.uk
Independent assessment and information

Advisory Unit – www.advisory-unit.org.uk
Information, resources and software

Crick Software Ltd – www.cricksoft.com and www.clickergrids.com
Early literacy software

Don Johnston – www.donjohnston.com
Software and access products

Inclusive Technology Ltd – www.inclusive.co.uk
Information, equipment and software for special needs and ICT

KCS – www.keytools.com
Alternative access devices

MAPE – www.mape.org.uk
Micros and Primary Education Web site. Information and software deals

Meldreth Manor School – atschool.eduweb.co.uk/meldreth/
Ideas and information for symbol users.

NCIP – www2.edc.org/NCIP/
Association with lots of useful information, advice on classroom applications, and reviews of software

Semerc – www.semerc.com
Educational software equipment and software for special needs and ICT

Words+ – www.words-plus.com
Computer access products

Further Reading

Special Access Technology, Paul Nisbet and Patrick Poon, CALL Centre publication, ISBN 1 898042 11 X

Voice Recognition Technology in Education, Factors for Success, Mick Donegan, ACE Centre publication, ISBN 1 903303 00 1