

Unit 10

ICT for visually impaired pupils

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The Learning Support Assistants who provide support on a daily basis for the visually impaired students mentioned in the Unit.

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.

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Introduction

This Unit covers ICT in the context of pupils with a visual impairment accessing the curriculum. The different media (visual, auditory and tactile) are explained, and consideration is given to technologies which pupils can use to study independently, such as note-takers, text scanning systems and Internet access.

After introducing underpinning concepts, a number of scenarios are presented and explained, which demonstrate effective use of ICT for pupils in a range of circumstances.

The accompanying **Unit 9 - Basic ICT for pupils with a visual impairment**, examines technology to provide basic access and skill development. Both Units cover a similar range of underpinning concepts. The first Unit also considers how technologies such as overlay keyboards, talking word processors and touch screens can be used to develop fundamental skills and concepts. These are the building blocks that can be used by older pupils to be independent and effective learners. It is anticipated that teachers will choose between these Units as appropriate to their students.

Using ICT with learners with a visual impairment

Throughout this Unit the term ICT (Information Communication Technology) is used to mean specialist computer hardware and software which is relevant to pupils with a visual impairment. For pupils with a visual impairment ICT primarily embraces:

- modifications to the output medium through either visual, auditory or tactile strategies
- modifications to the input medium to allow the unique needs of the student to be best met
- developing strategies to complement existing teaching methods whilst promoting greater independence when accessing the curriculum

Expected outcomes

By the end of this Unit, participants will...

- have an understanding of what ICT means in the context of pupils with a visual impairment
- have an understanding of the key issues involved in making appropriate ICT choices for pupils with a visual impairment
- be aware of the complex and unique needs of pupils with a visual impairment in relation to technology intervention
- be aware of possible technology solutions to implement within the learning environment of pupils with a visual impairment

Key skills covered in this Unit

Customize the screen appearance through the Windows operating system

Understand that the visual appearance on-screen can be changed for individual preferences.

See Scenario 1, Example 1a

Set up profiles for individual users

Save settings as a user profile with individual preferences already set up.

See Scenario 1, Example 1a

Use a CCTV effectively to gain access to print and diagrams

Enhance and enlarge print and diagrams using *Closed Circuit Television* (CCTV).

See Scenario 1, Example 1b

Use a screen reader to access a PC

Use screen reader software to read information from the screen, such as windows, menus, text etc.

See Scenario 2, Examples 2a, 2b, and 2c

Understand the necessary commands to use a Braille note-taker

Use a Braille note-taker to enter conventional Braille code, which can then be printed to a Braille, or downloaded to a computer.

See Scenario 3, Example 3a

Understand the commands necessary to activate a scanner and OCR software

Use a scanner and *Optical Character Recognition* (OCR) software to convert printed text to electronic form so that it can be read back for visually impaired pupils.

See Scenario 4, Example 4a

Reformat text with a word processor using a variety of fonts and formats

Create worksheets and notes in a range of fonts and sizes to suit personal preferences.

See Scenario 4, Example 4b
Scenario 8, Example 8a

Produce tactile diagrams

Understand the differences between a *fuser* and a *vacuum former* for producing tactile diagrams.

See Scenario 3

Use the enlargement facilities of a photocopier

Use a photocopier to enlarge printed materials for pupil use.

See Scenario 4, Example 4a

Understand features of the Control Panel and computer system itself that can be used to enhance access

See Scenario 5, Examples 5a and 5c

Use a screen reader or talking Web browser

Much information on computers is complex and visual. Understand how to set up and use a *screen-reader* to make auditory sense of visually presented information.

See Scenario 6, Example 6a
Scenario 7, Examples 7a and 7b
Scenario 8, Example 8a

Use an email package to send and receive email

See Scenario 7, Example 7b

Scenarios

This section is intended to give you ideas about how to incorporate ICT into your teaching and provide access for those students with visual disabilities. 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 the operating system your computer uses and can manage basic tasks such as starting up programs, simple word-processing, and saving and printing work. The key skills, software and any peripherals will be listed at the end of each scenario. These will be linked to the activities found at the end of this Unit.

Scenario 1 - Visual output

Adaptations and enhancements

Information presented in text or graphical form is often inaccessible to a child with little vision. Therefore, to gain access to standard resources, adaptations have to be made to alter the appearance of the screen display. A computer screen offers a display medium with the potential to alter the colour, contrast and brightness to suit individual preferences. It also offers extensive control over the presented text size, style and colour. The mouse pointer can often be difficult to see; this provides additional problems for a visually impaired user. However, there are features available within the operating system of a computer which can be customized to the user's preferences, such as slowing down the pointer or adding trails to its movement.

See **Unit B - Organizing your resources** for more information about setting up accessibility options in the operating system.

Example 1a

Tricia has a condition known as Colobomatous Microphthalmos and is registered partially sighted with good functional vision. Tricia lives as part of a family of four, with 'Mum', 'Dad' and a brother. The family computer is just that: a family computer used by all. Tricia is very able and, after a course of learning keyboard skills, navigates a standard **windowed** environment using a word-processing package very effectively.

Tricia has very specific needs in terms of how the computer is set up, to provide access to the computer and its software. She can see some areas of the screen, although her main mode of access is using speech via a bespoke screen reader software package: **JAWS**. Tricia likes to use what sight she has, so some areas of the screen have been enlarged; for example, the title bar and menus within her preferred word processor. These facilities are built in to the operating system, accessible through the **Control Panel** of a PC.

Having the computer set up for Tricia's specific needs occasionally causes tensions within the family, particularly between siblings. Games and other entertainment software do not often work well with the screen reader package. The enlarged areas of the screen can be disorientating for other sighted members of the family. The screen reader software (although it can be switched off at the speakers), frequently conflicts with other software packages, whereas unloading the speech software means that the computer has to be re-started to activate it again.

The Windows operating systems provides the opportunity to configure specific environments tailored to individual needs. These individual environments can be named and saved, subsequently to be called up whenever they are needed. By configuring several working environments, it is possible to accommodate the differing needs of family members. Interestingly, each environment can be configured to include not only changes to specific aspects of the visual environment, but also specific files and software. Tricia can now load her own tailor-made environment, with speech access and modifications to specific areas of the screen. Other members of the family can load their own environment without any special enhancements and with their chosen software packages.

Key skills and equipment

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

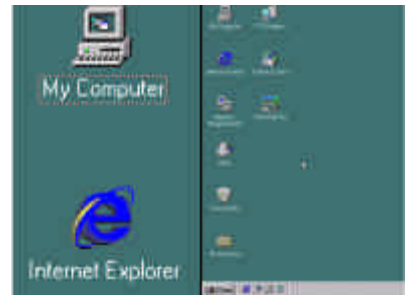
- customize the screen appearance through the Windows operating system
- set up profiles for individual users

The key equipment is:

- standard PC (Windows 95 or later)

Screen magnification

Where there is a need for greater enlargement, screen magnification software is available. The student starts by loading up the magnification utility, which enlarges all text, icons etc. The student can then determine the level of magnification necessary, viewing the screen a portion at a time. Magnification applications offer a variety of screen presentation options including split screen, which allow the student to magnify a portion of the screen according to their visual needs.



magnification of an area of the screen

This magnified **window** is moved around to enable the rest of the screen to be read as required. Normally, the screen magnification will automatically follow the focus of attention, so that the area around the cursor, mouse pointer or highlighted item is magnified. Moving the magnified window in order to view other parts of the original screen image is done using the mouse or through key strokes. The user is able to increase or decrease the magnification as necessary, for example within a Web page. There may be a need to change the magnification according to the material being viewed. Packages vary in the facilities they offer but general features include:

- continuously monitoring an area of the screen
- smoothing jagged edges of characters at larger magnifications, altering the colours of text foreground and background on the screen, changing the appearance of the mouse pointer and cursors
- changing the shape of the on-screen font
- using different sizes and shapes of magnified windows
- customizing which on-screen events are tracked by the magnified window, and which are not

Many of the magnification software packages can be tried out by obtaining a demonstration copy from the supplier. These demonstration copies have all the functions of the actual package but will run for a limited period, some will time-out after about 15 minutes but can be run again, others can be used until a given date.

For examples please see Appendix 5.

CCTVs

A simple way of producing large text, images, maps, objects etc, on-screen is to use a small TV camera attached to a visual display unit or screen; this combination is called **Closed Circuit Television (CCTV)**. A typical CCTV system consists of a television camera mounted above a moving platform. The material to be magnified (text, diagrams, objects etc.), is placed on the platform directly below the camera and scanned by moving the platform. The magnified image is displayed on the monitor; the contrast, magnification and colour may be adjusted to the suit the user. Some CCTVs can be connected to a computer, displaying the magnified image in a split-screen format, i.e. the screen is divided into two with both the magnified image and normal computer screen being displayed together. (It is important to check the compatibility of the CCTV, monitor and magnification software to be used together.)

CCTVs can be monochrome, full-colour or semi-colour (allowing a choice of text colours); all have the ability to display a negative image. Some have additional features such as underlining or curtaining to blank out unwanted parts of the screen. These features are particularly useful for children using their peripheral vision or who have difficulty locating and focusing on text.

Colour CCTVs are the most popular type for the child with a visual impairment being taught in a mainstream group. They can be used to enlarge most educational materials including text, colour maps, diagrams, and illustrations. It can further assist inclusion if all students in the class are encouraged to make some use of the CCTV, for example to magnify biological specimens. Some models of CCTV use a hand-held camera in order to make the device more portable. However, reading with a hand-held camera, especially on a small screen, is more difficult than with larger static CCTVs.

Positioning of the CCTV is important. It should be sited where the child will be expected to gain access to print: either the form room, study room or library. Where the child will need to gain access during the day and only one CCTV is available, it can be stored on a mobile trolley and wheeled to the classroom. The school environment and the presence of lifts, stairs, cobbles etc, will determine whether this is a viable option.

Example 1b

Josh is fourteen with macular degeneration; he makes good use of his functional vision by using eccentric viewing to access print. In the past Josh has been reluctant to use technology within the mainstream classroom setting, as he has not wanted to appear different from his friends; but a deterioration in his sight has made it increasingly difficult for him to access print for his studies or leisure reading material. A CCTV has been introduced into the library which allows him to magnify print and diagrams to suit his visual needs.



using CCTV to magnify diagrams and print

This has provided greater opportunity for independent work and reduces his need for constant support and teacher input, which in the past had been detrimental to Josh forming relationships with his peers.

Key skills and equipment

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

- use a CCTV effectively to gain access to print and diagrams
- training in eccentric viewing techniques

The key equipment is:

- suitable CCTV

Scenario 2 - The auditory medium

Speech output

Pupils who cannot easily access the computer using their vision may use the medium of speech output. In some cases the use of a talking word processor will help. In others a full screen reader will be required. In this case, as windows, menus and text pop up the user hears, rather than sees, the contents of the screen.

Example 2a

Sophie is registered blind with functional vision in only her left eye, which fluctuates during the day. She finds it very difficult to use a pen to form letters and write as she also has arthritis in her wrists. To enable her to record and produce work, which both she and her teachers can read, Sophie uses a talking word processor. This provides her with character and word echo when she inputs text and also allows her to read back the text rather than struggle with the display. The talking word processor also reads the pull-down menus, which gives her a prompt when she is saving or printing her work. Sophie is able to enlarge the text through the word processor but also has the option to use a screen magnification package when she feels that she needs extra enlargement. She is able to launch and close this application by using short cut keys which were set up for her; this means she can use it when she feels it necessary.

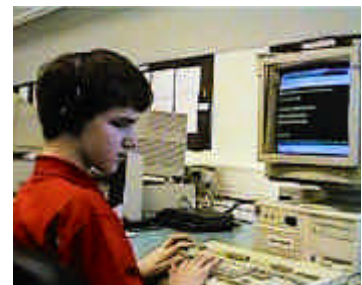
Key skills and equipment

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

- use a talking word processor to enter and read back text
- navigate the screen with a screen magnification application

The key equipment is:

- talking word processor (e.g. *IntelliTalk*, *Write:Outloud*)
- screen magnification application (e.g. *Lunar*, *Zoomtext*)



writing on the computer

Digitized speech

Some basic talking applications might use digitized speech. This is speech that has been digitally recorded and is played back when initiated by the user. As it is a recording the quality is good and easy to understand. Digitized speech is used mainly in CD-ROMs for talking stories or encyclopedias and in framework packages where the teacher or student is able to record sounds or speech themselves. The student and teacher would be able to make recordings of each other's voices and sound samples to incorporate into home made accessible talking books using readily available applications such as Microsoft *PowerPoint*.

However, digitized speech has a finite, predetermined vocabulary and cannot be used to offer full access to mainstream software. Only the samples that have been recorded can be accessed. It would not therefore be possible to use digitized speech within a word processor; it would be impossible for the designer to predict all potential words used in composition and record them.

Example 2b

Joel is registered partially sighted with cortical visual impairment, mild continuous nystagmus with a mild convergent squint. As he has experienced difficulty accessing print, he is a very reluctant reader and needs encouragement to engage in the literacy hour; but he does enjoy using the computer, as the multimedia combination of video, sound and pictures gives him multi-sensory stimulation.

Commercially available software has often proved inaccessible without the necessary enlargement options. Joel's teacher produces resources in large print for classroom discussion but in collaboration with the ICT teacher recreates poems and stories on the computer using *Word* and *PowerPoint*. The text is enhanced using clip art and pictures taken with a digital camera. Sound is added by recording Joel, his peers and teachers as well as using files downloaded from the Web. The rest of the class can also use the materials produced as an alternative to printed material.

Key skills and equipment

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

- find and create sound samples (e.g. recording, or using the Web)
- find and create images or photographs (e.g. via the Internet or digital camera)
- incorporate multimedia components into an application

The key equipment is:

- digital camera
- Web access
- microphone
- software such as *Word* or *PowerPoint*

Screen readers and synthetic speech

Packages used to provide speech output to mainstream programs are called **screen readers**. Key strokes rather than positional mouse clicks are used to control the computer and the menus; dialogue boxes and other text areas are spoken in a synthetic voice.

Many screens in most programs contain vast quantities of complex information. The screen reader has the job of representing this through speech – often a very difficult task. Because of these complexities and the variety of presentation methods, the choice of screen reader software has to be made very carefully. Advice is available from many sources and a good first reference point is the support service for pupils with visual impairments. They will be able to give advice on assessments and potential further sources of information.

The synthetic voice can be produced using a speech synthesizer (an internal or external hardware device) or more commonly these days by using the sound card. With either method the speech can be listened to through standard speakers or headphones.

They vary greatly in the quality of voice produced and the response speed of the synthesizer. Using rules for translating text into speech sounds, the speech synthesizer can speak anything that is typed onto the screen – even foreign languages in the case of some voice synthesizers. Sometimes, however, the pronunciation is not always as expected and so can sound odd to the untrained ear. As voice quality is such a subjective aspect of voice synthesis it is vital that the child listens to several synthetic voices to judge suitability before a system is purchased.

Example 2c

Kenneth is thirteen and has retrolental fibroplasia, which means he is totally blind. He attends a mainstream school and uses a laptop to record and produce work. Kenneth uses a screen reader to give him access to the computer and is able to produce hard copy Braille via an embosser and Braille translation software, which is permanently located in the support base.

To avoid having to produce large quantities of Braille, work is given to Kenneth on disc; he is able to read through this with the screen reader and complete his work, save it on a disc and return it to his teacher. When the work is completed he is able to print a Braille copy for himself if he needs one and a print copy for his work folder.

Key skills and equipment

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

- use a screen reader to access a PC
- use a standard word processor
- produce Braille via a translation package and embosser

The key equipment is:

- standard PC and word processor
- screen reader
- Braille translation package and Braille embosser

Scenario 3 - Tactile output

Electronic Braille displays

An electronic Braille display is a tactile device that represents the text on the computer screen using a row of **Braille cells**. Each cell consists of pins, which move up and down to represent, in Braille code, the text character displayed on the screen. The widths of the Braille displays vary between models, with 40 and 80-cell versions being common sizes.



Braille display from a word processor

The contents of the Braille display will change instantly as a pupil moves their cursor down through lines of text in a word processor. Keys on the front and top of the display allow the user to control the cursor and navigate the screen. This reduces the need to move hands from the display to the keyboard. A Braille display can be used in conjunction with speech output. Many children who are Braille users find this combination provides them with an effective way to navigate the screen and enter and edit text.

Braille production

As well as the need to work in real time with an electronic Braille display, users may require a permanent copy of a piece of information in hard copy Braille. A Braille translation package converts the text characters in a word processor into the Braille equivalent and prints the document using a Braille printer known as an embosser. Embossers print Braille output from a computer by punching dots onto paper. They connect to a computer in the same way as text printers, via the parallel port. Braille can be formatted and compressed in a number of ways. The Braille translation packages are flexible to enable the production of Braille to the individual specification and format requirements of the user.

Braille note-takers

The traditional metal Perkins Braille is a common recording tool for many blind students. However as the demands of the curriculum increase, and the learner needs a more efficient production and storage device, many choose an electronic Braille note-taker. The layout of the Braille keyboard contains a key or button for each of the six Braille dots and a space bar, allowing the user to use the conventional Braille code when typing. This results in a compact keyboard – important in a portable device.

Text can be entered, edited, read back via speech or an integral Braille line. It can then be transferred to a PC for viewing or printed in ink or Braille to the users specifications. Note-takers are also available with a 'QWERTY' rather than Braille keyboard.



using a Braille note-taker

Example 3a

Hamed is fourteen years old and has no useful vision. He has developed good keyboard skills and is able to use a word processor competently alongside a screen reader.

Within lessons he prefers to use a Braille note-taker with a refreshable Braille display. Whilst the teacher is talking and he is involved in discussion, he is able to turn off the voice output and rely on the Braille display to give him feedback about what he has written. Because of the contracted nature of Braille, Hamed is able to jot down notes very quickly whilst at the same time participating in the lesson.

He found that when he tried to use a laptop in lessons he was too distracted by the speech output to concentrate on what was actually being taught. At the end of the lesson, he is able to obtain and print a Braille copy of his notes, or transfer them to disc to edit or complete during private study time using the laptop.

Where he is not able to use his note-taker he also has the option of using a Perkins Braille and a pocket recorder to note down thoughts.

Key skills and equipment

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

- understand the Braille code
- understand the necessary commands to use the note-taker
- use a Braille translation program
- set up a Braille embosser

The key equipment is:

- Braille note-taker
- embosser
- pocket recorder

Tactile diagram production

The production of tactile diagrams for students with a visual impairment can be complex; it is therefore important to decide on the most appropriate production method. There are several ways of constructing tactile methods, such as a **fuser** and **swell paper** or **vacuum forming**.

When using a fuser, a print version is produced on standard paper with clear black outlines or areas and photocopied onto microcapsule or swell paper. This then passes through the fuser where it is heated. As the black areas absorb more heat than the white areas, they rise and swell to form tactile areas.

Vacuum formed diagrams use a raised diagram or collage as a template over which plastic is vacuum formed to produce a more permanent tactile resource. The equipment is often referred to as a **Thermoform**. It is often used to reproduce complex diagrams which include Braille labels, or where multiple copies of Braille texts are required.

There are some important points to consider when determining the best approach:

- Will the material being produced be used once or many times?
- Does the diagram need to offer contrast as well as tactile areas?
- Are varying texture qualities and depths required?
- What are the features of the diagram to be produced?

Scenario 4 - Access to printed materials

As well as needing to record information, students with a visual impairment need to access material printed on paper or available in electronic format.

Reading systems

Reading systems allow students who are blind or visually impaired to gain access to printed material. Reading systems are often referred to as scanning systems, optical character recognition systems (OCR) or electronic reading aids, which adds to the confusion.

They are available in two basic forms – a stand-alone system in a self-contained unit or as an add on to a PC. The information to be scanned is placed face down on a glass surface where a light then passes under and takes an electronic picture of the item. The OCR software examines this image and matches the pattern to form text characters. This can then be displayed on screen as recognizable text or read out using synthesized speech.

Example 4a

Jade is fifteen and has no useful vision. Due to an increase in workload she has found it progressively more difficult, time-consuming and stressful to adapt her traditional methods of studying, which involve reading text from Braille and taking notes. She also faces difficulty accessing periodicals, books, newspapers, and conference papers, as there is only a small selection of Braille material available in the library.

Within the library, to aid independent access to print, a scanner and optical character reader software have been added to a PC, to provide full print reading facilities. Using this with a word processor and a screen reader, Jade is able to search, use and manipulate text the same way as her sighted peers, without over dependence on teaching staff. The system allows Jade full control over speed, intonation, punctuation and even accent specification when listening to the text. She is able to scan text, listen and then save portions of the text to use as notes for her studies.

Key skills and equipment

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

- understand the commands necessary to activate the scanner and OCR software
- use the OCR software to import text to a word processor and edit

The key equipment is:

- scanner
- OCR software with speech output
- screen reader and word processor

Photocopier

Many partially sighted students find accessing standard print in study materials and books difficult. The use of a CCTV may not always be an appropriate means of enlargement, especially in classroom discussions where it is important that the student is able to participate fully. Another practical way of producing large text on paper is to use the enlarging facility on a photocopier. Many textbooks are A5 in size and an enlargement to A4 may provide enough assistance for the learner with partial sight to read the text.

Most handouts within the classroom environment are probably A4 size and enlargement to A3 would be necessary. A3 paper sets the child with a visual impairment out from the remainder of the class and is very bulky to manage and store, some may even feel so self-conscious about using oversized paper that they prefer to use non-adapted reading materials instead.

Printing in large print

Not all children with low vision need print presented in the same format. However all word processors allow text to be printed onto paper in a range of sizes, sans serif fonts and formats including enlarged, double-line spaced and emboldened. This versatility allows resources to be tailor-made to the needs of the individual.

Example 4b

Peter is fourteen and is registered partially sighted. He has nystagmus, which gives him difficulty in focusing, and bilateral congenital cataracts, giving him, reduced visual acuity in both eyes. He wears soft contact lenses, making objects smaller but clearer. He is able to make good use of his residual vision. With support and adaptation of learning materials, Peter is able to participate fully in a varied curriculum, alongside his sighted peers.

All learning materials are enlarged and enhanced by reconstructing class books, providing photocopied enlargements, enhancing diagrams, worksheets and maps. This is carried out through the use of technology sited within the resource base at his school. His teacher is able to use a sans serif font at 28 point size, with double-line spacing to reduce confusion and aid navigation around the page. When large amounts of text are necessary, it is presented in columns rather than in landscape format. This minimizes the need to move his head and focus point.

Text that Peter
can read.

The font is Arial
at point size 28.

Key skills and equipment

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

- reformat text with a word processor using a variety of fonts and formats
- use the enlargement facilities of a photocopier

The key equipment is:

- standard PC and laser printer
- photocopier

Colour printer and scanner

Often, an increase in the quality of accessible print can lead to a decrease in the use of images and illustration, and therefore in interest to the child.

Where images are photocopied with a monochrome copier, all colour and often line quality is lost. An increase in font size using a word processor may also lead to the removal of interesting images.

It is important to present visually interesting and stimulating handouts to learners with a visual impairment, to ensure motivation is maintained. One way of achieving this is to use a colour printer and scanner. The original image or illustration may be too small for the child to recognize or features may be hard to discriminate. If the image is scanned with standard OCR software, the whole image or selected areas can then be enlarged and printed using a colour printer.

Scenario 5 - Alternative devices for access

Some students who have physical disabilities as well as visual impairments, may need to modify the way they use a keyboard or mouse, or may even need to seek alternatives.

Special key functions available through the operating system, such as **StickyKeys**, **FilterKeys** and **ToggleKeys** (Windows **Accessibility Options**), allow users with limited mobility access to the keyboard.

See **Unit B - Organizing your resources** for more information about setting up accessibility options in the operating system.

There are many interchangeable alternatives such as rollerballs, joysticks, touchpads, enlarged keyboards and overlay keyboards to afford greater independence and access.

See **Unit 7 - Accessing Technology** for more information about alternative devices to replace or enhance use of the keyboard or mouse.

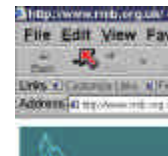
The use of hot key and keyboard short cuts is also a good approach where navigation around the screen is difficult.



Example 5a

Jenny is twelve years old and has Marfan's Syndrome. This means she is very short-sighted, and has a squint and glaucoma. She also has difficulty with motor control as she has disproportionately long limbs. For computer usage this has raised accessibility issues, which were initially resolved by using a rollerball. As she has developed an awareness of technology and its uses, it has been possible to rely less on positional mouse clicks and more on key strokes. Where she uses a word processor, the toolbars are removed to encourage her to use key strokes rather than clicking on icons. She is developing keyboard skills and although quite slow she is very accurate. To prevent errors in key presses, FilterKeys is activated, which prevents repeated key presses producing strings of letters by accident.

Where she does use the mouse to reposition images, she often finds it difficult to locate the pointer on screen; so she uses a mouse enlargement utility and turns on **Trails** in the **Pointer Options** of the **Mouse Control Panel**.



a better pointer
for Jenny

Key skills and equipment

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

- have a good understanding of the position of keys on the keyboard
- know short cut keys as alternatives for positional mouse clicks
- understand the options and enhancements available via the Control Panel

The key equipment is:

- standard computer and word processor

Example 5b

For some partially sighted students with functional vision the use of a touch screen (e.g. Touch Monitor) may also be appropriate.

It is often difficult to establish how much a student is able to see and the mechanics of eye-hand coordination may pose a barrier to developing visual skills. Touch screens allow the student to focus on both their hand and the screen contents at the same time, without the need for exaggerated hand movements. Many 'off-the-shelf' simple touch screen applications exist and simple authoring tools allow design and creation of tailor-made screens to better match the individual interests and abilities of the child.

The touch screen is not a suitable input method for a child who is totally blind. Although it can be used as an input method to develop causation skills, unlike switches, it provides no potential for progression or more complex usage based on tactile discrimination. It should therefore be avoided and a more appropriate method explored.

Key skills and equipment

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

- use a touch screen to activate applications

The key equipment is:

- touch screen
- suitable 'point and click' software

Where there is further reduced mobility, access to applications may be through switches. These are available in many designs to suit the needs and abilities of the user.

See **Units 7** and **8** for more information on using switches.

Voice activated software (VAS)

Perhaps the area under greatest debate at the moment is that of voice activated software (VAS). Sometimes considered to be the ultimate alternative access device, it has certainly captured the imagination of society, with great expectations being placed upon it.

Voice input can be used to type words and sentences into a word processor or similar program or to command and control menus and buttons. It does, however, need a great deal of training to perform with acceptable accuracy. If the student can see the screen, they will be able to dictate text and visually monitor recognition and errors. These errors may then be corrected, either by further voice control or by keyboard / mouse actions.

Where the student has no useful vision, the process is more complicated because of the need for a screen reader or a read-back facility to obtain voice output of text entered and errors made. The technology available now is able to knit together voice output and voice input well, and to provide the opportunity for accurate dictation.

It does, however, place high demands on both the student and support staff. It should not be considered unless the student is a very competent screen reader user, and even then it may still be more appropriate to develop good keyboard skills.

Scenario 6 - Accessing electronic information

CD-ROMs are a widely used educational tool, able to store large amounts of material in the form of text, pictures, sounds and movies. It offers the student the opportunity to search rapidly for information about a specific subject or to listen to an **electronic book** where they are able to turn pages, listen to passages again and zoom in on photographs.

All of these facilities are available to someone who can see the screen and use positional mouse clicks. The student who has no useful vision, and therefore uses speech, will experience greater difficulty with regards to accessibility and navigation.

Not all screen readers or magnification applications are compatible with all CD-ROMs. The way in which the information is presented and how the student is expected to sort and search will determine the level of accessibility. Where the screen layout is simple, magnification will make it easier for the student to read the information. But as the complexity of the screen increases, navigation becomes more difficult.

If search tools have multiple buttons, dialogue boxes or windows they are very difficult, if not impossible, to navigate with a screen reader. Using keyboard short cuts rather than the mouse can improve the use of these features; this obviously has to be included at the design stage.

Example 6a

Mustaff is totally blind and a competent screen reader user. He is able to access parts of Microsoft Encarta Encyclopedia for information, text and sound bites to reinforce his studies. He does experience a little difficulty with some pages where the information is organized in a highly graphical way. Here navigation with a screen reader is difficult and often he has to rely on his teacher to guide him or extract relevant information to read outside of the encyclopedia with the screen reader. As new versions are released he often finds that features have changed and accessibility methods need to be adapted; he does however give feedback to the designers to ensure that subsequent versions are accessible to students with a visual impairment.

Key skills and equipment

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

- be a competent screen reader user, capable of navigating unfamiliar situations with speech

The key equipment is:

- screen reader
- CD-ROM which is accessible to a screen reader or a magnification application

It is not possible to give a list of accessible titles; versions of both screen readers and CD-ROMs often change. Many suppliers offer users an evaluation period to assess accessibility with a particular screen reader.

Scenario 7 - Information on the Web

Widespread access to the Internet, and the World Wide Web in particular, has meant that many people who are blind or partially sighted are potentially able to access a great wealth of information, which may have previously been unavailable to them. There is enormous potential for the implementation of new technology to revolutionize the way in which children are taught, providing new avenues of access to information and revitalizing the way in which students engage in appropriate learning.

The Web can be likened to a library where the user can browse through thousands of pieces of information; but for the child with a visual impairment, the Web can be both a fantastic information resource and a source of immense frustration. It provides a valuable information resource, which is increasingly being used in schools to support the National Curriculum. However, the very things which attract sighted children to Web sites, such as graphics, animations, and varying fonts and formats, are the very things that provide potential obstacles to children with visual impairments.

When used effectively, the Web enhances learning opportunities for students with a visual impairment.

It is not, however, simply a matter of accessibility.

The Web can be accessed using magnification, screen readers or talking Web browsers; with the exception of badly designed pages, most information is available to the student. See **Unit A - Communicating with colleagues** for more information on accessibility issues of Web pages.

For visually impaired students, greater difficulties lie in finding material. Students with a visual impairment obviously take longer to read through or search for information as they are using magnification or speech. If they are given a vague term to search for they will spend the majority of their time trying to find a document that contains information relevant to their studies. If they are given a Web site which the teacher knows contains relevant information, the laborious task of searching has been removed and the student can spend quality time using the information.

Example 7a

Dinesh is fourteen and totally blind. He is a competent screen reader user and has recently gained access to the Web. Dinesh has made frequent use of the Web to support his curriculum studies. He has researched information for a number of projects in English and Geography, as well as practicing his Web browsing and search techniques whilst pursuing his main leisure interest of music and football. He does not have a computer at home and is therefore keen to get online at every opportunity whilst he is at school. Where he has found interesting material on the Web, he has saved the page in text format, and using Braille translation software, he has made a Braille printout. He is then able to use this information within homework and assignments. One of his favourite Web sites is the National Library for the Blind.

As a keen reader he is always interested in learning more about the books available from the library; he has made use of the Library's online ordering facilities to request books.

Asked why he enjoys using the Web so much, Dinesh replied, "It's good to be able to get current facts, especially about football and rock groups, which are not available in Braille".

Key skills and equipment

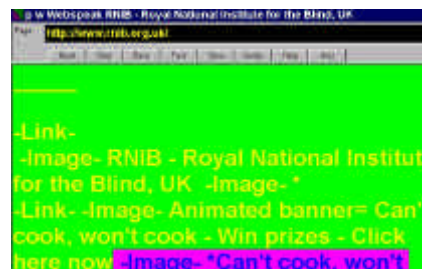
The key skills for the above example are the ability to:

- use a screen reader or talking Web browser
- understand the potential information available from the Internet

The key equipment is:

- screen reader or talking Web browser
- access to the Internet

Students using the Internet also have access to electronic mail (email). This is a very powerful communication tool. Students are able to communicate with others from all over the world and swap ideas, concerns, and thoughts without moving from their PC. The student is able to access email either with the addition of a magnification application or with a screen reader.



Dinesh can successfully browse the National Library for the Blind

Example 7b

Mica is fifteen and registered partially blind. She is also a wheelchair user. She attends a residential special school and she is able to read Braille, but finds it difficult to move around the school in the wheelchair carrying bulky Braille documents. She has recently begun to use the Internet and is particularly fascinated by email.

In the past, when she wanted to write letters to her friends, she would use a Perkins to produce Braille or a word processor for print. The letter would then need to be posted, which meant a reply was a while away. She finds the use of email a fantastic method of communicating. She is able to email her friends and family and receive replies instantly. Being able to access the Web through speech has also allowed her greater freedom to research and explore without the great weight of text materials.

Key skills and equipment

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

- use a screen reader or talking Web browser
- use an email package to send and receive email

The key equipment is:

- email account with an ISP or Web-based email

Keyboard skills

Keyboard skills are essential for children with a visual impairment if they are to use a computer with a 'QWERTY' keyboard. As curriculum demands and the quantity of text produced increases, it is vital for the child to have good keyboard skills. Keyboard skills can be defined as being able accurately and consistently to access the keyboard without visually locating the keys whilst using correct fingering. Accuracy is of far greater importance than speed.

Good keyboard skills enable the child accurately to record their ideas with a word processor, avoiding the frustrations of not being able to find the correct key. If the child has to constantly visually locate the key on the keyboard, the effects of a visual impairment may be exaggerated.

When a computer user is able to enter text without visually locating the keys, they demonstrate a much more efficient and effective use of technology. There are many keyboard training applications available. Not all allow you to change and adapt the display on screen.

Key features to look for are:

- uncluttered screen where presentation can be edited to suit the visual needs of the user
- opportunity to repeat lessons at any level – not to have to go through previous exercises
- feedback about progress
- ability to create exercises that use words that fit the ability and interests of the pupil
- speech feedback of text displayed on screen



using a typing tutor



Touch type typing tutor

An example of a touch-typing tutor which provides the above features is *Touch Type* – see Appendix 1 for supplier information.

Portability of device

Getting the most appropriate portable technology for a student is of the greatest importance, with their visual and curriculum needs being of highest consideration.

Many schools have technology suites where desktop computers are networked to provide timetabled access to equipment. There may also be isolated machines located across the rest of the school. When a child needs to use a computer throughout the day the issue of portability is very pertinent.

Having access to a computer on a rota basis is not appropriate if technology is their main method of producing work. The device needs to be portable, allowing the child to carry it from lesson to lesson and in some instances take it home to complete coursework.

Many children use laptop computers, which provide the same resources as the desktop machines they may also use within school. There are, however, many issues surrounding the use of laptops within school – not least the cost. There are physical considerations such as size, weight, keyboard, screen display and mouse design. There are also classroom issues such as ambient light, seating and positioning for the student. Finally there are management issues such as battery charging, maintenance and insurance.

It is important to be aware of the availability of other portable devices. There are devices which are designed to be word processors only; some have the addition of a calculator. The main aim is to be able to input text using a 'QWERTY' keyboard and either obtain a direct printout, or connect to a computer via direct cable or disc to transfer data. These devices have several limitations; the display is often of a set size with a low resolution and poor contrast, they may prove to be unreliable when attempting to transfer data, and the direct printout is of a fixed size and low quality.

However, despite limitations, some children with a visual impairment use them successfully within their learning environment to produce their written work.

Devices such as the Alphasmart, Dreamwriter or palm held equipment must be assessed by the student prior to purchase; they need to be able to see the display without any compromise on visual requirements.

Example 8a

Samuel is fifteen years old and attends a mainstream comprehensive school. He spends the majority of his time in mainstream classes with his year group but is withdrawn to the attached support unit for study periods. He was born with Retinopathy of Prematurity with no useful vision in his left eye and some useful vision in his right eye. Samuel has always been highly motivated by technology and was introduced to simple programs on the BBC in the Infant School. He was taught keyboard skills at Key Stage 2, which continued through into Key Stage 3.

He has had access to a laptop throughout secondary school, used with a screen reader. Within the support unit there is a desktop computer, scanner and a printer. This has given Samuel access to the Web, email and CD-ROMs. Samuel also has access to a similar set-up, provided by his parents, at home. The new computer has also made it possible to make much more efficient use of the support unit's existing embosser. The computer is Samuel's principal means of access to the curriculum.

Although he is a Brailleur, his Braille reading and writing skills are poor. Material is scanned onto disc and Samuel is able to 'read' it using his computer with headphones in class. Samuel is then able to type his answers, which can be printed out and given to the subject teacher. Samuel prefers to use his computer to write as it reads his work back to him and it is easy to edit and check spellings. His literacy skills have greatly improved since having access to word-processing as he can hear when he has misspelt a word and choose the correct word from the spelling checker. Previously he would have had several different misspellings in one piece of work.

The computer is also invaluable in preparing work for Samuel. Work can be scanned in and either saved on disc (which Samuel can take into class or take home to do his homework) or Brailled out, using the embosser.

Key skills and equipment

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

- use a screen reader to access a word processor
- use a word processor to enter and edit text

The key equipment is:

- standard laptop and word processor
- screen reader

Making the right choice

If only choosing the right technology involved selecting from a list!

As well as bringing new opportunities and opening up many possibilities, technology presents a range of challenges. Technology can assist individuals who are blind or visually impaired gain access to areas from which they may previously have been excluded. However, irrespective of rapid advancement and development, it is not a panacea for all difficulties. It can also be frustrating and intimidating. The benefits of technology can only be realized when careful consideration is given to:

- assessment of the needs of individual pupils
- training for staff and pupils
- appropriate selection of resources
- management of resources

Assessment

Before embarking upon a decision to purchase a particular device or application, it is necessary to determine the child's needs within the learning and home environments. Information has to be gathered from many sources, taking into account the child's attainment levels across many areas. As with all assessment procedures, this will be a multidisciplinary approach, involving input from many sources. It is the coordination of this information that leads to a decision being made over the most appropriate technology solution for the student. Information will include an understanding of the student's level of attainment in the following areas:

- reading and writing media
- motor control
- mobility and orientation
- visual perception
- auditory perception
- additional learning difficulties

The physical environment of the student and the skills of support staff will also have an impact on the successful implementation of technology.

Training

Technology sometimes fails to deliver results due to the lack of training; it is not fair to expect individuals to be able to operate a piece of technology without instruction; training should be a priority when introducing any new system. When equipment is not used effectively, difficulties experienced by the pupil are compounded rather than relieved. If new equipment is purchased and the support staff are not familiar with it then serious consideration should be given to obtaining training on that equipment or the full value of the equipment will not be realized.

Appropriate selection of resources

Making the decision about the suitability of a piece of technology for an individual can be thwarted by uncertainty. There are, however, many sources of information to help make the decision an informed one. Many suppliers offer demonstration or evaluation copies to help in the process of selecting the most appropriate software or hardware solution. Contact details are given in the Appendices.

Management of resources

There are obviously management and maintenance issues when introducing such complex devices and equipment into the learning environment of students. The following areas need careful attention before embarking upon a purchase:

- equipment charging and battery life
- portability and transportation between classrooms and home
- health and safety issues when using devices in the classroom
- insurance of equipment within school, when travelling home and at home
- after sales care and repair

Further information concerning the above points is supplied in the following Appendices.

Practical teaching activities

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

1. Selecting appropriate technology

Making a decision about the suitability of a piece of technology for an individual is a complex process. Information has to be gathered from many sources, taking into account the child's abilities across diverse areas. Identify areas for consideration when trying to identify the most appropriate technology solution for a particular curriculum demand.

2. Environmental barriers

Visual impairments affect a child to varying degrees, but often environmental barriers make the implementation of technology quite difficult. Identify a child you have worked with who experienced difficulties due to environmental barriers. What adaptations were necessary?

3. Adapting materials

How does technology allow you to adapt materials to the varying needs of visually impaired students? Outline how you would use these facilities with a particular student you support for a particular curriculum area.

4. The computer operating system

Identify features of the operating system of the computer that could help a student in your class. Try these out, one at a time, with the student. Evaluate their success, with contributions from the student.

5. Screen Readers

There are many screen readers available - compare and contrast the facilities offered by two products and relate them to the needs of a particular student you work with or support, in relation to access to a particular curriculum area.

6. Keyboards and Control Panels

Identify a student who has experienced difficulty accessing the standard keyboard. What facilities did the operating system offer the pupil. What alternative access devices were tried and how effective were they? Were there any other strategies not attempted that may have been suitable?

7. Curriculum access

Identify specific difficulties a particular student has when attempting to access the curriculum. Describe and evaluate the benefits of a specific piece of technology, which when implemented meets the curriculum needs of a visually impaired child.

8. Screen magnification

Compare the facilities offered by two magnification applications and discuss the suitability for a child identified as having partial sight.

9. Accessing the Internet

Outline how a particular child uses resources from the Internet to enhance the curriculum. What specific difficulties have arisen? What strategies have been developed to provide access to the Internet?

10. CCTV

There are many different models of CCTV available. Identify a child who needs to use a CCTV to access print and outline the features needed and the practical considerations when installing the device in the learning area.

Appendix 1 - Supplier information

Alphavision

www.alphavision.co.uk

Tel. 01872 870700

This company supply access technology that includes the ERGO range of CCTVs, the screen reader *Window-Eyes* and screen magnification software.

Black Cat Educational Software

www.blackcatsoftware.com

Tel. 0161 827 2927

Black Cat is a division of Granada Learning.

Blazie Engineering

www.blazie.co.uk

Tel. 020 8752 8650

This company specializes in products for Braille users. Products include Braille note-takers such as Braille 'n' Speak and Braille Lite, Braille embossers like Braille Blazer and Braille displays such as PowerBraille.

Concept Systems

www.conceptsystems.net

Tel. 0115 939 1391

This access technology supplier has the Clearview range of CCTVs and other products such as screen magnification packages.

Crick Software

www.cricksoft.com

Tel. 01604 671691

This company produce software for special needs and are the producers of the award winning product, *Clicker* - an on-screen keyboard with speech.

Dolphin Computer Access Ltd

www.dolphinuk.co.uk

Tel. 01905 754577

This company produces access software for visually impaired users such as *Hal*, *Lunar*, *Supernova*, *Cicero* and *Cipher*. These products include screen readers, screen magnifiers, reader magnifiers and Braille translators.

Don Johnston Special Needs

www.donjohnston.com

Tel. 01925 241642

This company produces software for special needs and are the suppliers of the talking word processor *Write:Outloud* which has a talking spelling checker.

Flexible Software Ltd

www.flexible.co.uk

Tel. 01865 391148

This company sells educational software for Primary and Secondary.

Inclusive Technology Ltd

www.inclusive.co.uk

Tel. 01457 819790

This company supplies access technology hardware and software for education including Touch Monitors, overlay keyboard products, including *IntelliKeys*, and *Inclusive Writer*. They also offer a comprehensive list of special needs articles and information along with links to supporting information and organizations on their Web site.

Longman Logotron

www.logo.com

Tel. 01223 425558

An educational software company who supply the talking word processor *Talking PenDown*.

Modern World Data

www.modern-world-data.com

Tel. 0151 650 6961

Suppliers of access technology including the Mountbatten Braille and Pictures in a Flash (PIAF).

Dreamwriter Solutions Ltd

www.dreamwriter.co.uk

Tel. 01902 425294

Suppliers of the DreamWriter.

Professional Vision Services

www.professional-vision-services.co.uk

Tel. 01462 420751

PVS supply a range of access technology products including the Magnilink range of CCTVs, note-takers, screen magnification and speech output packages.

Pulsedata International

www.pulsedata.com

Tel. 01933 626000

Pulsedata sells CCTVs, speech synthesizers and note-takers. Their products include the Smartview range of CCTVs.

Queen Alexandra College

www.qac.ac.uk

Tel. 0121 428 5050

QAC is a national residential and day college of further education for people aged 16 to 63 who are blind or partially sighted. It also supplies some access technology products including the Tactile Image Enhancer.

RCEVH

www.bham.ac.uk/RCEVH

Tel. 0121 414 6733

The Research Centre for the Education of the Visually Handicapped researches into education of the visually impaired and develops materials. They produce a publications list and a software catalogue of educational materials that can be used in the classroom. Their software includes *Soundbook*.

RESOURCE

www.resourcekt.co.uk

Tel. 01509 672222

RESOURCE is an educational software supplier and one of the suppliers of Touch Windows, the touch-sensitive screen that can be attached to your normal monitor.

RNIB ICT Sales

www.rnib.org.uk

Tel. 020 7388 1266

RNIB Hi-tech sales sell equipment including computers, speech systems, screen magnification packages, Braille displays, Braille embossers, Braille translation software and specialized and mainstream OCR reading software. RNIB Customer services sell the Perkins Braille on Tel: 0845-7023 153.

Semerc

www.semern.com

Tel. 0161 827 2927

Semerc is a supplier of educational multimedia and software for those with special needs. They also supply Concept keyboards.

Sherston Software

www.sherston.co.uk

Tel. 01666 843200

Sherston supply educational software for all ages, including curriculum-based software and CD-ROM talking stories such as *Naughty Stories*.

Sight and Sound Technology

www.sightandsound.co.uk

Tel. 01604 798070

This company supplies access technology including CCTVs, screen magnification software like *Zoomtext*, speech synthesizers, Braille embossers, Braille translation software and the popular *JAWS* screen reading software.

Soundlinks

www.soundlinks.com

Tel. 01494 794797

Soundlinks is a company that provides training in Internet use for those with a visual impairment. They are also the UK suppliers of the talking web browsers *PWwebspeak* and *IBM Home Page Reader*.

Tag Learning Ltd

www.taglearning.com

Tel. 0800 591262

Sell various software and hardware including the AlphaSmart.

Tagsearch Ltd

www.tagsearch.com

Tel. 023 8045 5004

Are a supplier of overlay keyboards.

Techno-Vision Systems Ltd

www.techno-vision.co.uk

Tel. 01604 792777

This company supplies various access technology products including the Tactile Image Enhancer.

Telesensory

www.telesensory.com

Tel. 020 8205 3002

This company supplies products for those with low vision, which includes the Aladdin range of Video Magnifiers.

Visualeyes

www.visualeyesonline.co.uk

Tel. 01422 846051

Visualeyes sell various products including Reinecker CCTVs, magnification software, scanners and the Hotspot Fuser Junior.

Widgit Software Ltd

www.widgit.com

Tel. 01926 885303

Widgit produces educational software to improve the literacy of pre-school, primary, special needs pupils and adults with learning difficulties. Software for those with a visual impairment includes *Inclusive Writer* and *Writing with Symbols*.

Zychem Ltd

www.zychem-ltd.co.uk

Tel. 01625 528811

Zychem sell the Zy-Fuse tactile image machine.

Appendix 2 - Useful organizations

AbilityNet

www.abilitynet.co.uk

Tel. 0800 269545

This charity provides impartial advice about computer technology for those with disabilities. They can also provide assessments.

ACE Centre, Oxford

www.ace-centre.org.uk

Tel. 01865 759800

These centres provide independent inter-disciplinary assessments, training, advice and information on the use of assistive technology, primarily for individuals communication impairments, although the needs of individuals with physical and / or communication impairments such as sensory impairment or learning difficulties are also considered. They also produce publications and software.

ACE Centre North, Oldham

www.ace-north.org.uk

Tel. 0161 627 1358

Action for Blind People

www.afbp.org

Tel. 020 7635 4800

Action for Blind People is a UK charity which aims to enable blind and partially sighted people to enjoy equal opportunities in every aspect of their lives.

American Council for the Blind

www.acb.org

The Council strives to improve the well being of all blind and visually impaired people by promoting greater understanding of blindness and the capabilities of blind people. Their Web site includes technology and information resources.

American Foundation for the Blind

www.afb.org

This organization is a leading resource in the US for people who are blind or visually impaired, the organizations that serve them, and the general public. They have a comprehensive Web site that holds news, information and other resources, including two online journals.

British Educational Communications and Technology agency (Becta)

www.becta.org.uk

Tel. 024 7641 6994

This organization promotes the use of new and existing technologies to enhance learning opportunities in all areas of education and training. Becta have been involved in many projects evaluating the use of computers and technology for use by those with special needs. These projects are undertaken by the inclusive education team, who research into these areas and produce reports, information sheets and publications.

British Computer Association for the Blind

www.bcab.org.uk

BCAB was formed to cover all aspects of computing and visual impairment. They produce a regular newsletter, have an electronic mailing list, and run training courses and introductory workshops.

Disability Net

www.disabilitynet.co.uk

Disability Net is one of the world's leading Internet-based disability information and news service.

Electronic Aids for the Blind

www.eabnet.org.uk

Tel. 020 8295 3636

This charity has a remit to enhance the independence of blind and visually impaired people through the provision of specialist or suitably adapted electronic equipment. They will raise funds for the purchase of equipment. Target groups are wide, including, for example, pupils in mainstream education who have their equipment provided by the LEA for use at school but who require similar equipment at home to permit homework and effective study.

National Association for Special Educational Needs (NASEN)

www.nasen.org.uk

Tel. 01827 311500

Aims include the promotion of the development of pupils and young people with special educational needs and influencing the quality of provision for these pupils. Activities include advice and support, the provision of courses, conferences and the publication of two journals.

RNIB Technology Information Service

www.rnib.org.uk/technology/

Tel. 024 7636 9555

The Technology Information Service can provide information on the use of technology for the visually impaired, primarily in the areas of education and employment. Enquiries can be received via phone, email, fax and letter. They aim to help sighted and visually impaired people such as parents, employers, those in work or seeking work, pupils, teachers and educational and employment professionals. Fact sheets can be sent to you, we can give you information over the phone, refer you to other RNIB departments or to other external services and organizations.

Scottish Sensory Centre

www.ssc.mhie.ac.uk

Tel. 0131 651 6501

The Scottish Sensory Centre is a UK-wide organization, which promotes and supports new developments and effective practices in the education of pupils and young people with sensory impairments, i.e. visual, hearing or dual sensory impairment. Their library has an extensive collection of books, videos and journals concerned with sensory impairment issues and education. They also have an online information service for the visually impaired community.

Appendix 3 - Other resources and sources of information

Journals

Access World: Technology for Consumers with a Visual Impairment

www.afb.org

This online journal is written by the American Foundation for the Blind and contains interviews, information and reviews concerning technology and software for the visually impaired.

British Journal of Special Education (BJSE)

The BJSE aims to cover the whole range of learning difficulties and disabilities, both in special and mainstream schools. There is a regular computer page.

Blackwells Publishers, 108 Cowley Rd, Oxford, OX4 1JS Tel: 01865-791 100

www.blackwells.co.uk

British Journal of Visual Impairment (BJVI)

This periodical covers all aspects of visual impairment. It is written for professionals who are concerned with pupils and adults who have a visual impairment. It is a national forum for all views on related subjects.

NASEN Tel. 01827 311500

Centre Software

This quarterly RCEVH journal concentrates on visual impairment and computing with special emphasis on additional needs and technology.

Research Centre for the Education of the Visually Handicapped (RCEVH), University of Birmingham, School of Education, Edgbaston, Birmingham B15 2TT Tel. 0121 414 6733

www.bham.ac.uk/RCEVH/welcome.htm

Educational Computing and Technology

This journal specializes in computing for schools. It includes news, reviews and information on most aspects of educational computing. Published six times per year.

Hobsons Publishing, Bateman Street, Cambridge CB12 1LZ Tel. 01223 354 551

Eye Contact

This journal focuses on the needs of pupils with impaired vision who have additional learning difficulties. It has news and other information for parents and professionals. It has technology features and is published termly.

RNIB Education Information Service, 224 Great Portland St, London, W1N 6AA Tel. 020 7388 1266

Journal of Visual Impairment and Blindness

www.afb.org.uk

This is an interdisciplinary journal for practitioners and researchers professionally concerned with blind and visually impaired persons. It provides a forum for wide ranging views and draws on many different disciplines in order to further work for visually impaired people. Published six times a year. Also available online.

The American Foundation for the Blind, 11 Penn Plaza, Suite 300, New York, NY 10001

New Beacon

A monthly magazine for people with a visual impairment and their families. It is also aimed at volunteers and professionals. It has news and views and articles on various subjects, including advances in technology.

Customer Services, RNIB, PO Box 173, Peterborough PE2 6WS Tel. 0845 702 3153

Special Children

This independent magazine focuses on pupils with special needs. It carries news, views and information with occasional special features on technology.

27 Fredrick St, Hockley, Birmingham B1 3HH Tel. 0121 212 0919

Visibility

Visibility is for parents and professionals working with pupils and young people who attend a local school or college.

RNIB Education Information Service, 224 Great Portland St, London W1N 6AA Tel. 020 7388 1266

Books, videos and other information

Access Technology: A guide to educational technology for visually impaired users

This RNIB book is a guide to educational technology resources for visually impaired users. It describes Access Technology hardware and software to support visually impaired pupils and pupils in mainstream schools and colleges.

Customer Services, RNIB, PO Box 173, Peterborough PE2 6WS Tel. 0845 702 3153

Leading the Way

This RNIB video complements the RNIB publication 'Access Technology'. It shows how ICT can benefit visually impaired pupils of all ages in a range of educational settings.

Customer Services, RNIB, PO Box 173, Peterborough PE2 6WS Tel. 0845 702 3153

A Vision Shared

This RNIB video identifies aspects of good practice and strategies for successful inclusion of visually impaired pupils in mainstream education.

Customer Services, RNIB, PO Box 173, Peterborough PE2 6WS Tel. 0845 702 3153

Web sites that work

This video from RNIB and the Web Accessibility Initiative (WAI) shows how people with disabilities use the Internet. It also explains the WAI, which promotes access to the Internet for all by encouraging Web site creators to think about accessibility issues whilst designing a site.

For a copy contact Julie Howell, RNIB, 224 Great Portland St, London, W1N 6AA Tel. 020 7391 2191

Models of mainstreaming for visually impaired pupils

HMSO, Dawkins, J ISBN 0-11-701556-3

This book looks at studies of local education authority services and blind and partially sighted pupils and examines the issues that need to be tackled by educators of visually impaired pupils.

Customer Services, RNIB, PO Box 173, Peterborough PE2 6WS Tel. 0845 702 3153

Supporting pupils with a visual impairment in mainstream schools

RNIB ISBN: 0 7496 1746 2

This book explains everything from medical causes to social and educational effects of visual impairment. It offers suggestions on how to teach and integrate the pupils into the class and discusses specialist equipment.

Customer Services, RNIB, PO Box 173, Peterborough PE2 6WS Tel. 0845 702 3153

Communication and access to computer technology

This book covers computer technology with reference to special needs and there is a chapter on Visual Impairment: computing equipment and access to computers.

Disability Information Trust, Mary Marlborough Centre, Nuffield Orthopaedic Centre, Headington, Oxford OX3 7LD Tel. 01865 227 592

Visual Impairment and IT

www.becta.org.uk/technology/info-sheets/sen.html

This information sheet explains how IT can help those with a visual impairment. It also lists books, journals, Internet resources and organizations where further information can be found.

Available from Enquiry Desk, Becta, Milburn Hill Rd, Science Park, Coventry CV4 7JJ

Tel. 024 7641 6994 Fax. 024 7641 1418

RNIB Technology Factsheets

www.rnib.org.uk/technology/factsheets/factsheets.htm

The RNIB Technology Information Service produces a range of factsheets that look at most areas of technology of interest to those with a visual impairment. There is information for example about producing Braille, screen magnification software, speech output software, note-takers, video magnifiers and reading aids.

RNIB Technology in Learning and Employment, c / o Exhall Grange School, Wheelwright Lane, Coventry CV4 7JJ Tel. 024 7636 9555

Appendix 4 - Some useful Web sites

Apple Disability Resources - www.qt-tv.net/education/k12/disability/

An Apple Mac site which explains the access software available for those with a Mac and highlights the support features which are built into a Mac to support those with a disability.

Center for Applied Special Technology (CAST) - www.cast.org

This organization supports the use of technology for those with disabilities to encourage access to learning for all. Their site includes information about teaching strategies, teaching tools, concepts, issues and initiatives.

Closing the Gap - www.closingthegap.com

This US organization provides support materials on the Internet, in newspaper format and via an annual conference for using technology for those with special needs. The library includes many articles including those on curriculum development and inclusion.

Hands and Eyes Newsletter - home.earthlink.net/~vharris/

This online newsletter includes ready to use art and learning activities for visually impaired pupils. These have been developed by a teacher for the visually impaired for use in an inclusive classroom.

Internet Resources for Special Children - www.irsc.org/blind.htm

The parent of a pupil with multiple disabilities developed this Web site. It is a resource with information and links to other Web sites of interest in the area of special needs.

Microsoft Enable - www.microsoft.com/enable

This site includes descriptions of accessibility features in Microsoft operating systems and applications. There is also a catalogue of accessibility aids designed for Windows.

The National Center to Improve Practice (NCIP) - www2.edc.org/NCIP

The National Center to Improve Practice (NCIP) in Special Education through Technology, Media and Materials holds information about educating a visually impaired child, and pupils with other special needs, in mainstream education.

National Grid for Learning - www.ngfl.gov.uk

This is a collection of resources brought together by the UK Government to help raise standards in education and support life-long learning. There is a section for special needs resources.

RNIB Accessing Technology Website - www.rnib.org.uk/technology/

This technology Web site contains information for blind and partially sighted people who are using or would like to use technology in employment, at study and for leisure. There is also information about the Technology Information Service and the Technology factsheets are available here.

RNIB Curriculum Clipboard - www.rnib.org.uk/curriculum/welcome.htm

This site offers information and advice to all professionals supporting a visually impaired pupil accessing the Curriculum. It also contains regularly updated news and information and VI qualified subject specialists are available to answer questions.

Sensory Information Service (V) - www.ssc.mhie.ac.uk/F4/V46.htm

SISV is an information service designed for the deaf and visually impaired community. There is a large technology section.

Special Education Exchange - www.spedex.com

This is a resource for educators, professionals, parents, consumers, pupils or anyone with an interest in special education.

Teaching Math to Visually Impaired Students - www.tsbvi.edu/math/

This site gives examples of how a teacher can teach maths to a visually impaired pupil. It gives comprehensive information and examples of how to teach various aspects of mathematics from graphs to quadratic equations.

Technology Guide to Assist Pupils with VI in meeting curriculum goals -

www.setbc.org/special/virg/

This US guide looks at a framework for addressing a range of technology options for meeting general learning expectations for the visually impaired pupil in a mainstream classroom. Outcomes in reading, writing and maths are concentrated on.

V I Guide - www.viguide.com

This site is a guide to Internet resources about visual impairments for parents and teachers. It has pointers to other Web sites concerned with Access Technology, services, organizations, research, education and leisure.

BLIND-L - <mailto:listserv@listserv.uark.edu>

BLIND-L is an email discussion group that discusses issues about visually impaired people using computer. Hints and tips on using Access Technology may be found here.

See listserv.uark.edu/archives/blind-l.html for information on how to subscribe.

[news:alt.comp.blind-users](mailto:alt.comp.blind-users)

This is an Internet newsgroup dedicated discussion of computer technologies for blind and visually impaired users. Consult your Internet provider for information on configuring newsgroup software.

Appendix 5 - Additional resource information

Please note that this is not an exhaustive list as it contains only some of the available software. It is important to discover the individual requirements of a pupil with a needs assessment before purchasing any software.

Speech output systems

Screen reader	Operating system	Supporting Braille	Supplier	Price (approx)
<i>Hal 95 / NT</i>	Windows 95/98/ME	YES	Dolphin Concept Systems	£345
	Windows NT/2000		AbilityNet	£520
<i>JAWS for Windows</i>	Windows 95/98/ME	YES	Sight and Sound Professional Vision Services	£585
	Windows NT/2000		RNIB	£950
<i>SuperNova</i>	Windows 95/98/ME	YES	Dolphin Concept Systems	£495
	Windows NT/2000		AbilityNet	£845
<i>outSPOKEN</i>	MacOS	NO	Don Johnston	£475
<i>WindowEyes</i>	Windows 95/98/ME 2000	YES	Alphavision	£410

Screen magnification systems

Magnification system	Operating system	Supplier	Price (approx)
<i>Lunar for Windows</i>	Windows 95/98/ME	Dolphin Concept Systems	£175
	Windows NT/2000	AbilityNet	£375
<i>MAGic</i>	Windows 95 / 98 Windows NT/2000	Sight and Sound	£260 £375
<i>Zoomtext Xtra</i>	Windows 95 / 98 Windows NT/2000	Sight and Sound Pulsedata RNIB	Level 1 £310 Level 2 £430
<i>inLarge</i>	MacOS	Don Johnston	£295

Cursor enhancement

Application	Operating system	Supplier	Price (approx)
<i>Biggy</i>	MacOS Windows 95	Don Johnston	£69
<i>ToggleMouse</i>	Windows 95 / 98 / NT	Toggle Software www.toggle.com	\$19.95 (free 30 day trial)
<i>Meta-Mouse</i>	Windows 95 / 98	Cyclex www.cylexinc.com/mmou.htm	\$21 (free 30 day trial)
<i>IntelliPoint</i>	Windows 95 / 98 / NT MacOS	Microsoft www.microsoft.com/products/hardware/mouse/driver/default.htm	free
<i>Lupe</i>	MacOS	ARTIS Software www.artissoftware.com	free

Overlay keyboards

Board	Size	Platforms	Supplier	Price (approx)
IntelliKeys	A4+	PC Macintosh	Inclusive Technology Ltd	£279
Concept Universal Plus	A4 A3	PC Macintosh Acorn	Semerc	£129
Concept Universal Plus Infra-red	A3 A4	PC Macintosh Acorn	Semerc	£159
Informatrix	A3	PC Acorn	Semerc	£149

Tactile image machines

Fuser	Supplier	Features	Price (approx)
Zy-Fuse	Zychem Ltd	Manual temperature adjustment A3-A4	£495
Tactile Image Enhancer	Queen Alexandra College Techno-Vision Systems	Manual temperature adjustment A4-A3	£695
Hotspot Fuser Junior	Visualeyes	Manual Temperature adjustment A4-A3	£350
Pictures in a Flash (PIAF)	Modern World Data	A4-A3	£650