

Unit 8

The development of switching skills to assist access to the curriculum for pupils with severe and complex needs

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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.

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Introduction

For many pupils with severe and complex needs, the use of a switch or switches offers the most versatile and effective means of accessing the curriculum.

For those pupils with severe physical impairments who cannot use a keyboard, mouse or voice, switches may offer a means of access, that will allow the pupil to exercise control independently. Pupils who find direct access too fatiguing or slow, or whose lack of accuracy results in many mistakes, may find that switches offer a more effective and efficient means of access to technology.

For highly distractible pupils and those with learning disabilities, switch use may offer a more appropriate means of access – a small number of items can be presented one at a time for selection with a switch; this can be simpler than making a choice from several items with a keyboard.

Once effective use of switches is established, a pupil can use these skills to access:

- environmental control systems – systems that enable a person to control their environment e.g. turn the television on, close the curtains, turn on the lights
- alternative and augmentative communication systems
- computer systems allowing access to curriculum software, the acquisition and development of literacy, and independent recording
- leisure opportunities
- mobility – electrical wheelchairs can be controlled through switches

In this Unit, the scenarios represent progressive stages in the development of switching skills. Each scenario contains several examples of pupils using switches at that particular stage of switch use.

Expected outcomes

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

- developed a greater understanding of why some pupils may need to use switches
- acquired a greater understanding of the development of switching skills for an individual pupil
- learned how to use switches with a range of equipment including battery-powered devices, electrical appliances, simple communication devices and computer
- explored the ways in which pupils can use switches to effect change on the environment (cause and effect)
- explored the use of switches and appropriate software to create participant resources to support communication, literacy and recording
- gained an understanding of the importance of working as part of a team to ensure the development of effective switching skills
- developed skills in recording accurately how individual pupils are using technology and the importance of sharing this information with other professionals

Key skills covered in this Unit

The identification of an appropriate switch and switch position for a pupil

To implement a process to facilitate the identification of an appropriate switch, position of switch and switch mounting for a pupil, and to ensure the pupil and resources are positioned appropriately for effective use.

See Scenario 1, Examples 1a, 1b, and 1c

The use of switches with battery-powered devices

Be able to adapt a battery-powered device to use with a switch. Use battery-powered devices with a timing unit (e.g. switch latch timer) to allow a pupil to participate in meaningful activities.

See Scenario 2, Example 2a
Scenario 3, Example 3a

The use of switches with mains-powered devices

Use a switch with a mains control unit to allow a pupil to participate in a meaningful activity.

See Scenario 2, Examples 2a and 2b
Scenario 3, Example 3b

Connecting switches to a computer

Plug switches into your computer. Understand that an interface always has to be used to connect switches to a computer and that it is often necessary to select the correct settings within the switch software to make the switches work correctly.

See Scenario 2, Example 2a
Scenario 3, Example 3d

The use of light-tech communication devices with switches for early learning activities

Use a light-tech communication device to give a pupil cause-and-effect, turn-taking and timing opportunities.

See Scenario 3, Example 3c
Scenario 5, Example 5b

The use of content-rich software activities for use at the spectator and participant stages

Use content-rich software to develop switching skills from cause-and-effect through build skills, timing skills to simple scanning.

See Scenario 2, Example 2a
Scenario 4, Example 4a
Scenario 5, Example 5a

The use of framework software to create appropriate activities for use at the spectator and early participant stages

Use framework software to create appropriate resources for an individual working at the cause-and-effect and build stages.

See Scenario 3, Example 3d

The use of framework software to develop resources to assist with the development of scanning skills

Use grid-making framework software to create grids with appropriate and motivating resources for a pupil using switches to develop the pupil's scanning skills.

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

The use of framework software for the development of resources across the curriculum

Use grid-making framework software to create appropriate grids for a pupil using switches to access literacy, communication and curriculum activities.

See Scenario 6, Example 6b
Scenario 7, Examples 7a, 7b, 7c, 7d, and 7e

Using switches

What is a switch?

A switch is a device for making an electrical connection between two contacts.

Most of us use switches every day without thinking about it; for example when turning on a light, radio etc.

A simple way to understand how switches work with a computer is to consider switch software as being written to recognize a keyboard keystroke or mouse button press as a switch and so the aim of the switch interface is to enable switches to copy these. So, when a switch is used with a computer it is replacing a keyboard keystroke or mouse click.

How do switches work as an access method?

A switch can be used with pupils with severe and complex difficulties at different development levels. For example, it can be used to control a toy, light or simple computer program at a cause-and-effect level, where the pupil needs to press the switch (cause) to have a consequence or resulting action (effect). At a more advanced level pupils can use scanning to make choices. Scanning is a technique used with switches, in which a computer program highlights choices available for selection one at a time, allowing the pupil to make a selection by activating a switch when the item they would like to choose is highlighted. Scanning can be used by a switch user to make simple choices, e.g. from a choice of two items, to more complex forms of scanning which can allow a pupil to exercise complete control over the computer, i.e. the operating system and the programs.

Different types of switches available

There are now a wide range of switches available that vary considerably in design, function, reliability and functionality. Switches can be divided into two categories: contact switches and non-contact switches.

Contact switches

These switches require the pupil to make physical contact with the switch, using the part of their body which they can control most accurately, e.g. head, foot or hand. These switches are the most common and will meet most needs if firmly fixed in a position appropriate to the individual.

Switches can be seen to have a number of characteristics, that allow you to make judgements about their effectiveness for particular individuals, including:

Size – the target area a pupil has to hit to activate the switch

Travel – how far (if at all) does the switch move before it makes an activation

Pressure – the pressure required to operate the switch

Feedback – kinaesthetic (i.e. does the movement comes to an end when activated), auditory (an audible click can be heard), visual (colour and its contrast to the background it is going to be placed on) and tactile (does it have a recognizable tactile feel that is different to its background e.g. tray)

Mounting options – some switches come with fixing holes making mounting easier

Robustness – some pupils hit switches quite hard and so it is sometimes necessary to make sure that they are robust and able to withstand rough treatment

All these factors will affect how well a pupil uses a particular contact switch.

Examples: AbleNet Jellybean switch; Tash Buddy Button switch; AbleNet BigRed switch; AbleNet Specs switch; QED lever switches; QED Pal Pads; QED Platform switches; Tash Micro light switch.



a range of different contact switches

Non-contact switches

Movement triggers these switches e.g. blink of the eye, tilt of the head, the making of a sound or the air movement caused by blowing or sucking. These switches are technically more difficult to set up and tend to require a higher level of understanding to operate than contact switches.

Examples: QED Suck-Puff switch; QED Mercury Tilt switch; Toby Churchill Eye-Blink switch; QED Sound Operated switch



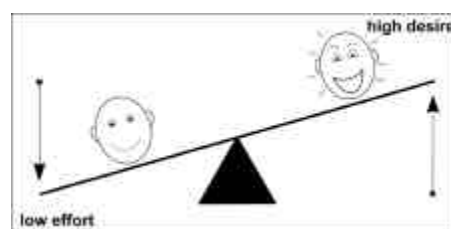
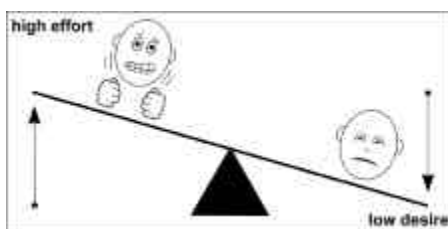
a range of different non-contact switches

Scenario 1 - Choosing switches and switch position

First principles

Although there are a wide range of switches available on the market, experience shows that simple contact switches such as the Jelly Bean switch, BigRed switch and Buddy Button switch, will provide effective access for the majority of pupils with severe and complex needs. The important factor in ensuring that these switches are effective is to have them firmly fixed in the most appropriate position for an individual pupil. However there are individual pupils who will require a specialized switch to be able to gain effective control of it to allow development of their switching skills. A prerequisite to identifying an appropriate switch and switch position is to ensure that the pupil is positioned in a stable and functional position.

To establish the most appropriate choice of switch, its position and its mounting for a pupil, the professionals working with the pupil should have a good understanding of the equipment, how it is operated via a switch, the physical motor abilities of the pupil and how the technology can enable access to the pupil's curriculum. This is best addressed by the combined expertise and knowledge of the pupil's multidisciplinary team, e.g. teacher, occupational therapist, physiotherapist, speech and language therapist, parent and learning support assistant. There may need to be compromise between professionals to ensure the pupil is using the most successful method for them. When the best switch position has been established, the pupil is more likely to be motivated to develop their switching skills.



As the abilities of pupils with severe and complex needs may well change over time, it is important that the establishment of a switch position is not a one-off activity but is a continuous process of trial, monitoring, evaluating and modifying.

In most cases it is desirable to identify one switch position for a pupil with severe and complex needs which will be used to access a range of activities throughout the day. This allows the pupil to establish an effective motor pattern to operate the switch, that in time will ensure that the action of pressing the switch takes as little effort as possible and be as quick as possible, thus allowing the pupil to concentrate on the activity being controlled rather than the process of pressing the switch. However there are exceptions when a switch position may need to be varied; for example when the pupil's tone changes from day to day or from hour to hour. In this situation there may be a position that is the most effective in the mornings but another that is more effective in the afternoons.

Positioning of the pupil

Effective seating and positioning often play a critical role in determining the success of switch use. Any seating or positioning equipment used should allow the pupil to concentrate on the activity under switch control and the movements required to make a switch activation, rather than on maintaining position and balance. The optimum position for switch use is achieved when the pupil can produce the movements required to activate the switch easily and with the least effort possible. The degree of support required to maintain a position is dependent on the pupil's physical abilities; the involvement of the Occupational Therapist and / or Physiotherapist is essential in identification of appropriate seating and positioning equipment.



good seating and positioning is essential

Example 1a

People working with Steven thought that his switch access was not particularly effective. During a review it was felt that Steven's seating might be contributing to or causing this difficulty. The team agreed that a period of monitoring, during which Steven's seating position should be varied, would be useful. Steven's team realized that the chair was reclined at an angle throughout the day, despite the fact that in this position Steven's functional control was limited. Putting the chair in a more upright position resulted in greater functional movement and consequently more effective switching. The team agreed to monitor this over time and review again in the future to enable them to reach a firm conclusion regarding the most effective seating position for Steven.

Key skills and equipment

The key skill is:

- the identification of an appropriate switch and switch position for a pupil

The key equipment is:

- team involvement
- supportive seating system

Positioning of resources

Ideally, equipment (e.g. monitor, toy, switch-operated device) should be directly in front of the pupil (except for pupils with visual field deficits) and at an appropriate height. It is recommended that equipment be placed on height-adjustable tables or trolleys to achieve this, particularly if the pupil is using several different seating and positioning systems.

Example 1b

Sue works in a number of different positions throughout the day. In the morning she often uses a standing frame, while in the afternoon she uses her supportive seating system. However, she needs to have access to her computer system at all times. This has been resolved through the use of a height-adjustable trolley.

Key skills and equipment

The key skill is:

- the identification of an appropriate switch and switch position for a pupil

The key equipment is:

- height-adjustable trolley



a height-adjustable trolley

Identifying a switch and switch position

We want a switch that the pupil can operate quickly, when they want to, consistently and reliably, and that is the least tiring for them. The switch must allow the pupil to both activate it and release it with ease. The location of a rest position is as important as the location of the switch position. It might be helpful to get advice from your local Occupational Therapist or Physiotherapist, or both, on where best to position the switch. It is also important that the pupil is given the opportunity to express their opinion on the location of the switch, as experience shows that pupils, from an early age, often know the best movement to use.

- First you need to identify which parts of the body offer the best possibilities for reliable control. Identify which voluntary movement with that part of the body the pupil finds the easiest to control.
- Establish the area they can reliably target with this movement. This will determine the size of switch they need to use.
- Establish the strength of the movement, which will influence which switch you use. Have they got enough pressure to activate the switch they are using?
- Establish the best position of the switch in relation to the pupils' body. The switch needs to be placed in the pupil's range of movement for the voluntary movement identified, so it is easy and quick for the pupil to activate the switch.

Fixing the switch into place

Once the best position is decided on, the switch should be firmly fixed, so that the pupil can be confident it will be where they expect it to be. There are several ways in which a switch can be firmly fixed into a position:

- Use **Velcro**. A Maxess board or a board covered in Velgrip material can provide a good surface onto which switches with hook Velcro on can be firmly fixed. If you make your own boards covered with **Velgrip** material they can be made to fit snugly into a pupils tray so that the board will remain in position.
- If angling a switch will ease access, the use of **switch mounts** will be beneficial. These fix to a Velgrip board and allow switches to be fixed to them with Velcro. In most situations, if the pupil is using their hand to activate the switch, angling the switch will make access easier; they can use one motor pattern movement to activate the switch and they will come off it with the aid of gravity. If the switch is flat they will be required to make one movement onto the switch and a second movement to move off.



mounting a switch with a board and wedge

- If a switch needs to be mounted by a particular part of the body e.g. head, foot or knee, then a more sophisticated mounting system will be required. There are several **mounting systems** that are excellent to mount switches in various positions. They can attach to a table edge or the pupil's chair or wheelchair. For some pupils, once the switch position is well established, a neater mounting system may be required; modular systems are available to achieve this.



switch attached to a mounting system

Example 1c

In Mr B's class, different pupils use different switches to access the computer. Through a process of assessing, implementing, monitoring and reviewing, the team working with the pupils in the class has found that:

Rita's most effective switch access method is through the use of a single large-contact switch mounted with a flexible arm mounting system. A single switch is used because it was found that Rita has only one very reliable and easy-to-produce movement. This switch is used because Rita needs a large target area and good feedback to confirm to her that an activation has been made. The mounting system is used because Rita's most reliable and easiest movement for switching makes it difficult to mount a switch in any other way. It has also been noted that during the day Rita's switching movement can change. The use of the mounting system allows for this.

Bob uses two medium-contact switches mounted on angled wedges. This is because he has more than one reliable and easy-to-produce switch movement; when given the opportunity to use either a single switch with an automatic scan, or two switches with one switch to direct the scan and the second switch to make a choice (directed scan), it was found that Bob preferred the two-switch method – this gave him greater control.

Key skills and equipment

The key skill is:

- the identification of an appropriate switch and switch position for a pupil

The key equipment is:

- flexible arm mounting system
- large contact switch
- angled wedges with velcro
- Velgrip board
- two medium-contact switches

Connecting switches

You may, at different times, and for different pupils, need to connect switches to battery devices, mains-powered devices or a computer. See Connecting switches on page 32 for more information about how physically to connect switch(es) to various devices.

Most switches now use a 3.5-mm plug and switch interfaces have 3.5-mm sockets. However you may have old switches in the school that have quarter-inch plugs; these can still be utilized with interfaces with 3.5-mm sockets by using a step-down adaptor. Similarly using a step-up adaptor you can use interfaces with a quarter-inch socket and switches with a 3.5-mm plug.



step-up and step-down adaptors for connecting switches

Scenario 2 – Developing switching skills

A pupil can be seen to move through the following stages: -

- **spectator**
- **participant**
- **creator**

For some pupils switch use will provide their most effective means of control (e.g. for recording, communication or mobility). To allow pupils to move through the stages of switch development they will need frequent opportunities to develop switch use. These opportunities should be incorporated into the routine of the school day. We need to think of switching as becoming that pupil's method of recording, so they should be given as much opportunity to develop their skills with a switch as other pupils would have to develop their pencil skills.

To give pupils opportunities to develop switching skills we need to be able to provide appropriate activities for the stage of switching they are presently at. At each stage we need to be clear about the cognitive and physical demands involved. If a pupil is given an activity that is both cognitively and physically challenging they may fail, but we will not be able to determine easily why they have failed. When introducing switching it is suggested that the activity controlled by the switch be as motivating as possible while as cognitively easy as possible. This will allow a judgement to be made about the potential of switch use for a pupil and for the pupil to devote their energy to the physical challenge of activating the switch. In this way we can be sure they understand the concepts of switching and can easily manage the physical skills required. This strategy may be needed at each stage of switching skill development.

Developing switching skills with many pupils is not a quick process and the time to move from one stage to the next can be considerable. For pupils taking time to consolidate their skills it will be important to provide a wide range of switch activities in order to maintain their interest and motivation. It will also be necessary to monitor pupils' progress carefully and to be ready to introduce more challenging activities as soon as they are ready, since staying at one stage for too long can result in boredom and an unwillingness to cooperate.

Prompting

Prompting is very important in the process of developing switching skills. The right kind of prompts, delivered at the right time, can have a very beneficial effect on the acquisition of switching skill, can increase the opportunities for switching and maintain a pupil's interest. On the other hand the wrong kind of prompts, delivered at the wrong time, can have a negative effect.

Physical prompting

Initially a pupil may need physical prompting to press the switch; this may start off with hand over hand but should be slowly reduced to, for example, a nudge of the elbow. As with any activity the physical prompting should be reduced over time so that eventually the pupil follows the activity without any physical prompting

Verbal prompting

When a pupil is learning to use a switch to achieve an effect it is important that the language used with them is consistent and appropriate. Do we say "press the switch", "hit the switch", "hit the button" or "turn on the music"? We all tend to use a combination of these verbal prompts. This can be very confusing, especially if the pupil works with several different people.

The best approach is likely to be to decide on a style of prompt to be used and stick to it; ensure that all those working with the pupil know what approach has been decided on to ensure consistency. As a general principle it will be more productive to focus the pupil's attention onto the activity being controlled rather than on the switch itself; so that prompts such as "play the music" and "make the car go" are used rather than "press the switch" and "hit the button". This can have the effect of consolidating pupils' understanding that the switch is a means to an end rather than an end in itself and can assist with establishing an understanding that the same switch can be used to gain control over a range of activities.

In addition to considering the type of verbal prompting used, it is also necessary to monitor the amount of prompting given. This is especially necessary in the early stages of switching skill acquisition, since it is necessary to determine if the pupil is demonstrating a real understanding of the effect of a switch activation or is responding to the verbal prompts provided instead.

Verbal prompting should be reduced as quickly as is appropriate so that the pupil is as independent in switching as possible. As the pupil moves through progressively more complex stages of switching the need for verbal prompting will vary. As a pupil becomes competent and confident at one stage the need for prompting will diminish and should be faded, but as the next stage is entered the need for verbal prompts is likely to increase. It can be difficult to get this balance right, but regular monitoring and team meetings can help.

Example 2a

In a review of Milly's switching skill development it became apparent that those working with her used a range of verbal prompting strategies. The team decided that as she was using a switch to activate a range of cause-and-effect activities and to consolidate her understanding of such, it would be appropriate to focus her attention onto the activity rather than onto the switch. The team members decided that they needed to standardize the prompts they used. To help them achieve consistency in the early stages of this new approach they even decided on the form of words they would use, e.g. "make the pig dance" (with the switch connected to a vibrating pig), "get the next picture" (with the switch connected to a computer with cause-and-effect software) and "play some more music" (with the switch connected to a tape recorder). At the next review the team felt that this approach had been successful, in that Milly's understanding of the purpose of the switch had developed and that the adoption of a standard approach had made it easier for them to determine what their role should be when working with Milly.

Key skills and equipment

The key skills for the above example are:

- the use of switches with mains-powered devices
- the use of switches with battery-powered devices
- the use of content-rich software activities for use at the spectator and participant stages

The key equipment is:

- contact switch
- switch latch / timer unit
- mains switching unit
- battery and mains-powered devices (e.g. tape recorder)
- computer with switch interface
- cause-and-effect software

Spectator

What this involves

The pupil is not exerting any active control over her environment but is showing interest by watching and listening. The use of technology may enhance sensory awareness, providing visual, auditory or tactile stimulation in an exciting and motivating curricular context. This can take place individually or in a group situation.

This stage can be useful in establishing a pupil's interest in a switch-driven activity and can be useful in directing a pupil's attention to the activity before placing the switch in such a place so as to facilitate its operation by the pupil.

It is important to move forward from this stage as quickly as possible and to get the pupil participating actively; otherwise motivation and interest will wane.

Example 2b

In a science session Mrs O'B. works with a small group of pupils to enhance their sensory awareness through the use of a mains switching unit. Connected to the switching unit she has a fan, a light and a bubble tube. When she activates the switch connected to the mains switching unit the three mains devices are turned on. By physically prompting pupils to activate the switch, Mrs O'B. is bridging the gap between the spectator stage and the participant stage.

Key skills and equipment

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

- the use of switches with mains-powered devices

The key equipment is:

- mains switching unit
- mains-powered devices

Participant

What this involves

This stage is made up of a number of component stages:

Cause and effect

At this stage the pupil begins to interact with his or her environment. It involves the development of understanding that an action can cause a response (**cause and effect**).

Build

The pupil learns to repeat presses; each switch press makes an advance towards a final auditory or visual reward e.g. when several switch activations are needed to complete a picture using 'Build' software.

Turn-taking

The pupil learns that there is a time to make a switch activation and a time not to make a switch activation and that a switch can be used to participate in an activity with others.

Timing

The pupil needs to respond to an action by activating the switch within a particular time frame. This is a prerequisite skill for one-switch scanning (as opposed to two-switch scanning or turn-taking) and is needed to be able to make selections from the screen. This stage involves a large cognitive step from the cause-and-effect and build stages.

Scenario 3 – Cause and effect

A pupil develops an understanding of cause and effect via a switch, i.e. when the switch is activated there is an understanding that it will cause something to happen.

We need to be sure that individuals have a true understanding of cause and effect, and that this is consolidated. Often it is felt that a pupil has understanding of cause and effect, but on closer scrutiny it is found that instead the pupil is enjoying the reward provided by the switch alone and that the effect of the switch activation e.g. movement of a toy, is merely a diversion to which the pupil's attention is drawn briefly, before returning to the reward provided by the switch itself.

A pupil demonstrating a clear understanding of cause and effect will activate the switch and then look and / or listen for the reward and show pleasure from that reward. When the reward has finished, providing it is sufficiently rewarding, the pupil will be motivated to activate the switch again for the reward to be repeated. In this way the individual demonstrates anticipation that something is going to happen and intent in ensuring that they receive the reward.

The development of understanding of cause and effect can be encouraged through a wide variety of curriculum activities by using the following:

- switch-adapted battery-powered devices with or without a timer unit
- a mains switching unit, enabling the use of electrical appliances, e.g. tape recorder, food blender, hairdryer, sensory stimulation resources such as the bubble tube
- light-tech communication devices, e.g. BIGmack, One Step Communicator, DecAid
- computer with cause-and-effect software

Using a switch with battery-powered devices

Introduction

The use of a switch and switch adaptors gives pupils with physical disabilities the opportunity to have control of a variety of battery-powered devices, e.g. toys or a tape recorder, and to interact with curriculum activities. This will encourage them to become active rather than passive participants in learning. Using a switch in this way can encourage the pupil to:

- understand that their actions can control their environment, i.e. cause and effect
- increase interaction with other people
- make choices
- develop switching skills, which could lead to more advanced switching and its use with other equipment



operating a toy by means of a switch

Choosing a battery-powered device

The following points need to be considered when purchasing suitable battery-powered devices to adapt for switch use:

- Battery-powered toys need to have a simple on / off switch.
- If the toy runs on a track, the battery compartment and on / off switch must be attached to the track rather than to the moving toy.
- Bump-and-go toys are useful as they can be contained within a lipped tray and so remain within the pupil's field of vision, or within a hoop on the floor.

- Remote control toys with a simple on / off motion are useful, as the toy is free of any wires.
- Some make-believe toys (e.g. food mixer) are battery-powered and can be used to perform real functions, e.g. mix pancake mixture.
- Any real battery-powered devices with an on / off switch can be adapted, e.g. tape recorder.
- If you see a toy you like, buy it right away – it will probably be gone when you return!

See Connecting switches on page 32 for information on how to adapt battery-powered devices for switch use.

If a switch-adapted battery-powered device is used directly with a switch, the pupil needs to hold the switch down to keep the device working. Since many of the pupils using switches are doing so because of the physical control difficulties they have, such a skill is very difficult for them to acquire and it is not useful in relation to the future development of switching skills. In later development of switching skills we need a pupil to press a switch and release rather than holding down a switch. Thus, when using battery-powered devices a timing unit should be used e.g. a switch latch / timer unit. This connects between the battery-powered device and the switch. Most units have two operating modes:

- **timer mode** – the device can be turned on with one switch press and will stay on for a preset period, even if the switch is held down.
- **latched mode** – one press of the switch turns the device on – it will stay on until the switch is pressed again to turn the device off.



a toy control box that allows timer and latched modes - press the switch and teddy blows bubbles!

When the pupil is learning the concept of cause and effect the latch / timer unit should be used in the timed mode. This encourages the pupil to press the switch again to achieve more of the reward.

Activities

If a battery-powered device, such as a toy, is used and the pupil is only expected to turn it on and watch it, they will soon become bored. It is important to make the device part of a fun activity; for example:

- moving the car across the table to knock over a tower of blocks
- operating a tape recorder for a game of musical statues with their peers
- operating a tape recorder to listen to a story
- controlling the action of a 'Twirl-o-Paint' to assist in making decorative cards
- using a battery-powered mixer to make a milkshake
- directing a bubble blower at someone and blasting them

Example 3a

Jane and Freddy both enjoy playing with remote-controlled cars. As a joint activity, their teacher sets up a racetrack on the table top between them. Jane and Freddy then enjoy racing their bump-and-go cars around the track. They each have their cars attached to a switch latch / timer unit set to timed mode. On each switch press the car will run for 30 seconds. They each have to press the switch repeatedly in order to continue to operate the cars.



racing and crashing the cars through switches

Key skills and equipment

The key skill is:

- the use of switches with battery-powered devices

The key equipment is:

- switch latch / timer units
- appropriate switches and mountings
- battery adaptors
- remote-controlled cars

Using a switch with mains-powered electrical devices

For a pupil with physical disabilities, being able to use a switch to control electrical appliances may give them access to more meaningful activities whilst encouraging their participation in everyday activities. The success in using electrical appliances depends on them being used within a context, e.g. being able to turn the light on when entering a room. The use of electrical appliances could vary from developing an awareness of their environment to the user having control over everyday activities. The aim in the first instance is for the reward to be sufficiently motivating to encourage the pupil to repeat the switch press. Then moving on to operate the device at the right time can be developed.



controlling the fan

To use electrical appliances with a switch a mains control unit is required. A range of units are available; the common units are listed in Appendix 4. See Connecting Switches on page 32 for information on how to use switches with a mains control unit.

Activity ideas

- participating in cookery sessions by operating a food mixer
- operating a hairdryer to dry their hair after swimming / hydro pool
- making drinks for peers using a juicer (a trip to the shops to choose the fruit can be part of the activity)
- operate a foot spa to give them, or their peers, a soothing foot massage
- a fan and light both plugged into the control unit via a double plug adaptor, to create a 'mini' sensory room experience – having streamers which shine in the light and blow in the air from the fan, can increase the experience

Electrical appliances that can be used with these units include:

Foot spa	Christmas lights	Portable lamp	Disco lights
Toaster	Portable electric fan	Tape recorder	Hairdryer
Kettle	Juicer / Ice-cream machine	Microwave oven	Popcorn Maker

Note: *Be sure to check that the power rating (wattage) of the mains control unit is greater than the sum of the power ratings of all the appliances connected at one time, to ensure safety.*

Example 3b

Alex's class makes milkshakes to sell in the school tuck shop each week. Alex has been practising his switching skills in a number of different ways throughout the school day, but this is by far his favourite activity. By using his switch in this way, Alex has the opportunity to repeatedly use the switch, but for someone else's milkshake each time. This keeps Alex's motivation up to a maximum level, and engages him in a class activity. The other pupils **need** him to be involved!

Key skills and equipment

The key skill for the above example is:

- the use of switches with mains-powered devices

The key equipment is:

- mains control unit
- appropriate switch
- appropriate mounting system
- blender

Using a switch with light-tech communication devices

Successful communication enables pupils to have control. However, in order to achieve this, the pupil must have both a method of communication and an environment that is conducive to the activity. The communication aid cannot only assist in enabling a pupil to communicate a message but can also provide the motivation to do so.

Communication devices that can be used with a switch to deliver a single message include the BIGmack, One Step Communicator, Talking Buddy, and Adaptation Chipper. All these devices have a built-in switch but an external switch can be connected if required. For example a pupil who activates a switch mounted by his head can have their switch connected to the device to ensure easy and reliable access.

To encourage a pupil to develop an awareness of the environment, the communication device can be a particularly effective resource.



switch connected to a One Step communicator

The following messages offer the pupil the opportunity to control others – a very motivating activity! This can then be extended to encourage the pupil to make choices by selecting to whom the instruction should be directed, e.g. by eye-pointing to someone.

“Tickle me” – “Blow a raspberry” – “Pull a funny face” – “Jump up and down”

This can be incorporated into a group activity whereby pupils are controlling their peers. It can also be used to introduce switches to pupils in order to enable environmental control. The motivation to control another person is far greater than any distraction a switch may cause, encouraging them to become aware of the potential of a switch as a method of communication.

Other activities encouraging understanding of cause and effect using the communication aid include attaching it, via the cable connection, to a battery-powered toy, e.g. car, doll or animal, and inserting a message such as:

“Neenahneenah” – “I’m going to walk off the table” – “ROARRR” – “Knock the bricks down”

Alternatively, it can be connected through a mains control unit to a fan, foot spa or food mixer, and incorporating messages such as:

“I’m hot – cool me down” – “Wash my feet” – **“Feed me!”**

Example 3c

Pete was moving from the spectator to participant stage of switch use. His family noted that he was more motivated controlling people than he was controlling items. The team working with Pete had established a position by his knee to fix switches. Various messages to control the actions of others were put into a single message light-tech communication device. This gave Pete the opportunity to develop his concept of cause and effect.

Key skills and equipment

The key skill is:

- the use of simple light-tech communication devices with switches for early learning activities

The key equipment is:

- single message light-tech communication device (e.g. BIGmack)
- mounting system, medium contact switch

Making things happen on the computer

By connecting a single switch to the computer and using suitable software, pupils can develop their cause-and-effect skills with a variety of motivating images. There is a range of cause-and-effect software available that has set content and can be matched to the pupils’ interests and curriculum areas. Alternatively there is ‘framework’ software that allows you to use your own images and sounds to create specific cause-and-effect activities for a curriculum area or to match a pupil’s individual interests.

Appropriate content-rich and framework software for cause and effect is listed in Appendix 1. To connect switches to the computer an interface box is required. See Connecting switches on page 32 for more information.



making things happen on the computer

Example 3d

Andrew has been using single-switch cause-and-effect software activities on the computer for a number of years. He is now in his early teens and his team is concerned that he is bored with these. However, Andrew still needs activities at this level. The use of framework software programs allows the team to develop activities, which are of an appropriate interest level for him.

Andrew uses a contact switch placed on an angled wedge on his tray. The switch is attached to the computer using a SwitchBoard.



put the pot in a warm place and wait

a cause-and-effect activity made with SwitchIt! Maker

Key skills and equipment

The key skills for the above example are:

- connecting switches to a computer
- the use of framework software to create appropriate activities for use at the spectator and early participant stages

The key equipment is:

- appropriate switch and switch mounting
- switch interface
- framework switch software, e.g. *SwitchIt! Maker*

Scenario 4 - Build

Once a pupil has a good understanding that pressing their switch will cause a response, 'build' activities should be used that require several switch presses to elicit or repeat a reward. Activities like this are more likely to be found using the computer. There is a wide range of software designed to encourage this skill, listed in Appendix 1. The programs offer a 'motivator' with each switch press resulting in a final animated reward with sound or speech.

Example 4a

Bob loves diggers. Bob's team decided that the software *SwitchIt! Diggers* was perfect to motivate Bob to wait a little longer for his reward. Initially, the software was set up so that Bob had to press three times to build the picture of the digger. As Bob's attention skills grew, the team decided that the number of steps required could be increased.



Bob loves building up the vehicles in SwitchIt! Diggers

Key skills and equipment

The key skill for the above example is:

- the use of content-rich software activities for use at the spectator and participant stages

The key equipment is:

- *SwitchIt! Diggers*
- appropriate switch and switch mounting
- switch interface

Scenario 5 - Turn-taking

Turn-taking involves the alternation of at least two switch presses. It is a useful strategy to encourage pupils to work together, or to develop shared attention. Alternatively, it can be used to familiarize a pupil with a second switch position. Some pupils derive a reward through the physical activation of the switch only and thus develop a habit of continuously hitting the switch which can prevent their understanding of 'cause and effect'. Setting software for use in a turn-taking mode can also help to reduce this behaviour. This will mean that the switch user will have to wait for a second person to press their switch before a reward is given. This skill can be encouraged to develop with the use of a range of software programs, listed in Appendix 1, and through the use of light-tech communication devices.

Example 5a

Greg and Annie both enjoy using simple build activities on the computer. Through practise, they both now understand that each switch press builds up to a complete picture and a reward. To further develop their interaction skills alongside their switching skills, Greg and Annie's team decided to set their favourite program onto the turn-taking mode. This has helped to develop their social interaction skills, as well as developing their attention and listening skills.



taking turns to build a picture

Key skills and equipment

The key skill for the above example is:

- the use of content-rich software activities for use at the spectator and participant stages

The key equipment is:

- appropriate switch and switch mounting
- switch interface
- software with turn-taking setting

Example 5b

Jane and Duncan enjoy their PE lessons in the hall. During the introductory activity, the class members pass a ball between them claiming a turn each. The pupils use a light-tech communication device with "my turn" recorded onto it to claim a turn in this game.

Key skills and equipment

The key skill for the above example is:

- the use of light-tech communication devices with switches for early learning activities

The key equipment is:

- appropriate switch and mounting
- single-message light-tech communication aid

Scenario 6 - Timing

Once a pupil has gained a good understanding of cause and effect, and build, with a switch, activities involving timing can be introduced in order to establish whether they have the motor coordination skills to control a single-switch scan. This stage involves perceptual and cognitive concepts that might be new to the switch user; so time will need to be spent developing this skill. Timing is the ability to press your switch within a predetermined time-frame in response to a prompt being given. For some pupils, it may take a long time to establish and develop the physical skills required to achieve 'timing' with a switch. For these pupils curriculum activities should continue through the use of two switches with both switches being worked by the pupil or the second switch by an assistant.

It may become obvious that the pupil will not cope with a single-switch scan because of their physical coordination difficulties. For instance, if the delay between recognition of the need to press the switch and the switch-pressing action is significant, because of the effort required, it is likely that the pupil will lose interest in the activity. Also, if the pupil is experiencing a limited success rate despite delaying the scan speed, frustration, and consequently loss of motivation, may result. In these cases activities involving the use of two switches should be encouraged. The second switch may be worked by the pupil, if they have a suitable second movement, or by an assistant, teacher or peer.

Software suitable for developing this skill is listed in Appendix 1.

Example 6a

Joe is working towards the use of a high-tech communication device. Due to his physical abilities, he will need to access this through switches.

He currently has a varied profile of skills in relation to switching and communication. His team therefore meet regularly to plan the next step. Joe's low-tech communication book is developing quickly. He is now able to find vocabulary placed within categories. His low-tech book is accessed by his communication partner pointing to messages within his book and Joe indicating through vocalization when the message he wanted is reached.

Joe had been practising his switching skills separately to his communication system; mainly through using computer programmes and switching mains-powered and battery-powered devices, including single-message light-tech communication devices. His team felt he could now do this reliably, if given time to make the movement.

Joe's team now had to make the decision as to whether he would be most efficient accessing a high-tech communication device using one or two switches. Following a team assessment, it was established that a reliable position for a second switch could not be found. The team therefore decided that Joe needed to develop timing skills in order to use his high-tech communication device through single-switch scanning in the future.

Joe's low-tech communication system therefore continued to develop with his needs, and Joe practised his timing skills using various software programs.

Joe also enjoyed listening to stories, and so practised his timing skills filling in repetitive phrases in his favourite books using a single message light-tech communication device.

Key skills and equipment

The key skill for the above example is:

- the use of light-tech communication devices to encourage the development of timing skills with a switch
- the use of content-rich software to develop timing skills and introduce simple single-switch scanning
- the use of framework software to develop resources to assist with the development of scanning skills

The key equipment is:

- light-tech communication device e.g. BIGmack
- reading books with a repetitive phrase
- content-rich software e.g. *Spot on Games*, *SwitchIt! Opposites*
- framework software e.g. *Chooselt! Maker*
- grid-making software such as *Clicker*
- appropriate switches, mounting and switch interface

Creator

What this involves

The pupil develops the ability to discriminate, to purposefully make choices and create options; so moving from being a participant to a creator [making selections]. The pupil begins to use the computer as a tool to express his / her imagination and creativity, and to complete work across the curriculum. The pupil will need to be able to cope with scanning with either one or two switches.

Choosing

A prerequisite skill for using a switch to make choices is the ability to cope with some form of scanning. Scanning involves making each of the choices available for selection in turn. This is done either by highlighting each available choice in turn automatically, for selection by a switch activation when the desired choice is highlighted (single-switch scanning), or under the control of the pupil with one switch to move the highlight and another switch to make the choice (two-switch scanning).

For scanning a pupil needs:

- the ability to press and look / listen
- the ability to either:
 - use two switches
 - or
 - activate a single switch within a given time frame
- the ability to recognize pictures / symbols / auditory prompts
- to enjoy the activity and to be motivated by the outcome
- the ability to understand that when an area is highlighted it can be selected by a switch activation to produce an outcome

Scanning methods

Single-switch scanning: the pupil is required to press their switch to stop the scan when the target item is highlighted. The speed of the scan can be altered to suit individual needs. To be successful with automatic scanning, the pupil requires good timing skills, being able to coordinate their switch press with the scan. This may be difficult for some pupils who, despite understanding the scanning concepts, cannot organize and carry out appropriate motor movements sufficiently quickly.

Two-switch scanning: with this type of scan the pupil takes control of the scan using one switch to step the scan through the available choices and the second switch to activate the target item. This method does not require the coordinated motor control necessary for timing, but the pupil does need the ability to discriminate between the two functions and have two reliable voluntary movements to operate two switches. Also, this can place increased physical demands on the pupil.

Example 6b

Clare and Lisa both use on-screen grids containing words and symbols to help develop their literacy skills. Both Lisa and Clare are switch users; Lisa uses a single switch but Clare uses two switches. Their teacher uses the same grids for both pupils but has identified them as separate users on the program so that when each pupil uses it, their access method is automatically set up.

Key skills and equipment

The key skill for the above example is:

- the use of framework software for the development of resources across the curriculum

The key equipment is:

- grid-making framework software, e.g. *Clicker*, *Writing with Symbols 2000*, or *Inclusive Writer*
- appropriate switches and switch mountings
- switch interface

Scanning patterns

The scan can operate in a variety of ways. Common scanning arrays include simple-step, row-column and column-row. Some programs offer more sophisticated scanning arrays.

simple-step: each item is scanned one at a time. After a selection, the scan can either move to the next item or be set to return to the beginning.

row-column: each row is scanned in turn and when one is chosen, the items in that row are scanned one at a time.

column-row: each column is scanned in turn and when one is chosen, the items in that column are scanned one at a time.

Scan settings

Most switch software will allow you to set the type of scan and colour of scan you use. The two common options are fill scan and outline scan. Fill scan fills the whole of the cell being highlighted whereas an outline scan places a highlight border around the option, which can be altered in thickness. Careful consideration of scan type and colour needs to be made, taking into account any visual difficulties or visual perceptual difficulties the pupil may have.

Switch settings

Most switch software will allow you to configure the switch settings to suit individual pupils. Most switch users have physical difficulties and may need adjustment of these settings.

Debounce setting: whether using single or two-switch scanning, most scanning software has a 'debounce' setting. This allows you to set the length of time the program waits before accepting the next press, preventing unwanted repetitions for a pupil with a tremor.

Acceptance delay: again, whether single or two-switch scanning, most scanning program offer an acceptance delay setting. This determines how long the switch must be held down before the application recognizes switch activation.

Scenario 7 - Developing an understanding of scanning

Given knowledge of scanning methods, it is possible to identify the many perceptual and cognitive concepts involved, along with the physical motor control required.

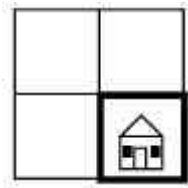
Rarely will a pupil latch on to the idea of scanning without a step-by-step introduction. As well as the switching and timing skills, there are new cognitive challenges involved.

When scanning is introduced, the pupil should be presented with only a few choices, e.g. four, with the scan working in a simple step fashion.

Regardless of whether the pupil is going to be a single or two-switch user, the scanning method should be set to a two-switch step scan whilst the concepts involved are taught and understood. Give the pupil the 'move' switch, i.e. the switch that will move the scan onto the next choice. In this way there is time to explain what is happening, i.e. what the scan looks like; where it will go next; target item needing to be highlighted by the scan. When the pupil has highlighted the target item with the scan they indicate to the person working with them and they then press their switch to produce the desired outcome, e.g. spoken message. Using this method, the number of choices can be increased.

It is helpful to introduce grids with only one item whilst introducing scanning.

In this way the pupil has only one target item to focus on whilst grasping the concepts of scanning.



For the single-switch user

When it is clear that the single-switch user has a good understanding of all the concepts, the scan should be changed back to a single-switch scan. It is best to keep a selection of choices they are familiar with and let them watch you demonstrate the scan working first.

The choice of scanning speed will have to be evaluated; remember that setting the scan speed too slow can be frustrating, but so is missing your choice because it is too fast. A happy medium needs to be found.

Example 7a

The school topic during the summer term was 'holidays'. Becky needed to practise her scanning skills during her curriculum work. As a classroom exercise and game, her teacher devised a series of grids using an on-screen grid programme. One vocabulary item on each page related to holidays, and at the start the other squares were blank. When Becky could cope with a higher cognitive demand, distractor items were placed in the other squares.

The grids were explained to Becky as a 'maze game'. Each time Becky found the correct item, her selection would lead to the next grid. She had to find, within the grids, all the items that she needed to take on holiday in order to pack her suitcase. Becky's teacher put a reward picture at the end of the exercise, showing people going on holiday.

Initially Becky had the move switch only, and would stop on the item she wanted to 'pack'.

Key skills and equipment

The key skills for the above example are:

- the use of framework software to develop resources to assist with the development of scanning skills
- the use of framework software for the development of resources across the curriculum

The key equipment is:

- grid-making framework software, e.g. *Clicker*, *Writing with Symbols 2000*, or *Inclusive Writer*
- appropriate switches and switch mountings
- switch interface

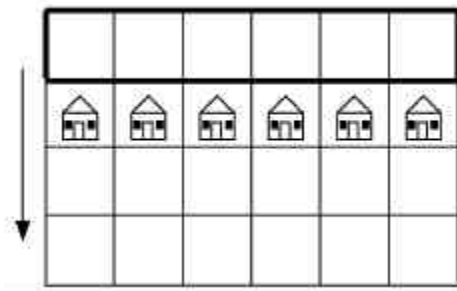
Moving on to group scanning

When a pupil has progressed to having approximately twelve items within a grid, and is coping with a simple scan (i.e. moving from left to right along each row in turn) group scanning such as row-column scanning should be introduced. This will speed up the process of choosing items for the pupil.

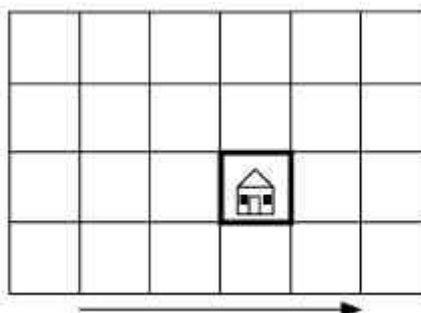
Row-column scanning can be introduced in a similar way to simple scanning. By using a two-switch mode you will be giving the pupil time to take in and understand the concepts involved. It may be worth recording the frequency of successful selection using a variety of scan options.

Again it is useful to set up grids that focus on the concepts of the row-column scanning and only give one target e.g.

a row of identical target items so they understand the concept of choosing the row



then one target item, so they choose the correct row and the correct column.



Although it has been found that this method of introducing scanning can be successful for many switch users, it must be remembered that they are all individuals and methods of introduction should be tailored to their specific needs.

As the number of choices to be scanned is increased, attention should be paid to their layout, so that the items most frequently chosen are the quickest to access. When scanning using this method, the item in the top left of the screen is the quickest to access.

Example 7b

Becky enjoyed the game described in Example 7a, so her teacher incorporated the idea into other curriculum areas. As a reinforcement activity for cooking, Becky then had to find all the items she had used last time in cookery. This time, Becky was moving on to row-column scanning. The grids were devised as above, with vocabulary relating to cooking. This time, Becky's reward grid was a digital photo of the item she had made in cookery.

Key skills and equipment

The key skills for the above example are:

- the use of framework software to develop resources to assist with the development of scanning skills
- the use of framework software for the development of resources across the curriculum

The key equipment is:

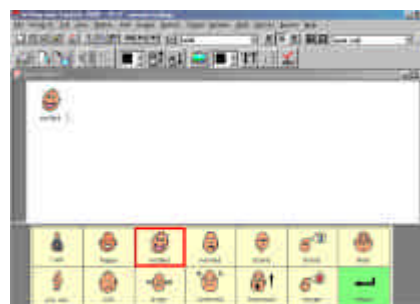
- grid-making framework software, such as *Clicker 4*, *Writing with Symbols 2000*, *Inclusive Writer*
- appropriate switches and switch mountings
- switch interface

Using on-screen grids for curriculum work

When a pupil has an understanding of scanning and can successfully make choices from a selection provided on-screen, grid-making framework software can be used to give the pupil access to curriculum activities. Grids can contain pictures, symbols, words, letters or functions such as *'print'*.

More information on developing on-screen grids can be found in **Unit 1 - Literacy and recording - Using symbols, pictures and sound**.

When designing on-screen grids for a switch user consideration of the layout of the selection set needs to be made. The selection of a cell within a grid even for the most proficient switch user is a slow process, therefore we should help by making the layout as efficient as possible, to speed up selection. When creating an on-screen grid we need to consider which items will most frequently be used and place these in the grid so that they take the least time and fewest switch presses to select. For row-column scanning this is in the top left corner of the grid.



Writing with Symbols 2000 showing an on-screen grid being scanned by a simple scan to record feelings.

Example 7c

Kevin and Darren were writing sentences about their holidays. Kevin was using whole words to build sentences, whereas Darren needed to access phrases to build similar sentences. Their team decided to devise on-screen grids with a symbol word processor for each pupil. This meant that pupils could do a similar activity at their own level.

Kevin and Darren then selected either the word or phrase from the on-screen grid, and this was sent to the symbol word processor. Their work was then printed at the end of the activity.

Key skills and equipment

The key skill for the above example is:

- the use of framework software for the development of resources across the curriculum

The key equipment is:

- grid-making symbol word processor, such as *Clicker 4, Writing with Symbols 2000, Inclusive Writer*
- appropriate switches and switch mountings
- switch interface

Use of on-screen keyboards for recording

It is important that switch users can access items that are needed most frequently, most quickly. The quickest location to reach is the top left corner of the screen, when using a row / column scan. Switch users accessing on screen keyboards should therefore have access to frequency based layouts, which place the most frequently used letters in the top left corner. *Clicker* users may download frequency-based on-screen layouts from the Clicker Grids for Learning Web site.



using *Clicker 4* with *Penfriend* (word prediction software) to provide a frequency-based keyboard with word prediction for a switch user using row-column scanning.

Word prediction packages can also run within the grids, so that as letters are selected from the grid words are predicted within designated cells. This can assist in increasing speed of text entry.

More information on using on-screen keyboards and word prediction can be found in **Unit 2 - Literacy and recording - Using ICT to support literacy across the curriculum.**

Example 7d

Mia uses an on-screen grid to record her written work. As a switch user, she has found that moving to a frequency-based keyboard layout, along with using word prediction, has had two main effects. These are a reduction in the number of switch selections required for each letter, and a reduction in the number of letters she needs to select to gain the whole word. This has significantly increased the speed of her recording.

Key skills and equipment

The key skill for the above example is:

- the use of framework software for the development of resources across the curriculum

The key equipment is:

- grid-making framework software, such as *Clicker 4, Writing with Symbols 2000, Inclusive Writer*
- word prediction software, such as *Penfriend*
- appropriate switches and switch mounting
- switch interface

Auditory scanning

For most pupils presenting selection sets visually will not present any difficulties. However, some pupils with visual difficulties or difficulty coordinating looking with the physical movement required to press the switch, may also require an auditory prompt to help them select the desired choice.

Auditory scanning is a technique where the selection set is presented auditorily (e.g. spoken aloud) for the pupil. Most switch-accessible on-screen grids allow you to attach a spoken prompt to the scan. The pupil then can scan through the choices listening to the spoken prompts; when they hear the desired choice, they can press the switch to select it.

Example 7e

Ali accesses on-screen grids through auditory scanning. Her team use switch-accessible on-screen grids for Ali to participate in a range of curriculum activities. One example is a science lesson in which the class explore the concepts of 'light' and 'heavy'.

Following practical experience of handling a range of objects, Ali uses a switch to listen to the labels "light" and "heavy". Ali feels the objects and then steps through the two choices to select whether she feels the item is light or heavy. When Ali stops on her choice, her co-worker makes the selection, and then a fuller message is spoken, e.g. "This one's heavy"; this is to help Ali know the difference between the scan and the selection.

Key skills and equipment

The key skill for the above example is:

- the use of framework software for the development of resources across the curriculum

The key equipment is:

- grid-making framework software, such as *Clicker 4*, *Writing with Symbols 2000*, *Inclusive Writer*
- appropriate switches and switch mountings
- switch interface

Common misconceptions

Assuming the use of hands for switch operation

Assuming that progression to two switches is desirable

Assuming there is a progression in type of switch provided

Assuming that visual skills are necessary for switch operation

Scenario 8 - Recording switch use

So that everybody working with the pupil is familiar with their method of access and the level they are working at, it may be useful to have an information sheet like the example on the next page. Also, a photograph (perhaps digital) can be particularly helpful to show the correct switch position.

It is important that progress is recorded, monitored and evaluated. At the early stages of switch development there is often no record of their work, but screen shots of the software being used or digital photographs of them using an electrical appliance etc, could be printed and placed in their record of achievements.

Example 8a

The team working in Class 5 is aware of how switches are positioned for individuals, and for which activities the pupils in the class use their switches. Photos were taken of all the pupil's switch positions, and placed within records kept in the classroom. New staff working in the classroom are shown the records, and mounting systems are demonstrated if necessary. Appropriate activities are also included in the records.

Key skills and equipment

The key skill for the above example is:

- the ability to use a camera (digital or other) to record switch positions

The key equipment is:

- camera, recording system

SWITCHING SKILLS

Name:

Date:

Age:

Seating / positioning:

Type of switch:

Mounting system:

Position of switch

Sensory needs:

Switch level of skill:

Aim:

Activities:

Software:

Connecting Switches

Using a switch with battery-powered devices

A switch can control any battery-powered device with a single on / off switch by connecting a battery device adaptor.

It is recommended that an adaptor be connected to each individual device. This means the device is always ready for use with a switch and ensures the adaptor leads last longer.

Battery tips – although NiCad rechargeable batteries often seem a good idea, be aware that they can lose capacity over time, as they are discharged and recharged. Alkaline batteries might give better value, but you may also consider NiMH rechargeables; these are more expensive and require a special charger, but last much better than NiCads.



battery device adaptors

Fitting an adaptor to a device



If there is a lid over the battery compartment, use a file to notch a groove in the lid to prevent it pinching the wire.



Insert the battery device adaptor's contact disc between the battery and one of the battery contacts. Close the lid.

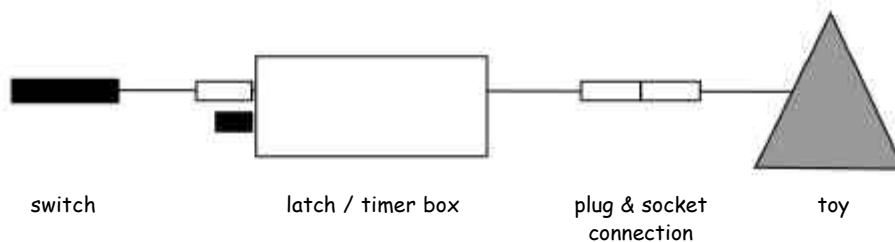


Plug the switch into the battery device adaptor and turn the device's on / off switch to its 'on' or 'play' position.



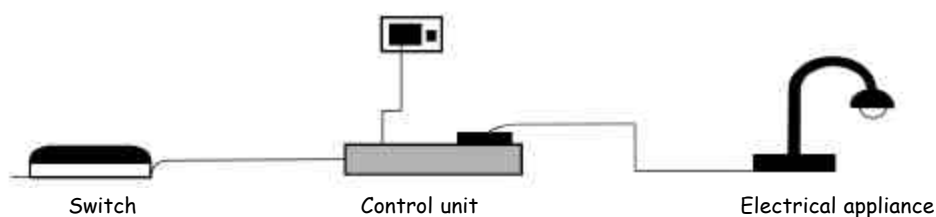
The user activates the switch to turn the device on.

Connecting a switch latch / timer unit to a battery-powered device



Using a switch to control electrical appliances

To control a mains-powered appliance with a switch, it **must** be linked through a control unit. The control unit ensures safety by isolating the switch from the mains voltage.



Never try to switch mains current directly.

The control unit

Some examples of suitable control units are described in the Appendix 4. The units vary in power rating (wattage). The electrical appliance used should not exceed this wattage, as this would be unsafe, and a fuse would be blown in the control unit. If driving more than one appliance at a time, take account of the **total** power rating.

Although the switch itself is entirely safe (it is isolated from the mains), it is important to remember that the lead to the appliance from the unit should be kept out of reach of the pupil, as this is at mains voltage.

Modes of control

All the control units have a selection of operating modes. These include:

Momentary or **direct**. The appliance will operate for as long as the input switch is pressed.

Timed: The appliance is switched on when the user presses the input switch, and switches off after a preset timed period, regardless of what the user is doing with the switch.

Latched: The appliance is switched on and off with alternate switch presses.

Connecting switches to a computer

When you are using switches with a computer, the switches will usually work as though they are sending keyboard presses (usually '**Space**' or '**Enter**') or sometimes mouse clicks. So most switch software will allow you to use the standard keyboard or mouse to operate it, as well as switches. This can be very useful if you want to try out the software without connecting switches – or sometimes to work alongside a pupil.

To use switches with a computer, some kind of interface to connect the switches is required. There are essentially three different types:

- keyboard switch interface – PC or Mac
- mouse switch interface – PC or Acorn
- serial switch interface – PC or Acorn

Keyboard switch interface

This method of attaching switches is the standard throughout the world. Common interfaces are the Don Johnson Switch Interface or IntelliKeys (an overlay keyboard with switch sockets). More recently available devices are the SwitchBox (a programmable keyboard switch interface) and SwitchBoard (a standard keyboard with switch sockets).



Don Johnston switch interface



IntelliKeys with switches attached



SwitchBox - a programmable switch interface



SwitchBoard with switches attached

Mouse switch interface

There are interfaces that connect through the mouse port, such as the Mouser, or a special mouse or roller that has switch sockets built in (such as the Inclusive KidTrac). You should note that not all switch-accessible software will allow mouse clicks for the switch action, so this solution will not work for all switch access.

However, mouse-switches can be especially useful in the situation where a carer / peer moves the mouse pointer and the pupil presses the switch to select. Alternatively you may have a pupil who can manage to move the pointer, but needs to hit a bigger target than a mouse button (i.e. the switch).



Inclusive KidTrac with switches

Serial switch interface

This is usually a small box which connects to the serial port of the computer. The box has (usually) two switch sockets. A software driver will cause the switches to emulate key presses. This driver may be an integral part of the program you are using, or may be a separate program.

This is the least expensive option, but can be the least reliable. Historically it has been the most common way of attaching switches in the UK. But as more software from other countries is now localized for use here, it becomes a less viable option.



a serial switch interface

Selecting a switch interface

Before selecting an interface box, you need to ensure compatibility with the switch software you intend to use. For example, not all switch software will give the option of using mouse buttons, which is required if you are using a mouse interface. Some software does not offer the option of using switches through a serial interface box.

It is recommended that professional advice is sought in identifying the most appropriate switch box for your school computers. See **Unit B - Organizing your resources** for more information.

Practical teaching activities

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

1. Review switches and switch-related resources available in school

Over time schools can acquire a wide range of switches and switch-related resources. Conduct an audit of what is available and take this opportunity to get rid of the things that are no longer in use or which are no longer appropriate for use. It might well be useful to write down what you have in the form of a Switches Resource List.

2. Developing awareness of cause and effect may take time

Select a pupil in your teaching group who is beginning to understand cause and effect. Identify a range of age appropriate resources that will provide this pupil with varied experiences across the curriculum and prevent boredom for the pupil and staff. Consider both software and low tech resources.

3. Physical versus cognitive complexity

Many pupils experience difficulties in demonstrating their understanding and ability to learn as a result of their physical disabilities. Once an effective method of access is identified, they can overcome these difficulties. Identify a pupil for whom an access method has been agreed and evaluate its effectiveness with a range of curriculum activities. Review the activities accessed by the pupil in terms of the cognitive complexity of the activities and in relation to the success of their switching skills.

4. Single-switch versus two-switch scanning

The identification of one switch position for a pupil with complex physical disabilities is often challenging. For a pupil who may benefit initially from a two-switch access method, the location and use of a second switch requires consideration of a range of issues. Profile a pupil for whom these issues may be appropriate and discuss the advantages and limitations of both methods.

5. Positioning of pupil and resources

Good positioning can make an enormous difference on the effectiveness of switching for a pupil. Identify a pupil and review his / her positioning and the positioning of switches and associated resources with a view to ensuring that it is facilitating effective switch use. Find a way of recording the optimum position of the pupil, the switch and associated resources so that everybody involved in working with the pupil is aware of its importance and can make sure that the positions identified are adhered to.

6. Switch activities to develop a pupil's understanding beyond cause and effect

Identify a pupil in your school who is consistently demonstrating understanding of cause and effect in a range of contexts. Use the continuum of switching skills to identify appropriate activities to move them on.

7. Accessing literacy for pupils through the use of early communication technology

Implement appropriate switch-activated resources to enable access to literacy for pupils with severe and complex needs.

8. Using low / light-tech resources to assist the development of switching skills

Low / light-tech resources can be used in a number of ways to enable differentiation of the curriculum and to develop switching skills. These resources may include communication boards and books, battery and mains-powered devices, and light-tech communication aids. Discuss the use of these resources to assist the development of skills and access to the curriculum for a pupil with severe and complex needs.

9. Use a framework program to design an activity to develop scanning skills

There are a number of framework programmes available that can be used to design activities to develop scanning skills including:

- * Switch Clicker (various versions)
- * Inclusive Writer
- * Writing With Symbols 2000
- * IntelliPics
- * ChooseIt! Maker

Using one of these programs design an age-appropriate activity to develop the scanning skills of a pupil with severe and complex needs.

10. Recording for the switch user

There are a number of programs that can be used to provide a switch user with the means of recording independently including:

- * Switch Clicker (various versions)
- * S.A.W.
- * Discover Switch
- * Hands Off!
- * Writing With Symbols 2000
- * Inclusive Writer

Identify an appropriate program for a pupil's use and implement appropriate strategies to maximize the pupil's rate of text production.

Appendix 1 - Software

A guide to software for developing switching skills

This list includes examples of useful software – it is not inclusive of all available software

Spectator

Any of the Cause and Effect or Build software titles can be used for this stage.

Cause and Effect

Content	Make It Happen 1
The Amazing One Bear Band	– Build It – single
Switch On Original	– Start It
Switch On Travel	– Anytime
Switch On Zoo	Make It Happen 2
Touch Games 1	– Tree 1
– Catherine Wheel	Smart Alex – Random Expressions
SwitchIt! Patterns	– Random Actions
SwitchIt! Pictures	Movies
SwitchIt! At home	Beatles
SwitchIt! Diggers	Radsounds
SwitchIt! Gadgets	Step by Step
SwitchIt! Scenes	Press to Play – Animals, Speedy, Zoo
Happy Duck	Single switch Software for Teens
AbraKadabra	Single Switch Software for Preschoolers
Disco	Circletime Tales Deluxe
K-1	Toyshop
First Steps	Rainbow stories
Blob	
Framework	
SwitchIt!Maker	PowerPoint
Project Presenter	Clicker

Build

The Amazing One Bear Band	SwitchIt! Patterns
Switch On Original	SwitchIt! Pictures
Switch On Travel	SwitchIt! At home
Switch On Zoo	SwitchIt! Diggers
Touché – Books	SwitchIt! Gadgets
Make It Happen 1	SwitchIt! Maker
– Build it – multiple	AbraKadabra
– Surprise	SwitchIt! Scenes
Make It Happen 2	Touch Games 2a – Wake up
– Block – Dive 1	Disco
– Reveal	Happy duck

Timing

Spot on Games	SwitchIt! Ziko World
Switch On	SwitchIt! Opposites
Switch On Travel	Chooselt! Maker
Switch On Zoo	Single switch Software for Teens
Make It Happen – Jump O	Single Switch Software for Preschoolers
– Tree 2 Q + S	
– Tree 3	

Turn-taking

The Amazing One Bear Band	SwitchIt! Patterns
Switch On	SwitchIt! Pictures
Switch On Travel	SwitchIt! At home
Switch On Zoo	SwitchIt! Diggers
Ted's Adventures	SwitchIt! Gadgets
Make It Happen – Ball SW2	SwitchIt! Maker
– Out about	SwitchIt! Scenes
– Race	

Choices

FacePaint	Learn more thru' Games
Clicker	Learn more about Maths
Switch On	Learn more about Words
Switch On Zoo	Circletime Tales Deluxe
Switch On Travel	Making sense with Numbers
Choices	On the Farm
Smart Alex	Toyshop
Blob	Switch Connection CD
Chooselt! Maker	Teddy Games
Ted's Adventures	Making Sense with Words
Phinneas Frog	From A to Z
SwitchIt! – Opposites	Spider in the Kitchen
Making Tracks to Literacy	Spider and friends - easy Maths
Doorway Classroom Pack	Living Books Access Sets
Jigsaw	From 1 to 100
Press to Play – Animals, Speedy, Zoo	

Cloze procedure exercises

Making Tracks to Literacy	Writing With Symbols 2000
All My Words	Switch Clicker
Inclusive Writer	

Creator

The following give switch users access to programs enabling them to be creative:

Clicker Plus (Switch)	Wivik
*Clicker 2, 3 or 4 (Switch)	*Discover Switch
Inclusive Writer	*ClickIt!
Writing With Symbols 2000	Music Factory
*S.A.W.	Inter_Comm
*Hands Off!	** Switch Cursor
*EZ Keys	

*Also allows mouse emulation

**Mouse emulation

NB: Software compatibility with IBM, Acorn, Macintosh, BBC is indicated in Appendix 2

Appendix 2 - Switch software resource list

Acorn	Mac	PC	Software	Supplier
✓	✓	✓	Touch Games 1; 2a; 2b / Touch Funfair	Semerc
✓	✓	✓	Switch On Original / Travel / Zoo	Semerc
✓			Touché	Semerc
		✓	Step by Step	Inclusive Technology
✓			First Steps	Semerc
✓			The Amazing One Bear Band	Semerc
✓		✓	Blob	Widgit, Inclusive Technology
✓		✓	Count with Blob	Widgit
		✓	Make It Happen	Widgit
		✓	Learn More Thru' Games	Inclusive Technology
		✓	Learn More about Maths / Words	Inclusive Technology
✓	✓	✓	Smart Alex	Semerc
✓	✓	✓	Clicker (switch versions)	Crick / Inclusive / Semerc
	✓	✓	Single switch Software for Teens	Don Johnston
	✓	✓	Single Switch Software for Preschoolers	Don Johnston
✓		✓	Spot on Games	Semerc
✓		✓	Ted's Adventures	Semerc
✓		✓	FacePaint	Semerc
✓		✓	Choices	Widgit
✓		✓	Grid It	Widgit
		✓	S.A.W.	ACE Centre, Oxford
		✓	Phinneas Frog	Widgit
✓		✓	My World + support disks	Inclusive Technology / Semerc
✓		✓	Beetles	Semerc
	✓	✓	Switchit! – Diggers / Gadgets / At Home / Opposites / Patterns / Pictures / Scenes	Inclusive Technology
	✓	✓	AbraKadabra	Inclusive Technology
	✓	✓	Ziko World	Inclusive Technology
	✓	✓	Disco	Inclusive Technology
	✓	✓	PowerPoint	Microsoft
✓		✓	Project Presenter	Semerc
		✓	Build It	Inclusive / Semerc
		✓	Hot Spots	ACE Centre, Oxford
		✓	Kaleidoscope	Inclusive Technology
		✓	Hands Off!	Inclusive Technology
		✓	EZ Keys	CAC
		✓	Wivik	Liberator

Acorn	Mac	PC	Software	Supplier
		✓	K-1	Inclusive Technology
	✓	✓	Press to Play Animals / Speedy / Zoo	Don Johnston, Inclusive
		✓	Happy Duck	Inclusive Technology
		✓	Making Tracks	Widgit, Inclusive Technology
	✓	✓	Discover Switch	Don Johnson
✓			Doorway Classroom Pack	Crick
		✓	Jigsaw	Crick
		✓	Radsounds	Liberator
	✓	✓	IntelliPics	Inclusive Technology
	✓	✓	ClickIt!!	Inclusive Technology
		✓	SwitchIt! Maker	Inclusive Technology
		✓	Chooselt! Maker	Inclusive Technology
		✓	All My Words	Crick, Inclusive Technology
		✓	Inclusive Writer	Inclusive Technology, Widgit
		✓	Writing with Symbols 2000	Widgit, Inclusive Technology
		✓	Music Factory	Widgit, Inclusive Technology
		✓	Inter_Comm	Widgit, Inclusive Technology
	✓	✓	Circletime Tales Deluxe	Don, Johnson, Inclusive
		✓	On the Farm	Inclusive Technology
		✓	Toyshop	Inclusive Technology
		✓	Switch Connection CD	Inclusive Technology
		✓	Teddy Games	Inclusive Technology
		✓	Making Sense with Words	Inclusive Technology
		✓	Making Sense with Numbers	Inclusive Technology
		✓	From A to Z	Inclusive Technology
		✓	Rainbow Stories	Resource
		✓	Spider and friends - Easy Maths	Inclusive Technology
		✓	Spider in the Kitchen	Inclusive Technology
		✓	Living Books Access Packs	Inclusive Technology
		✓	Switch Cursor	Resource
	✓	✓	IntelliMathics	Inclusive Technology
	✓	✓	IntelliTalk II	Inclusive Technology

Appendix 3 - Hardware resources

Equipment

Main suppliers

Switches

Inclusive Technology, Semerc, CAC,
Don Johnston, Techcess, QED, Liberator

Step up / down plug / socket adaptors

Various shops, e.g. Tandy

Battery device (toy) adaptors

Inclusive Technology, Semerc, Liberator, QED

Switch Latch and Timer Units

Inclusive Technology, Semerc

Switch Mountings:

Universal Mounting System

Inclusive Technology, Semerc, Liberator, QED

Slim Armstrong Mounting

Liberator

Daessy Mounting system

Techcess

Maxess Switch Tray + Switch Mounts

Inclusive Technology, Maxess, Semerc

Maxess Stickyboards

Maxess

Multi-purpose velcro boards	Widgit
Mount Board	QED
Foam Wedge Switch Mounts	QED
Velgrip loop nylon material	Maxess
Battery powered toys	Local shops, Toys for the Handicapped
BIGmack	Inclusive Technology, Semerc, Liberator
One Step Communicator	Inclusive Technology, Semerc, Liberator
Step-by-Step communicator	Inclusive Technology, Semerc, Liberator
Talking Buddy	QED
Adaptivation Chipper	QED
Switch-Activated Activities e.g. Vibrating pillow Pethna box Clown box	Toys for the Handicapped (TfH)
For fixing switches	
Sticky pads	Sellotape from local stationery suppliers
Self adhesive velcro	QED
Velgrip	Maxess
Electrical appliance control	See Appendix 4
Don Johnston switch Interface	Don Johnston, Inclusive Technology
IntelliKeys	Inclusive Technology
SwitchBox	Inclusive Technology
SwitchBoard	Inclusive Technology
Mouser 3	Semerc
KidTrac	Inclusive Technology
Serial Switch interface	Semerc, Inclusive Technology, Widgit, Crick Software

Appendix 4 – Mains control units

Call Centre Mains Switcher (3 amp) – QED 2000 Ltd

Allows the user to control electrical appliances up to 750-watt power rating by the use of a single input switch. Provides the user with four modes of control: – latched; timed; momentary and momentary timed.

Call Centre Mains Switcher (10 amp) – QED 2000 Ltd

Same unit as above but allows appliance up to 2.5-kilowatt power rating to be used.

Powerlink 2 – AbleNet

Allows the user to operate electrical appliances up to 2.4-kilowatt power rating by the use of a single input switch. Provides the user with three modes of control: direct, timed and latched.

Mini Controller – Space Kraft

Allows the user to control an electrical appliance up to 2.0-kilowatt power rating by the use of a single input switch. It provides the user with three modes of control: momentary, latched and timed.

Master Controller – Kirton Liteworks

Allows the user to control up to two electrical appliances through a single input switch.

Space Portable Controller – Space Kraft

This unit has six switch inputs with six corresponding mains outlets. The user can control electrical appliance up to 2 kilowatts (total) by the use of a switch powered in several modes: momentary, latched on / off, timed, sequence and manual sequence.

Portable Switch Control Unit – Mike Ayres Design

Allows the user to control electrical appliances up to 1.5-kilowatt power rating by the use of a single input switch. Provides the user with four modes of control: on, latched, momentary and timed.

Note: The switch connection on individual units may use stereo or mono sockets. Ensure the connection is compatible with the switches you want to use it with.

Please ring individual suppliers for current prices. They vary from £100 to £1,200.

Appendix 5 - References

Barnes D. & Coles C., 1995, **IT for All: Developing Curriculum and IT Curriculum for Pupils with Severe or Profound and Multiple Learning Difficulties**, David Fulton Publishers, London

Colven D. & Detheridge T., 1990, **Common Terminology for Switch Controlled Software**, ACE Centre, Oxford. ISBN 1 85379 112 1

Cook A.M. & Hussey S.M., 1995, **Assistive technologies: principles and practice**, Mosby, ISBN 0 8016 1038 9

Fraser G., Mc Gregor G.A., Arango K. & Kangas B.A., 1994, **Physical Characteristics Assessment (PCA)**, Don Johnston Development Equipment

Goossens C. & Crain S., 1992, **Utilizing switch interfaces with children who are severely physically challenged**, Pro-Ed, Austin, Texas, USA

Levin J. & En Selein K., ***Selection and Use of Simple Technology In Home, School, Work and Community Settings**

Levin J. & Scherfenberg L., ***Fun For Everyone - A Guide to Adapted Leisure Activities for Children with Disabilities**

Levin J. & Scherfenberg L., ***Breaking Barriers - How Children and Adults with Severe Disabilities Can Access The World Through Simple Technology**

Nisbet P. & Poon P., 1998, **Special Access Technology**, CALL Centre. Chapter 8 - Switch Access using Scanning and Encoding; Chapter 9 - Switches

Switch into action, The National Toy Libraries Association, 68 Churchway, London NW1 1LT (Tel: 020 7387 9592)

* Available from: AbleNet Division, Liberator Ltd, Whitegates, Swinstead, Lincs, NG33 4PA
Tel: 0476 550391

Appendix 6 - Suppliers' addresses

ACE Centre Advisory Trust

92 Windmill Road, Headington
Oxford OX3 7DR
Tel. 01865 759800
Web: www.ace-centre.org.uk

ACE Centre North

1 Broadbent Road,
Watersheddings
Oldham OL1 4HU
Tel. 0161 627 1358
Web: www.ace-north.org.uk

Cambridge Adaptive Communication (Possum Controls Ltd)

8 Farmborough Close
Aylesbury Vale Industrial Park
Stocklake, Aylesbury
Bucks. 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

Inclusive Technology Ltd

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

Kirton

23 Rookwood Way, Haverhill
Suffolk CB9 8PB
Tel. 0800 212709
Web: www.kirton-healthcare.co.uk

Liberator Ltd (AbleNet)

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

Maxess

The Chinestone, Charlbury
Oxon OX7 3RZ
Tel. 01608 811909

Mike Ayres Design & Development Ltd.

Russell House
47 Wilkinson Street, Sheffield
S.Yorkshire S10 2GB
Tel. 0114 2760731
Web: www.mike-ayres.co.uk

Penfriend Ltd

30 South Oswald Road
Edinburgh EH9 2HG
Tel. 0131 688 2121
Web: www.penfriend.ltd.uk

QED 2000 Ltd

1 Prince Alfred Street, Gosport
Hampshire PO12 1QH
Tel. 0870 787 8850
Web: www.qedltd.com

Resource

51 High Street, Kegworth
Derbyshire DE74 2DA
Tel. 01509 672222
Web: www.resourcekt.co.uk

Rompa International

Goyt Side Road, Chesterfield
Derbyshire S40 2PH
Tel.: 01246 211777
Web: www.rompa.co.uk

Semerc

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

Spacekraft Ltd

Crowgill House
Rosse Street, Shipley
West Yorkshire BD18 3SW
Tel. 01274 581007
Web: www.SpaceKraft.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

TFH

76 Barracks Road
Sandy Lane Industrial Estate
Stourport-on-Severn
Worcestershire DY13 9QB
Tel. 01299 827820
Web: www.tfhuk.co.uk

Widgit Software

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

Appendix 7 - Some useful Web sites

ACE Centre – www.ace-centre.org.uk

Information and software. Publishers of SAW.

ACE Centre-North – www.ace-north.org.uk

Information, Advice, Training and Assessments in regard to the use of Assistive Technology with people with physical and communication disabilities.

CALL Centre – callcentre.education.ed.ac.uk

CENMAC – www.cenmac.demon.co.uk

Crick Software Ltd. – www.cricksoft.com and www.clickergrids.com

Information and resources for Clicker.

Don Johnston – www.donjohnston.com

Information and resources for Discover, Ke:nx and other Don Johnston software and products.

Inclusive Technology Ltd – www.inclusive.co.uk

Extensive information on a range of issues around special needs and ICT.

MAPE – www.mape.org.uk

Micros and Primary Education Web site. Information and software deals.

NCIP – www2.edc.org/NCIP/

Association with useful information, advice on classroom use, and reviews of software.

Widgit Software – www.widgit.com

Excellent site with lots of information about symbols, switch software and techniques for introducing switches and scanning.

Words+ – www.words-plus.com

Information on EZ Keys and other Words+ communication and computer access products.

QED 2000 – www.qedltd.com

Information and resources about a range of switch products.