Two Switches to Success: Access for Children with Severe Physical and/or Multiple Challenges

Linda J. Burkhart

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Dedicated to the children and their families who have taught me so much! Especially:
Alex, Emily, Greg, Katie, Kyle, Kristin and Sixten

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Introduction

Many students with severe physical challenges have difficulty accessing communication devices and computer software. Their ability to even access a single switch can be problematic because of their physical challenges. Very few options are available for a single switch user. Cause and effect software and single message voice-output devices are available for the very beginning user, but there is a huge leap from these simple devices to the more complex use of automatic scanning. This limits the student's access to software and communication devices that could offer more appropriate cognitive content.

Automatic scanning involves only a single switch; however, this method is dependent on the student being able to time a motor response with a predetermined auditory or visual scan.   Often, as the student anticipates the approaching item, excitement increases and his ability to control his motor responses decreases. Lengthening the time between scanned items may help, but also requires increased attention and concentration on the task, which may be difficult for some children. Many students, who face severe physical challenges are unable to successfully control automatic scan - especially in the early stages of communication and access.
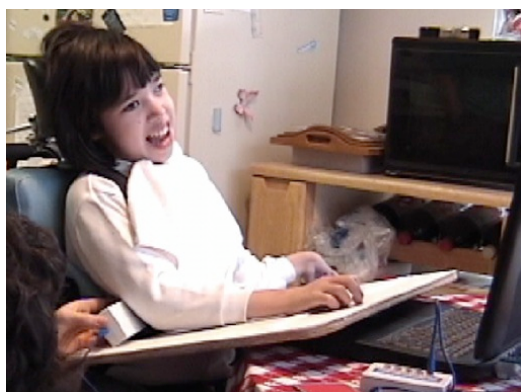
Timing May be Difficult for Some Children

Two switch step scanning has been around for a long time, however, the technology for its effective use is not always available. The term two switch step scanning has many different definitions depending on the manufacturer or developer. For the purpose of this presentation, it will be defined as follows: One switch advances the scan to the next item. To advance to the next item, the switch must be released and activated again. Once the desired item is reached, a second switch is used to select it. Length of time on and off either switch does not effect correct responses and there is no timing involved. This should not be confused with inverse scanning or step scanning with a delay, both of which require an element of timing and are not the subject of this discussion.

Two switch step scanning offers a step between cause and effect and automatic scanning. Since no timing is involved, the task does not require the same intense amount of concentration. If the student becomes distracted or if a social opportunity arises in the middle of the scan, the child can stop, interact, and return to the scanning without having lost his or her place. This allows the child to be more actively involved in the process instead of passively waiting for the scan to reach a desired item. Even though access is slightly more difficult since the child needs two switches instead of one, two switches offer a simpler cognitive map. In addition, this requires more motor effort and may lead to fatigue with some children. However, since the child will need practice with a large number of successful repetitions to learn the motor skill of activating a switch, this strategy may allow the child to refine the movement sooner. Once switch access becomes efficient, some of these children may move to a single switch scanning strategy. Others may continue to find it faster to use two switches. Please respect the child's physical endurance and provide activities appropriate to the child's stamina.

A wide variety of "light tech" as well as "high tech" activities can be set up for two switch step scanning. Software, dynamic displays, and authoring programs that may be accessed by two switch step scanning are now commercially available. Consider providing opportunities to learn and use two switch step scanning for use with play, communication, emergent literacy, and curricular activities.

Stepping Stones to Switch Access

Note: These Stepping Stones are provided as a general guide. Not all children will need all Stepping Stones, some steps may be skipped, and often times, a child will be working on more than one step at a time. Some may not even follow the suggested order. The important things is to customize for the individual child so that at each step along the path to learning switch access is successful and enjoyable for the child.

Stepping Stone #1: Single Switch - Cause and Effect

Start children with a single switch and cause and effect activities. However, don't stay on this step too long. I have found that consistency is often not possible for many of these children, and many times the child habituates to or gets bored with an activity before he has met some artificial criterion. Don't dwell on inconsistency, because this may prevent the child from getting to the next step. Data sheets don't usually give you a reliable measure of whether or not the child understands the concept of cause and effect. Take your cues from the child. Anecdotal notes and interactive observations will

be more useful. The more meaningful the activity is to the child, the better chance for success. See the article on this CD called: Motivation for Learning.

**A Single Switch for Cause and Effect May be Used with a Computer
or with a Battery-Powered Toy**

Directed instruction and physical prompting are not very effective in teaching children cause and effect, because it is not a concept that can be readily taught. Children learn this concept most effectively through experiencing cause and effect situations in a discovery learning approach. The problem for children who face severe multiple challenges, is that they don't get many opportunities to experiment with this concept on their own. The teacher's or therapist's task is to engineer the situation to make this possible.

Step one is to observe the child closely in a variety of positions and positioning equipment and identify movements that the child makes with some voluntary control. Sometimes it is helpful to position the child in a manner where gravity can assist movement, or at least not get in the way of movement. For example, the child may have difficulty holding her head up and turning her head when upright, but she may be able to turn her head side to side, fairly easily, when reclining. Placing the child in therapeutic positioning equipment is generally better than having a person hold the child, when first learning cause and effect. This is because it will be easier for the child to associate his own movements with a reaction and not be confused by movements of the person holding him.

Primitive reflexes, such as an ATNR (Asymmetrical Tonic Neck Reflex - head turn linked with arm extension) should be avoided if possible. However, if this is the only movement that the child uses, and if the child doesn't get "stuck" in the reflex, in other words, they can move in and out of it themselves, then you may need to use this type of movement, for a short while, until the child gets the concept of cause and effect. At that point, you can help them develop more functional movements, because the intent to

move will already be established, and you can help guide them to more appropriate movements. Consult with the child's occupational and physical therapists.

Step two is to find a switch that you can put in the way of the movement in such a way as to be easily activated when the child makes that movement. Again, use gravity to help. For example, a switch placed on its side in a vertical plane may be activated by an arm moving across a surface, instead of the child having to lift her hand up and place it on top of a switch. If the child will be activating the switch with her head or bare arm, you may want to pad the switch with a piece of dense foam, such as pipe wrap from the plumbing store, so that activating the switch produces a more pleasant sensation than bumping up against hard plastic.
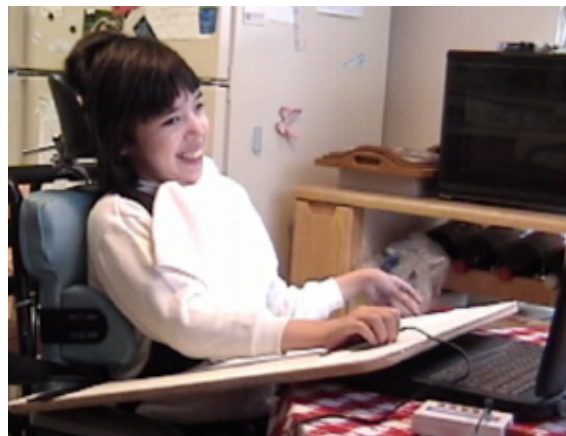
Reclining Means the Child Doesn't have to Hold his Head up While Learning to Use Switches
A Flat Switch Allows the Child to Slide her Hand onto it, instead of Lifting Her Hand

Step three is to find something that can turn on with the switch that the child finds interesting. This can be difficult to guess, and a variety of items that provide different sensory feedback may need to be tried to find something that intrigues the child. Keep in mind that the child may tire of one type of input and need a variety of items with which to interact. When a child is first learning that she can move in some way to make something happen, it is best to have very clear feedback for her efforts. To do this, present opportunities that provide **direct** or **momentary** activation. For example, when the child contacts the switch, the item is turned on. When the child moves away from the switch, the item stops immediately. This is the way most battery-operated toys and adapted tape players work. However, there are only a limited number of software applications that will do this. Everybody Has Feet, and Cause and Effect Sights and Sounds, (Simtech, http://www.hsj.com/), are two examples of software that provide this option. Otherwise, look for software that plays only for a very short time with each activation. Place the toy or monitor in the best location for the child to observe it when she activates it.

Some children will be able to maintain the pressure on the switch that is set up for direct or momentary activation, and then experiment with activating and releasing the switch as they refine their motor control and understanding of cause and effect. Other children will not have the motor ability to maintain pressure on the switch. Even with these children, however, it is often still useful to start with direct or momentary activation. This may only be for a short time to get the child to focus on what movement is activating the switch. The newness of successfully activating the switch, even for just a short click or spectacle, may be enough to tap the child's curiosity, at least for a little while, while he is experimenting with the motor aspect of activating the switch. Next, a delay timer or slightly longer sequence of animation and sound may be used in order to keep the child's interest and to continue to generate a feeling of success. As the motor movement becomes more automatic, and no longer requires the child's full attention, then what is activated becomes the focus. Sometimes the child only needs about 5-10 min. of direct activation, and then, once they have isolated the movement to some degree, you can move on to a short timed activation. For example, use a delay timer with a battery-operated toy set to stay on for 4-8 seconds, or a short animation and sound sequence from the computer.   Longer time delays and sequences that last for more than 15-20 seconds are much too long for the child to use when learning cause and effect. The problem is that by the time the activation stops, the child may no longer be in a good position to easily reactivate the switch and may not have the attention span to wait and do nothing while waiting for the action to stop. Short activations keep the child focused on learning to move to create an effect through practice and multiple repetitions.

Much of the software on the market that is labeled as "cause and effect" plays a long animation sequence. That type of software should be more appropriately labeled for recreation and leisure activities and used with children who already understand cause and effect.   While it is true that you want to make the reward worth the child's effort, it may be more useful to make the activity more challenging/intriguing or increase the social aspect than to lengthen the response. For example add cheers and clapping from a family member or begin moving the switch to new locations as in the next stepping stone.

Big Billy Goat Picture on a Battery-Powered Car Knocks the Mean Ugly Troll into the River! Battery-Powered Doll Delivers Snack

Giving the battery-operated toy a mission or purpose will often increase the child's interest and active engagement. Examples include: a walking animal toy that walks into a pile of blocks and knocks them down, a moving toy that can deliver a cookie to the child or a friend, a moving toy that can kick or push a ball across the floor or table to a friend.

Step four: Wait with anticipation. The only types of prompts that are appropriate are environmental prompts that encourage initiation of movement by the child. For example, if the child is using a switch on the left side of her head and if she enjoys people. Turn her facing away and to the right of people. She will naturally be motivated to turn toward people, she will have initiated the action that results in switch activation. Another example is a child who doesn't sit up very long and often leans over on the tray of her wheelchair. The switch can be placed on the tray, so as the child leans over, she will accidentally activate it. Placing the switch where it will be accidentally activated is the best strategy for setting up a situation where a child can learn cause and effect.

If the child is not catching on within about 3 trials, then change something. Make sure that the child's movements are activating the switch. Try different sensory based toys as well a social interaction to be the result of the child's efforts. The location, time of day, internal feelings of hunger or discomfort, environmental and social distractions can all impact the child's success.

The child may understand the concept of cause and effect before she has had enough repetitions to develop a reliable motor response. The goal now changes from learning cause and effect to refining motor control for a purpose.   At that point, motivation is key to provide the child with additional opportunities with enough variety and interest to keep her interest. Children often need a large number of problem solving experiences with intent and purpose to be come efficient at switch activation. That means that a certain amount of mistakes are good. The child needs to sometimes miss activating the switch in order to have a reason to refine her movements. She should be allowed to try again without interference.   Monitor this to make sure that the child doesn't miss too much and become frustrated. In that case, the location of the switch or the position of the child may need adjustment.

Stepping Stone #2: Single Switch Activation in Multiple Locations and for Multiple Functions

At this stage, the child understands cause and effect and may even have grown bored with that type of activity. Now she is ready to pay more attention to refining motor movements and focusing more on specific effects and functions that can be

achieved through the use of switches. Depending upon the severity of the physical challenges that a child faces, one can now begin to challenge the child by experimenting with a variety of locations for positioning the switch. This gives the child the opportunity to experiment with other movements and begin isolating movements for different functions. For a child at a cognitively young level, just the excitement of discovering that he can activate the switch in multiple ways can be cognitively motivating. It is also motivating for a child functioning at a more advanced cognitive level if he hasn't had many opportunities in the past to be successful with motor skills.
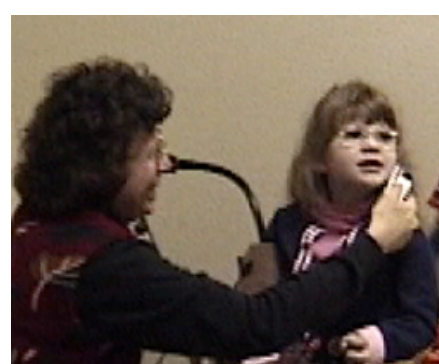
Single Switch / Multiple Locations: shoulder (lean forward), shoulder (lean back), knee, left hand (arm splinted), elbow, right hand, left cheek, right cheek

It is important to make sure the switch is moved to a location where the child can be successful. It is not as important to mount the switch, yet. It is OK to hold it in just the right position for success according the child's tone and position for a particular activity. Work toward a balance of leaving a switch in one location long enough to achieve some automaticity but not too long that the child is unable to develop other switch sites.

Activities should cover a wide variety of functions but still involve multiple repetitions for problem solving to activate the switch. Therefore, short repeatable responses, with variety, are still important. A message on a single voice-output device that results in a short interaction, such as clap my hands, tickle me, bounce me, swing me, etc. often works well. Try the same type of activities described above in Stepping Stone 1. However, after a few successful activations, move the switch to a new location within reach in a fun enticing manner. For children with better motor control, the switch can be moved more often and to a wider range of locations. For children with extremely high tone and very severe physical challenges, the location should not be changed as often because it will take them longer to readjust to the new location and be successful. Never leave the switch in a place that is too difficult for the child to activate at least some of the time.

Provide exaggerated feedback for the child as you move the switch to a new location. For example make sure they hear, see or feel the movement. You can drag it along a carpet surface so that the Velcro on the bottom of the switch makes a scratchy sound. You can move it slowly as you tap or click it as you move it through the child's visual field before placing it in a new location. You can brush the child's arm or cheek, etc. with part of the switch as you move it. These strategies help the child notice that the switch has been moved and also gives him a clue to how to locate it again.

The idea is to make this a fun game. Social play and interaction can be a crucial aspect to the success of this activity. You want the child to enjoy the activity and be motivated to explore locating the switch in multiple locations. Since developing new motor skills takes multiple repetitions with intent and purpose, it is important to provide a variety of meaningful activities that allow for this practice, without becoming boring, before the child has developed enough automaticity so that she no longer has to cognitively attend to activating the switch. Once the motor movement is more automatic, then the child is more able to put her attention to the task being performed by the switch.

To increase practice opportunities, select a few locations that work well for a child and place the switch in one of those locations for a variety of functional activities. At this point, you don't have to move the switch within each activity, but you may want to use different locations for different activities. Let the child help you decide where to place the switch for different purposes.

Other functional activities might include activating a battery-operated game spinner as part of play a game with others, Turning pages of adapted story books and/or listening to songs on a computer, (IntelliPics Studio, Buildability, Powerpoint, Hyperstudio, etc.) or using environmental control to participate in cooking, working or listening to music. Try the activities on this CD in the folder of IntelliPics Studio Files: **Cause and Effect Activities**: **Cause and Effect Butterfly**; **Cause and Effect Face**; **Cause and Effect Sun**; **Cause Effect for Replace**, **Cause Effect Replace Look**, or **Peek a Boo for Replace**.

Another great strategy is to use a switch attached to a sequenced voice-output device for Conversational or Action Scripts, as described in the book and CD: **Can we Chat? - Sequenced Social Scripts**. (Musselwhite and Burkhart, 2001) In this strategy a partner plans a script with the child and records it into the device. The child then uses the script on the device to interact with a number of individuals. Because the child helps plan the script and a variety of communicative functions are included in the script, this provides a scaffold for practicing conversational turn taking as well as excellent practice for multiple switch activations. More information can be found at - http://www.Lburkhart.com - look under handouts and products.

The types of activities used for developing single switch control do not require timing. However there are social and pragmatic timing aspects that encourage improved control without putting the kind of pressure on the child for exact timing that would be required for automatic or inverse scanning.

Stepping Stone #3: Two Switches - Two Functions

Once the child is able to activate one switch in several locations, you can move on to two switches. Place one switch in the most preferred location and the other in the second most preferred, However, it is OK to keep experimenting with new switch sites. Strive to achieve a balance between leaving a switch in one place long enough for the child to accommodate to it, and experimenting with moving the switch to a place that might be

easier for the child to access and/or allow him to use different movements. Typically, it is best to locate the switches in clearly different places so the that the motor skill used to activate each is distinctly different. For example, instead of two switches side by side on the child's tray, where they are activated by a similar reach, try placing one switch on the tray and one next to the child's cheek or behind the child's elbow. It is also helpful to choose two locations that are difficult for the child to activate with one movement. For example, if the child typically moves her left arm back when turning her head to the right, then placing one switch on the right side of her head and one behind her left arm would be difficult for her, because she has difficulty isolating those two movements. Perhaps she would do better using two sides of her head, or one by her head and one at a different angle near her arm that wouldn't accidentally be bumped when turning her head but is still within easy reach when she is looking forward.   Many of these children have associated motor reactions. That means when they move one part of their body, other parts typically move as well. In addition, they may need to move away from a switch first in order to coordinate moving toward it. Make sure not to place the other switch in a location that would be accidentally activated on this "wind-up" to move to the other switch.

Two Sides of her Head   **One Side of Head and One Hand**

The above strategies help the child make clearer choices and means that the child will be less likely to activate a switch when he does not intend to activate it. The switches may be mounted to the wheelchair, or held by a partner as needed. Picture symbols of some type can be placed on or near the switches to represent that switch's current function. Textured surfaces may also be helpful for some children, especially if the switch is not within the child's view.

The process of using two switches can be very empowering for the child. Now the child can make a choice. You will often see increased cognitive engagement and

motivation on the child's part. Sometimes, children who have not been very interested in a single switch for cause and effect activities will suddenly be interested with this new challenge of two switches. Because there is no right or wrong switch, the child has an opportunity to exercise his sense of self and independent control. With one switch, that control is often only able to be expressed through the choice of activating the switch or not activating it. Now control can be experienced through choice.

Using Two Switches Can be Empowering for the Child and Provide a Sense of Control

As you move the child to two switches, you may want to provide a short activity for each switch in the two locations that you will be using, before presenting both switches at the same time. This helps the child "warm up" and get his movements for each switch working individually.
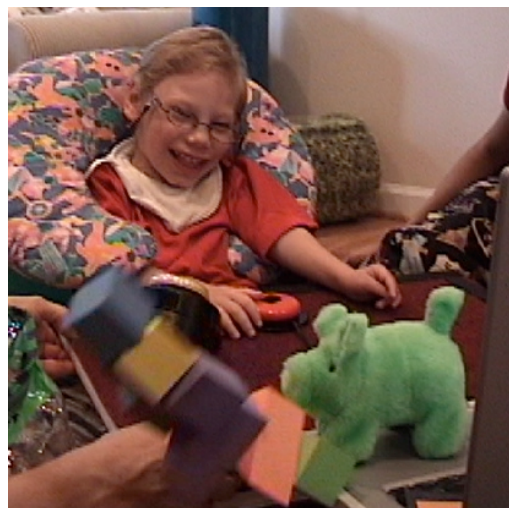
One Switch for voice-output "Build up the blocks!" and the second switch to control the battery-operated pig that knocks them down.

It is a good idea to follow the principle of "Two Switches Two Functions." This means having the switches connected to different types of toys , devices or purposes on the computer, so it is easier for the child to discriminate between the two switches based on function. Two functions also means that there may be pragmatically appropriate times that one switch makes more sense to use than the other - which also increases cognitive engagement. It is still important, at this point, that the child is involved in an errorless problem solving of which switch to activate within motivating and functional activities. There should be no wrong answers for which switch to activate, and the child should not be directed or quizzed to activate a named switch. Instead of right and wrong there can be logical and pragmatic reasons for selecting one over the other within the context of an activity, which provides the child natural feedback as to the result of her choices. This will give the child practice in activating a desired switch for a purpose. For example, one switch can activate a walking toy that knocks over blocks, and the other switch can activate a voice-output device that asks someone to build up the blocks. Once the blocks have been knocked down, there is a natural context for using the other switch to ask someone to help build them up again.

There are many simple "light tech" activities that may be set up to utilize two switches. Some examples include: the one mentioned above with knocking down blocks, a battery-operated toy that kicks or pushes a ball across the table and a voice-output device that asks to have the ball thrown back to the child, an adapted game spinner and a sequenced voice-output device that makes social comments about the game such as "I'm going to get you," and "you better watch out now!", a rotating plate scanner that slowly turns, with art or play materials that move under a pointer and a voice output device that comments about the activity or says something like "That's the one I want.". a battery-operated bubble blower that runs out of bubbles after a short while and a voice-output device that asks for some more bubble stuff, a switch operated Spin Art and a voice message that ask for some more paint. etc. When using two simple voice-output devices, choose messages that are different, such as may I have a drink, vs. Clap my hands!, instead of May I have a pretzel or a cracker - which are both foods and result in a similar response. Other examples might be two messages that have a logical sequence such as "blow up the balloon" and "let it go! ", or "I want to turn the page" vs. "Oh no, what's going to happen?" or the repeated line in the story.


One Switch- Penguin kicks the ball, Second Switch- Voice-output "Throw it to me!"
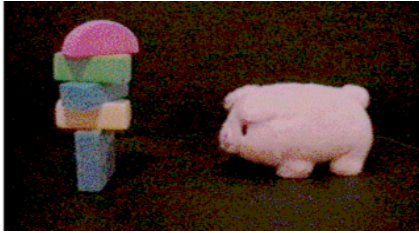
Build it up!

One Switch- Pig Knocks Down Blocks,   Second Switch- Voice-Output "Build it up!"

The computer can also be useful for two switches. You can have one switch connected to the computer to do one thing, such as read a story or sing a song, and a second switch connected to a voice-output device for making comments, calling someone's attention to see what is happening on the computer, or to add sound effects to the story or song. Software also allows for using two switches to control the computer according to location, turn taking and trial and error.   Inclusive TLC has a number of creative "Switch-it" programs that allow you to use two switches alternately or randomly. (http://inclusiveTLC.com/) Using Overlay Maker and the IntelliKeys, assign any two locations on an IntelliPics or IntelliPics Studio, to the two switches. For example, two verses of a song such as Wheels on the Bus and the Doors on the bus, or one that plays the song and the other that comments, such as Yea!
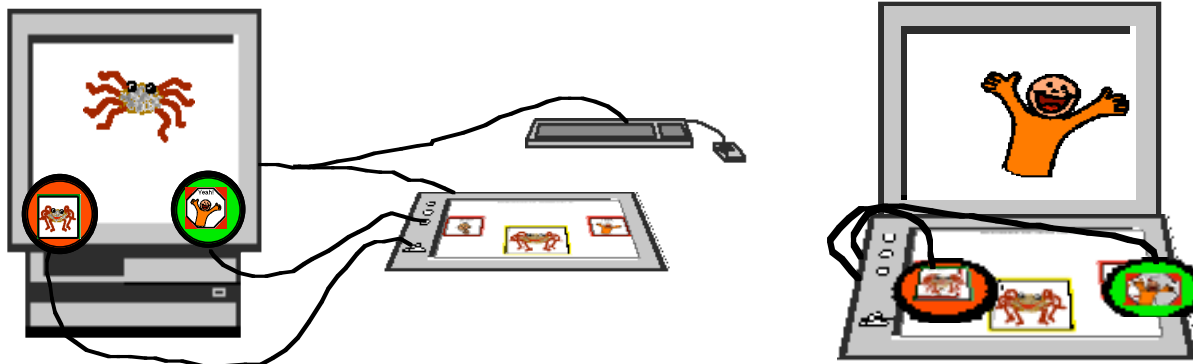
The IntelliKeys has Jacks for Two Switches.   Using Overlay maker, these switches can be Assigned to Perform Any Two Actions from the Overlay

The **Left Right Switch Activities** for IntelliPics Studio on the CD that show an item hiding behind one of two places on the left and right of the screen, illustrate another type of activity that provides practice with two switches - related to function by location. Activities include: **Hide Box Template**, **Hide Chair Templates**, **Left Right Fish**, **Hide Underwater**, and **Where is Butterfly**?   These templates can be modified to use a photo of the child, family member, pet, friend or favorite toy. See **Direc Left Right Hide** or **Left Right Replace**, on this CD.
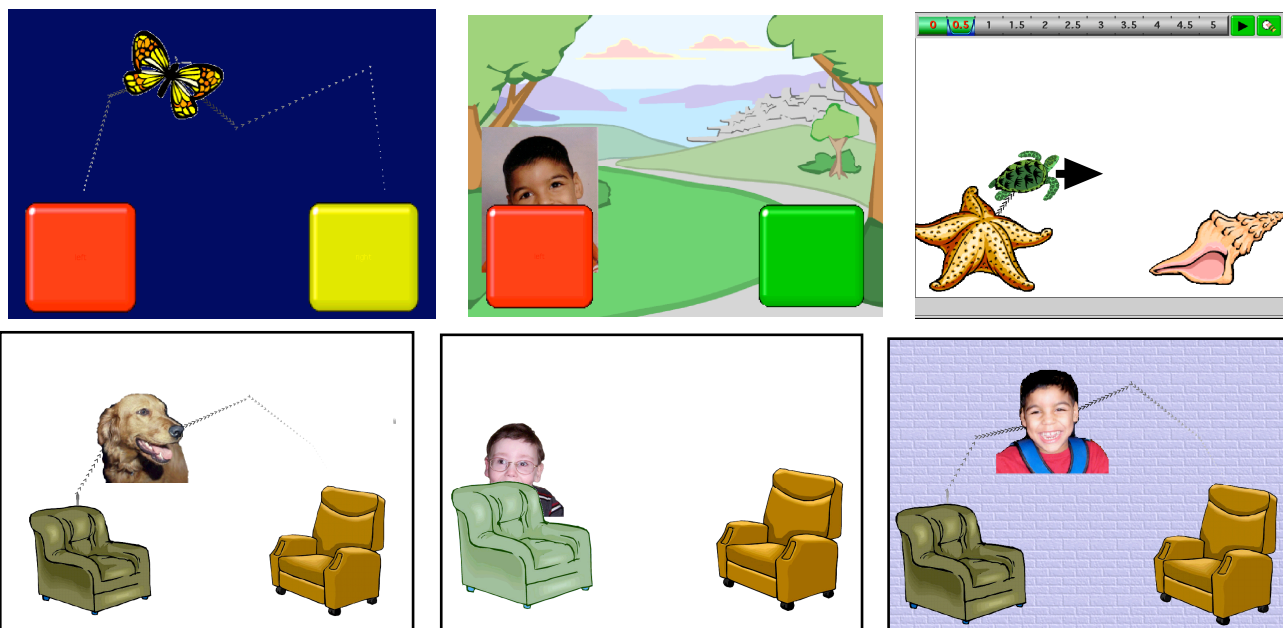
Left Right Hide Activities May be Customized for the Child

Notes on Moving to Two Switch Step Scanning:

Some children have difficulty moving to two switch step scanning because they do not yet understand the cognitive task. The goal for these students is to provide them with graduated experiences so they can experience success in learning the task of two switch step scanning. These students will go on to Step 4, Learning to Step Scan. Other children will understand the concept of 2 Switch Step Scanning, as soon as they are shown how it works. These students will go on to Step 5 and not need Step 4.

Some children have difficulty moving to two switch step scanning because of the motor component, even though they cognitively understand the task. The goal for these students is developing and refining the motor skills while maintaining motivation for continued success, so they can use two switch step scanning for communication and to learn a variety of curricular content. Go on to Step 5 or 6.

Some children have difficulty moving to two switch step scanning because of passivity and learned helplessness. For these students it is especially important to provide purposeful activities with which they can experience control and success. Refer to motivational factors discussed in the article on this CD titled: Motivation for Learning

Still other children have a combination of motor and cognitive challenges and it may be difficult to know if they understand the task or if the motor component is too difficult. The goal is to find motivating activities tied to what they do understand and

relate to, and then add moderate challenges to gradually increase their skills. These children may benefit from working on Step 4 activities.

Stepping Stone #4: Learning to Two Switch Step Scan

This step is for children who do not yet understand how Two Switch Step Scanning works. The activities for this step provide clear feedback and practice with using one switch to move somewhere and the second switch to select that location. The first switch is often referred to as the "mover" or "lister" and the second switch is the "get it" or "selector" switch. If a child activates the two switches randomly when given errorless activities, then this step will help them understand the function of each switch.

For "light tech" activities, a delay timer is a useful tool. Delay timers are available from most companies that sell switches. The delay timer may be set so that the toy is activated for a few seconds with each switch press and then stops. The switch must be released and repressed to activate the toy again. This simulates the stepping switch. You can have a walking animal move over colored spots on a table that represent different choices. For example, the child can repeatedly activate the first switch to move the animal or car to the pile of collage materials that she would like to put on her art project. A second switch can be set up with a simple voice-output device to say something like: "that's it, that's the one I want." A rotating plate (Burkhart 1987) can be used with the delay time as well. The idea is to use a toy that slowly rotates, such as a battery-powered fish game and place a round sectioned tray on top of it. Then an arrow is mounted at one location. The switch turns the tray a little at a time, until the desired item is under the arrow. Then, the child can activate the voice-output device to say "That one, that's what I want."
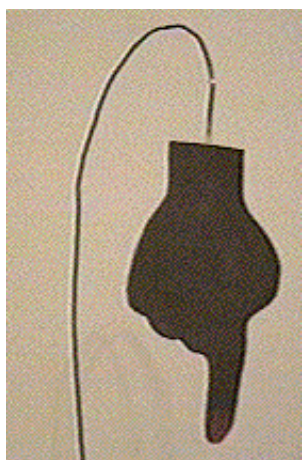

Rotating Plate Switch and Pointer on a stand made from a hanger

For computer activities, one switch can actually move something across the computer screen and then the second switch activates something in relation to where the item has moved. With the computer, it is easy to allow only one switch to work at a time, so that if the child tries the other switch, the natural lack of feedback will direct her back to the first switch. Moving an actual item is in contrast to typical two switch step scanning where the movement on the screen or display is simulated by a highlight or box showing one item after the next. Some children may have trouble seeing this as movement.
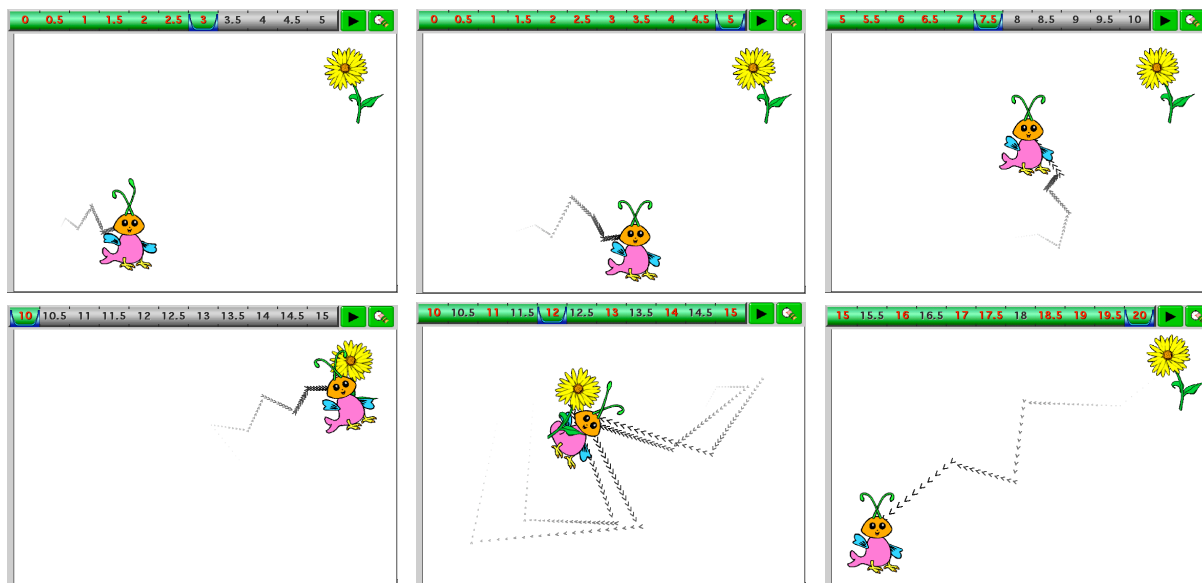
Activities on this CD include: **Boy to Kite**, **Critter to Flower**, **Butterfly to Ball**, **Hats to Kyle**, **Old McDonalds Two Switch**, and **Bus to Boy Template**. The **Bus to Boy template** allows you to substitute your own pictures in the activity to customize it for the child. Directions for replacing pictures as well as for creating these activities from scratch are included on this CD in the Directions folder. These activities provide an environment for a child to explore actions, early cognitive concepts and concepts that will later be used in two switch step scanning. Such as: using one switch to move to something and then selecting it with the other; exploring when to use which switch in an errorless manner; visual tracking; using two switches for two different purposes/functions, isolating, refining and observing the effects of two motor movements for two results; and self-directed errorless learning. Feedback is enhanced by the feature that only one switch is active at a time. This way, if the child tries to activate the second switch before the item has moved to the appropriate location, nothing happens. The IntelliKeys Overlay (left right switches) will be sent automatically, when these activities are opened, if it is placed in the IntelliPics Studio Overlay Folder. If you are not using the IntelliKeys, these activities require switch interfaces that can be programmed. See "How to Connect Switches" on this CD.
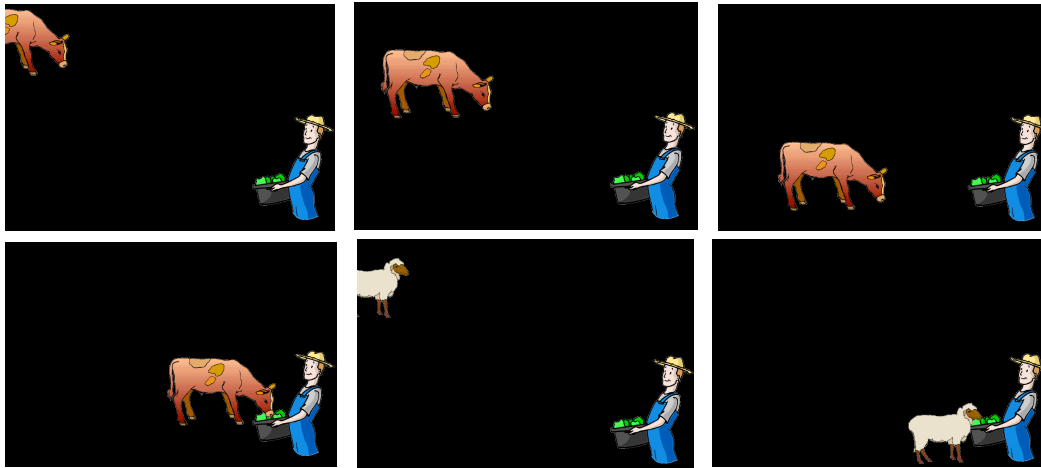
To use these activities with a child, set up a switch on the left side of the child plugged into switch jack number 1 on the IntelliKeys. Set up a switch on the right side, plugged into switch jack number 2 on the IntelliKeys. The switches should be positioned in a location that is easy for the child to activate with a hand, elbow, knee, side of the head, etc. Consult the child's occupational and physical therapists for help with switch placement. If the child needs both switches on the same side, try to use very different looking / textured switches that are activated by different types of motor movements.

The most effective method of teaching this step is to use a combination of trial and error and modeling. Play a game where. you, a puppet, friend, or action figure takes turns with the child. When taking your turn, use self-talk, such as there it goes, it's getting closer, closer, closer, it's there! Make sure that the child is positioned to view the screen as well as the person or toy taking the turn. Allow extra time between each switch activation to allow the child to observe and process what is happening. Use the switches with your or the toy's body parts in the same manner as the child will use them. For example. use you head to activate one switch and your hand to activate the second. I have found it is useful to mount the switches with Velcro or hold them with your hand, so they can easily be moved between people taking turns. Sometimes it is useful to leave the second switch in place so that the child can assist in activating it, even when it is your turn. If you move toward this switch slowly, sometimes the child will activate it before you can reach it, which provides for more active participation on the part of the child.

For children who have very severe motor problems, it is sometimes helpful to use partner assisted scanning. For example, the child will activate only the second switch. The partner activates the first switch according to some signal from the child, for example an eye-gaze or tone change. It is important to activate the switch within the child's view so she knows what you are doing and feels as if she is controlling it. Then, when it is time for the second switch to be activated, the partner pauses and allows the child as much time as needed to access that switch.

Stepping Stone #4a: Side Step - Single Switch Timing

Many children will continue to do better to follow steps 5 through 8 using two switch step scanning, but there may be some children who will do better going through these steps using a timed scanning mode such as automatic scanning. This step is for those children who have developed some automaticity with single switch activation and might be able to time activations well enough to utilize automatic scanning, inverse scanning or single switch step scanning with a delay time. Timed scanning should be considered for any child who does not have trouble activating a switch on cue. It is especially important when locating a second switch site has been very difficult for a particular child. However, please note that two switch sites without timing may be easier for some children than one switch site with timing.

This is considered a "side step" because it allows you to temporarily try out a different path for those children who might benefit more from automatic scanning, inverse scanning or step scanning with a delay. Then, you can decide it if is better to continue steps 5 through 8 with two switch step scanning or with a timed scanning strategy.   Observe these children closely as you work with them, to make sure they are successful enough to stay actively involved. If they get discouraged, consider going back to two switch step scanning, at least for a period of time. If they are successful with a timed scanning mode, then continue through steps 5 through 8 using timed scanning.

Many people assume that one switch is easier than two switches for a child because the child may fatigue easily.   Fatigue is a factor to consider. But, for the beginner, also consider that increased active involvement on the part of the child and multiple success with two switches, may outweigh the downside of fatigue. Consult the child's OT and PT for help with positioning and switch placement that will reduce fatigue. Monitor the child closely to prevent frustration from fatigue and build endurance over time with highly motivating activities.

Note: Some children, who will later be automatic or timed scanners, will not yet do well at this step and may need to continue with two switches through more steps. Automaticity and the motor skill to time activations may not yet be efficient enough to move to timing at this time. However, these may develop with more purposeful practice with two switches - without the pressure of timing. Periodic observation and trials can help determine if and when it might be appropriate for the child to try automatic scanning.

Note: Automatic or timed scanning may be less fatiguing for some children and end up being the best access strategy for them. But for others, two switch step scanning may

be the best long term access strategy. For some children, it may actually be faster for them. Others will be faster at a timed form of scanning.

Since this step requires more accurate motor control, it is important to select activities that are highly motivating and that do not require difficult cognitive attention from the child.   In order to help the child see this strategy as different from two switch activities, you may want to choose very different activities than ones tried before. By introducing a new activity with this new access strategy, the child will more easily understand that it is used in a different manner. Select simple fun activities, and play with the child, taking a turn using the switch to scan the same way the child will be using it. Many of the previously discussed "light tech" activities can be modified for timed scanning. Numerous fun software actives are available to try with children. Look at software that scans from companies such as:

Creative Communicating - http://www.creative-comm.com
Inclusive TLC - http://inclusiveTLC.com/
Judy Lynn Software - http://www.castle.net/~judylynn/
RJ Cooper -   http://www.rjcooper.com
Simtech - ! http://www.hsj.com/
Soft Touch - http://www.funsoftware.com/softtouch/

In addition, any of the two switch step scanning activities on this CD may also be used in an automatic scanning mode. Either attach an automatic scanning overlay, instead of the 2 Switch Step Scan Overlay, or use the Dedicated Scanning Mode under Options. With Dedicated scanning, plug the switch into a switch interface that sends either the keyboard equivalent of the number 1 or space. For programmable switch interfaces, you can use built-in automatic scanning by programming the switch interface to send Control / Enter.

Timed Scanning Modes:

1. Automatic scanning - One switch starts the scan and also stops it. (Scan time between items is adjustable.)

2. Inverse scanning - One switch is held down until desired item is reached and then the switch is released to accept that item. (Scan time between items is adjustable.)

3. Step scan with delay - One switch is repeatedly activated, and must be released to move to next item. Then, when the desired selection is reached the user stops activating the switch and waits for a preset delay time and if the switch is not reactivated within

that time, then the selection will be made by the device. (Acceptance time is adjustable.)

Note: There have been other forms of scanning, such as activating the switch a short time to scan and a long to accept. These are not very commonly used, but may be useful for some children.

Stepping Stone #5: Two Switch Step Scanning - Errorless Learning

This step provides the child with a variety of fun opportunities to practice two switch step scanning, where any choice may be selected. Instead of just selecting one of two choices, the child now has a list of choices that may be accessed through step scanning. Switch one lists and/or moves a highlight through the choices and switch two selects the last listed or currently highlighted choice. There are no right or wrong choices. However, some choices might be more interesting to the child than others. The idea is that the child is rewarded for making any choice, but at the same time, if the child would like to make a specific choice she also has that option.

The best way to learn this step is through modeling, by having an adult, peer, sibling, puppet, or action figure take turns with the child, using the child's switches. This stage should allow the child opportunity for trial and error, instead of directed instruction such as: "get the _____." Through trial and error, the child is in control and will usually be more actively engaged. When someone else is taking a turn, self-talk is very useful. For example, when choosing a verse of Wheels on the Bus, you can say: "I'm going to choose the Doors, hmm, wheels, no, driver, no, horn, no, doors, yes!" Use this self talk as you activate each switch, going slowly enough for the child to process what you are doing.


Sibling Modeling use of Head Switch

**Adult and Toy Modeling use of Head Switch**

Examples of errorless scanning activities on this CD include; choosing verses of a song to be sung in any order **(Wheels on the Bus - Imported)**, selecting letters for pages of an alphabet book at random **(abc book LJB)**, "scribbling" with a talking word processor with a limited set of letters **(Emily play with letters)**, using different computer voices to listen to a selected tongue twister or silly sayings **(Tongue Twisters LJB)**, write an errorless letter to a friend **(Errorless letter LJB)**, **(Errorless Action letter)**, creating an errorless rhyme **(Errorless Story)**, choose a vehicle verse of a song **(Vehicle Explore** or **Step Scan 4 Vehicles)**, chose a vehicle and then an action **(Go Vehicle)**, and choose a plastic bug to place on which body part **(Bugs on Me)**,
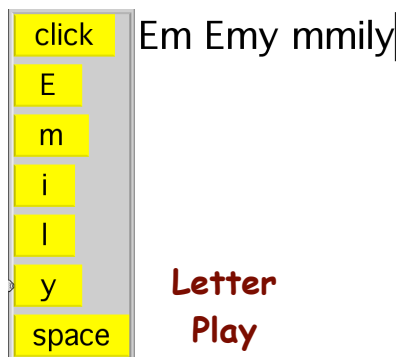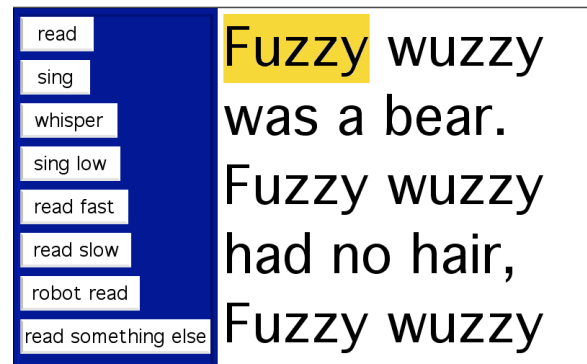
Errorless Scribbling, Making Play Shopping Lists, and Reading Tongue Twisters

Communication devices that utilize two switch step scanning may be set up with simple pages that allow the child to direct action of others through an errorless set of vocabulary. For example: playing follow the leader or directing someone to draw a picture. See suggested vocabulary below.

Draw a face:
- Draw a head
- Make it Big
- Make it Small
- Make it Silly
- Draw a nose
- Draw an eye
- Draw a mouth
- Add some straight hair
- Give it curly hair
- I want silly hair
- That's goofy!
  That's wild!
- That looks great!

Follow the Leader:
- Everybody, clap your hands
- Stop!
- Everybody stamp your feet!
- All right!
- Everybody act like a chicken!
- You guys are so silly!
- Now who wants to be the leader?

Stepping Stone #6: Two Switch Step Scanning for Clear Choices – Activities for Increasing Accuracy and Cognitive Engagement

This step helps children refine their choices by making some choices more interesting or more right than others, thus increasing cognitive engagement for the child. Feedback for incorrect choices is not punitive or negative, but rather, it is neutral. Feedback for appropriate choices matches the natural context of the activity and is more positive. For example, blanks can be inserted into an array of choices, within a computer activity or on a communication display. When a blank is selected, nothing happens, or the feedback may state "nothing there". When something besides a blank is selected it produces the usual result. When using auditory scanning, the blanks can be scanned as "click", or "nothing".

Some children tend to make random choices when just given errorless activities. This is great for beginning practice, but at some point, the child may be ready to move on to something that provides a logical reason to pay attention and not just select randomly. Moving to this step requires a careful judgment call, because you don't want the child to become frustrated if the task is too difficult for him. It may be helpful to offer a variety of Step 5 errorless activities interspersed with activities from this step. This allows the child to "warm up" with an errorless activity and then be challenged with one that offers clearly correct choices, and then move back to an errorless activity when fatigue starts to set in.
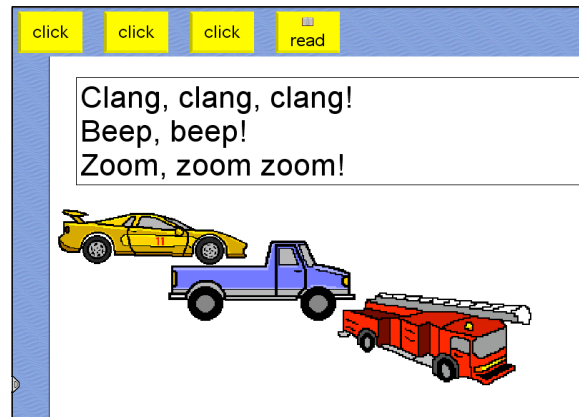
Blanks in Wheels on the Bus Choices

Clang, clang, clang!
Beep, beep!
Zoom, zoom zoom!

Click, Click, Read for Reading a Storybook

Once again, the most effective methods for teaching this step are modeling and trial and error practice on the part of the child. Self talk, when you take a turn, is also still useful. Mention what you are going to try to select, then say: no, no, no, yes (out loud but quietly to yourself) as you take your turn using the switch to find something that is not a blank.   Another thing to consider is that the child will probably activate many blanks as he is learning this process. Since the process of learning a motor skill such as switch access, needs to involve problem solving, selecting blanks should be considered a positive part of the learning process. This is not a time for data collection on correct switch activations. Progress should be measured by how much time the child spends actively engaged in the activity.

A crucial feature of this step is that the number of clicks or blanks before a possible choice should be varied. This is very important, to keep the child focused on the task of looking for or listening for a target word, or making a clear choice, and not just falling into a rote motor pattern of some set number of clicks. The activities on this CD use a rotating set of toolbars/palettes that put the click in a different location for each new choice. For example the first toolbar/palette may show: click, click, read, click, and once read is selected, it changes to one that shows click, click, click, read and then, that changes to click, read, click, click.
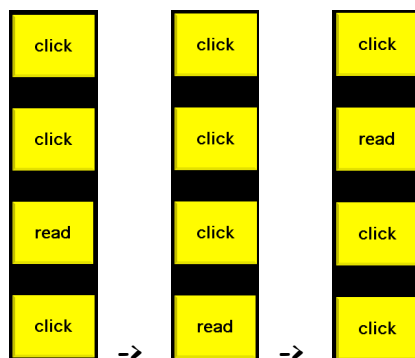
Activities for this step on this CD include: for IntelliTalk: **Click Read Hid Jake**, and **Click Read Hide Template**. For IntelliPics Studio: **Click Read Driving Book**; **Click, Click Read Template**; and **Click Click Sing Template**.

On a communication device you can also use a word like "click" or "nothing" repeatedly and have the child listen/look for a target word such as: "read", "sing", "tickle me", or "show me!" Vary the number of clicks each time by branching to a new page if possible.

If you are using an older computer where the software: Clickit from IntelliTools still works, you can set up a fun activity for listening to an audio CD. Open an audio CD application of some type. One usually comes with the operating system on the computer. Make a few hot spots on the screen on places that a mouse click does nothing have them auditorily scan "click". Then make a hot spot on the next song button that says: "change the song" or make one on the pause button that says: "Turn it on or off."   The child will use the first switch to step through the clicks until she hears one of these phrases and then use the second switch to select it. The new version of Discover Switch from Madentec, should be able to do this type of setup as well.

Stepping Stone #7: Practice for Increasing Accuracy with Two Switch Step Scanning

Children working at Stepping Stone #7 now understand how two switch step scanning works. However, many still need practice with refining motor control for activating switches and since this skill is not yet automatic, some of their cognitive attention is still needed for access. This means that the child may still be working on integrating the use of the switches with her cognitive, language, and sensory abilities. Due to this, inconstancy of performance should continue to be expected. Activities still need to be highly motivating, and be relevant to the child's experiences. The child must have enough variety with interesting activities in order to develop motor automaticity, without getting bored.

Once the child understands the process, then two switch scanning can provide an access strategy to many curricular applications as well as a means of communication. Music, animation, and logical or humorous sequences are often a good starting place. Emerging literacy for creating stories, playing with sounds and letters, or constructing a rhyme or sentence are also motivating for many children.

At this step, children can be exposed to activities that have correct and incorrect selections. But children will probably be most successful when these type of activities continue to be interspersed with errorless activities as well. There are an endless variety of activities that can be set up to give children experience with two switch step scanning using authoring programs and communication devices. The more variety the better.

Activities on this CD that have correct and incorrect choices or illogical choices include: Intellitalk - **(Clean Up Choices)**; IntelliPics Studio - recognizing sight words **(Emily Words LJB)** and **(Ten Sight Words Template)**; finding a hidden car **(z Car Hide 4 Places)**; counting **(Count 1-6 activities)** and **(Count 7-12 activities)**; quizzes **(What Wear?)**, **(Which are Animals?)**, and **(What do you Ride?)**.
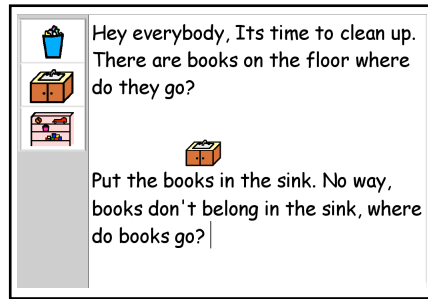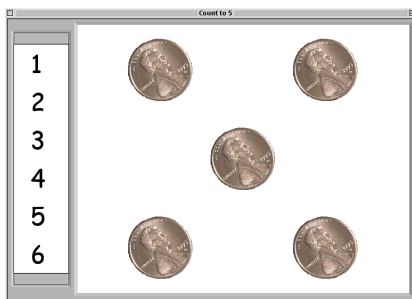
When selecting errorless activities at this level, consider activities that use phrases and sentences that will make more logical sense when combined in certain ways, while still allowing the child to be creative and generative. For example: writing a customized **errorless Letter**, or **Errorless Rhymes**.
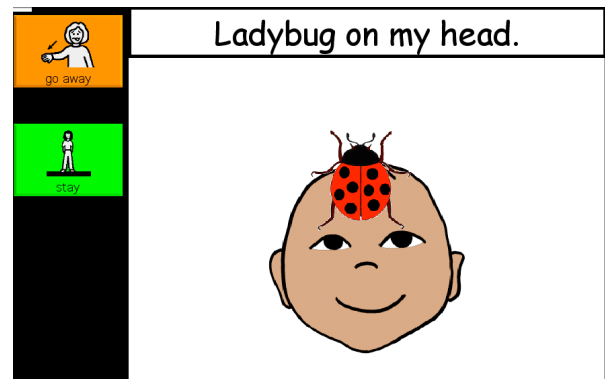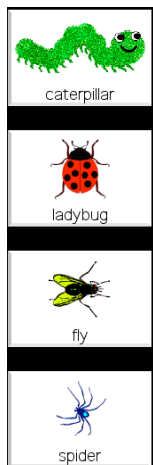
Bugs on Me Activity

Activities such as **Bugs on Me**, become more cognitively engaging when the child is given choices that effect social interaction. For example, Let the child choose who to put
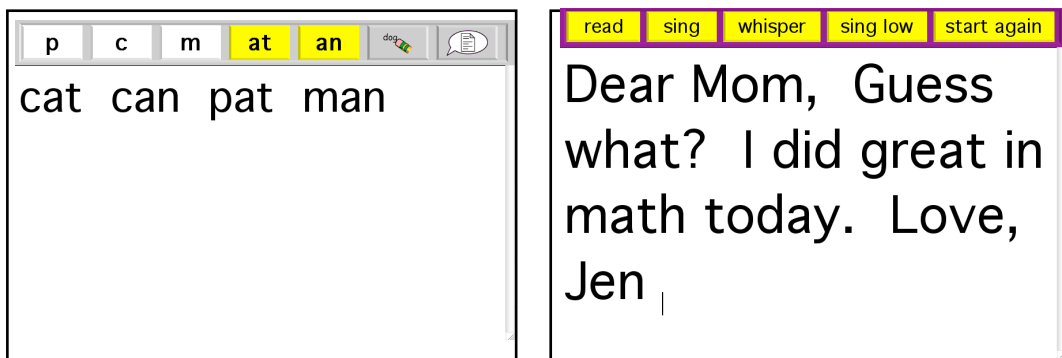
the bug on, through partner-assisted scanning. Such as: "Should we put the bug on Mommy, Ms. Linda, or Daddy?"   The child then uses the two switches with the computer activity to pick the bug and then choose the body part to put it on. Finally the child decides if it should "stay" or "go away!" Make this a social activity where other children and adults take turns to choose these things using the same methods as the child.

For communication displays, select vocabulary items that have different pragmatic intents, so that the responses from the listeners provide clear feedback for the child's comments. This way, the child will learn to "say" the right type of thing at the right time.

Stepping Stone #8: Reducing Time for Success with Two Switch Step Scanning

This is the stage where children have developed some automaticity with the switches and can now use the switches to learn. The child no longer needs to focus on how to use the switches and she can put her attention to the academic or communicative task. Using switches will always demand effort from the child and is a fairly slow way to write and produce work. Because of this, activities can be designed to maximize success while reducing the time it takes to produce the work.

One way to do this is to present a limited array at appropriate times, to increase efficiency. For example, when learning about beginning sounds and word endings, the child can be given a limited set of letters and word endings in order to construct words. (p, c, m, at, an) A similar idea would be to give the child a limited set of letters that can be used for a beginning "Making Words" Activities (Patricia Cunningham). The file on this CD that demonstrates this is **Chunks at an LJB**. The **Errorless Letter Templates** are also perfect for customizing an email to a friend, a Valentine, a journal entry or a book report and provide a quick efficient means to produce something.

p	c	m	**at**	**an**	dog	💬

cat can pat man

read	sing	whisper	sing low	start again

Dear Mom, Guess what? I did great in math today. Love, Jen

Another example would be to use word banks for writing. For example, the child could have a bank of frequently used words in a toolbar/palette of the letters of the alphabet. The child can select a letter from the first toolbar/palette which then automatically changes to a toolbar/palette of words that start with that letter. The child then selects the word, instead of typing each letter of the word. Software with Word Prediction capabilities falls into this category, if the child has enough spelling skills to make use of it.

Sentence starters, phrases, and a customized/limited sets of words, in a palette or toolbar, can be used for specific writing activities. For example words to construct simple sentences can be selected off a list, instead of individually spelled out. There are numerous activities that work in this manner that have been created for children who can use the mouse or the IntelliKeys with Intellitalk. See **Intellitools.com** - activity exchange to locate some of these. These activities may need to be modified for the child who uses switches. For example, instead of beginning with all of toolbars/palettes on the screen, start with just the first one, and once something is selected on that toolbar/palette, make it automatically change to the next needed toolbar. In this way, the child will only have to scan through one toolbar at a time, which reduces complexity and saves time. The action to assign to the selected item or button is "switch to palette" or "switch to toolbar." On this CD, the action "switch to palette/toolbar" is used frequently in activities that use more than one palette/toolbar. For example: **Bugs on Me**, and **Errorless letter templates**.

A good resource for this type of activity is Caroline Musselwhite. She has created numerous writing and poetry activities using this strategy. See her products listed at: http://aacintervention.com/carsoft.htm

On communication devices, use the feature of natural branching to present a limited number of choices at each logical step of a discussion, sequence of activity, composition or story. (For example: the next logical vocabulary needed in a sequenced type activity, automatically appears, instead of having to be navigated to from the main page.)

Activities can be set up as a study tool for students. Vocabulary or other concepts can be listed in a toolbar/palette and the child can select items to practice or learn about. The activity can give written and spoken feedback of definitions and explanations for incorrect or illogical choices. See **Clean up Choices** on this CD for an example of feedback for illogical choices.

Multiple choice and fill in the blank activities may save some children time, for assignments that are not graded for writing skills. An Encoding array, where the child

selects a group of letters and then an individual letter, may be faster than scanning through all 26 letters individually. Other access strategies may also be useful at this level. For example, Morse Code input works with one, two or three switches and can be set up to control all the functions on a computer and/or do written work.

<u>Conclusion</u>

Two switch step scanning is not for every child, but is simply an option that is frequently overlooked and needs to be considered. Because it eliminates the timing factor, it can make a big difference in accuracy and success for a child. Vendors and software developers do not always consider two switch step scanning a high priority and therefore, automatic scanning may be the only alternative access provided. Hopefully, by educating vendors, developers, teachers, therapists and parents about the possibilities of two switch step scanning, more options will be available for children. This access strategy may provide a bridge for those children who are not yet ready for automatic scanning or may provide the only or best option for some students. With the use of two switch step scanning for refining switch use, some children can then move on to single switch automatic scanning which may be less fatiguing for them in the long run. Another progression might be to some type of two switch directed automatic scanning, such as one switch for up/down and one switch for left/right on an array, or Morse Code.

Last Revision: November, 2004