“GOT SWITCH, WHAT’S NEXT?”

**Establishing Switch Access,
Assessing Cognition and Communication,
and Implementing a Training Curriculum
for Individuals Who Use Switches**

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PREFACE

Our Boulder Valley Assistive Technology Team has been working with students with severe to profound disabilities who use switches for communication and environmental interaction and control for a number of years. We have gradually developed a three-stage "system" for working with our students:

1. **establishing basic switch access: determining the type and positioning of the switch(es), and generating a list of preferred and non-preferred activities,**
2. **evaluating cognition and language, and then,**
3. **developing and implementing a skills training curriculum.**

These three stages are not necessarily mutually exclusive—they are ideally interdependent and should form a dynamic unity. Each of the stages has definite challenges: determining positioning and preference in the first stage, judging intentionality, consistency, and communicative intent in the second, and then ascertaining how we as educators might best facilitate this whole process in the third stage. Existing assessments and educational curricula that are appropriate for students with severe to profound disabilities are relatively few and not necessarily customized for switch use. In addition, as we discovered, there are a number of difficulties with adapting various instruments such as the old Uzgiris and Hunt Ordinal Scales (a Piagetian approach for cognitive assessment) and the Nonspeech Test for Receptive and Expressive Language, both written long ago and now out of print (though the Nonspeech test is currently being revised). Several more recent possibilities that have proved useful include:

- **Every Move Counts--Clicks and Chats**
- **The Communication Matrix (online version)**
- **First Things First: Early Communication for the Pre-Symbolic Child with Severe Disabilities.**
- **The SENSwitcher website**
- **ICTS Unit 8: The Development of Switching Skills to Assist Access to the Curriculum for Pupils with Severe and Complex Needs (online)**

Extensive web searches reveal a few research teams in various parts of the world (e.g., the British Isles, Europe, several places in the U.S.) who have been working on various "pieces of the puzzle" but so far no one has proposed a complete "system."

Our current work and thought is represented in this document and is based on our own experience in the field, as well as being a synthesis of the work of Rowland and Schweigert, the Saunders team, the Lancioni team, Richard Walter, Tina Detheridge, Ian Bean, Jana Birch, Wetherby and Prizant, Linda Burkhart, and the many other sources listed in the Bibliography.

We hope you find this material useful in your own work with students or clients. If you have any questions or comments, please email us at <bogart_r@msn.com> or <visvader@earthlink.net> or <kaona186@gmail.com>

ESTABLISHING SWITCH ACCESS

Switch access affords opportunity for people with even the most severe disabilities. In our electronic age, switches can operate everything from lights and garage doors to wireless communication. Even the tiniest muscle movement, such as an eye blink, can activate an electronic switch of some type. From the most sophisticated and world renowned physicist like Dr. Stephen Hawking, to the youngest child just beginning to learn the properties of cause and effect, switch access can provide opportunities for active participation, interaction, and control. Before we can assess knowledge and understanding and provide appropriate educational activities, we must first establish a reliable means of switch access.

Establishing reliable switch access means finding a movement that can be willfully controlled and repeated and then matching that movement with an accessible switch. There are switches that can be activated by anything from the kick of a leg, to the transmission of an electronic impulse through a nerve or muscle, to a change in brain wave patterns. For people who have acquired disabilities such as spinal cord injuries, or degenerative disorders such as Lou Gehrig's Disease (ALS), the process of establishing switch access may be somewhat easier in that these people may be able to give accurate feedback about what works best for them. For people with more complicated neurological disorders such as cerebral palsy (CP) or traumatic brain injury (TBI), the process may be more trial and error. There can be multiple options and it can be difficult to determine which movements are most facile. While it may be necessary to continually adjust and refine access methods, the first step is a movement inventory and analysis of movement patterns. Understanding muscle control and movement patterns can be very complex, and physical and occupational therapists can make invaluable contributions in this process. Some general principles of movement apply, and it is important to understand how voluntary muscle control develops from reflex to reaction to refinement.

There is ongoing discussion on whether to utilize reflexive movements in accessing switches. It is in repeating reflexive patterns that we learn to override reflexes and exert voluntary control. Reflexes initially serve a purpose (*for example, rooting reflex: brush a baby's cheek and it will turn its head to find a nipple*) but quickly become unnecessary and can be willfully inhibited (*the baby learns that a nipple is a source of milk and that every touch on the cheek is not a nipple. The baby no longer turns its head every time it feels a touch on the cheek*). Reflexes are based in the ganglia next to the spinal column and do not require the brain, in order to function. In fact, overriding reflexes is a cognitive function of the brain and this is why central nervous system damage can impair or inhibit a person's ability to override or voluntarily control reflexive muscle activity. "Runaway" or uncontrolled reflexes are contributors to abnormal muscle tone and abnormal movement patterns; however, only by repeating, controlling, and refining can we learn motor control. Initially, reflexive movements may not be voluntary but even through reflexive movement, a person can learn that his/her own body movement is related to the operation of an electronic device and can come to understand that

initiating the movement can activate the device (cause/effect). Intentionally operating a device may give the feedback and motivation necessary for a person to learn motor control.

Another important principle of motor control is that, typically, coordination develops first in the head and moves outward. Cephalocaudal (literally head to tail) and proximodistal (core toward extremities) motor development are the guiding principles here. Babies begin by directing eye gaze, then head turning, head righting (head upright), rolling, and then begin using their arms in increasingly purposeful ways. They regard their hands and arm movements and quickly begin using their arms to help them push toward head upright in a prone position. They learn the more refined movements of the hands and fingers as they learn to hold and manipulate objects. Once they learn to control their legs, they can learn to crawl and walk. Generally speaking, a person will have better, more refined control in their head and trunk than in their arms and legs. However, remember that this is not always the case. For example, a quadriplegic with a high level spinal cord injury might have best control using tongue or eye movements while someone with progressive weakness like ALS might best use a fingertip. Additionally, some people with brain damage like CP or TBI can have better control of their legs than their arms. When it comes to the central nervous system, there is considerable individual variation. Also remember that no movement will be successful in accessing a switch unless the person's body, the switch, or both are positioned so that they are anchored securely.

Proper positioning is imperative. The principle that occupational and physical therapists call "mobility on stability" means that coordinated, controlled movement requires a stable base of support. As an example, consider this: Try holding a pad of paper at arm's length with one hand and write on it with the other. It's not easy. It's very difficult to write legibly in that position. You need to support the paper, and probably your hand, on something solid like a counter or desk. In order to write well, you need stability for both your hand and for the surface on which you write. The same principle is true for switch access and can also be applied to computer access, access to communication devices (AAC), and to coordinated movements in general. The switch needs to be stable, in easy reach, and the body and extremities need to be positioned to optimize coordinated movement. Different switches and switch sites (head, hands, legs, etc.) may be required for different positions (sitting, standing, side lying, etc.). Again, consultation with an occupational or a physical therapist can be invaluable here. Proper positioning of both the person and the switch are critical to successful switch access.

"Setup for success" is our overarching guiding principle. Whether or not the person understands their interaction with switch accessible devices, they need opportunities to be successful in order to learn. Usually, simpler is better and the more successful a person can be, the more they will be inclined to continue. Just as an aside, using these guiding principles of starting with the easiest movement to repeat and stable positioning, we have generally had the best success teaching switch access by starting with head turning and/or neck extension. Placing a small button switch just beside and almost behind a student's head, directly on his or her wheelchair headrest, so that all s/he has to do to press the switch is to turn his or her

head slightly, is usually the simplest and most successful way to set up a switch. That said, always try to find the simplest and easiest movements and switches to maximize success. Don't change so much or so frequently as to be confusing but don't be afraid to experiment. As much as possible, change only one thing at a time (switch, switch site, position, activity) and use hard data to evaluate. Setup for success and go from there.

Once you've established basic switch access for your student (including proper positioning and sensory issues), you might consider getting more information on his/her cognitive and communicative abilities. The major questions to address would be:

- **What does the student know? (What's inside his/her head?)**
- **How can students demonstrate what they know? (we can only observe behavior)**
- **How do we provide appropriate learning opportunities?**

The problem is that at this level of interaction, our student can't express through language what he or she needs, wants, or understands. We really cannot know what is inside the student's head (what are they thinking, experiencing, trying to express) and so we need to adopt more of a behaviorist approach—observing behavior, taking data, making judgments about treatment efficacy, and then providing the learning opportunities so that the student can maximize his/her potential.

ASSESSMENT AND IMPLEMENTATION: A THEORETICAL OVERVIEW

❖ **No Prerequisites**

This may be in the realm of "preaching to the choir" for the readers of these pages, but there are a few important points that have been misunderstood, even as recently as 2003 in the professional literature: "Communication" and the term "AAC" may or may not involve the use of a symbol system such as objects, pictures, manual sign, or language. Current conventional wisdom & best practice states that all individuals can learn and thus there are no prerequisites for communication or environmental control. As educators, we can only guess about a student's potential; we have to give them the benefit of the doubt and jump in & work with them.
In the past, therapists and teachers tended to wait until a certain developmental threshold was achieved before introducing specific assistive technologies (AT) or augmentative or alternative communication (AAC) strategies. It is controversial how this is interpreted even now (some recent articles in the AAC literature allude to this). There are NO perquisites for communication; however, we need to keep in mind that communication may look very different and incorporate switches, utterance, gesture, facial expression, etc.—the true sense of "multimodal" communication.

❖ **General Theory: "Big Steps" vs. "Mini Steps"**

Our Assistive Technology Team is always re-thinking and re-evaluating our work and our approach. What follows is based on our own experiences and current level of discussion, evidence-based practice, research (articles, books), and web searches. (please refer to our Bibliography which lists many wonderful resources, and/or feel free to email us for more details or information).

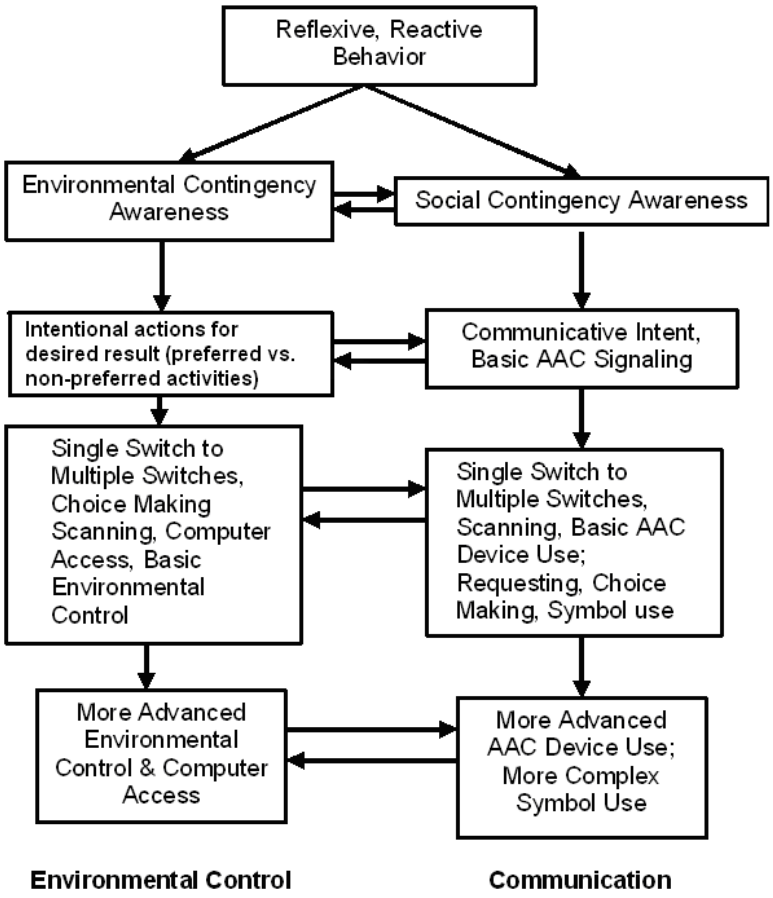
We can view our approach from two perspectives: "Big Steps" (a meta-view or an overview of general skill clusters or categories), and "Mini-Steps" (a more detailed "task analysis" and a framework for a possible skills training curriculum)—we feel that this is the most effective way of seeing the forest as well as the trees.

❖ **"Big Steps": An Introduction**

This is our own sense of the "Big Steps" that a student who uses switches might take to progress cognitively and communicatively. If you notice, we have included two "theoretically" separated pathways or tracks—environmental (or "non-social") control on the left and communication on the right. This separation is based on the findings and implications of the most recent articles in the pertinent literature. Starting with Rowland & Schweigert's work back in the early 1990s and continuing with more recent literature in developmental psychology, social psychology, cognitive neuroscience, and neurology (e.g., some clever experiments using brain scanning). Basically there is a difference in the way our brains process

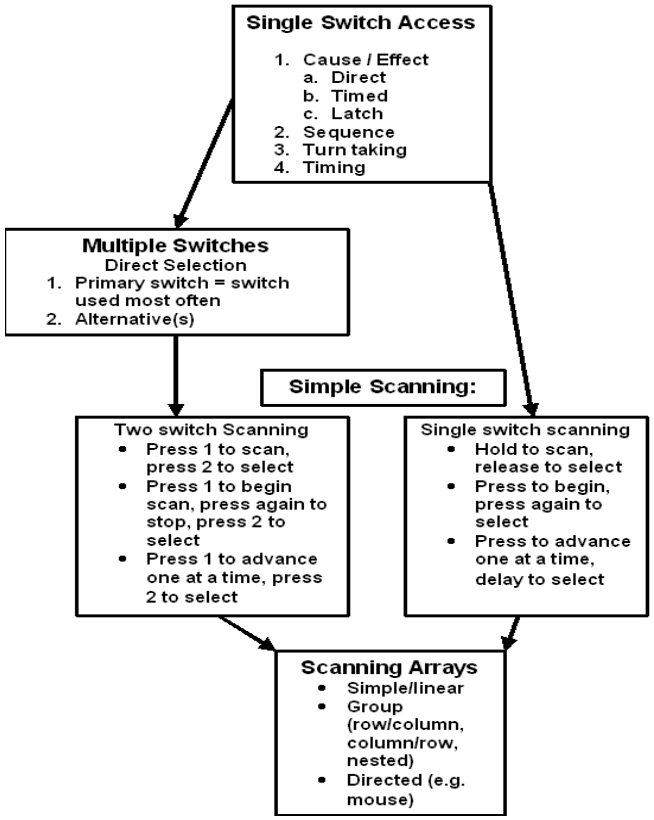
environmental information vs. social information and detect "animacy" vs. "inanimacy." Keep in mind that the separation is clear in theory "in the laboratory" but as you can see with all the intersecting arrows on the chart, in practice (that is to say, outside of the carefully controlled clinic and into the classroom) there is a LOT of overlap and sharing between the tracks. For example, in some of the most recent articles on switch access, individuals use switches to activate various devices, but in relative isolation with the researcher sitting by and recording data OR with an electronic data logger taking data. In the classroom, there is usually always social interaction of some type, with teachers and peers offering encouragement and verbal & physical prompting. Things may not be as "controlled" as in the research clinic.

Communicative/Cognitive Progression



Another facet of the "Big Steps" perspective is a switch training protocol or curriculum which we have developed--starting with single switch cause/effect and going all the way to complex scanning arrays:

Switch Access Training Protocol



❖ "Big Steps": A Consideration of Some Key Topics

Reflexive/Reactive Behavior

The first Big Step level is reflexive and reactive behavior. At this level, the individual is self-involved but is beginning to develop a sense of "self" and "other" ("I am one thing and everything else in the environment is somehow external, separate, and different from me.") In the reflexive stage, the individual has a limited repertoire of behaviors which can be assigned intention and meaning by a caregiver or interactor. Typical reflexive behavior might include things like sucking, grasping, startle, rooting, crying, smiling, and undifferentiated vocalizing.

In the reactive stage, the individual is engaging with stimuli from all his/her senses and beginning to react to objects and people. Examples might include: eyes widening when a new activity begins, expressing feelings differentially using traditional or non-traditional means, reacting to familiar or non-familiar people or preferred or non-preferred stimuli.

Contingency Awareness

The next "Big Step" level is contingency awareness which is "The recognition of the relationship between one's actions and the environmental outcomes these actions elicit." (Fielding, 1995). This is essentially the behaviorist term for "cause & effect" and implies that the student's actions are intentional in some sense—this is beautifully defined by Wetherby and Prizant (1989): "Intentionality may be defined as the deliberate pursuit of a goal. Behavior is intentional if the individual has an awareness or mental representation of the desired goal, as well as the means to obtain the goal." For students who use switches, this may be demonstrated by a change in the frequency or duration of specific movement patterns, whether positive or negative. A positive change indicates a preference while a negative change indicates an aversion.

As mentioned, we've separated "environmental contingency awareness" (or "non-social contingency awareness") from "social contingency awareness." This is the distinction between people and objects, animacy and inanimacy, and social and nonsocial cognition in the field of cognitive psychology. The notion is that people react differently to people and people's actions than they do to objects (including robots) and object motion. Some theorists (the behaviorists like John Watson) believe this is a learned distinction, whereas others (Andrew Meltzoff & Maria Legerstee) believe it is an innate feature of "being human."

Some interesting recent research that would seem to support these theories has been done in the past ten years with brain imaging and the study of "mirror neurons." This research has shown that your brain actually processes things differently when you are watching object motion than when you are watching human motion or action. The "mirror" neurons in your brain are activated ONLY when you are watching a person move or act (not an inanimate object) and the specific neurons that are activated are precisely the same ones that would be activated if you were performing the same action yourself. To illustrate: if you watch someone reach for a banana, your own "banana reaching" neurons will fire. Those neurons would not be activated if you saw a robot arm reaching for the banana.

Communicative Intent

It might be useful to consider some crucial principles concerning the communication track—more specifically, the progression of social contingency awareness leading to bonafide communicative intent—these are THE vital ingredients in the recipe for successful communication.

…encounters with social contingencies are critical to communication development. It is clear that contingency learning tasks with the nonsocial world are insufficient to develop sociocommunicative competence, for they do not address social contingency experiences. (Schweigert & Rowland, 1992)

Put another way, if <u>communication</u> is the goal, you need to…communicate! This might at first glance seem to be a trivial and completely obvious point, and with a typically-developing child it is. However, in the context of switch access, what this means is that simply setting up the switch with a switch toy and setting it in front of the student will NOT teach him/her anything about communicating with another person. Remember, it's a different processing path and a different pathway in the brain. There are two crucial studies ("required reading" for anyone interested in this area) Schweigert, 1989 and Schweigert & Rowland, 1992 where they make this point quite clearly and they go further: if "environmental" contingencies are not working out effectively, "social" contingencies may work better either by themselves or combined with environmental contingencies. (e.g., give ample vocal feedback & encouragement & interaction when the music plays or the lights go on).

Here is psycholinguist Elizabeth Bates' classic definition of communicative intent as quoted in an excellent article by Wetherby and Prizant (1989): "…behavior in which the sender is aware a priori of the effect that a signal will have on his listener, and he persists in that behavior until the effect is obtained or failure is clearly indicated." Communicative intent is separate and distinct from "intentionality" since it requires the awareness of an communication partner and some sense of the partner's state of mind—this is the whole notion of a "theory of mind," so we're progressing here on the "social cognition" track from the basic awareness of animacy to social contingency awareness to theory of mind and communicative intent (in the expressive domain).

The most complete and clearly-stated criteria that we have found anywhere for determining whether a student's actions have "communicative intent" are the ones described in the previously-mentioned Wetherby & Prizant paper. Variations of these criteria have been used in many research projects and publications since 1989.

Wetherby & Prizant (1989) criteria:

1. **alternating eye gaze between a goal and a listener,**
2. **persistence in signaling until the goal is reached,**
3. **changing the quality of the signal until the goal is met,**
4. **using a signal that is ritualized or has a conventional form within a specific context,**
5. **awaiting a response from the receiver,**
6. **terminating the signal when the goal is achieved, and**
7. **indicating satisfaction if the goal is met or dissatisfaction if it is not met.**

Obviously, with our students, some of these skills may not be applicable, or may not be consistently present across all situations or contexts, (e.g., alternating eye gaze) and therefore it can be sufficient to judge communicative intentionality without some of these criteria being demonstrated. Each student and situation is unique.

Another consideration with "communicative intent" is what possible purpose the interaction may serve pragmatically. This is now commonly called "communicative function" and we can see the three major functions of greeting & calling, requesting or protesting (requesting is essentially using the communicative partner as a possible "means to an end" or a "tool" to get something desirable), and finally commenting (which implies more strongly that the student has some sense of the other person's mental state and is trying to establish joint attention):

"Communicative Function":

- **social interaction—greet, call, attract attention**
- **behavioral regulation—request object or action; protest**
- **joint attention—comment on object, action; clarify, request information**

--Wetherby & Prizant (1989, 2004), Camaioni, (1994)

ASSESSING COGNITION AND COMMUNICATION: TECHNICAL ISSUES

There are some very specific technical issues which you encounter as soon as you begin to plan a cognitive/communicative switch assessment. Once basic switch access has been established (e.g., positioning, controlling for sensory issues), you need a very systematic and rigorous way to assess specific factors such as consistency, intentionality, wait time, prompting patterns, attention span, etc.: since there is no other reliable way of assessment, essentially you need to use the scientific method. Why bother? This allows us to more precisely evaluate student capabilities and refine educational programming accordingly--e.g., teaching within Vygotsky's Zone of Proximal Development (ZPD)—this means not having the task be too difficult where the person has no hope of performing properly and not too easy where the person might become bored. In addition, we need to base our training strategies as much as possible on proven research and not anecdotal supposition. The "scientific" approach requires more "objectivity"—we need to step back from the student and really observe, and if we need to, statistically analyze the student's responses. This is very different from role of educator, caregiver, or parent: enabler, encourager, "giving the benefit of the doubt."

We have found that we absolutely need to VIDEOTAPE--you miss too many details and subtleties taking data "in real time." With a videotape, information about switch hits per unit time, and duration of switch activation can be easily be calculated using a stopwatch or converting the numbers from the time counter on the tape itself (some teams use specially-designed electronic data loggers). In addition, it is crucial to arrange the assessment over multiple sessions in order to control for the student simply having a bad day or being tired or moody. Finally, flexibility in assessment planning is vital, since you may come in with one plan of action and find out quickly that it is totally irrelevant!

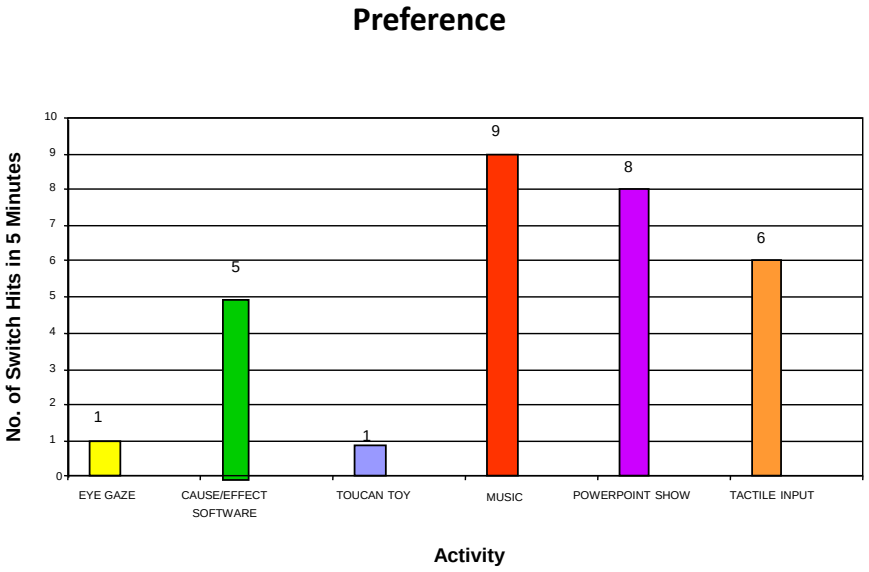
The questions of intentionality and consistency are paramount in terms of understanding the student's ZPD (e.g., with greater intentionality and consistency, you can, to some degree, understand and predict the student's behavior, and learning can hopefully take place more rapidly and the student can communicate and control his/her environment more effectively). The question to ask is "Is there clear intention and consistency of response?" If "yes," then you can proceed easily with more advanced training. If "no" (as is usually the case) then how do you determine intentionality? What is random? What is accidental? How do you make decisions about what is consistent or what might or might not be intentional? Look for consistency of observer interpretation, and allow synergistic collaboration between professionals in different disciplines (and the family).

Here are some crucial considerations when you are trying to determine consistency and intentionality:

1. **Preference**
2. **Wait time**
3. **Prompting patterns**
4. **Attention span**

1. Preference

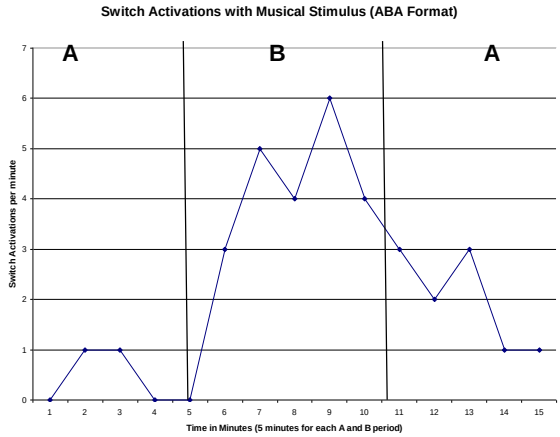
It is ideal to have some prior knowledge of the student's likes and dislikes—this can be done during parent and staff interview sessions (information gathering) which is a crucial part of planning and preparing for the actual assessment time with the student. Here is a bar chart of activities we tried with one particular student several years ago. It is obvious from the results that she really liked music, tactile stimulation, and the Powerpoint show. Presenting the data in chart or graph form like this is ideal for getting the point across: a picture is worth a thousand words!



In order to get an accurate picture of the student's response to the activity (or to determine whether s/he has a consistent sense of contingency awareness) it is important to gather baseline data—with the switch positioned properly but not connected (e.g., without any stimuli). Having little or no activations per unit time is optimal—it means that the student is responding positively to the activity. However, if you find there are substantial activations without the cue being present, this can be confounding for the assessment and should be controlled for in some way. The reasons should be ascertained: is the student "stimming" from the switch itself; is s/he "anticipating the cue" even without the cue present; is s/he generating random movements that do not pertain to the cue at all? Ideally you get nice clean data like in the following chart, with little or no switch activity during the A phases and lots of activity during the B phases (with the stimulus). You don't have to use ABA format. Depending on the situation you can use BAB or ABAB or BABA—the main thing is that you can discern a clear data pattern between the baseline &

intervention phases where the student is reacting to the stimulus and not to other possible internal or external distractions. With our student (who enjoyed moving her head back and forth), we used ABA to get an idea of how many switch activations per unit time were "typical" for her with no stimulus. With other students we have used a variation of BAB and introduced the activity with three trials "for free" (e.g., hand over hand or full physical prompting) in order to "teach" the activity.

PREFERENCE: Baseline & "ABA" Format



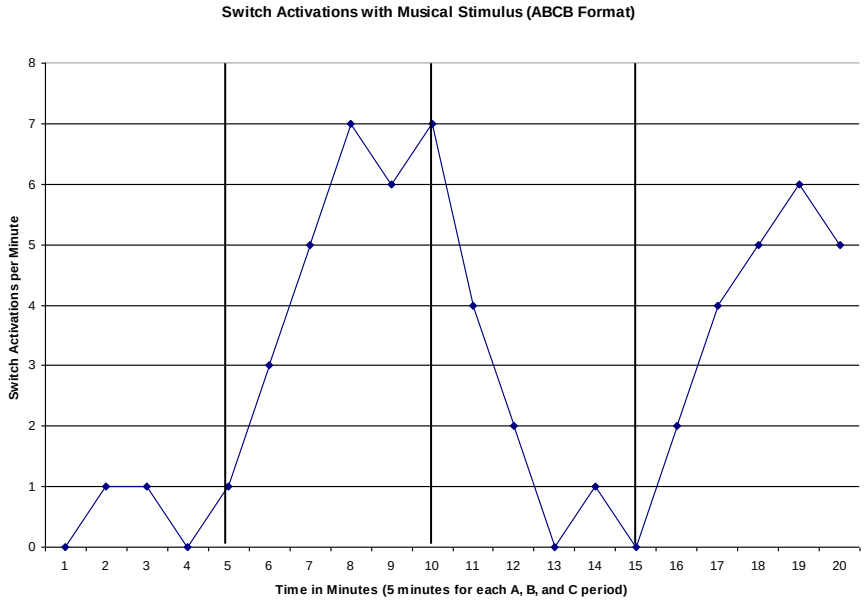
The question arises: what do you measure, and more specifically, do you measure frequency of switch activations or duration? There are no hard and fast answers to this and it really depends on the student and the activity being tried. Richard & Muriel Saunders & their team at the University of Kansas Lifespan Institute (2003) suggest the following:

- **Using switches in a "direct" mode rather than "timed." Using switches in a "timed" mode may be problematic, because although it reduces effort, additional switch closures during the timed interval have no effect. Thus, closing the switch sometimes produces a specific outcome (i.e., stimulus change, stimulus onset) and sometimes it does not. This approach could be a problem, however, for individuals who have trouble holding the switch down in the "activated' position for any length of time.**
- **Using "duration of activation" measures rather than (or at least in addition to) "rate of activation" measures—they found this to be a more reliable and consistent measure of contingency awareness. Rate of activation measures were found to be confounded with direct switch feedback (the pressure and click of actually hitting the switch) and declining rates of response might suggest that the student is tiring when s/he is actually shifting from frequent, short activations of the device to less frequent, longer activations. A possible**

difficulty with this approach might be that long durations can reflect periods of sleep or distraction during which the switch is unintentionally depressed.

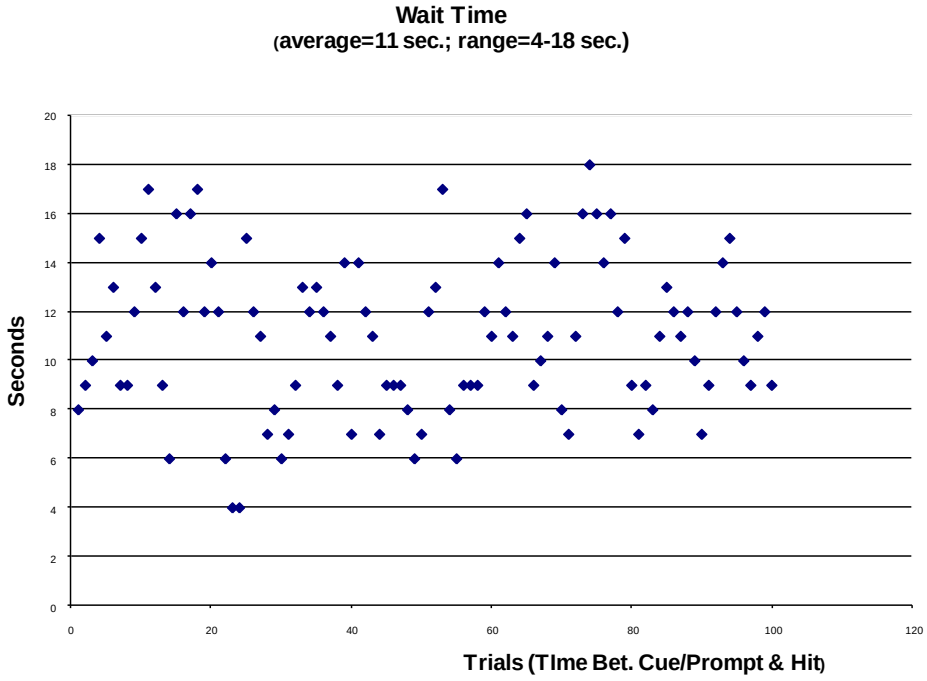
The Saunders team also did some interesting research on the possibility of using a "reversal" design—what they call a DRO procedure (behaviorist terminology for "differential reinforcement of other behavior"). Instead of comparing a baseline A with intervention B and then with another baseline A which should lead to an extinction of the behavior of switch activation, they introduced a REVERSAL of the intervention (C) in which responding de-activated the device. They were able to tell quickly whether the person had contingency awareness and they felt that this method might be preferable in that extinction procedures (e.g., setting the switch to be inactive until no response from the student is elicited), which might disrupt subsequent responding and learning, can be avoided.

ABCB Reversal Design—
Possible use of a "DRO Procedure" (Saunders & Saunders)



2. Wait Time

Wait time or "latency of response" time is also a crucial thing to measure: it can vary tremendously from student to student, activity to activity, and session to session. It is ideal to allow unlimited or maximum latency time and note average, minimum & maximum, and use a scatter plot graph to determine "optimal range" wait time—this is key to intervention & developing a skill training protocol.
Our student had a response range between 4 and 18 seconds, but had most of her responses within about 7-15 seconds (with an average of about 9-10). We might propose from this data that the student typically responds in about 9-10 seconds, needs about 7 seconds to "warm up" and after about 15 seconds, she either needs more prompting or she has possibly lost interest.

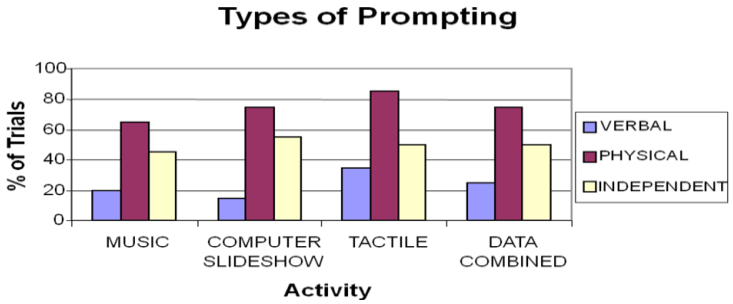


3. Prompting Patterns

If prompts are used, carefully note whatever prompting patterns are used and the precise wording if a verbal prompt is used—prompts are integral factors in generating an intervention and skill training protocol. There is a distinction between "cues" and "prompts." Providing a cue is providing the antecedent stimulus just before a particular behavior takes place. e.g., the music stopping just before having the student hit the switch to play a radio. Frequently the student needs help in learning to respond to a cue. A prompt is a reminder that follows the cue to make sure the student responds to the cue. There are six common types of prompts:

- **verbal (signed) prompts;**
- **pictorial or written prompts;**
- **gestural prompts;**
- **model prompts;**
- **partial physical prompts;**
- **full physical prompt**

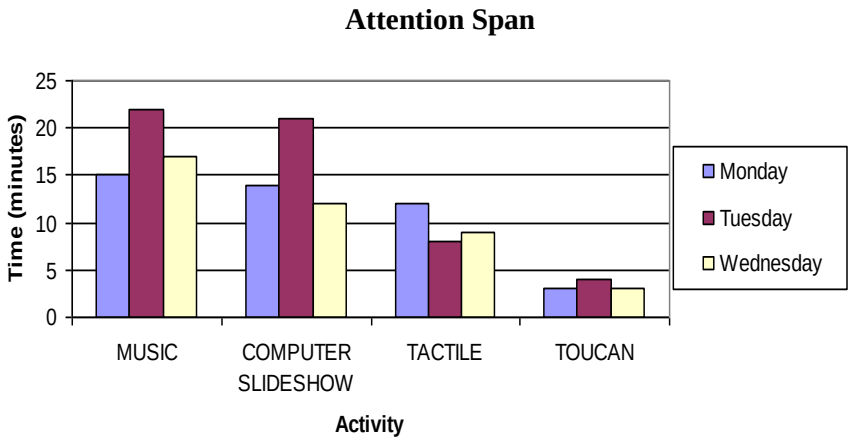
A number of different prompting systems can be used and the one most often recommended for our students is the "least-to-most" hierarchy. This is essentially providing the natural cue first, allowing for sufficient wait time, and then if there is no response, proceeding down the hierarchy sequentially (as needed) through partial and full physical prompts. Here in the graph below is our same student with her prompting patterns displayed in bar graph form. It is readily apparent that physical prompts were the most useful; however, we found out to our surprise that verbal prompts were counter-productive (she became distracted) and we therefore recommended against them.



It should be noted here that some teams (e.g., the Saunders team) maintain that the use of prompts at all is counter-productive and that if the switch is positioned correctly and the reward is pleasurable, the individual will learn to activate the switch effectively through random movements and pure operant conditioning. They feel that prompting can be disruptive and may foster a prompt dependency that can be difficult to transcend.

4. Attention Span

Attention span is another crucial thing to consider—how long the student can spend on task before his/her performance deteriorates, s/he gets tired, distracted, falls asleep, etc. This can obviously vary day to day and activity to activity, and should be measured over a series of sessions in order to develop reliable data. Here is our student again and we can see that music is definitely a favored activity (followed by the computer Powerpoint show) that she can spend substantial time with before losing interest.



Interpretation and Planning

After assessment data has been generated, it might be useful to consider the following variables when analyzing it (e.g., answering the question of "why did the student do what s/he did?"). A less than optimal response might be due to:

- **Refusal! "Just saying no."**
- **The specific activity,**
- **The student's motivation or interest for that particular session,**
- **The specific switch type & positioning (maybe whether it was comfortable or uncomfortable),**
- **Various physical/psychological factors,**
- **Various environmental factors (noise, other people in the room, etc.),**
- **The student's general awareness and attention level (an interesting and revealing question is: does the student understand what is happening? And, can s/he focus appropriately?),**
- **Finally, many other miscellaneous "intangibles."**

At this point the team (including the family/caregivers) need to meet to generating possible interpretations of the clinical data and pose theories based on the assessment results. Revisions and reinterpretations are quite common, especially if the results have been inconclusive, unclear, unexpected, and/or in some way controversial. All members of the team can learn new information or have new insights into the student's behavior and abilities. Final considerations include whether the data has reliability & validity, consistency and repeatability over time, predictive value for training, and whether it can clearly lead to bonafide explanation and interpretation.

Some "artifacts" which can be generated from the assessment include:

- **The switch assessment data sheets--the latest versions are included in the Appendix to this book. We use a "macroanalysis" sheet for online data taking during the assessment or when first watching the videotape) and a "microanalysis" sheet for going back over specific sections of the videotape and analyzing in greater detail things like prompting patterns, contingency awareness, communicative intent, communicative function, etc.**
- **The training protocol sheet (in the Appendix) which is a "quick & dirty" reference for the classroom with basic information on the student and how to set up a switch training program for that student. It would be especially useful for staff members who are unfamiliar with the student.**
- **An edited videotape—a kind of "greatest hits" compilation containing visual information about positioning and what "success" might look like for the student (again, a picture is worth a thousand words).**

DEVELOPING AND IMPLEMENTING A SKILLS TRAINING CURRICULUM: "Mini-Steps"

As we all see ourselves as separate from our surroundings, we also explore, experience, and respond to our world. Understanding how our actions affect the world around us, we adjust, adapt, and act accordingly. Our senses give us information (visual, auditory, tactile, gustatory, olfactory, kinesthetic, and proprioceptive), our brains receive and process that information and signal our bodies to react appropriately. As we grow and develop, we learn to modify and refine our actions and reactions. We learn to overcome our reflexive responses and to act in more purposeful ways. Opportunities for meaningful actions are the building blocks of meaningful, purposeful participation in life activities. We use our abilities to adapt to the demands of the environment and the tasks at hand. Disabilities that interfere with the cycle of sensation, understanding, and movement can impair successful interaction with the environment. For students with severe disabilities, our "Mini-Steps" toward switch access can provide the necessary opportunities for success.

The "Mini-Steps Checklist" which begins on the next page, is comprised of each stage of "Big Steps" (both the Communicative/Cognitive Progression and the Switch Access Training Protocol) broken down into a detailed, task-analyzed progression of skills that a student might follow in learning in both environmental control and communicative tracks.

It represents our current thinking based on our experiences with students, our discussions with colleagues, and is a synthesis and an expansion of the systems used in British schools for students with PMLD or Profound and Multiple Learning Difficulties (e.g., Richard Walter, Tina Detheridge, Ian Bean, and the SENSwitcher website), and, in addition, the work of Jana Birch, the Nonspeech Test, and many of Rowland & Schweigert's publications. The "Mini-Steps" checklist might be useful as a tool for planning skills training strategies and generating customized and appropriate educational goals & objectives.

At the outset, we want to emphasize several important points:

- **Each student has a unique learning style which may feature "splinter" or "scatter" skills and abilities that s/he may demonstrate inconsistently at best. The steps, sequences, and flow charts in this discussion are meant to be used flexibly and customized as necessary or appropriate. For example, not every category or "small step" needs to be mastered sequentially before the student is "allowed" to progress to the next level (e.g., not every student will use scanning). That said, it might also be inadvisable to add more than one level of "complexity" at a time--e.g., moving from very basic contingency awareness mini-steps directly to pressing a switch with picture symbols, voice output and generative language (see Cress, 2001 for an excellent discussion). Each student needs to be carefully and sensitively assessed and a skills training protocol should be formulated according to his/her unique profile and learning aptitude/ability.**

- **We need to be very careful before making blanket declarations like "our student has mastered cause and effect" or "our student does not demonstrate communicative intent." A student may progress "vertically" in terms of mastering a particular skill such as cause and effect, but also "horizontally"--that is, exhibiting a particular skill in certain specified contexts (this is represented in our Mini-Steps section in the final column: Purpose/ Activity/Context). For example, s/he may demonstrate consistent and reliable cause and effect with activating a tape player to play music, but may not with another type of device like a blender. Or alternatively, s/he may perform more effectively in certain settings or with certain people. Part of the training protocol may (or may not) involve generalizing abilities into different environments and contexts. Again, the primary consideration is to generate an accurate "profile" of abilities in order to more precisely target appropriate training goals and objectives.**
- **It also should be noted although switch access may serve as an initial introduction to formal AAC for many students, it may not be the end point of a system, unless they are using scanning. For example, a functional communicative skill such as requesting might be accomplished with a certain stylized behavior as well as, or instead of using a switch. Choice making might be accomplished through various "modes" from a small array, a large array, or a dedicated device. In the "Mini-Steps" section, these possibilities are indicated, when appropriate, by placing the functional skill (e.g., "calling for attention") first, and then offering the possibilities of using a Speech-Generating Device ("SGD"), or traditional (vocalization, facial expression, gesture, motion, etc.) or non-traditional modes (e.g., modes that are unique and specific to the individual student).**
- **Finally, as Temple Grandin eloquently expresses it: "See the person, not the label."**

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

REFLEXIVE

The individual has a limited repertoire of behaviors which can be assigned intention and meaning by a caregiver or interactor.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student displays reflexive behavior: sucking, grasping, startle, rooting.**				
• **Student displays cries, smiles, undifferentiated utterances.**				

REACTIVE

The individual is reacting to stimuli from all his/her senses and beginning to react (passively) to various types of stimulation

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student responds/reacts to sensory input (tactile, vibratory, auditory, olfactory, visual).**				
• **Student responds/reacts to changes in sensory input.**				
• **Student responds/reacts (e.g., eyes widen) when a sensory activity begins.**				
• **Student responds/reacts when a sensory activity ends.**				
• **Student shows anticipation of sensory input (e.g., smiles, cries, moves during preparation for activity).**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

• **Student shows preference for certain sensory input.**				
• **Student pays attention to or responds/reacts to a device providing sensory stimulus (tactile, vibratory, auditory and/or visual).**				
• **Student pays attention to or responds/reacts to a device with visual stimulus (images, motion, animations).**				
• **Student pays attention to or responds/reacts when a device providing sensory stimulus is turned off.**				
• **Student shows anticipation for a device providing sensory stimulus (e.g., smiles, cries, moves during preparation for activity)..**				
• **Student tracks moving visual images (movement left/right; movement up/down)**				

BASIC CONTINGENCY AWARENESS: SINGLE ACTION

The individual interacts with the switch and input device (reward) and is developing an understanding that an action on his/her part can cause a reciprocal action in the environment. This is clear-cut cause and effect or "contingency awareness": a switch activation or "hit" leads directly to a response (a preferred activity).

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
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G=Gestural prompts—movements to direct attention, pointing
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ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

A logical progression or sequence in this program for using the environmental control unit (the ECU or "mains") sequence can be to move from direct mode to timed mode to latch. In direct mode, there is a direct relationship between pressing (or releasing) the switch and an action (or reward) in the environment. If you press the switch and keep it pressed, the radio plays, if you release it, the music stops, In timed mode, the switch is pressed and released and the activity or reward continues for a specific period of time (this period is controllable on the ECU). When you press the switch again after that, the activity begins again and continues for the same period of time. The latch mode is similar to the switch action we are familiar with in day-to-day activities such as turning on a lamp or radio: you press the switch once and release it and the activity or reward begins and continues indefinitely until the switch is pressed again to turn it off.

When the switch is set to direct mode, data can be taken on either switch activations per unit time (e.g., how many switch hits per minute) or the duration of time that the switch is pressed down, or both (depending on the student)--there are advantages to each approach (e.g., see Saunders, et. al, 2003) and the data may vary depending on the activity. For example, when the control unit is set to "direct," the length of time maintaining pressure on the switch may be more relevant, while when the control unit is set on "timed," the number of times the student presses the switch to reinstate the activity may be the more relevant measurement.

Please note that necessary prompting varies from individual to individual and that some prompting--e.g., verbal--may actually be distracting from the switch-accessible activity and can introduce the element of social interaction. As previously mentioned (p. 17), some teams feel that the use of prompts at all is counter-productive and that if the switch is positioned correctly and the reward is pleasurable, the individual will learn to activate the switch effectively through random movements and pure operant conditioning. They feel that prompting can be disruptive and may foster a prompt dependency that can be difficult to transcend.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• Student shows awareness of switch				
• Student, using random movements, presses a switch (in direct mode)				

POSSIBLE PROMPTS

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G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

and turns on a preferred activity/device.				
• **Student, with prompting, presses a switch in direct mode and turns on a preferred activity/device. Fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate,**				
• **Student shows an increase in movements used to press a switch (direct mode) and turn on preferred activity/device.**				
• **Student shows an increase in movements used to press a switch (direct or timed mode) and reinstate or re-activate a preferred activity/device after the activity has stopped.**				
• **Student shows more switch activations per unit time when device is connected than when it is not connected (e.g., using an "ABA" or "BABA" or "ABABA" or other design format where "A" represents the time the switch is not connected and "B" when it is connected).**				
• **Student presses switch controlling activity/device and pays attention to**				

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G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

the device when the activity is tactile, vibratory, or auditory.				
• **Student presses switch controlling a device and pays attention to the switch when the activity is visual (e.g., student may actually need prompting to pay attention to the device rather than the switch when the activity/stimulus is visual).**				
• **Student presses switch controlling a device and pays attention to the device when the activity is visual (specify level of prompting and fade, as appropriate).**				
• **Student reaches or shows increased attention and searching for the device when the activity stops—(indicate type of sensory stimulus: tactile, vibratory, auditory, visual--visual may be more difficult). Fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.**				
• **Student reaches or shows increased attention and searching for the device when activity stops then presses the switch again to reinstate activity—(indicate type of sensory stimulus: tactile, vibratory,**				

POSSIBLE PROMPTS

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G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

auditory, visual --visual may be more difficult). Fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.				
• **Student presses the switch again when activity/device has stopped—(indicate type of sensory stimulus: tactile, vibratory, auditory, visual --visual may be more difficult). Fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.**				
• **When the switch is set up in direct mode, the student presses the switch down to keep the activity/device on (e.g., the switch is pressed for a longer duration per unit time).**				
• **When the switch is set up in timed mode, the student pays attention to the device when activity stops—(indicate type of sensory stimulus: tactile, vibratory, auditory, visual--visual may be more difficult).**				
• **When the switch is set up in timed mode, the student pays attention to the activity/device and when activity/device stops s/he presses the switch to reinstate the activity.**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

• **Student successfully turns device on and off repeatedly (in any of the three modes—direct, timed, or latch). Fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.**				

CONTINGENCY AWARENESS: SEQUENCED (PROGRESSIVE) ACTIVITY OR "BUILD"

The feasibility of this goal or skill depends on the individual's physical and cognitive profile—it may require the ability to recognize symbols—pictures and/or language. If symbols are introduced, it should be noted that an additional level of complexity is being added to the system (see Cress, 2001). Sequenced, progressive, or "build" programs are ones in which the computer or device responds to each switch press by completing part of a multiple-step action—e.g., drawing part of a picture or progressing along part of a sequence. Repeated switch presses are required to finish the picture or sequence, at which point there is usually a reward of some kind (music, motion, etc.). The program then begins again. With this type of activity, the student is learning to discriminate, concentrate, and also act (pressing the switch repeatedly) within a progressive sequence in order to achieve a desirable goal.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **<u>Baseline skill:</u> Student understands that switch action causes effect (e.g., s/he has mastered crucial steps in previous program "Basic Contingency Awareness—Single Action")**				

<u>POSSIBLE PROMPTS</u>

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

• **<u>Baseline skill:</u> Student is motivated to press switch to cause effect (e.g., s/he has preferred activities) numerous times to engage with activity or device**				
• **Student repeats switch presses in "build" activity: a few times**				
• **Student repeats switch presses: many times**				
• **Student explores "build" pattern: e.g., presses switch repeatedly, attends and/or responds/reacts as the sequence or picture progresses, stops, presses switch again to explore pattern, etc.**				
• **Student recognizes partial image in a familiar picture or a segment within the complete sequence (e.g., student watches, exhibits "collateral" behavior: smiles, laughs, shows surprise, etc.)**				
• **Student repeats build activity repeatedly, shows responses or collateral behaviors (smiles, laughs, shows surprise, etc.)**				
• **Student understands when switch sequence is complete (discontinues pressing the switch or requests reinstatement of the activity)**				

<u>POSSIBLE PROMPTS</u>

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

CONTINGENCY AWARENESS: TIMING AND ACCURACY

The feasibility of this program or goal depends on the student's physical and cognitive profile: s/he must be able to control movements with relative precision. S/he is learning that there's a time to hit the switch and a time not to, based on events that are taking place with reference either to the reward (what's happening on the device or computer) or in response to another individual's actions (taking turns in an interaction). Simply waiting for the opportune moment to hit the switch can be the most difficult part of this type of activity! On the previously-described switch "building" level the student is encouraged to repeatedly press a switch which always gains a reward of some kind. However, this level requires on-line monitoring and sustained attention to the task, and some students may not understand why some of their switch presses yield results and others do not. This stage can be an important precursor to most scanning procedures (see below), since they rely so heavily on the ability of the student to time movements with some relative precision (step scanning is a possible exception).

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Baseline skill: Student understands that switch action causes effect (e.g., s/he has mastered crucial steps in previous program Basic Contingency Awareness—Single Action)**				
• **Baseline skill: Student is motivated to press switch to cause effect (e.g., s/he has preferred activities) numerous times to engage with activity or device**				
• **Student observes that some switch presses do not result in the desired effect (shows surprise, frustration, or other collateral behavior) and begins to try to "correct" for this through trial and error.**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

• **Student observes pattern that dictates when switch presses cause the desired effect and successfully times his/her switch presses to coincide with that pattern (the "pattern" can either be part of the activity itself, as when a toy is on a timer and repeated switch presses will have no effect, OR when taking turns with another partner).**				
• **Student can recognize and correct/repair errors or missteps in the above actions.**				

MAKING CHOICES: MULTIPLE SWITCHES

The feasibility of this option depends on the student's sensory, motor, and cognitive profile—it requires multiple switch sites or locations and it may require the use of symbols of some type (visual, tactile, etc.). If symbols are introduced, it should be noted that an additional level of complexity is being added to the system (Cress, 2001).

*****For the fourth and subsequent steps, periodically alternate the functions of the switches in order to avoid position-bias.**

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Baseline skill: Student understands that switch action causes effect (e.g., s/he has mastered crucial steps in "Basic Contingency Awareness—Single Action")**				
• **Baseline skill: Student is motivated to press switch to cause effect (e.g., s/he has preferred activities) numerous times to engage with activity or device**				
• **Baseline skill: Student uses two (or more) switches positioned in different sites--usually one primary and one (or more) secondary switch site(s).**				
• **With two switches controlling different activities/devices positioned in two different switch sites, the student presses either one repeatedly and shows a reaction to the activity/device, then changes to the other one. (fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.)**				
• **The student presses two switches in different switch sites in a random**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

fashion and responds/reacts to the two different activities/devices controlled by the switches.				
• **With two switches positioned in different switch sites, one connected to an activity/device and one not connected, the student presses the switches in a random fashion and responds/reacts to the activity/device.**				
• **With two switches positioned in different switch sites, one connected to an activity/device and one not connected, the student presses the switches in a random fashion at first, and then presses the connected switch more frequently.**				
• **With more than two switches positioned in different switch sites, one connected to an activity/device and the others not connected, the student presses the switches in a random fashion at first, and then presses the connected switch more frequently or for a longer duration.**				
• **With two switches controlling different activities/devices (one preferred and one non-preferred or less preferred) and positioned in**				

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G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

two different switch sites, the student presses each one randomly and responds/reacts (positively or negatively) to each activity/device. (fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.)				
• **With two switches controlling different activities/devices (one preferred and one non-preferred or less-preferred) and positioned in two different switch sites, the student presses each one randomly at first, and then presses the switch with the preferred activity/device more frequently or for a longer duration. (fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.)**				
• **With more than two switches controlling different activities/devices (one preferred and the others non-preferred or less-preferred) and positioned in different switch sites, the student presses each one randomly at first, and then presses the switch with the preferred activity/device more**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

frequently or for a longer duration. (fade prompting, if appropriate, from physical to partial physical to model to gestural to verbal to independent.)				

SCANNING

Scanning refers to a technique for a sequential display of a set of items and selection using a small number of switches. It can be a useful means of access when direct selection movements are limited, too fatiguing, or lack accuracy. Scanning can be introduced via partner-assisted scanning techniques and/or the introduction of symbols (pictures, text, colors, auditory speech output, etc.). If symbols are introduced, it should be noted that an additional level of complexity is being added to the system (Cress, 2001). In addition, scanning is commonly considered to be a much more difficult physical, cognitive, and sensory task for students than direct selection (it is slower and more laborious, involves substantial waiting, and requires the cognitive ability to comprehend or learn what a "sequence" of different choices means)--see the relevant discussion in Ratcliff, 1994.

Partner-assisted scanning is accomplished with the partner showing/pointing and/or speaking the names of items and the student making the choice either by means of a switch and Speech-Generating Device (SGD), by traditional (vocalization, facial expression, gesture, motion, etc.) or non-traditional means. Partner assisted scanning may be visual (the student relies on visual recognition of the objects and/or symbols), auditory (the partner reads out loud the labels for each symbol or a group of symbols) or a combination of both.

In symbol-based scanning methods, the student is presented with a matrix of symbols from which s/he can choose an item when that item appears as a choice within the scanning sequence. Scanning is usually accomplished with either one or two switches in either an automatically timed progression or a student-controlled stepwise sequence. The variables are speed of scan (for one-switch operation), size of grid (usually 2, 4, 8 or 16), and the elements within the matrix. Scanning is an

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G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

important skill necessary for the operation of switch operated SGDs and of switch based word /symbol processors. There is no hierarchy or skill-level progression within scanning; from a single switch to a two switch method, from step scanning to automatic--all have advantages and disadvantages and depend on the sensory, physical, and cognitive profile of the student.

In learning accuracy and error-correction procedures with scanning, a student initially can be presented with one real choice (the "target"), and with the other possibilities null (blank choices). A next step could be having one preferred choice and the others non-preferred. More equally-preferred choices can be introduced after that point, when accuracy has improved.

SCANNING: PARTNER-ASSISTED SCANNING

Partner-assisted scanning (see above description) can be a way for the student to make choices using a single switch and it may be an excellent introduction to scanning (e.g., choice-making via sequential presentation) for some students—the partner can facilitate by reading the student's responses, giving prompts when needed, and helping with error correction.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Baseline skill: Student has preferred and non-preferred activities and objects that s/he reacts to in a reasonably consistent or predictable manner.**				
• **Possible baseline skill: Student is familiar with the symbols (traditional or non-traditional) used to represent his/her preferred and non-preferred activities and/or objects.**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
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FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

• **Student is presented with two objects and/or symbols (color, texture or tangible symbol, picture, drawing, printed text, voice output content) in a sequential manner and makes a choice using** ○ **direct selection access to a SGD, or else**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student is presented with more than two objects and/or symbols (color, texture or tangible symbol, picture, drawing, printed text, voice output content) in a sequential manner and makes a choice using** ○ **direct selection access to a SGD, or else**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g.,**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

modes that are unique and specific to the individual student).				
• **Student can recognize and correct/repair errors or missteps in the above actions**				

SCANNING: SINGLE SWITCH SCANNING

Single switch scanning can either be automatic or stepwise or a combination. There are many possibilities described in the literature for single-switch scanning. Here are three major ones:

Possibility 1. **The student holds the switch down to start and continue the automatic scanning sequence, and releases the switch to make a choice.**

Possibility 2. **The student presses and releases the switch to begin the automatic scanning sequence, and presses it again to make a choice.**

Possibility 3. **The student presses (and releases) the switch multiple times to proceed (one item at a time) in a user-controlled stepwise sequence, and holds the switch down for a longer duration (a specific "dwell time") to make a choice.**

The feasibility of using single switch scanning depends on the student profile: it requires use of symbols: color, texture or tangible symbol, picture, drawing, printed text, voice output content (if symbols are used, it should be noted that an additional level of complexity is being added to the system). For all three possibilities, the student must be able to recognize the target, understand the scanning sequence, anticipate the scanning pattern as it is in progress, and time his/her movements with relative precision. In addition, for #3, the student must have the patience and stamina to step towards the target.

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Baseline skill: Student has preferred and non-preferred activities and/or objects that s/he reacts to in a reasonably consistent or predictable manner.**				
• **Baseline skill: Student is familiar with the symbols (traditional or non-traditional) used to represent his/her preferred and non-preferred activities and/or objects.**				
• **Student is presented with two or more symbols (color, texture or tangible symbol, picture, drawing, printed text, voice output content) on a scanning device, computer screen, or Speech Generating Device and recognizes a target symbol from the presented array.**				
• **Student activates the scanning sequence of highlighted symbols either by pressing and holding the switch down (Possibility #1), by pressing and releasing the switch once (Possibility #2) or pressing and releasing it multiple times (Possibility #3).**				
• **Student recognizes and anticipates**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

the patterns and progression of highlighted items in a simple linear pattern scanning array.				
• **Student activates or selects the target symbol when it is highlighted either by releasing the switch (Possibility #1), pressing and releasing it (Possibility #2) or holding the switch down for a certain "dwell time" (Possibility #3)--fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate.**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
FOR MORE COMPLEX SCANNING ARRAYS:				
• **Student activates the scanning sequence of highlighted symbols either by pressing and holding the switch down (Possibility #1), by pressing and releasing the switch once (Possibility #2) or pressing and releasing it multiple times (Possibility #3).**				
• **Student recognizes and anticipates the patterns and progression of highlighted items in more complex**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

scanning arrays: group pattern (row column, column/row, nested), or directed pattern.				
• **Student activates or selects the target symbol when it is highlighted either by releasing the switch (Possibility #1), pressing and releasing it (Possibility #2) or holding the switch down for a certain "dwell time" (Possibility #3)--fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate.**				
• **Student can recognize and correct/repair errors or missteps in the above action**				

SCANNING: TWO-SWITCH SCANNING

Two-switch scanning can either be automatic or stepwise, or else a combination of both. There are many possibilities described in the literature for two-switch scanning. Here are three major ones:

Possibility 1. **The student presses (and releases) the first switch to begin the automatic scanning sequence, and presses (and releases) the second switch to make a choice.**

Possibility 2. **The student presses (and releases) the first switch to begin the automatic scanning sequence, and presses (and releases) the first switch again to stop. S/he then presses the second switch to make a choice.**

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

Possibility 3. **The student presses (and releases) the first switch multiple times to proceed (one item at a time) in a user-controlled stepwise sequence, stops when the target item is highlighted, and then presses (and releases) the second switch to make a choice.**

The usual advantage of two-switch scanning is decreased errors. The student has the option of continuing the scan without making a selection if the scan has inadvertently stopped on the wrong choice. The feasibility of using two-switch scanning depends on the student profile: it requires the use of symbols: color, texture or tangible symbol, picture, drawing, printed text, voice output content (if symbols are introduced, it should be noted that an additional level of complexity is being added to the system). For all three possibilities, the student must be able to recognize the target, understand the scanning sequence, anticipate the scanning pattern as it is in progress, and (for #1 and #2 only) time his/her movements with relative precision. For #3, while timing is not critical, the student must have the patience and stamina to step slowly towards the target.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Baseline skill: Student has preferred and non-preferred activities and/or objects that s/he reacts to in a reasonably consistent or predictable manner.**				
• **Baseline skill: Student is familiar with the symbols (traditional or non-traditional) used to represent his/her preferred and non-preferred activities and/or objects.**				
• **Student is presented with two or more symbols (color, texture or tangible symbol, picture, drawing,**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

printed text, voice output content) on a scanning device, computer screen, or Speech Generating Device and recognizes a target symbol from the presented array.				
• **Student activates the scanning sequence of highlighted symbols either by pressing and releasing the first switch once Possibilities #1 and #2), or multiple times (Possibility #3).**				
• **Student recognizes and anticipates the patterns and progression of highlighted items in a simple linear pattern scanning array.**				
• **Student activates or selects the target symbol when it is highlighted either by pressing and releasing the second switch (Possibilities #1 and #3), or pressing and releasing the first switch and then pressing and releasing the second switch (Possibility #2)--fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate.**				
• **Student can recognize and correct/repair errors or missteps in the above action**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

ENVIRONMENTAL INTERACTION & CONTROL: "MINI-STEPS"

FOR MORE COMPLEX SCANNING ARRAYS:				
• **Student activates the scanning sequence of highlighted symbols either by pressing and releasing the first switch once Possibilities #1 and #2), or multiple times (Possibility #3).**				
• **Student recognizes and anticipates the patterns and progression of highlighted items in more complex scanning arrays: group pattern (row column, column/row, nested), or directed pattern.**				
• **Student activates or selects the target symbol when it is highlighted either by pressing and releasing the second switch (Possibilities #1 and #3), or pressing and releasing the first switch and then pressing and releasing the second switch (Possibility #2)--fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate.**				
• **Student can recognize and correct/repair errors or missteps in the above action**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

REFLEXIVE

The individual has a limited repertoire of behaviors which can be assigned intention and meaning by a caregiver or interactor.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student displays reflexive behavior: sucking, grasping, startle, rooting**				
• **Student cries, smiles, makes undifferentiated utterances**				

REACTIVE

The individual is reacting to stimuli from all his/her senses and beginning to react to objects and people.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student's eyes widen when new activity begins**				
• **Student expresses feelings differentially to stimuli using traditional (cries, laughs, etc.) or non-traditional means**				
• **Student has preferred and non-preferred activities and objects, discernable via a repertoire of traditional (vocalization, facial expression, gesture, motion, etc.) or non-traditional behaviors**				
• **Student reacts to the presence of**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

other people				
• **Student reacts to a familiar person providing tactile, visual, and/or auditory input (another person's voice, touch, sight)**				
• **Student reacts to an unfamiliar person providing tactile, visual, and/or auditory input (another person's voice, touch, sight)**				
• **Student attends to a familiar person providing tactile, visual, and/or auditory input**				
• **Student attends to an unfamiliar person providing tactile, visual, and/or auditory input**				

SOCIAL CONTINGENCY AWARENESS

The individual develops an understanding of the relationship between his/her behavior and the behavior of another person. An important distinction between social and non-social ("environmental" in our terms) contingency awareness for the student is the nature or consistency/inconsistency of the reward: when the student learns to hit the switch to activate a radio, the radio will always come on when it is connected. When the student hits a switch to call for attention, a communication partner may or may not be available at all times—the elements of effective timing and the subtleties of social interaction, and a "theory of mind" (some awareness of other people's separateness, sentience, and independent purposiveness) have been introduced.

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
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COMMUNICATION: "MINI-STEPS"

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student anticipates (via smiles, frowns, motions, etc.) a familiar person providing tactile, visual, and/or auditory input.**				
• **Student anticipates (via smiles, frowns, motions, etc.) an unfamiliar person providing tactile, visual, and/or auditory input.**				
• **Student responds/reacts to a familiar person's input with a specific reaction.**				
• **Student responds/reacts to an unfamiliar person's input with a specific reaction.**				
• **Student explores the contingent relationship between his/her actions (and/or switch activations) and reciprocal (general) actions by another person.**				
• **Student explores the contingent relationship between his/her actions (and/or switch activations) and reciprocal (specific) actions by another person.**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

COMMUNICATIVE INTENT: BASIC AAC (CALLING FOR ATTENTION)

If there is no way for the individual to gain attention using natural behaviors, a switch connected to some type of Augmentative/Alternative Communication ("AAC") or Speech-Generating Device ("SGD") may be used. This is the beginning of bonafide "communicative intent:" "…behavior in which the sender is aware a priori of the effect that a signal will have on his listener, and he persists in that behavior until the effect is obtained or failure is clearly indicated." (Elizabeth Bates) Communicative intent is separate and distinct from "intentionality" since it requires the awareness of a communication partner and some sense of the partner's state of mind—the whole notion in psychology of a "theory of mind" (e.g., the student is aware that other people are separate from him/herself and they can act in an independent and novel manner) Obviously, with our students, some of these skills may not be applicable, or may not be consistently present across all situations or contexts, and therefore it can be sufficient to judge communicative intentionality without some of these criteria being demonstrated.

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student calls (initiates) the need for attention from another person using** ○ **a "calling" device (Speech-Generating Device or "SGD") or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

• **Student awaits response from the listener/interactor**				
• **Student indicates satisfaction if attention is gained or dissatisfaction if it is not**				
• **Student terminates the signal/action once the goal (attention) is achieved**				
• **Student persists in activating switch and SGD until goal (attention) is reached**				
• **Student tries other strategies to achieve goal (attention) if the goal is not forthcoming in a timely manner**				

COMMUNICATIVE INTENT: REQUESTING REINSTATEMENT OR REFUSAL

Expressing the desire to repeat or continue a preferred activity (as well as expressing refusal or rejection of an activity) can be powerful initial means for an individual to connect his/her behavior to the behavior of another person. The student is developing an awareness that other people can assist in obtaining preferred objects or activities, whether those objects or activities are nearby and within visual/sensory range or not.

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student makes requests to reinstate or obtain more of a preferred activity presently occurring or nearby object using a** ○ **switch and SGD combination or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Student makes refusals or rejects non-preferred activities presently occurring or nearby objects using** ○ **a switch and SGD combination or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g.,**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

modes that are unique and specific to the individual student).				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Student makes comment (e.g., approval, disapproval) on activity presently occurring or nearby object (joint attention)**				
• **Student makes requests to reinstate or obtain more of a preferred activity not presently occurring or more distant object (e.g., not in the room) using** ○ **a switch and SGD combination or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student makes refusals or rejects non-preferred activities not presently occurring or more distant object (e.g., not in the room) using**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

○ **a switch and SGD combination or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student alternates eye gaze (or facial or body orientation) between a goal, the switch and SGD, and a listener/interactor**				
• **Student awaits response from the listener/interactor**				
• **Student indicates satisfaction if the goal is met or dissatisfaction if it is not met**				
• **Student terminates the signal/action once the goal is achieved**				
• **Student persists in activating switch and SGD until goal is reached**				
• **Student tries other strategies to achieve goal if the goal is not forthcoming in a timely manner**				
• **Student makes comment (e.g., approval, disapproval) on activity**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

not presently occurring or more distant object, e.g., not in the room—(joint attention)				

CHOICE MAKING

Expressing preferences and communicating choices (not just taking a preferred item) is another vital pragmatic function in early communication development. Partner-assisted scanning can be introduced at this point with the partner showing/pointing and/or speaking the names of items and the student making the choice by means of a switch and SGD combination or other traditional (vocalization, facial expression, gesture, motion, etc.) or non-traditional modes (e.g., modes that are idiosyncratic or specific to that individual). Partner assisted scanning may be visual (the student relies on visual recognition of the symbols), auditory (the partner reads out loud the labels for each symbol or a group of symbols) or a combination of both. (Please refer to the Environmental "Mini-Steps" schema for more detailed information.) If symbols are being introduced, it should be noted that an additional level of complexity--an additional "tool"--is being added to the system

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Given two choices, the student makes the choice for a preferred activity from one preferred choice and one foil (a null choice or blank) using** ○ **partner-assisted scanning or**				
○ **two switches and SGDs or**				
○ **other traditional (vocalization, facial**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

expression, gesture, motion, etc.) or				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Given three (or more) choices, the student makes the choice for a preferred activity from one preferred choice and multiple foils (null choices or blanks) using** ○ **partner-assisted scanning or**				
○ **two switches and SGDs or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Given two choices, the student**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

makes the choice for a preferred activity from one preferred and one non-preferred choice using ○ **partner-assisted scanning or**				
○ **two switches and SGDs or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Given three (or more) choices, the student makes the choice for a preferred activity from one preferred and multiple non-preferred choices using** ○ **partner-assisted scanning or**				
○ **two switches and SGDs or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Given two (or more) choices, the student makes the choice for a preferred activity from multiple preferred choices using** ○ **partner-assisted scanning or**				
○ **two switches and SGDs or**				
○ **other traditional (vocalization, facial expression, gesture, motion, etc.) or**				
○ **non-traditional modes (e.g., modes that are unique and specific to the individual student).**				
• **Student can recognize and correct/repair errors or missteps in the above action**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
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FP=Full physical prompts—full physical guidance (hand over hand)
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COMMUNICATION: "MINI-STEPS"

SYMBOL USE: INTRODUCTION

The student performs one "communicative act," and progresses from using the main level/overlay on the SGD to incorporating subsidiary levels/overlays. Choices can be made by means of direct selection access, or else by some type of scanning. (Please refer to the Environmental "Mini-Steps" schema for more detailed information on scanning.) Since symbols are being introduced (visual, tactile, and/or auditory, in the form of words), it should be noted that an additional level of complexity--an additional "tool"--is being added to the system.

Communicative acts can include: refusal (protest or rejection); obtaining (expressing comfort, continuing an action, obtaining more of something, requesting a new action, requesting more of an object, making choices, requesting a new object, requesting objects that are not present); social (requesting attention, showing affection, greeting people, offering things or sharing); or relating information (answering yes/no questions, asks questions, names things or people, makes comments).

Mini-Step	Observed	Mastered	Comments/Cue/Prompt	Purpose/Activity/Context
• **Student recognizes patterns in SGD organization via the item or symbol position on the device and/or the intermediary of symbol (color, texture or tangible symbol, picture, drawing, printed text, voice output content) for** ○ **A single item or symbol on the main level/overlay (a single communicative act);**				
○ **Student recognizes the location of other additional single items or symbols (communicative acts)**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

elsewhere on the SGD				
• **Student recognizes SGD patterns via the item position on the device and/or the intermediary of symbol (color, texture or tangible symbol, picture, drawing, printed text, voice output content) using** ○ **direct selection access to the SGD, or else**				
○ **some type of scanning method. (Please refer to the Environmental "Mini-Steps" schema for more detailed information on scanning)**				
• **Student actively chooses intended message from among possible choices for one item (communicative act) via the item or symbol position on the device and/or the intermediary of symbol (color, texture or tangible symbol, picture, drawing, printed text, voice output content) using** ○ **direct selection access to the SGD, or else**				
○ **some type of scanning method. (Please refer to the Environmental "Mini-Steps" schema for more**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

detailed information on scanning)				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Student locates appropriate item (communicative act) from subsidiary (second or third) level/overlay and activates it as part of an intentional communicative exchange (fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate)**				
• **Student can recognize and correct/repair errors or missteps in the above action**				
• **Student is able to begin to sequence two or more items as part of an intentional communicative exchange (fade prompting from physical to partial physical to model to gestural to verbal to independent, as appropriate)**				
• **Student can recognize and correct/repair errors or missteps in the above action**				

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
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COMMUNICATION: "MINI-STEPS"

SYMBOL USE: REFINING THE BASICS

At this point, the communicative small steps progression can be viewed on a "meta-level" apart from the mechanics of access and production (selection and scanning techniques, device characteristics, etc.). This stage is essentially a progression from very basic functional communicative acts to the production of language: the student learns more and more different types of symbols and, after approximately 50 items, begins to "build," construct, or generate a more complex message or communicative act via simple language organization patterns (combining two or more "signals" into a basic syntax or grammar)—The term "signals" is used here in the same multi-modal sense as in The Nonspeech Test (Huer, o.p.): "…one type of behavior, including speech, which is performed for the purpose of communicating. Communicative signals will include behaviors ranging from vocalization to a gesture to flipping switches on a sophisticated communication device." These mini-steps, derived from the Nonspeech Test, were chosen because they are the most appropriate for individuals who use switches. (in addition, at this point, other language assessments might profitably be introduced to assess linguistic complexity: vocabulary, semantic categorization, syntax, mean length of utterance, morphology, etc.)

Mini-Step	Observed	Mastered	Type of Signal	Comments/Cue/Prompt	Purpose/Activity/Context
• Student uses one signal meaningfully					
• Student uses several signals meaningfully (specify which ones and how many)					
• Student signals one object name					
• Student signals several object names (specify how many)					
• Student signals several familiar object names (specify which ones and how many)					

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

• **Student signals several body parts (specify which ones and how many)**					
• **Student imitates several two-signal combinations (specify which ones and how many)**					
• **Student uses up to 50 signals meaningfully (specify which ones and how many)**					
• **Student spontaneously combines 2 signals (specify which ones and how many)**					
• **Student combines three signals (specify which ones and how many)**					
• **Student spontaneously combines nouns with verbs (specify which ones and how many)**					
• **Student signals several prepositions correctly (specify which ones and how many)**					
• **Student spontaneously combines nouns and adjectives (specify which ones and how many)**					
• **Student uses more than 50 signals meaningfully (specify which ones and how many)**					
• **Student describes experiences**					

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

COMMUNICATION: "MINI-STEPS"

using 2 or 3 signal combinations					
• **Student answers wh- questions (specify which ones)**					
• **Student combines signals to express possession (specify)**					
• **Student spontaneously asks wh-questions (specify which ones)**					
• **Student constructs SVO (subject-verb-object) sentence(s)**					

POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

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Appendix

Switch Access

ON-GOING ACTIVITY PREFERENCE LOG

Student: School year:

Preferred Activities (Favorites)	Non-Preferred Activities (No interest or aversion)

BVSD Assistive Technology Team:
Rosemary Bogart, OT
Anja Kintsch, teacher
Paul Visvader, SLP

SWITCH ACCESS ACTIVITY RECORD

Student: _____

Date:	Activity:	+/-	Position:	+/-	Switch/Site:	+/-	Comments:	Initials:

+/- = General impression – Would you use this intervention again?

Rosemary Bogart, 8/01

SWITCH ACCESS ACTIVITY RECORD

Date:	Activity:	+/-	Position:	+/-	Switch/Site:	+/-	Comments:	Initials:

Special Education Teacher:	Para –educator(s):
OT:	
PT:	
Speech therapist:	

+/- = General impression – Would you use this intervention again?

Rosemary Bogart, 8/01

Switch Access Evaluation
Session "Record of Activities" Sheet--Macroanalysis

Student _____Date_____ Observer(s)_____

Student position	Switch position	Switch type/ mode	Activity/ device	Prompt/assist (see below)	Student action/reaction	Comments: Familiarization protocol, level of alertness, attention, misc. observations

Switch Access Evaluation
Session "Record of Activities" Sheet--Macroanalysis

Notes:

(1) POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
G=Gestural prompts—movements to direct attention, pointing
M=Model prompts—demonstrations of the target behavior
PP=Partial physical prompts—brief touching, tapping, nudging, pushing, pulling
FP=Full physical prompts—full physical guidance (hand over hand)
O=Refusal, no response

(2) INDICATIONS OF COMMUNICATIVE INTENT (after Wetherby & Prizant, 1989, 2004)

AEG---alternating eye gaze between a goal and a listener
PSGR---persistence in signaling until the goal is reached
CQS---changing the quality of the signal until the goal is met
UCS---using a signal that is ritualized or has a conventional form within a specific context
ARR---awaiting a response from the receiver
TSGA---terminating the signal when the goal is achieved
ISGM---indicating satisfaction if the goal is met
DGNM---Indicating dissatisfaction if goal is not met

(3) COMMUNICATIVE FUNCTION (after Wetherby & Prizant, 1989, 2004)

BR---Behavioral Regulation—act used to regulate the behavior of another person to obtain a result (request object, request action, protest)
SI---Social Interaction—act used to attract or maintain attention to oneself (request social routine, greet, attract attention, call, request permission, acknowledgement)
JA—Joint Attention--- acts used to direct another's attention for purposes of sharing the focus on an entity or event (comment on object, comment on action, clarification, request information

Switch Access Evaluation
Data Collection Form--Microanalysis (Use with Coding Key)

Student _____ Date_____ Observer(s)_____ Live/Video

Student position	Switch position	Switch type & mode	Activity/ device	(A) Time that cue occurred on VCR indicator	(B) Switch pressed: time on VCR indicator	Wait time-- B minus A	(C) Switch released: time on VCR indicator	Total duration: time switch is pressed-- C minus B	Total duration: time that switch is not pressed	Prompt (see Coding Key #1)	Student action or reaction	Intent; cont. aware-ness (+/-)	Comm. Intent (see Coding Key #2)	Comm. Function (see Coding Key #3)	Comments

Switch Access Evaluation: Data Coding Key

(1) POSSIBLE PROMPTS

I=Independent—independent level (no prompts or just the cue)
V=Verbal (or signed) prompts—words or signs that tell the student how to respond
P or W=Pictorial or written prompts—pictures or line drawings telling how to respond
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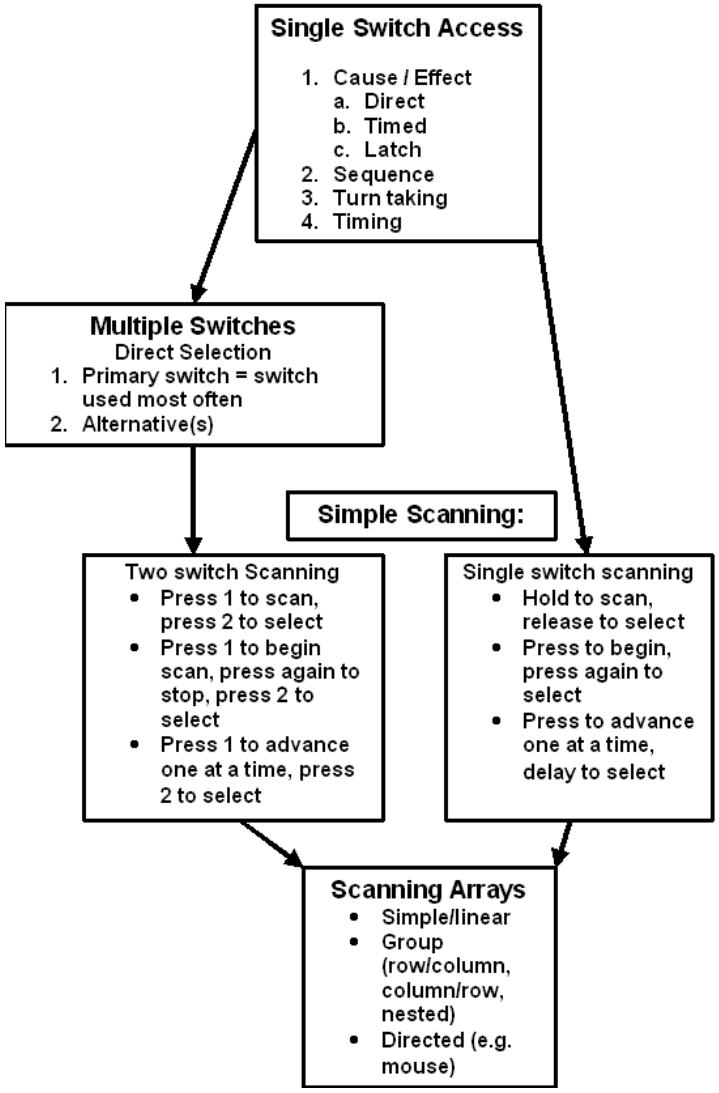
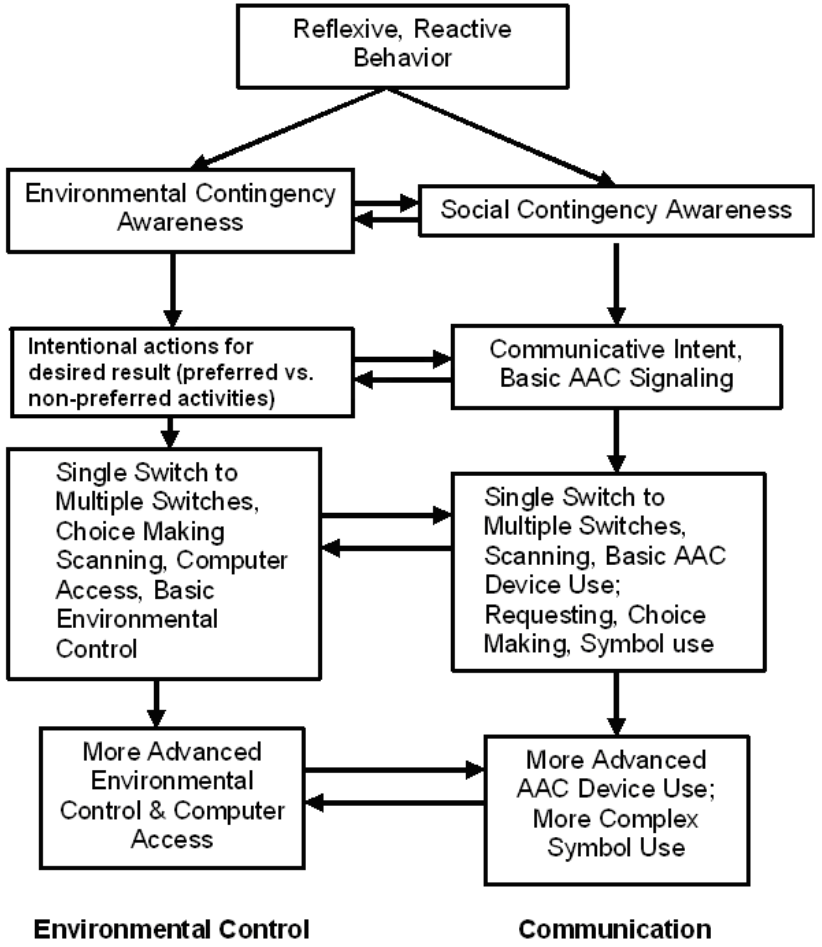
JA—Joint Attention--- acts used to direct another's attention for purposes of sharing the focus on an entity or event (comment on object, comment on action, clarification, request information)

Switch Access Training Protocol Diagram



Communicative/Cognitive Progression for Individuals who use Switches



INTERVENTION PROTOCOL

Student:	**School:**
Teacher/Clinician:	**Date:**

Physical & environmental considerations & precautions (e.g., seizures, light or sound sensitivity, etc.)

Motor Skills

Communication Skills

Cognitive Skills

Wait Time

Familiarization Protocol When introducing a new activity…

Goals

Objectives

Switch Setup: General Considerations

Switch Setup

POSITION	SWITCH TYPE	PRIMARY SWITCH SITE	SECONDARY SWITCH SITE

Activity Setup

ACTIVITY	ENVIRONMENT	POSITIONING	EQUIPMENT	PROMPTS

SWITCH ACCESS for EDUCATION

Students with severe physical disabilities need switches to participate in many activities. By activating a switch connected to an electronic device, these students can explore and interact with their environment, communicate with other people, and operate computers.

SWITCHES CAN OPERATE

Environmental controls:

- electronic toys and games
- popcorn poppers, blenders, lights, fans, and other appliances
- tape recorders
- radios, TVs, VCRs

Communication devices:

- message recording devices
- electronic speaking devices

Computers:

- switch activated games and activities
- mouse click
- pre-programmed "hot spots" to allow mouse activation of any Macintosh program
- typing by scanning an "on-screen" keyboard or through Morse code
- authoring software such as "PowerPoint" to give reports, read stories, poems, etc.

WHAT TO DO:

1) Find a switch the student can access.
2) Position the switch so the student can reach.
3) Make favorite music available on a tape player.
4) Make greetings available on a message recorder
5) Keep a log of preferred and non-preferred activities.
6) Monitor switch use and look for successful sites that the student can really control (don't make changes *too* often).
7) Offer choices of activities with more than one switch.
8) **Remember: Set up for success!**

NECESSARY EQUIPMENT:

Each student needs their own:

- Switch or switches
- message recording device

Equipment which can be provided on a per school basis and shared:

- tape player
- control unit for plug in devices
- battery adapter(s)
- computer switch interface or switch adapted mouse or keyboard
- specialized computer software for switch access

SOME VENDORS:

AbleNet
www.ablenetinc.com
Assistive Technologies, Inc.
www.assistivetech.com
ATKidSystems
www.atkidsystems.com
Don Johnston
www.donjohnston.com
Dynavox Systems
www.dynavoxsystems.com
Enabling Devices
www.enablingdevices.com
Inclusive TLC
www.inclusiveTLC.com
Intellitools
www.intellitools.com
Judy Lynn
www.judylynn.com
Marblesoft
www.marblesoft.com
Prentke Romich
www.prentrom.com
RJ Cooper
www.rjcooper.com
Simtech
www.hsj.com
SoftTouch
www.softtouch.com
Tash
www.tashinc.com
Toolfactory
www.toolfactory.com
Words+
http://www.words-plus.com/website/products/products.htm

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SWITCH ACCESS for EDUCATION

Activity ideas for younger children:

GROUP ACTIVITIES:

- **Taped messages** such as greetings, jokes, and stories. Students can use recorded messages to tell what they did over the weekend or to report home from school.
- **Sharing/show and tell**
- **Playing music** on radio or tape
- **Games** like "Red light/Green light", "Simon Says", or "Musical Chairs"
- Use a tape player or simple message recording device for "**circle time" games and activities**. Repetitive phrases work especially well. If a whole poem or song is used, the child playing the tape can be leader, (they can't adjust their rate to follow)
- **Read directions** to classmates on tape or computer. Good for recipes, science projects, etc.
- **Making smoothies or popcorn.** Any electronic appliance can be controlled with a single switch.
- **Science projects** using electricity

INDIVIDUAL ACTIVITIES:

- **Reading books** on tape, computer, or slide projector
- **Computer access** - typing and even mouse can be controlled with a single switch.
- Special software is available for switch access to **Living Books, Edmark**, and others
- **Matching, patterns, math, and coloring** on the computer
- Switch activated electronic **toys**
- "Living Books" and other **interactive computer software**

Activity ideas for older children:

GROUP ACTIVITIES:

- **Taped messages** such as greetings, jokes, and stories. Students can use recorded messages to tell what they did over the weekend or to report home from school.
- **Class reports, poems, stories,** etc.
- **Lead the Pledge of Allegiance** or other pledges
- **Interview or survey questions**
- **Reading books** on tape, computer, or slide projector. Older children can read stories to younger children.
- **Read directions** to classmates on tape or computer. Good for recipes, science projects, etc.
- **Playing music** on radio or tape
- **Show pictures** on slides
- **Making smoothies or popcorn**. Any electronic appliance can be controlled with a single switch.
- **Science projects** using electricity

INDIVIDUAL ACTIVITIES:

- **Computer access** - typing and even mouse can be controlled with a single switch
- **Spelling, math, and games** on the computer
- **Music and videos**

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