**MULTIPLE MEANS OF ACTION & EXPRESSION**

**Learners differ in the ways that they can navigate a learning environment and express what they know.** For example, individuals with significant movement impairments (e.g., cerebral palsy), those who struggle with strategic and organizational abilities (executive function disorders), those who have language barriers, and so forth approach learning tasks very differently. Some may be able to express themselves well in written text but not speech, and vice versa. It should also be recognized that action and expression require a great deal of strategy, practice, and organization, and this is another area in which learners can differ. In reality, **there is not one means of action and expression that will be optimal for all learners**; providing options for action and expression is essential.

**Physical Action**

A textbook or workbook in a print format provides limited means of navigation or physical interaction (e.g., turning pages, handwriting in spaces provided). Many interactive pieces of educational software similarly provide only limited means of navigation or interaction (e.g., using a joystick or keyboard). Navigation and interaction in those limited ways will raise barriers for some learners—those with physical disabilities, blindness, dysgraphia, or who need various kinds of executive functioning supports. **It is important to provide materials with which all learners can interact. Properly designed curricular materials provide a seamless interface with common assistive technologies**through which individuals with movement impairments can navigate and express what they know—to allow navigation or interaction with a single switch, through voice activated switches, expanded keyboards and others

# *Vary the methods for response and navigation*

Learners differ widely in their capacity to navigate their physical environment. To reduce barriers to learning that would be introduced by the motor demands of a task, provide alternative means for response, selection, and composition. In addition, learners differ widely in their optimal means for navigating through information and activities. To provide equal opportunity for interaction with learning experiences, an instructor must ensure that there are multiple means for navigation and control is accessible.

* Provide alternatives in the requirements for rate, timing, speed, and range of motor action required to interact with instructional materials, physical manipulatives, and technologies
* Provide alternatives for physically responding or indicating selections (e.g., alternatives to marking with pen and pencil, alternatives to mouse control)
* Provide alternatives for physically interacting with materials by hand, voice, single switch, joystick, keyboard, or adapted keyboard

# *Optimize access to tools and assistive technologies*

Providing a learner with a tool is often not enough. We need to provide the support to use the tool effectively. Many learners need help navigating through their environment (both in terms of physical space and the curriculum), and all learners should be given the opportunity to use tools that might help them meet the goal of full participation in the classroom. However, significant numbers of learners with disabilities have to use Assistive Technologies for navigation, interaction, and composition on a regular basis. It is critical that instructional technologies and curricula do not impose inadvertent barriers to the use of these assistive technologies. An important design consideration, for example, is to ensure that there are keyboard commands for any mouse action so that learners can use common assistive technologies that depend upon those commands. It is also important, however, to ensure that making a lesson physically accessible does not inadvertently remove its challenge to learning.

* Provide alternate keyboard commands for mouse action
* Build switch and scanning options for increased independent access and keyboard alternatives
* Provide access to alternative keyboards
* Customize overlays for touch screens and keyboards
* Select software that works seamlessly with keyboard alternatives and alt keys

***Expression & Communication***

There is no medium of expression that is equally suited for all learners or for all kinds of communication.  On the contrary, there are media, which seem poorly suited for some kinds of expression, and for some kinds of learning.  While a learner with dyslexia may excel at story-telling in conversation, he may falter when telling that same story in writing. **It is important to provide alternative modalities for expression, both to the level the playing field among learners and to allow the learner to appropriately (or easily) express knowledge, ideas and concepts in the learning environment.**

# *Use multiple media for communication*

Unless specific media and materials are critical to the goal (e.g., learning to paint specifically with oils, learning to handwrite with calligraphy) it is important to provide alternative media for expression. Such alternatives reduce media-specific barriers to expression among learners with a variety of special needs, but also increases the opportunities for all learners to develop a wider range of expression in a media-rich world. For example, it is important for all learners to learn **composition**, not just writing, and to learn the optimal medium for any particular content of expression and audience.

* Compose in multiple media such as text, speech, drawing, illustration, comics, storyboards, design, film, music, dance/movement, visual art, sculpture, or video
* Use physical manipulatives (e.g., blocks, 3D models, base-ten blocks)
* Use social media and interactive web tools (e.g., discussion forums, chats, web design, annotation tools, storyboards, comic strips, animation presentations)
* Solve problems using a variety of strategies

# *Use multiple tools for construction and composition*

There is a tendency in schooling to focus on traditional tools rather than contemporary ones. This tendency has several liabilities: 1) it does not prepare learners for their future; 2) it limits the range of content and teaching methods that can be implemented; 3) it restricts learners ability to express knowledge about content (assessment); and, most importantly, 4) it constricts the kinds of learners who can be successful. Current media tools provide a more flexible and accessible toolkit with which learners can more successfully take part in their learning and articulate what they know.Unless a lesson is focused on learning to use a specific tool (e.g., learning to draw with a compass), curricula should allow many alternatives. Like any craftsman, learners should learn to use tools that are an optimal match between their abilities and the demands of the task.

* Provide spellcheckers, grammar checkers, word prediction software
* Provide text-to-speech software (voice recognition), human dictation, recording
* Provide calculators, graphing calculators, geometric sketchpads, or pre-formatted graph paper
* Provide sentence starters or sentence strips
* Use story webs, outlining tools, or concept mapping tools
* Provide Computer-Aided-Design (CAD), music notation (writing) software, or mathematical notation software
* Provide virtual or concrete mathematics manipulatives (e.g., base-10 blocks, algebra blocks)
* Use web applications (e.g., wikis, animation, presentation)

# *Build fluencies with graduated levels of support for practice and performance*

Learners must develop a variety of fluencies (e.g., visual, audio, mathematical, reading, etc.). This means that they often need multiple scaffolds to assist them as they practice and develop independence. Curricula should offer alternatives in the degrees of freedom available, with highly scaffolded and supported opportunities provided for some and wide degrees of freedom for others who are ready for independence. Fluency is also built through many opportunities for performance, be it in the form of an essay or a dramatic production. Performance helps learners because it allows them to synthesize their learning in personally relevant ways. Overall, it is important to provide options that build learners’ fluencies.

* Provide differentiated models to emulate (i.e. models that demonstrate the same outcomes but use differing approaches, strategies, skills, etc.)
* Provide differentiated mentors (i.e., teachers/tutors who use different approaches to motivate, guide, feedback or inform)
* Provide scaffolds that can be gradually released with increasing independence and skills (e.g., embedded into digital reading and writing software)
* Provide differentiated feedback (e.g., feedback that is accessible because it can be customized to individual learners)
* Provide multiple examples of novel solutions to authentic problems

# *Executive Functions*

At the highest level of the human capacity to act skillfully are the so-called “executive functions.” Associated with networks that include the prefrontal cortex, these capabilities allow humans to overcome impulsive, short-term reactions to their environment and instead to set long-term goals, plan effective strategies for reaching those goals, monitor their progress, and modify strategies as needed. In short, they allow learners to take advantage of their environment. Of critical importance to educators is the fact that executive functions have very limited capacity due to working memory.This is true because executive capacity is sharply reduced when: 1) executive functioning capacity must be devoted to managing “lower level” skills and responses which are not automatic or fluent thus the capacity for “higher level” functions is taken; and 2) executive capacity itself is reduced due to some sort of higher level disability or to lack of fluency with executive strategies. The UDL framework typically involves efforts to expand executive capacity in two ways: 1) by scaffolding lower level skills so that they require less executive processing; and 2) by scaffolding higher level executive skills and strategies so that they are more effective and developed. Previous guidelines have addressed lower level scaffolding, this guideline addresses ways to provide scaffolding for executive functions themselves

# *Guide appropriate goal-setting*

It cannot be assumed that learners will set appropriate goals to guide their work, but the answer should not be to provide goals for students. Such a short-term remedy does little to develop new skills or strategies in any learner. It is therefore important that learners develop the skill of effective goal setting. The UDL framework embeds graduated scaffolds for learning to set personal goals that are both challenging and realistic.

* Provide prompts and scaffolds to estimate effort, resources, and difficulty
* Provide models or examples of the process and product of goal-setting
* Provide guides and checklists for scaffolding goal-setting
* Post goals, objectives, and schedules in an obvious plac

# *Support planning and strategy development*

Once a goal is set, effective learners and problem-solvers plan a strategy, including the tools they will use, for reaching that goal. For young children in any domain, older learners in a new domain, or any learner with one of the disabilities that compromise executive functions (e.g., intellectual disabilities), the strategic planning step is often omitted, and trial and error attempts take its place.To help learners become more plan-full and strategic a variety of options are needed, such as cognitive “speed bumps” that prompt them to “stop and think;” graduated scaffolds that help them actually implement strategies; or engagement in decision-making with competent mentors.

* Embed prompts to “stop and think” before acting as well as adequate space
* Embed prompts to “show and explain your work” (e.g., portfolio review, art critiques)
* Provide checklists and project planning templates for understanding the problem, setting up prioritization, sequences, and schedules of steps
* Embed coaches or mentors that model think-alouds of the process
* Provide guides for breaking long-term goals into reachable short-term objectives

# *Facilitate managing information and resources*

One of the limits of executive function is that imposed by the limitations of so-called working memory. This “scratch pad” for maintaining chunks of information where they can be accessed as part of comprehension and problem-solving is very limited for any learner and even more severely limited for many learners with learning and cognitive disabilities. As a result, many such learners seem disorganized, forgetful, and unprepared. Wherever working memory capacity is not construct-relevant in a lesson, it is important to provide a variety of internal scaffolds and external organizational aids—exactly those kinds that executives use—to keep information organized and “in mind.”

* Provide graphic organizers and templates for data collection and organizing information
* Embed prompts for categorizing and systematizing
* Provide checklists and guides for note-taking

# *Enhance capacity for monitoring progress*

Learning cannot happen without feedback, and that means learners need a clear picture of the progress that are (or are not) making. When assessments and feedback do not inform instruction or when they are not given to the students in a timely manner, learning cannot change because students do not know what to do differently. This lack of knowledge about what to improve can make some learners seem “perseverative,” careless, or unmotivated. For these learners all of the time, and for most learners some of the time, it is important to ensure that options can be customized to provide feedback that is more explicit, timely, informative, and accessible. Especially important is providing “formative” feedback that allows learners to monitor their own progress effectively and to use that information to guide their own effort and practice.

* Ask questions to guide self-monitoring and reflection
* Show representations of progress (e.g., before and after photos, graphs and charts showing progress over time, process portfolios)
* Prompt learners to identify the type of feedback or advice that they are seeking
* Use templates that guide self-reflection on quality and completeness
* Provide differentiated models of self-assessment strategies (e.g., role-playing, video reviews, peer feedback)
* Use of assessment checklists, scoring rubrics, and multiple examples of annotated student work/performance examples