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# Universal Design for Learning Guidelines

*version 1.0*



# UNIVERSAL DESIGN FOR LEARNING (UDL) GUIDELINES

## Version 1.0

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## Introduction

The goal of education in the 21<sup>st</sup> century is not simply the mastery of knowledge. It is the mastery of learning. Education should help turn novice learners into *expert* learners—individuals who know how to learn, who want to learn, and who, in their own highly individual ways, are well prepared for a lifetime of learning.

Universal Design for Learning (UDL) is an approach that addresses and redresses the primary barrier to making expert learners of all students: **inflexible, one-size-fits-all curricula** that raise unintentional barriers to learning. Learners with disabilities are most vulnerable to such barriers, but many students without disabilities also find that curricula are poorly designed to meet their learning needs.

Diversity is the norm, not the exception, wherever individuals are gathered, including schools. When curricula are designed to meet the needs of the broad middle—at the exclusion of those with different abilities, learning styles, backgrounds, and even preferences, they fail to provide all individuals with fair and equal opportunities to learn.

Universal Design for Learning helps meet the challenge of diversity by suggesting flexible instructional materials, techniques, and strategies that empower educators to meet these varied needs. A universally designed curriculum is designed from the outset to meet the needs of the greatest number of users, making costly, time-consuming, and after-the-fact changes to curriculum unnecessary.

Three primary principles guide UDL—and provide structure for these Guidelines:

- **Principle I: Provide Multiple Means of Representation** (the “what” of learning). Students differ in the ways that they perceive and comprehend information that is presented to them. For example, those with sensory disabilities (e.g., blindness or deafness); learning disabilities (e.g., dyslexia); language or cultural differences, and so forth may all require different ways of approaching content. Others may simply grasp information better through visual or auditory means rather than printed text. In reality, there is no one means of representation that will be optimal for all students; providing options in representation is essential.
- **Principle II: Provide Multiple Means of Expression** (the “how” of learning). Students differ in the ways that they can navigate a learning environment and express what they know. For example, individuals with significant motor disabilities (e.g. cerebral palsy), those who struggle with strategic and organizational abilities (executive function disorders, ADHD), those who have language barriers, and so forth approach learning tasks very differently and will demonstrate their mastery very differently. Some may be able to express themselves well in writing text but not oral speech, and vice versa. In reality, there is no one means of expression that will be optimal for all students; providing options for expression is essential.

- **Principle III: Provide Multiple Means of Engagement** (the “why” of learning). Students differ markedly in the ways in which they can be engaged or motivated to learn. Some students are highly engaged by spontaneity and novelty while others are disengaged, even frightened, by those aspects, preferring strict routine. In reality, there is no one means of representation that will be optimal for all students; providing multiple options for engagement is essential.

At CAST (the Center for Applied Special Technology), we began working nearly 25 years ago to develop ways to help students with disabilities gain access to the general education curriculum. In the early years, we focused on helping individuals adapt or “fix” themselves – overcoming their disabilities in order to learn within the general education curriculum. That work, commonly focused on assistive technologies, is an important facet of any comprehensive educational plan.

However, we also came to see that this focus on assistive technologies was too narrow. It obscured the critical role of the environment in determining who is or who is not considered “disabled.” In the 1990s, we shifted our focus towards the general curriculum and its limitations: how do those limitations contribute to the “disabling” of our students?

This shift led to a simple, yet profound realization: the burden of adaptation should be first placed on the curriculum, not the learner. Because most curricula are unable to adapt to individual differences, we have come to recognize that our curricula, rather than our students, are disabled.

CAST began in the early 1990s to research, develop, and articulate the principles and practices of Universal Design for Learning. The term was inspired by the universal design concept from architecture and product development pioneered by Ron Mace of North Carolina State University in the 1980s, which aims to create built environments and tools that are usable by as many people as possible. Of course, since people are not buildings or products, we approached the universal design problem via the learning sciences. Thus, the UDL principles go deeper than merely focusing on access to the classroom; they focus on access to learning as well.

This work has been carried out in collaboration with many talented and dedicated education researchers, practitioners, and technologists. As the UDL field has grown, so has the demand from stakeholders for Guidelines to help make applications of these principles and practices more concrete.

These UDL Guidelines will assist curriculum developers (these may include teachers, publishers, and others) in designing flexible curricula that reduce barriers to learning and provide robust learning supports to meet the needs of *all* learners. They will also help educators evaluate both new and existing curricula goals, media and materials, methods and assessments.

But first, some clarifications of terms and underlying concepts of UDL may be helpful for understanding these Guidelines. These include:

- What are expert learners?
- What is meant by the term “curriculum”?
- What does it mean to say that curricula are “disabled”?
- How does UDL address and redress curricular disabilities?
- What evidence supports the practices of UDL?
- How are the UDL Guidelines organized and how should they be used?

The pedagogical, neuroscientific, and practical underpinnings of UDL are discussed at greater length in books such as *Teaching Every Student in the Digital Age* by Rose & Meyer (ASCD, 2002), *The Universally Designed Classroom* (Rose, Meyer, & Hitchcock, Eds.; Harvard Education Press, 2005), and *A Practical Reader in Universal Design for Learning* (Rose & Meyer, Eds.; Harvard Education Press, 2006).

### **What are expert learners? Expert learners are:**

1. Strategic, goal-directed learners. They formulate plans for learning, devise effective strategies and tactics to optimize learning; they organize resources and tools to facilitate learning; they monitor their progress toward mastery; they recognize their own strengths and weaknesses as learners; and they abandon plans and strategies that are ineffective.
2. Resourceful, knowledgeable learners. They bring considerable prior knowledge to new learning; they activate that prior knowledge to identify, organize, prioritize and assimilate new information. They recognize the tools and resources that would help them find, structure, and remember new information; and they know how to transform new information into meaningful and useable knowledge.
3. Purposeful, motivated learners. Their goals are focused on mastery rather than performance; they know how to set challenging learning goals for themselves and how to sustain the effort and resilience that reaching those goals will require; they can monitor and regulate emotional reactions that would be impediments or distractions to their successful learning.

### **What is meant by the term curriculum?**

In this document, curriculum (or curricula) is defined broadly to include four basic components:

1. Goals: The benchmarks or expectations for teaching and learning, often made explicit in the form of a scope and sequence of skills to be addressed;

2. Methods: The specific instructional methods for the teacher, often described in a teacher's edition;
3. Materials: The media and tools that are used for teaching and learning;
4. Assessment: The reasons for and methods of measuring student progress.

The term curriculum is often used to describe only the goals, objectives, or plans, something distinct from the “means” of methods, materials, and assessment. Yet since each of these components are essential for effective learning—and since each includes hidden barriers that undermine student efforts to become master learners—curriculum design should consider each of them as a piece.

These guidelines apply to the general education curriculum which, when universally designed, should meet the educational needs of most students, including those with disabilities. This document can help guide the design of expectations, content, methods, and outcomes across differing classrooms in each school or system.

### **What does it mean to say curricula are “disabled”?**

General education curricula are often disabled in the following ways:

1. They are disabled in **WHO** they can teach. Curricula are often not conceived, designed or validated for use with the diverse populations of students which actually populate our classrooms. Students “in the margins”—those with special needs or disabilities, those who are “gifted and talented,” those who are English language learners, etc.—often bear the brunt of curriculum devised for the happy medium.
2. They are disabled in **WHAT** they can teach. Curricula are often designed to deliver information, or content, without consideration for the development of learning strategies—the skills students need to comprehend, evaluate, synthesize, and transform information into usable knowledge. Mainstream curricula are largely constructed around print-based media, which are good at delivering narrative and expository content (such as literature or history) to students who are facile with print but are not ideal for domains—like math, science, and language—that require an understanding of dynamic processes and relationships, computations, or procedures.
3. They are disabled in **HOW** they can teach. Curricula often provide for very limited instructional options or modalities. Not only are they typically ill-equipped to differentiate instruction for differing students, or even for the same student at different levels of mastery, but they are handicapped by their inability to provide many of the key elements of evidence-based pedagogy: the ability to highlight critical features or big ideas, the ability to provide relevant background knowledge as needed, the ability to actively model

successful skills and strategies, the ability to monitor progress dynamically, the ability to offer graduated scaffolding, and so forth. Present curricula are typically much better designed to present information than to teach.

### **How does UDL address and redress curricular disabilities?**

The usual process for making existing curricula more accessible is adaptation of curricula—and especially instructional materials and methods—so that they are more accessible to students. Often, teachers themselves are forced to make heroic attempts to adapt curricular elements that were not designed to meet the learning needs of diverse students. The term “universal design” is often mistakenly applied to such after-the-fact adaptations.

However, Universal Design for Learning refers to a process by which a curriculum (i.e., goals, methods, materials, and assessments) is intentionally and systematically designed from the beginning to address individual differences. With curricula that are universally designed, much of the difficulties of subsequent “retrofitting” and adaptation can be reduced or eliminated—and a better learning environment for all students can be implemented.

The challenge of diversity is not merely to differentiate the curriculum but to do so *effectively*. To do that, UDL depends upon identifying practices that have proven effective not just for the “average” student, if such a student exists, but for those students who are distinctly “not average”: students with disabilities, English language learners, students who have endured sub-optimal instruction in the past, students who are “gifted and talented,” students who are otherwise “in the margins.” Considerable research already exists that identifies evidence-based optimal practices for students presently in the margins. Unfortunately, these best practices have been sparsely available, typically provided only after students have already failed in the mainstream curriculum. They are subsequently provided in separate remedial or special placements where ties to the mainstream curriculum and its high standards have been severed entirely. A UDL curriculum provides the means to repair those severed ties.

While the best educators have found ways to differentiate curriculum for thousands of years, the field of UDL has benefited greatly from the recent advent of powerful digital technologies that make it possible to more easily and effectively customize or personalize curriculum for diverse students. Advances in technology and the learning sciences have made such “on-the-fly” individualization of curricula possible in practical, cost-effective ways. Furthermore, learning and demonstrating effective uses of new media is itself an important instructional outcome. New media dominate our culture in the workforce, communication, and entertainment. Every student now in school needs a much higher level of literacy than ever before, but also a literacy that is much broader and more inductive of the media of our culture.

Consequently, the UDL Guidelines make frequent references to technology options for implementing UDL.

### **What evidence supports the practices of Universal Design for Learning?**

UDL is based upon the most widely replicated finding in educational research: students are highly variable in their response to instruction. In virtually every report of research on instruction or intervention, individual differences are not only evident in the results, they are prominent. Rather than treat these individual differences as irrelevant (or even annoying) sources of error variance, UDL treats them as main effects; they are fundamental to understanding and designing effective instruction. Accordingly, to meet the challenge of high standards, the UDL approach eschews “one size fits all” curriculum in favor of flexible designs with customizable options to meet individual needs. Such options are varied and robust enough to optimize instruction for diverse learners—the learners that are found in every classroom.

The research that supports UDL comes from three categories: first, there is the research basis for the general principles of UDL. The three basic principles are derived from modern neuroscience and the cognitive science of learning, but they also are deeply rooted in the foundational work of Lev Vygotsky and Benjamin Bloom, who espoused nearly identical principles for understanding individual differences and the pedagogies required for addressing them. (For example, Vygotsky emphasized what is also a key point of a UDL curriculum—that supports or “scaffolds” are not permanent but rather are gradually removed as an individual becomes an expert learner—the way training wheels are unnecessary once a person has successfully mastered bike-riding.)

Second, there is the research identifying the specific practices that are critical to meeting the challenge of individual differences—research that has been amassed over decades and by many different researchers in many different universities and laboratories.

Third, there is the research on specific applications of UDL—this new area of research is in its early stages but will take a more prominent place as full-scale curricular applications and system-wide implementations are developed. Because the research on which these the UDL guidelines are based would extend this summary unmanageably, we will be providing the research associated with each guideline in a separate document on this website.

### **How are the Guidelines organized and how should they be used?**

The UDL Guidelines are organized according to the three main principles of UDL that address representation, expression, and engagement. For each of these areas, specific “Checkpoints” for options are highlighted, followed by examples of practical suggestions.

Like UDL itself, these Guidelines are flexible and should be mixed and matched into the curriculum as appropriate. The UDL Guidelines are not meant to be a “prescription” but a set of strategies that can be employed to overcome the barriers inherent in most existing curricula. They may serve as the basis for building in the options and the flexibility that are necessary to maximize learning opportunities for all students. Educators may find that they are already incorporating many of these guidelines into their practice.

The Guidelines presented here are a first draft; they are an outline or précis of what will eventually emerge. While the UDL Guidelines will eventually address the whole curriculum in depth, this first effort focuses most heavily on two curricular components: instructional methods and materials. Admittedly, instructional goals and assessment do not receive adequate consideration in this initial edition but will be in later versions.

These Guidelines are labeled Version 1.0 because we expect that as others contribute suggestions, we will be able to revise and vastly improve them in future “editions.” Our intention is to collect and synthesize comments from the field, weigh it against the latest research evidence, and, in consultation with an editorial advisory board, make appropriate changes, additions, and updates to the UDL Guidelines on a regular basis. This is just a beginning but, we hope, a promising one for improving opportunities for *all* individuals to become expert learners.

# Universal Design for Learning Guidelines

## I. Representation

Use multiple means of representation

### 1. Provide options for perception

- Options that customize the display of information
- Options that provide alternatives for auditory information
- Options that provide alternatives for visual information

### 2. Provide options for language and symbols

- Options that define vocabulary and symbols
- Options that clarify syntax and structure
- Options for decoding text or mathematical notation
- Options that promote cross-linguistic understanding
- Options that illustrate key concepts non-linguistically

### 3. Provide options for comprehension

- Options that provide or activate background knowledge
- Options that highlight critical features, big ideas, and relationships
- Options that guide information processing
- Options that support memory and transfer

## II. Expression

Use multiple means of expression

### 4. Provide options for physical action

- Options in the mode of physical response
- Options in the means of navigation
- Options for accessing tools and assistive technologies

### 5. Provide options for expressive skills and fluency

- Options in the media for communication
- Options in the tools for composition and problem solving
- Options in the scaffolds for practice and performance

### 6. Provide options for executive functions

- Options that guide effective goal-setting
- Options that support planning and strategy development
- Options that facilitate managing information and resources
- Options that enhance capacity for monitoring progress

## III. Engagement

Use multiple means of engagement

### 7. Provide options for recruiting interest

- Options that increase individual choice and autonomy
- Options that enhance relevance, value, and authenticity
- Options that reduce threats and distractions

### 8. Provide options for sustaining effort and persistence

- Options that heighten salience of goals and objectives
- Options that vary levels of challenge and support
- Options that foster collaboration and communication
- Options that increase mastery-oriented feedback

### 9. Provide options for self-regulation

- Options that guide personal goal-setting and expectations
- Options that scaffold coping skills and strategies
- Options that develop self-assessment and reflection

## UNIVERSAL DESIGN FOR LEARNING GUIDELINES

### Principle I. Provide Multiple Means of Representation

Students differ in the ways that they perceive and comprehend information that is presented to them. For example, those with sensory disabilities (e.g., blindness or deafness); learning disabilities (e.g., dyslexia); language or cultural differences, and so forth may all require different ways of approaching content. Others may simply grasp information better through visual or auditory means rather than printed text. In reality, there is no one means of representation that will be optimal for all students; providing options in representation is essential.

#### **Guideline 1: Provide options for perception**

To be effective in diverse classrooms, curricula must present information in ways that are perceptible to all students. It is impossible to learn information that is imperceptible to the learner, and difficult when information is presented in formats that require extraordinary effort or assistance. To reduce barriers to learning, therefore, it is important to ensure that key information is equally perceptible to all students by: 1) providing the same information through different sensory modalities (e.g. through vision, or hearing, or touch); 2) providing information in a format that will allow for adjustability by the user (e.g. text that can be enlarged, sounds that can be amplified). Such multiple representations not only ensure that information is accessible to students with particular sensory and perceptual disabilities, but also easier to access for many others. When the same information, for example, is presented in both speech and text, the complementary representations enhance comprehensibility for most students.

#### ***1.1 Options that customize the display of information***

In print materials, the display of information is fixed, permanent, one size fits all. In properly prepared digital materials, the display of the same information is very malleable; it can easily be changed or transformed into a different display, providing great opportunities for customizability. For example, a call-out box of background information may be displayed in a different location, or enlarged, or emphasized by use of color, or deleted entirely. Such malleability provides many options for increasing the perceptual clarity and salience of information for a wide range of students and adjustments for preferences of others. While these customizations are difficult with print materials, they are commonly available automatically in digital materials.

#### ***Examples:***

- Information should be displayed in a flexible format so that the following perceptual features can be varied:
  - the *size* of text or images
  - the *amplitude* of speech or sound
  - the contrast between background and text or image
  - the *color* used for information or emphasis

- the speed or timing of video, animation, sound, simulations, etc
- the layout of visual or other elements

### ***1.2 Options that provide alternatives for auditory information***

Sound is a particularly effective way to convey the impact or “energetics” of information, which is why sound design is so important in movies and why the human voice is particularly effective for conveying emotion and significance. However, information conveyed solely through sound is not equally accessible to all students and is especially inaccessible for students with hearing disabilities, for students who need more time to process information, or for students who have memory difficulties. To ensure that all students have equivalent access to learning, options should be available for any information, including emphasis, presented aurally.

#### ***Examples:***

- Text equivalents in the form of captions or automated speech-to-text (voice recognition) for spoken language
- Visual analogues for emphasis and prosody (e.g. emoticons or symbols)
- Visual equivalents for sound effects or alerts

### ***1.3 Options that provide alternatives for visual information***

**Graphics, Animations, or Video** are often the optimal way to present information, especially when the information is about the relationships between objects, actions, numbers, or events. But such visual representations are not equally accessible to all students, especially students with visual disabilities or those who are not familiar with the graphical conventions employed. To ensure that all students have equal access to that information, provide non-visual alternatives that use other modalities: text, touch, or audition.

#### ***Examples:***

- Descriptions (text or spoken) for all graphics, video or animations
- Touch equivalents (tactile graphics) for key visuals
- Physical objects and spatial models to convey perspective or interaction

**Text** is a special case of visual information. Since text is a visual representation of spoken language, the transformation from text back into speech is among the most easily accomplished methods for increasing accessibility. The advantage of text over speech is its permanence, but providing text that is easily transformable into speech accomplishes that permanence without sacrificing the advantages of speech. Digital synthetic text to speech is increasingly effective but still disappoints in the ability to carry the valuable information in prosody.

#### ***Examples:***

- Properly formatted digital text (e.g. NIMAS, DAISY). Such text can be automatically transformed into other modalities (e.g. into speech by using

- speech by text-to-speech software or into touch by using refreshable Braille devices) and navigated efficiently by ScreenReaders
- A competent aide, partner, or “intervener” who can read text aloud as needed

## **Guideline 2: Provide options for language and symbols**

Students vary in their facility with different forms of representation – both linguistic and non-linguistic. Vocabulary that may sharpen and clarify concepts for one student may be opaque and foreign to another. A graph that illustrates the relationship between two variables may be informative to one student and inaccessible or puzzling to another. A picture or image that carries meaning for some students may carry very different meanings for students from differing cultural or familial backgrounds. As a result, inequalities arise when information is presented to all students through a single form of representation. An important instructional strategy is to ensure that alternative representations are provided not only for accessibility, but for clarity and comprehensibility across all students.

### ***2.1 Options that define vocabulary and symbols***

The semantic elements through which information is presented – the words, symbols, and icons – are differentially accessible to students with varying backgrounds, languages, lexical knowledge, and disabilities. To ensure accessibility for all, key vocabulary, labels, icons, and symbols should be linked to, or associated with, alternate representations of their meaning (e.g. an embedded glossary or definition, a graphic equivalent). Idioms, archaic expressions, culturally exclusive phrases, and slang, are translated.

#### **Examples:**

- Pre-teach vocabulary and symbols, especially in ways that promote connection to the students’ lived experiences and prior knowledge
- Highlight how complex expressions are composed of simpler words or symbols (e.g. “power – less – ness”)
- Embed support for vocabulary and symbols within the text (e.g. hyperlinks or footnotes to definitions, explanations, illustrations, previous coverage)
- Embed support for unfamiliar references (e.g. domain specific notation, idioms, figurative language, jargon, archaic language, colloquialism, and dialect) within the text

### ***2.2 Options that clarify syntax and structure***

Single elements of meaning (like words or numbers) can be combined to make new meanings. Those new meanings, however, depend upon understanding the rules or structures (like syntax in a sentence, or the conventions of a formula) with which those elements are combined. When the syntax of a sentence or the structure of a graphical presentation is not obvious or familiar to students, intelligibility suffers. To ensure that all students have equal access to information,

provide alternative representations that clarify, or make more explicit, the syntactic or structural relationships between elements of meaning.

Examples:

- Complex syntax (in language or in math formulas) or underlying structure (in diagrams, graphs, illustrations, extended expositions or narratives) is clarified through alternatives that:
  - highlight structural relations or make them more explicit
  - offer less complex alternatives
  - make relationships between elements explicit (e.g. highlighting the transition words in an essay, antecedents for anaphoric references, links between ideas in a concept map, etc.)

### ***2.3 Options for decoding text or mathematical notation***

The ability to fluently decode words, numbers or symbols that have been presented in an encoded format (e.g. visual symbols for text, haptic symbols for Braille, algebraic numbers for quantity) takes years of practice for any student, and some students never reach automaticity. That lack of fluency or automaticity greatly increases the cognitive load of decoding, thereby reducing the capacity for information processing and comprehension. To ensure that all students have equal access to knowledge, at least when the ability to decode is not the focus of instruction, it is important to provide options that reduce the barriers that decoding raises for students who are unfamiliar or dysfluent with the symbols.

Examples:

- Digital text used with automatic text-to-speech programs
- Digital mathematical notation (Math ML) with automatic voicing
- Digital text with accompanying human voice recording (e.g. Daisy Talking Books)

### ***2.4 Options that promote cross-linguistic understanding***

The language of curricular materials is usually monolingual, but the students in the classroom often are not. Especially for new learners of the dominant language (e.g., English in American schools) the accessibility of information is greatly reduced when no linguistic alternatives are available that provide entry points for non-native speakers of the dominant language, or students with limited English proficiency. Providing alternatives as an option, especially for key information or vocabulary is an important aspect of accessibility.

Examples:

- Make all key information in the dominant language (e.g. English) also available in first languages (e.g. Spanish) for students with limited-English proficiency and in ASL for students who are deaf whenever possible
- Link key vocabulary words to definitions and pronunciations in both dominant and heritage languages
- Define domain-specific vocabulary (e.g. “matter” in English, “material” in Spanish) using both domain-specific and common terms

- Provide electronic translation tools or links to multilingual glossaries on the web. (e.g., [www.google.com/translate](http://www.google.com/translate))

### ***2.5 Options that illustrate key concepts non-linguistically***

Classroom materials are often dominated by information in text. But text is a weak format for presenting many concepts and for explicating most processes. Furthermore, text is a particularly weak form of presentation for students who have text- or language-related disabilities. Providing alternatives - especially illustrations, simulations, images or interactive graphics – can make the information in text more comprehensible for any student and accessible for some who would find it completely inaccessible in text.

#### ***Examples:***

- Key concepts presented in one form of symbolic representation (e.g. an expository text or a math equation) are complemented with an alternative form (e.g. an illustration, diagram, model, video, comic strip, storyboard, photograph, animation, physical or virtual manipulative)
- Key concepts presented in illustrations or diagrams are complemented with verbal equivalents, explanations, or enhancements
- Explicit links are made between information provided in texts and any accompanying representation of that information in illustrations, charts, or diagrams

### **Guideline 3: Provide options for comprehension**

The purpose of education is not to make information accessible (that is the purpose of libraries), but to teach students how to transform accessible information into useable knowledge. Decades of cognitive science research has demonstrated that the capability to transform accessible information into useable knowledge is not a passive process but an active one. Constructing useable knowledge, knowledge that is accessible for future decision-making, depends not upon merely perceiving information but upon active “information processing skills” like selective attending, integrating new information with prior knowledge, strategic categorization, and active memorization. Individuals differ greatly in their skills in information processing and in their access to prior knowledge through which they can assimilate new information. Proper design and presentation of information – the responsibility of any curriculum or instructional methodology - can provide the cognitive ramps that are necessary to ensure that all students have access to knowledge.

### ***3.1 Options that provide or activate background knowledge***

Information – facts, concepts, principles, or ideas - is more accessible and open to assimilation as knowledge when it is presented in a way that primes, activates, or provides any pre-requisite knowledge. Differential barriers and inequities exist when some students lack the background knowledge that is critical to assimilating or using new information (e.g. knowing the rules that underlie math operations).

Those barriers can be reduced when options are available that supply or activate relevant prior knowledge, or link to the pre-requisite information elsewhere.

Examples:

- Anchoring instruction by activating relevant prior knowledge (e.g. using visual imagery, concept anchoring, or concept mastery routines)
- Using advanced organizers (e.g. KWL methods, concept maps)
- Pre-teaching critical prerequisite concepts through demonstration or models, concrete objects
- Bridging with relevant analogies and metaphors

**3.2. Options that highlight critical features, big ideas, and relationships**

One of the big differences between experts and novices (including those with disabilities) in any domain is the facility with which they distinguish what is critical from what is unimportant or irrelevant. Because experts quickly recognize the most important features in information, they allocate their time efficiently, quickly identifying what is valuable and finding the right “hooks” with which to assimilate that most valuable information into existing knowledge. As a consequence, one of the most effective ways to make information more accessible is to provide explicit cues or prompts that assist individuals in attending to those features that matter most while avoiding those that matter least. Depending on the goal of the lesson, highlighting may emphasize 1) the critical features that distinguish one concept from another, 2) the “big ideas” that organize domains of information, 3) the relationships between disparate concepts and ideas, 4) the relationships between new information and prior knowledge to build networks and contexts in which the new information has meaning.

Examples:

- Highlight or emphasize key elements in text, graphics, diagrams, formulas
- Use outlines, graphic organizers, unit organizer routines, concept organizer routines and concept mastery routines to emphasize key ideas and relationships
- Use multiple examples and non-examples to emphasize critical features
- Reduce background of extraneous features, use masking of non-relevant features
- Use cues and prompts to draw attention to critical features

**3.3 Options that guide information processing**

Successful transformation of information into useable knowledge often requires the application of mental strategies and skills for “processing” that information. These cognitive, or meta-cognitive, strategies involve the selection and manipulation of information so that it can be better summarized, categorized, prioritized, contextualized and remembered. While some students in any classroom may have a full repertoire of these strategies, along with the knowledge of when to apply them, most students do not. For those latter students, one of the

most beneficial interventions is to teach them explicitly those strategies and have them practice in their appropriate use in context. Well-designed materials can provide customized and embedded models, scaffolds, and feedback to assist students who have very diverse abilities and disabilities in using those strategies effectively.

Examples:

- Explicit prompts for each step in a sequential process
- Interactive models that guide exploration and inspection
- Graduated scaffolds that support information processing strategies
- Multiple entry points to a lesson and optional pathways through content
- Chunking information into smaller elements
- Progressive release of information, sequential highlighting

### ***3.4 Options that support memory and transfer***

While each of the cognitive scaffolds described above is likely to enhance retention for some students, others have weaknesses or disabilities that will require explicit supports for memory and transfer in order to improve cognitive accessibility. Supports for memory and transfer include techniques that are designed to heighten the memorability of information as well as those that prompt and guide students to employ explicit mnemonic strategies.

Examples:

- Checklists, organizers, sticky notes, electronic reminders
- Prompts for using mnemonic strategies and devices (e.g. visual imagery, paraphrasing strategies, method of loci, etc.)
- Explicit opportunities for spaced review and practice
- Templates, graphic organizers, concept maps to support note-making
- Scaffolding that connects new information to prior knowledge (e.g. word webs, half-full concept maps)
- Embedding new ideas in familiar ideas and contexts, use of analogy, metaphor

## **Principle II. Provide Multiple Means of Action and Expression**

Students differ in the ways that they can navigate a learning environment and express what they know. For example, individuals with significant motor disabilities (e.g. cerebral palsy), those who struggle with strategic and organizational abilities (executive function disorders, ADHD), those who have language barriers, and so forth approach learning tasks very differently. Some may be able to express themselves well in writing text but not oral speech, and vice versa. In reality, there is no one means of expression that will be optimal for all students; providing options for expression is essential.

### **Guideline 4: Provide options for physical action**

A textbook or workbook in a print format provides limited means of navigation or physical interaction (e.g. by turning pages with fingers, handwriting in spaces provided). Many interactive pieces of educational software similarly provide only limited means of navigation or interaction (e.g. via dexterously manipulating a joystick or keyboard). Navigation and interaction in those limited ways will raise barriers for some students – those who are physically disabled, blind, dysgraphic, or who have various kinds of executive function disorders. It is important to provide materials with which all students can interact. Properly designed curricular materials provide a seamless interface with common assistive technologies through which individuals with motor disabilities can navigate and express what they know – to allow navigation or interaction with a single switch, through voice activated switches, expanded keyboards and others.

#### ***4.1 Options in the mode of physical response***

Students differ widely in their motor capacity and dexterity. To reduce barriers to learning that would be introduced by the differential motor demands of a particular task, provide alternative means for response, selection, and composition.

##### **Examples:**

- Provide alternatives in the requirements for rate, timing, amplitude and range of motor action required to interact with instructional materials, physical manipulatives, and technologies
- Provide alternatives for physically responding or indicating selections among alternatives (e.g. alternatives to marking with pen and pencil, to mouse control)

#### ***4.2 Options in the means of navigation***

Students differ widely in their optimal means for navigating through information and activities. To provide equal opportunity for interaction with learning experiences, ensure that there are multiple means for navigating so that navigation and control is accessible to all students.

##### **Examples:**

- Provide alternatives for physically interacting with materials:
  - by hand

- by voice
- by single switch
- by joystick
- by keyboard or adapted keyboard

### ***4.3 Options for accessing tools and assistive technologies***

Significant numbers of students consistently use assistive technologies for navigation, interaction, and composition. It is critical that instructional technologies and curricula not impose inadvertent barriers to the use of these assistive technologies that would interfere with instructional progress. An important design consideration, for example, is to ensure that there are keyboard commands for any mouse action so that students 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. The goal is not to make answers physically accessible, but to make the learning that underlies those answers accessible.

#### ***Examples:***

- Keyboard commands for mouse action
- Switch options
- Alternative keyboards
- Customized overlays for touch screens and keyboards

### **Guideline 5: Provide options for expressive skills and fluency**

There is no medium of expression that is equally suited for all students 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 students. While a student with dyslexia may excel at story-telling in conversation, he may falter drastically when telling that same story in writing. Alternative modalities for expression should be provided both to level the playing field among students, and to introduce all students to the full range of media that are important for communication and literacy in our multimedia culture.

Additionally, students vary widely in their familiarity and fluency with the conventions of any one medium. Within media, therefore, alternative supports should be available to scaffold and guide students who are at different levels of their apprenticeships in learning to express themselves competently.

### ***5.1 Options in the media for communication***

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

Examples:

- Composing in multiple media:
  - text
  - speech
  - drawing, illustration, design
  - physical manipulatives (e.g. blocks, 3D models)
  - film or video
  - multimedia (Web designs, storyboards, comic strips)
  - music, visual art, sculpture

***5.2 Options in the tools for composition and problem solving***

There is a pervasive tendency in schooling to focus on traditional tools for literacy rather than contemporary ones. This tendency has several liabilities: 1) It does not prepare students for their future; 2) It limits the range of content and teaching methodologies that can be implemented; and, most importantly, 3) It constricts the kinds of students who can be successful. Modern media tools provide a more flexible and accessible toolkit with which students with a variety of abilities and disabilities can more successfully 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, students should learn to use tools that are an optimal match between their abilities and the task demands.

Examples:

- Spellcheckers, grammar checkers, word prediction software
- Speech to Text software (voice recognition), human dictation, recording
- Calculators, graphing calculators, geometric sketchpads
- Sentence starters, sentence strips
- Story webs, outlining tools, concept mapping tools
- Computer-Aided-Design (CAD), Music notation (writing) software

***5.3 Options in the scaffolds for practice and performance***

Students who are developing a target skill often need multiple scaffolds and graduated supports to assist them as they practice and develop independence. Those same scaffolds that are important for any novice are often critical for students with disabilities in both practice and performance. Curricula should offer alternatives in the degrees of freedom available, with highly scaffolded and supported opportunities (e.g., templates, physical and mnemonic scaffolds, procedural checklists, etc.) provided for some followed by gradual release and wide degrees of freedom for others who are ready for independence.

Examples:

- 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 – see also Guideline 6.4)

### **Guideline 6: Provide options for executive functions**

At the highest level of the human capacity to act skillfully are the so-called “executive functions.” Associated with prefrontal cortex in the brain, 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. Of critical importance to educators is the fact that executive functions have very limited capacity and are especially vulnerable to disability. 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 (due to either disability or inexperience) and 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 approach 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.

#### ***6.1 Options that guide effective goal-setting***

When left on their own, most students - especially those who are immature or who have disabilities that affect executive function - set learning and performance goals for themselves that are inappropriate or unreachable. The most common remedy is to have adults set goals and objectives for them. That short-term remedy, however, does little to develop new skills or strategies in any student, and does even less to support students with executive function weaknesses. A UDL approach embeds graduated scaffolds for learning to set personal goals that are both challenging and realistic right in the curriculum

##### **Examples:**

- Prompts and scaffolds to estimate effort, resources, and difficulty
- Models or examples of the process and product of goal-setting
- Guides and checklists for scaffolding goal-setting

#### ***6.2 Options that support planning and strategy development***

Once a goal is set, effective learners and problem-solvers plan a strategy for reaching that goal. For young children in any domain, older students in a new

domain, or any student with one of the disabilities that compromise executive functions (e.g. ADHD, ADD, Autism Spectrum Disorders), the strategic planning step is often omitted and impulsive trial and error trials take its place. To help students become more plan-full and strategic a variety of options – cognitive “speed bumps” that prompt them to “stop and think;” graduated scaffolds that help them actually implement strategies; engagement in decision-making with competent mentors – are needed.

Examples:

- Embedded prompts to “stop and think” before acting
- Checklists and project planning templates for setting up prioritization, sequences and schedules of steps
- Embedded coaches or mentors that model think-alouds of the process
- Guides for breaking long-term goals into reachable short-term objectives

**6.3 Options that 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 in immediate memory where they can be accessed as part of comprehension and problem-solving is very limited for any student and even more severely limited for many students with learning and cognitive disabilities. As a result, many such students seem disorganized, forgetful, unprepared. Wherever short-term 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.”

Examples:

- Graphic organizers and templates for data collection and organizing information
- Embedded prompts for categorizing and systematizing
- Checklists and guides for note-taking

**6.4 Options that enhance capacity for monitoring progress**

Many students seem relatively unresponsive to corrective feedback or knowledge of results. As a result they seem “perseverative,” careless or unmotivated. For these students all of the time, and for most students 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 (see representational guidelines above and guidelines for affective feedback.). Especially important is providing “formative” feedback that allows students to monitor their own progress effectively and to use that information to guide their own effort and practice.

Examples:

- Guided questions for self-monitoring

- Representations of progress (e.g. before and after photos, graphs and charts showing progress over time)
- Templates that guide self-reflection on quality and completeness
- Differentiated models of self-assessment strategies

### III. Provide Multiple Means of Engagement

Students differ markedly in the ways in which they can be engaged or motivated to learn. Some students are highly engaged by spontaneity and novelty while other are disengaged, even frightened, by those aspects, preferring strict routine. In reality, there is no one means of representation that will be optimal for all students; providing multiple options for engagement is essential.

#### **Guideline 7: Provide options for recruiting interest**

Information that is not attended to, that does not engage student's cognition, is in fact inaccessible. It is inaccessible both in the moment - relevant information goes unnoticed and unprocessed - and in the future: relevant information is unlikely to be remembered. As a result, teachers devote considerable effort to recruiting student attention and engagement. But students differ significantly in what attracts their attention and engages their interest. Even the same student will differ over time and circumstance: their "interests" change as they develop and gain new knowledge and skills, as their biological environments change, and as they differentiate into self-determined adolescents and adults. It is, therefore, important to have alternative ways to recruit student interest; ways that reflect the important inter- and intra-individual differences amongst those students.

#### ***7.1 Options that increase individual choice and autonomy***

One of the most successful ways of recruiting any student's interest is by providing them with choices and opportunities for personal control. In an instructional setting, it is often inappropriate to provide choice of the learning objective itself. But it is often appropriate to offer choices in how that objective can be reached, in the context for achieving the objective, in the tools or supports available, and so forth. It is often even sufficient to provide peripheral options – in the appearance or sequence of options – to recruit interest. Offering students choices can develop self-determination, pride in accomplishment, and increase the degree to which they feel connected to their learning. (It is important to note that providing choices is an important option, not a fixed feature - there are cultural and individual differences where increased choice is a negative rather than a positive influence.) (See also Guidelines 6.1 and 6.2.)

#### **Examples:**

- Provide students with as much discretion and autonomy as possible by providing choices in such things as:
  - the level of perceived challenge
  - the type of rewards or recognition available
  - the context or content used for practicing skills
  - the tools used for information gathering or production
  - the color, design, or graphics of layouts, etc.
  - the sequence or timing for completion of subcomponents in tasks
- Allow students to participate in the design of classroom activities and academic tasks
- Involve students, wherever possible, in setting their own personal academic and behavioral goals

### **7.2 Options that enhance relevance, value, and authenticity**

Individuals are engaged by information and activities that are relevant and valuable to their authentic interests and goals. Conversely, individuals are rarely interested in information and activities that have no relevance or value. In an educational setting, one of the most important ways that teachers recruit interest is to highlight the utility, the relevance, of learning and to demonstrate that relevance through authentic, meaningful activities. It is a mistake, of course, to assume that all students will find the same activities or information equally relevant or valuable. To recruit all students equally, it is critical to have options in the kinds of activities and information that are available.

#### Examples:

- Vary activities and sources of information so that they can be:
  - personalized and contextualized to students' lives
  - socially relevant
  - age and ability appropriate
  - appropriate for different racial, cultural, ethnic, and gender groups
- Design activities so that outcomes are authentic, communicate to real audiences, and are purposeful
- Provide tasks that allow for active participation, exploration and experimentation
- Invite personal response, evaluation and self-reflection to content and activities

### **7.3 Options that reduce threats and distractions**

Students differ considerably in their response to stimuli and events in their environment. The same novel event in a classroom can be exciting and interesting to one individual but ominous and frightening to another. Similarly, for some students reducing potential distractions is of great benefit to sustaining effort and concentration. For others, the presence of “distracters” in the environment may actually have beneficial effects: they study better in a noisy environment than in a quiet one. Differences in the effects of novelty, change, stimulation, complexity, and touch, are just a few examples of stable differences among individuals that have both physiological and environmental roots. The optimal instructional environment offers options that, in their aggregate, reduce threats and negative distractions for everyone.

#### Examples:

- Vary the level of novelty or risk
  - charts, calendars, schedules, visible timers, cues, etc. that can increase the predictability of daily activities and transitions
  - alerts and previews that can help students anticipate and prepare for changes in activities, schedules, novel events
  - options that can, in contrast to the above, maximize the unexpected, surprising, or novel in highly routinized activities
- Vary the level of sensory stimulation

- variation in the presence of background noise or visual stimulation, noise buffers, optional headphones, number of features or items presented at a time
- variation in pace of work, length of work sessions, availability of breaks or time-outs, timing or sequence of activities
- Vary the social demands required for learning or performance, the perceived level of support and protection, the requirements for public display and evaluation

**Guideline 8: Provide options for sustaining effort and persistence**

Many kinds of learning, particularly the learning of skills and strategies, require sustained attention and effort. When motivated to do so, many students can regulate their attention and affect in order to sustain the effort and concentration that such learning will require. However, students differ considerably in their ability to self-regulate in this way. Their differences reflect disparities in their initial motivation, their capacity and skills for self-regulation, their susceptibility to contextual interference, and so forth. A key instructional goal is to build the individual skills in self-regulation and self-determination that will equalize such learning opportunities (see Guideline 9). In the meantime, however, the external environment must provide options that can equalize accessibility by supporting students who differ in initial motivation, self-regulation skills, etc.

***8.1 Options that heighten salience of goals and objectives***

Over the course of any sustained project or systematic practice, there are many sources of interest and engagement that compete for attention and effort. For some students, a significant limitation exists in merely remembering the initial goal or in maintaining a consistent vision of the rewards of reaching that goal. For those students it is important to build in periodic or persistent “reminders” of both the goal and its value in order for them to sustain effort and concentration in the face of attractive distracters.

***Examples:***

- Prompt or requirement to explicitly formulate or restate goal
- Persistent display, concrete or symbolic, of goal
- Division of long-term goals into short-term objectives
- Use of hand-held or computer-based scheduling tools with reminders
- Prompts or scaffolds for visualizing desired outcome

***8.2 Options that vary levels of challenge and support***

Students vary not only in their skills and abilities but in the kinds of challenges that motivate them to do their best work. Some students prefer high-risk, highly challenging endeavors, for example, while others prefer safely reachable objectives with predictable outcomes. Students with emotional and behavioral disabilities may fall at either end of that spectrum. Providing a range of challenges, and a range of possible supports, allows all students to find objectives that are optimally motivating.

Examples:

- Differentiation in the degree of difficulty or complexity within which core activities can be completed
- Alternatives in the permissible tools and scaffolds
- Opportunities for collaboration
- Variation in the degrees of freedom for acceptable performance
- Emphasize process, effort, improvement in meeting standards as alternatives to external evaluation, performance goals, competition

**8.3 Options that foster collaboration and communication**

For some, but not all, students, the option of working collaboratively with other students is an effective way to sustain engagement in protracted projects and activities. The distribution of mentoring through peers can greatly increase the opportunities for one-on-one support. When carefully structured, such peer cooperation can significantly increase the available support for sustained engagement. Flexible rather than fixed grouping allows better differentiation and multiple roles. For other students, especially those for whom peer interactions are problematic, encouraging open lines of communication helps to develop student-teacher relationships that support achievement and engagement.

Examples:

- Cooperative learning groups with scaffolded roles and responsibilities
- School-wide programs of positive behavior support with differentiated objectives and supports
- Prompts that guide students in when and how to ask peers and/or teachers for help
- Peer tutoring and support
- Construction of virtual communities of learners engaged in common interests or activities

**8.4 Options that increase mastery-oriented feedback**

Assessment is most productive for sustaining engagement when the feedback is relevant, constructive, accessible, consequential and timely. But the *type* of feedback is also critical in helping students to sustain the motivation and effort essential to learning. Feedback that orients students toward mastery (rather than compliance or performance) and that emphasizes the role of effort and practice rather than “intelligence” or inherent “ability” is an important factor in guiding students toward successful long-term habits of mind. These distinctions may be particularly important for students whose disabilities have been interpreted, by either themselves or their caregivers, as permanently constraining and fixed.

Examples:

- Feedback that encourages perseverance, focuses on development of efficacy and self-awareness, and encourages the use of specific supports and strategies in the face of challenge

- Feedback that emphasizes effort, improvement and achieving a standard rather than on relative performance
- Feedback that is frequent, on-going, and presented in multiple modalities
- Feedback that is substantive and informative rather than comparative or competitive
- Feedback that models how to incorporate evaluation, including errors and wrong answers, into positive strategies for future success

### **Guideline 9: Provide options for self-regulation**

While it is important to design the *extrinsic environment* so that it can support motivation and engagement (see guidelines 7 and 8), it is also important to develop students' *intrinsic* abilities to regulate their own emotions and motivations. The ability to self-regulate – to strategically modulate one's emotional reactions or states in order to be more effective at coping and engaging with the environment – is a critical aspect of human development. While many individuals develop self-regulatory skills on their own, either by trial and error or by observing successful adults, many others have significant difficulties in developing these skills. Unfortunately most classrooms do not address these skills explicitly, leaving them as part of the “implicit” curriculum that is often inaccessible or invisible to many. Furthermore, those classrooms that address self-regulation explicitly generally assume a single model or method for doing so. As in other kinds of learning, considerable individual differences are much more likely than uniformity. A successful approach requires providing sufficient alternatives to support learners with very different aptitudes and prior experience in learning to effectively manage their own engagement and affect.

#### ***9.1 Options that guide personal goal-setting and expectations***

In learning to set goals for self-regulation, the goals are explicitly affective – learning to avoid frustration, learning to modulate anxiety, learning to set positive expectations. The actual goals that are optimum, however, will depend on the individual – some students need to dampen anxiety to succeed while others may need to elevate it somewhat. Consequently, it is essential that the models, prompts, guides and rubrics must also be varied enough to accommodate the full range of students who will need the support. Students need to see models, for example, that differ in the kinds of expectations and self-regulatory goals they set.

#### **Examples:**

- Prompts, reminders, guides, rubrics, checklists that focus on:
  - self-regulatory goals like reducing the frequency of tantrums or aggressive outbursts in response to frustration
  - increasing the length of on-task task orientation in the face of distractions
  - elevating the frequency of self-reflection and self-reinforcements
- Coaches, mentors, or agents that model the process of setting personally appropriate goals that take into account both strengths and weaknesses

### ***9.2 Options that scaffold coping skills and strategies***

Providing a model of self-regulatory skills is not enough for most students. They will need sustained apprenticeships with a gradual release of scaffolding. Reminders, models, checklists, and so forth can assist students in choosing and trying an adaptive strategy – from among several alternatives – for managing and directing their emotional responses to external events (e.g. strategies for coping with anxiety-producing social settings or for reducing task-irrelevant distracters) or internal events (e.g. strategies for decreasing rumination on depressive or anxiety-producing ideation). Such scaffolds should provide sufficient alternatives to meet the challenge of individual differences in the kinds of strategies that might be successful and the independence with which they can be applied.

Examples:

- Differentiated models, scaffolds and feedback for:
  - managing frustration
  - seeking external emotional support
  - developing internal controls and coping skills

### ***9.3 Options that develop self-assessment and reflection***

In order to develop better capacity for self-regulation, students need to learn to monitor their emotions and reactivity carefully and accurately. Individuals differ considerably in their capability and propensity for such monitoring and some students will need a great deal of explicit instruction and modeling in order to learn how to do this successfully. For many students, merely recognizing that they are making progress toward greater independence is highly motivating. Alternatively, one of the key factors in students losing motivation is their inability to recognize their own progress. It is important, moreover that students have multiple models and scaffolds of different techniques so that they can identify, and choose, ones that are optimal.

Examples:

- Recording devices, aids, or charts are available to assist individuals in learning to collect, chart and display data from their own behavior (including emotional responses, affect, etc.) for the purpose of monitoring changes in those behaviors
- These devices should provide a range of options that vary in their intrusiveness and support – providing a graduated apprenticeship in the development of better ability to monitor behavior and build skills in self-reflection and emotional awareness
- Activities should include means by which students get feedback and have access to alternative scaffolds (charts, templates, feedback displays) that support them in understanding their progress in a manner that is understandable and timely

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