CHAPTER 1

An Introduction to Universal Design for Learning

Questions and Answers

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What is Universal Design for Learning, or UDL? If you're a recent graduate of an education program, you have probably heard the term in your preservice courses. If you're a practicing educator, you may have read about UDL in a professional journal, or attended a workshop in which UDL was the topic or was mentioned as a framework for planning. You may know that federal education law provides for incorporating UDL into teacher training (both preservice and inservice). You may have heard that UDL has something to do with technology, personalized learning, neuroscience, or differentiated instruction. Regardless of what you have heard or read, you may want to know more, and that's why you've picked up this book.

In this chapter, we answer that primary question—"What is UDL?"—along with many others you may have. In doing so, we aim to provide you with a good grasp of the fundamentals of UDL. In subsequent chapters, you will read about how UDL is put into practice at different grade levels and across varying content areas. Those chapters will be even more helpful to you once you read this overview. And if you want to know more, we invite you to visit our websites (*http://www.cast.org* and *http://www.udlcenter.org*).

WHAT IS UDL?

UDL is a framework for instruction organized around three principles based on the learning sciences. These principles guide the design and development of curriculum that is effective and inclusive for all learners (Rose & Gravel, 2010).

Based on two decades of research into the nature of learning differences and the design of supportive learning environment, the UDL principles map onto three groups of brain networks—recognition, strategic, and affective networks—that play a primary role in learning (see the next question for more on this). These are the three UDL principles (Rose & Meyer, 2002):

I. To support recognition learning, provide multiple means of representation—that is, offer flexible ways to present *what* we teach and learn.
II. To support strategic learning, provide multiple means of action and expression—that is, flexible options for *how* we learn and express what we know.
III. To support affective learning, provide multiple means of engagement—that is, flexible options for generating and sustaining motivation, the *why* of learning.

In the Higher Education Opportunity Act (HEOA; Public Law 110-315, August 14, 2008), Congress defines UDL as

a scientifically valid framework for guiding educational practice that—

(A) provides flexibility in the ways information is presented, in the ways students respond or demonstrate knowledge and skills, and in the ways students are engaged; and
(B) reduces barriers in instruction, provides appropriate accommodations, supports, and challenges, and maintains high achievement expectations for all students, including students with disabilities and students who are limited English proficient.

For more on how the UDL principles are applied in practice, see Lapinski, Gravel, and Rose's discussion of the UDL Guidelines version 2.0 (CAST, 2011) in Chapter 2, as well as other chapters in this book.

WHAT ARE THE THREE GROUPS OF BRAIN NETWORKS?

Advances in neuroscience and education research over the past 40 years have reshaped our understanding of the learning brain. One of the clearest and most important revelations stemming from brain research is that there is no such thing as a "regular student." Instead, learning is as unique to individuals as their fingerprints or DNA. The notion of broad categories of learners—"smart–not smart," "disabled–not disabled," "regular–not regular"—is a gross oversimplification that does not reflect reality. By categorizing students in this way, we miss many subtle and important qualities and strengths. Science shows that individual qualities or abilities are not static and fixed; rather, they are continually shifting, and they exist in relationship to the environment. The intersection between the individual and the environment is a dynamic and complex balancing act. In short, there is tremendous variability among individuals in how they perceive and interact with any

environment, including the classroom. Variability and difference, therefore, constitute the *norm* from student to student—even among those who seem to share similar characteristics, such as culture, age, race, or level of success. The differences among the "A students" in any given class are as stark as those among the "A students" and "F students."

This reframes our understanding of learners away from the vision of education based on the needs of some mythical "average" learner who can be counted on to experience a curriculum in a certain "average" way. We know that variability is the rule, both within and among all individuals, and that such variability is systematic rather than random.

At CAST (an educational nonprofit organization focused on promoting and researching UDL), we refer to three sets of brain networks that, taken together, can help us better understand how the brain functions during learning episodes. This is simply a model—a fairly basic way to partition the learning brain. There are other, more complex models of brain activity that address many different networks or functions. But this model reveals the fundamental foundations of learning, and it enables us to analyze the curriculum and how learners interact with it. The three groups of networks are as follows:

- "Recognition networks" are specialized to sense and assign meaning to patterns we see; they enable us to identify and understand information, ideas, and concepts. This is the "what" of learning.
- "Strategic networks" relate primarily to the executive functions and are specialized to generate and oversee mental and motor patterns. They enable us to plan, execute, and monitor actions and skills. This is the "how" of learning.
- "Affective networks" are specialized to evaluate patterns and assign them emotional significance; they enable us to engage with tasks and learning and with the world around us. This is the "why" of learning.

These three sets of neural networks, though distinguishable, work closely together to coordinate even simple acts. For example, say you want to wrap a present for a friend. Recognition networks enable you to identify the present, the wrap, and the concept of a gift. Strategic networks help you set your goal of wrapping the present and make a strategy for accomplishing this; they guide you through the folding and taping, allow you to monitor your progress, and permit you to make small adjustments (such as refolding a corner) until the task is complete. Affective networks motivate you to take on this task as you think about your friend, and they help you persist through the various steps, keeping you on task; wrapping may be hard for you, but you sense how happy it will make your friend and yourself, so you persist.

Understanding the recognition, strategic, and affective networks and their interrelations can help us appreciate the differences each individual brings to the learning process—and the need for flexibility in the "what," "how," and "why" of learning.

WHY IS UDL NECESSARY?

The principles of UDL enable us to recognize that variance across individuals is the *norm*, not the exception, wherever people are gathered. Therefore, the curriculum should be adaptable to individual differences rather than the other way around. In this sense, traditional curricula have the "disability," because they only work for certain learners. They are filled with barriers that are erected at the point of curriculum design, especially when printed text is the near-exclusive medium. Learners with disabilities are the most vulnerable to such barriers: Those with motor disabilities cannot turn pages, while individuals with dyslexia may struggle to decode the text. But many students without disabilities also find that curricula are not adequately designed to meet their learning needs.

As standards-based reform movements have arisen and gained strength over the past quarter-century, federal, state, and local education agencies have placed increasing emphasis on providing all individuals with equal opportunities to learn in the general education curriculum. This has changed the makeup of classrooms dramatically, as students with disabilities and students with various cultural and linguistic backgrounds are included in general education settings and expected to succeed. Furthermore, the cost of retrofitting inaccessible materials has led to a rethinking of how curriculum is designed and delivered.

The challenge for teachers can be daunting. Although teachers do not want their students to fail, many feel that they lack a guiding framework—one allowing for instructional design that is inclusive of the vast linguistic, cultural, and cognitive variability present within their classrooms each year. UDL provides us with such a framework.

SO IS UDL SPECIAL EDUCATION OR GENERAL EDUCATION?

UDL encompasses education for all learners, which of course includes general and special education, early education and postsecondary education. In fact, UDL enables us to envision a time when there will be one curriculum that is designed to be truly appropriate for all learners. "Universal" doesn't mean "one-size-fits-all." Rather, it means that all learners with all their individual differences have equal and fair access and opportunity to learn the same content in ways that work best for them.

We recognize that under the current system there is a need for special education. Indeed, the development of special education was a critical step forward for students with disabilities, because it guaranteed them an education that they were once shut out of completely.

However, experience tells us that separate is seldom equal, and the idea of separating students with certain differences from their peers suggests that the "disability" resides in those individuals, not in the curriculum itself. As general education becomes more flexible through UDL, it should be able to serve the needs and interests of all learners.

WHAT IS UDL'S RELATIONSHIP TO UNIVERSAL DESIGN?

The term "Universal Design for Learning" (UDL) echoes a concept from architecture and product development called "universal design (UD)." What makes UDL different is its focus on *learning*. The principles central to UDL reflect that focus: They address the dynamic processes of teaching and learning.

Originally formulated by Ron Mace at North Carolina State University, UD supports the development of buildings, outdoor spaces, products, and communications that meet the needs of individuals with disabilities at the design stage. This practice has spread to such areas as civic engineering and commercial product design. Designs that from the start increase accessibility for individuals with disabilities tend to yield benefits that make everyone's experiences better.

The development of closed captioning on television provides a good example of UD in practice. When captioning first became available, it was intended for people with hearing impairments. However, it now benefits not only those with hearing impairments, but also exercisers in health clubs, travelers in airports, and individuals working on their language skills.

UDL shares a goal with UD—considering as many individuals as possible with designs that work from the outset and do not require retrofitting. However, the principles and techniques for accomplishing this are quite different in education, since creating learning experiences is a fundamentally different process from building things (Rose & Meyer, 2002, 2005).

WHAT IS THE RESEARCH BASIS FOR UDL?

For its work on UDL, CAST has drawn on research from several sources. First, research from neuroscience forms the basis for the UDL principles. In recent years, new technologies have allowed researchers to investigate the neurology of learning in ways that were unimaginable even a decade ago. This research has produced two findings that are critical to UDL: (1) Learning in the individual brain is highly diverse and distributed, and (2) learning *among* different individuals is also highly diverse and distributed. The foundational research in cognitive neuroscience, cognitive science, and other learning sciences is critical in articulating the range of what learning is, and what the range of individual differences in learning are. When learning is considered too narrowly, then we are likely to create curricula and lessons that are too poorly differentiated to optimize learning.

Second, CAST's work on UDL draws from research identifying the specific practices that are critical to supporting all students—research that has been amassed over decades and by many different researchers in many universities and laboratories. Typically these practices have already proven effective for individual students "in the margins," but they are generally not integrated within the standard "one-size-fits-all" curriculum of general education. UDL provides a vehicle for delivering these practices to the individual students for whom they are likely to be most effective. But which practices, and for whom? The UDL approach offers both a

framework and guidelines to help in making informed decisions about what practices are optimal. The purpose of the framework is to ensure comprehensiveness, and to ensure that the instructional designs will address the full range of learning abilities and disabilities present in any group of students. See Chapter 2 for more specifics on how the UDL is applied to curriculum development.

Third, CAST has utilized the research on specific applications of UDL. This kind of research is nascent (since UDL itself was articulated less than two decades ago), but exemplars are emerging. For example, researchers at CAST have developed and evaluated an illustration of UDL as it is applied to the teaching of reading comprehension strategies. Chapter 3 provides more details about this work. Other chapters in this book also discuss research on specific implementations.

WHAT DOES IT MEAN TO SAY THAT UDL APPLIES TO THE WHOLE CURRICULUM?

We see any curriculum as having four essential components—goals, assessments, materials, and methods—and each should be designed with consideration for all learners (Rose & Meyer, 2002). In each of this book's chapters, the authors address these fundamental components in light of the UDL principles and particular content areas (science, math, history, etc.).

Goals need to be clearly defined so that they provide appropriate challenges for all learners—and don't raise unintentional barriers in how they are articulated. For example, if a goal is to learn the stages of photosynthesis, the statement of that goal should not prescribe the methods and materials for accomplishing it (e.g., "Read a chapter about photosynthesis"), since some otherwise capable learners may not be able to use those particular methods and materials.

Assessments, both during (formative) and following (summative) learning episodes, need to be sufficiently flexible (1) to provide accurate information on how well learners are meeting goals, and (2) to inform adjustments in methods and materials to make instruction more effective. Assessments can and should be designed to provide assessment data to guide not only overall instructional activities for the classroom, but also just-in-time adjustments for individual students.

Instructional methods and materials should be flexible and varied to provide the right balance of access, challenge, and support for learners, and to allow learners to achieve their goals in the ways that work best for each individual.

WHY ARE TECHNOLOGY AND UDL SO OFTEN DISCUSSED TOGETHER?

Many classrooms continue to be dominated by a single, inflexible medium—printed textbooks. We categorize as "disabled" those students for whom a printed textbook is difficult or impossible to use. We then prescribe for them special goals, teaching

methods, and materials, often with a remedial focus. Even students able to access text are missing out, because we know that there are other media more suitable for communicating particular kinds of material, and for deepening particular students' engagement with that material.

UDL, on the other hand, calls for taking advantage of the power and customizability of modern technology to deliver, by design, flexible instructional practices directly within the core instructional curriculum where students can access them on an individualized basis. These best practices, often essential for students identified with disabilities or other struggling learners, often prove advantageous for many other students as well.

Digital media are powerful because they are versatile and transformable. Unlike a printed book, digital media can display content in many formats—text, still images, sound, moving images, or any combination of these—with just a few keystrokes. Learners visiting the same website can alter how content is presented. They can change the appearance of text or images, turn off graphics, or turn on sound. Using a program with text-to-speech capabilities, a teacher can set up a computer to read words aloud on demand for a student with dyslexia, transforming the medium from print to sound.

Digital media are also powerful because they can be networked. This makes it possible to link one piece of digital content to others via hyperlinks. For example, a digital text of the Gettysburg Address can provide embedded learning supports, such as a glossary or background-knowledge briefs, to support readers without taking them off task. (See *http://udleditions.cast.org* for an example.)

With a better understanding of new and traditional media and of how individual brains interact with each, teachers can reevaluate how they teach, how students learn, and how best to use various tools and techniques to individualize these processes. The digital capacity to combine and transform text, speech, and images opens new vistas of learning for many individuals who struggle in print-only environments (Rose & Meyer, 2002, 2005; Rose & Gravel, 2009).

CAN THE UDL PRINCIPLES BE APPLIED WITHOUT TECHNOLOGY?

Although technology can be an important factor in implementing UDL, it is not a requirement. It is understood that many schools have outdated computers, poor software, or insufficient access to computer labs for teachers to take advantage of technology in implementing their curricula. While this divide between applicability and access can surely be a source of frustration, excellent UDL instruction can be achieved without technology, and many examples of such instruction are described throughout this book. For example, Chapter 9 discusses an elementary school lesson where the goal is to help students understand and be able to articulate their understanding of the life cycle of plants. Even though it does not use technology, it can still be considered UDL. There certainly might be ways that technology could be beneficial in this lesson, but it is not essential.

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By embracing UDL both in principle and in practice, we can dramatically improve learning opportunities for all learners. UDL provides a blueprint for designing curricula that accommodate learner differences. Chapter 2 presents the UDL Guidelines; it is followed by chapters focused on specific content areas: reading, writing, mathematics, science, history, and the arts. In these chapters, the authors discuss the challenges of teaching these subjects given the tremendous variability of individual learners as documented by neuroscience, as well as the diversity of learners as measured by educational experiences, cultural backgrounds, and disability. The authors then demonstrate some of the common barriers to learning and suggest ways to design more inclusive learning environments. Technology plays an especially supportive role in most cases, but the authors also show how UDL can be applied in low-tech or no-tech ways. Chapter 9 addresses UDL in a no-tech environment (specifically, an elementary-grade classroom) head on, offering helpful insights from practice. Rounding out the book is Chapter 10's discussion of UDL in postsecondary settings, where preservice instructors can not only learn about but also experience UDL. In assembling this book, we aim to provide a helpful introduction to UDL. We hope that you, the reader, will view this not as a prescription but as an invitation: We invite you to join the conversation and to share your wisdom with others. Visit *http://www.udlcenter.org* to find a community of educators who together are exploring ways to reform education in positive ways at the point of curriculum design and implementation, with the UDL principles as their guide.

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