# Preface

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Sometimes a simple shift in perspective can change not only how we see the world but how we live in it. In 1958, electrical engineer Jack S. Kilby questioned standard thinking in his industry by suggesting that both active electronic components (transistors) and passive ones (resistors and capacitors) could be made from the same semiconductor material and linked together at the point of manufacture. This eliminated the need for soldering many parts together in bulky modules. Kilby's brainstorm led to the creation of the integrated circuit, or microchip, which in turn ushered in the digital computer age. Think of the extraordinary changes in manufacturing, media, transportation, medicine, education, business, and entertainment brought about by Kilby's simple *what if?*

*What if?* also lies at the core of Universal Design for Learning (UDL). What if all learners had genuine opportunities to learn in inclusive environments? What if we recognized that our inflexible curricula and learning environments are "disabled" rather than pinning that label on learners who face unnecessary barriers? Beginning in the 1980s, we and our colleagues at the Center for Applied Special Technology (CAST) began exploring how to use new technologies to expand educational opportunities for learners of all abilities. Our work taught us that when education fails, barriers to learning are likely found in the curriculum—not in individual learners, who fall along a long continuum of diverse abilities, interests, and skills. As a result, the burden to adapt must, as a first step, be placed where it belongs: on the curriculum itself.

## UNIVERSAL DESIGN FOR LEARNING

Grounded in research of learner differences, the capacities of new media, and the most effective teaching practices and assessments, UDL provides a framework for creating more robust learning opportunities for everyone. Emerging educational technologies, which are remarkably flexible, can support such new approaches to learning and teaching in ways that are impossible in a curriculum based entirely on print and lecture (Meyer & Rose, 2005).

As science reveals new findings about how learning happens in the brain, we can apply those insights to education. Brain imaging technologies allow us to "see" the brain as it learns by performing enormously complicated computations on subtle changes in brain activity that are then displayed on a computer screen. They confirm the vast variety of learners' abilities—and undermine efforts to shoehorn learners into standardized, one-size-fits-all approaches. Such technologies enable us to actually see the activity in three elaborate sets of nerve networks that play a primary role in learning.

Building on the work of Russian psychologist Lev Vygotsky (1978), we refer to these three nerve networks as the recognition, strategic, and affective networks to reflect their individual specializations. Briefly,

- Recognition networks are specialized to receive and analyze information (the "what" of learning);
- Strategic networks are specialized to plan and execute actions (the "how" of learning);
- Affective networks are specialized to evaluate and set priorities (the "why" of learning).

Collectively, these networks coordinate how we work and learn. Likewise, the corresponding principles of UDL aim to minimize barriers and maximize learning by flexibly accommodating individual differences in recognition, strategy, or affect, respectively:

- To support students who are diverse in learning to recognize their world, provide multiple, flexible methods of presentation;
- To support students who are diverse in learning strategies for action, provide multiple, flexible methods of expression and apprenticeship;

**TABLE 1 UDL Principles**

| *Brain Networks* | *UDL Response*<br>*To anticipate differences in these networks* |
|---|---|
| Recognition networks make it possible to receive and analyze information—i.e., to recognize patterns, concepts, and relationships. This is the "what" of learning. | Provide multiple, flexible methods of *presentation.* Give learners various ways to acquire information and knowledge. |
| Strategic networks make it possible to generate patterns and develop strategies for action and problem-solving. This is the "how" of learning. | Provide multiple, flexible methods of *expression* and apprenticeship. Offer students alternatives for demonstrating what they know. |
| Affective networks fuel motivation and guide the ability to establish priorities, focus attention, and choose action. This is the "why" of learning. | Provide multiple, flexible options for *engagement* in order to help learners get interested, be challenged, and stay motivated. |

*Source:* Rose and Meyer (2000, 2002)

- To support students who are diverse in what motivates them to engage and sustain effort, provide multiple, flexible options for engagement (Rose & Meyer, 2000, 2002).

These UDL principles guide curriculum developers and teachers in applying the flexibility of digital media to create curriculum with built-in adjustability so that each learner finds the content and level of challenge and support that's right for him or her.

## WHY THIS BOOK?

Of course, the real challenge is to put these principles into practice at the classroom level. The concerns of classroom teachers and the wisdom they share have shaped our definition of the principles and guided our UDL research at CAST. CAST works with school practitioners through our National Consortium on Universal Design for Learning, a virtual community of educators who share ideas and information; through our professional development with states, districts, and postsecondary insti-

tutions throughout the United States; through UDL institutes; and in our classroom research projects, where teachers help us develop more inclusive and effective learning environments.

Skilled and dedicated teachers are essential to making a universally designed curriculum successful: They are the ultimate source of customized teaching and support. Good teachers make adjustments all the time to accommodate diverse learner needs. The UDL framework helps them do so more effectively. Several articles collected here emphasize the central place education practitioners have in any meaningful reform.

The importance of digital learning environments is also highlighted in this book, though a clarification of this point is in order. UDL is often mistaken for some kind of technology program, just as our organization, CAST, is misunderstood as a technology-development house. On the contrary, ours is a learning organization focused on finding ways to improve classroom learning and teaching. Universally designed, multimedia learning environments extend a teacher's ability to reach individual learners, something printed textbooks alone cannot do. New technologies are not themselves instructional. However, when combined with effective instructional methods in the UDL model, they offer extraordinary ways to customize learning and teaching. Articles on new learning environments and alternatives to the traditional textbook demonstrate such possibilities.

Finally, literacy is a cornerstone of CAST's work and therefore is a key theme of this reader. The reason for this is simple: Students need robust reading comprehension skills and strategies, both of print and digital texts, in order to succeed across a number of subject areas. In articles about the development of the Thinking Reader literacy environment, teaching Internet literacy strategies, and improving adolescent literacy we highlight best practices and classroom-based research in Universal Design for Learning. In recent years, CAST has expanded its research into subjects such as science, mathematics, and history, as well as postsecondary learning. The innovations in classroom literacy discussed in this volume have produced fertile soil in which to plant these other projects.

## REFERENCES

Meyer, A., & Rose, D. H. (2005). The future is in the margins: The role of technology and disability in educational reform. In D. H. Rose, A. Meyer, & C. Hitchcock (Eds.), *The universally designed classroom: Accessible curriculum and digital technologies*. Cambridge, MA: Harvard Education Press.

Rose, D., & Meyer, A. (2000). Universal design for individual differences. *Educational Leadership, 58*(3), 39–43.

Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Alexandria, VA: ASCD. (Also available in digital format at http://www.cast.org.)

Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.