

# Using the Universal Design for Learning Framework to Support Culturally Diverse Learners

MEIA CHITA-TEGMARK, BOSTON UNIVERSITY, JENNA W. GRAVEL, HARVARD GRADUATE SCHOOL OF EDUCATION, MARIA DE LOURDES B. SERPA, LESLEY UNIVERSITY, AND YVONNE DOMINGS AND DAVID H. ROSE, CENTER FOR APPLIED SPECIAL TECHNOLOGY (CAST)

## ABSTRACT

This article describes the mechanism through which cultural variability is a source of learning differences. The authors argue that the Universal Design for Learning (UDL) can be extended to capture the way in which learning is influenced by cultural variability, and show how the UDL framework might be used to create a curriculum that is responsive to this cultural dimension of learning. We also suggest that when used in this way, the UDL framework may not only reduce barriers for culturally diverse learners, but also increase the learning opportunities for all learners—helping them to develop proficiency in a broader range of expressive, analytic, and cognitive styles that are crucial to success in the twenty-first century.

One of the recent advances to come out of the modern learning sciences is a clearer picture of the profound influence of experience in shaping the brain, leading to the understanding that brain activity and learning cannot be separated from the context in which they occur. In other words, one cannot expect to impact learning in the current moment if the context in which learning has happened in the past is not considered.

All experiences occur when individuals interact with their immediate physical and social contexts, which are constantly being informed by the larger cultural context in which they are embedded. For purposes of this article, culture is defined as “the shared patterns of behaviors and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization. These shared patterns identify the members of a culture group while also distinguishing those of another group” (CARLA, 2009, p. 1). As such, culture informs all aspects of learning, from the high-level reasoning skills to perceptual habits. Different cultures provide different experiences; therefore, they are a significant source of learner variability. However, learner variability raises many challenges, which have not been addressed adequately by most educational systems.

Based upon research in the learning sciences, the Universal Design for Learning (UDL) is a promising framework that seeks to deal with learner variability by offering multiple means of representation, multiple means of action and expression, and multiple means of engagement. The framework was developed after an extensive review of empirical studies in the learning sciences from which key findings were extracted and translated in order to create a set of research-based instructional design principles. By pointing

to areas where learners are most likely to vary, these principles help teachers design their instruction for a variety of learning needs (Meyer & Rose, 1998; Meyer & Rose, 2005; Rose & Meyer, 2000, 2002). As described by Meyer and Rose, it is *the students in the margins of the bell curve*, the atypical learners, that first drew attention to the necessity of providing options for access and learning. Therefore, the original aim of the UDL framework was to cater to students with special needs and to provide and promote an inclusive learning environment for all children. The UDL framework sought to accomplish this goal by translating findings extracted from established research literature that investigated variability in learning needs and delivering them in an educator-friendly format (for more information on the empirical literature on which the UDL framework is based see <http://www.udlcenter.org/research/researchevidence>). Therefore, most of the focus of UDL has been on learner variability attributable to what is referred to as disability, with less attention to learner variability attributable to experience or culture. If UDL is to be useful globally, it is necessary to consider not only how the framework translates to other cultures, but also, how it can be used to create curriculum that accounts for learner variability that is attributable to culture.

Therefore, this article seeks to raise awareness of the impact of culture on learning and cognition as well as to provide some examples of how the UDL framework might be extended to capture the cultural dimension of learner variability. We suggest that, when applied in this way, the UDL framework may not only reduce barriers for culturally diverse learners, but also increase culturally informed learning opportunities for *all* learners—helping them to develop proficiency in a broader range of expressive, analytic, and cognitive styles that are crucial to success in the twenty-first century. A key goal of this article, therefore, is to consider a broader spectrum of sources of learning differences, including those related to culture.

This article is not a report of findings, but rather a description of an approach to using the UDL framework in innovative and creative ways to address learning needs that have not been traditionally targeted through UDL, namely those of students from culturally diverse backgrounds. By raising awareness both inside and outside the UDL community about the potential for using the UDL framework to address the needs of students of different cultural backgrounds, our hope is that this will trigger research that will explore the effectiveness of the UDL framework in meeting the instructional needs of these students.

The reader will notice that we have made substantial efforts to avoid the terminology “multicultural education” and/or “culturally

responsive" curriculum. We have done so deliberately. These terms have been the focus of a significant body of work and a field of study that is concerned with the cultural differences of cultural minorities within the larger culture of the United States. Although this is a legitimate focus, our article is an attempt to initiate a different discussion, one that addresses a more global view of culture. In doing so, we hope to draw attention to the ways in which culture shapes teaching and learning, and the ways that UDL can be used as a lens to create a universal pedagogy that is useful to improving the education of all learners globally.

## THE INFLUENCE OF CULTURE ON LEARNING

### Culture and the Brain

As mentioned above, advances in the modern learning sciences have revealed that our brains are constantly shaped and reshaped by the interaction with the surrounding environment. Therefore, the physical, social, and cultural components of the environment influence the way in which the brain constructs cognition. As Karmiloff-Smith (1992) points out, "The brain is not pre-structured with ready-made representations; it is channeled to progressively *develop* representations via interaction with both the external environment and its own internal environment" (p. 10).

Since culture shapes our interaction with the environment, it determines what parts or aspects of the world we attend to, what type of knowledge we value, and what kind of behavior we deem appropriate in various circumstances (Nisbett, Peng, Choi, & Norenzayan, 2001). All these decisions ultimately represent culturally influenced responses to surrounding stimuli and can lead to variability in the neural pathways.

Culture also offers the cognitive tools through which we make sense of the surrounding world. In response to using these tools, the brain develops in specific ways and acquires different neural structures and cognitive pathways. One example is the way in which culture can shape the activity in the brain's reward system, which in turn affects behavior (Freeman, Rule, Adams, & Ambady, 2009). In an experiment conducted by these researchers, sketches of people in a dominant or subordinate posture were shown to subjects who were American and subjects who were Japanese. While the sketches illustrating dominant body language triggered reward-related neural responses in subjects who were American, the subjects who were Japanese showed a reward response when presented with the subordinate displays. This could be explained in many ways, but one explanation might be the different value systems held by the American and Japanese societies, and the different types of behaviors the two cultures likely reinforce.

Culture depends on the brain just as much as the optimal development of the human brain depends on interaction with the socio-cultural context. Dehaene (2009) suggests that there is a limit to the ability of cultures to create variations in interpretations, theories, tools, and artifacts, and that these limits come from the specific features of the human nervous system. For example, in order for the nervous system to process information in the form of text, certain characteristics of text must be present. The font must be

of a certain dimension in order to be captured by the fovea (the part of the retina that contains high-resolution cells), and the spacing between letters should not be wider than two characters in order for bigram neurons (that respond to pairs of letters) to be activated. These examples are just a small part of the large body of evidence presented by Dehaene to show the interaction and interdependence of culture and the human brain. Neurological variability can be a product of the environment and culture and can in turn be a generator of new cultural forms.

### Culture and Learning

Culture and learning are closely connected since, as Tomasello (1999) points out, cultural evolution is only possible through social learning, where individuals innovate the knowledge and cognitive tools that the group has inherited. Tomasello calls this process "social-collaborative creativeness" (p. 6). On the other hand, learning also bears the imprints of the cultural context in which one develops. People from different cultures may learn the same things, but they may learn them differently. As mentioned earlier, culture can influence all aspects of learning (Ambady & Bharucha, 2009; Kitayama & Tompson, 2010; Nisbett & Miyamoto, 2005; Nisbett et al., 2001). In fact, culture influences all three dimensions of learning that are targeted by the UDL guidelines: representation, action and expression, and engagement. From a representational perspective, as Tomasello suggests, culture provides the imagery systems, the reasoning structures, the analogies, and the relationships that have been developed by one's social group. Culture also informs action and expression by determining what constitutes appropriate behavior and strategies for solving problems. From the perspective of engagement, the most obvious influence of culture on learning is through the system of values and beliefs that is acquired from the cultural context in which one develops (Nisbett et al., 2001).

Adaptation to a cultural context refers to the individual's internalization of a cognitive system created by a group. Humans learn by reconstructing patterns of thought developed by others (Tomasello, 1999). In most cases, in mono-cultural environments, internalizing the cultural pattern seems to happen naturally in most learners as they adopt the behavioral norms and the value systems of the dominant culture. However, if both the increasingly global society made possible by modern technology and the culturally diverse societies in which we live are considered, success in the twenty-first century requires individuals to incorporate more than a single culture's system of thought. One needs to connect one's familiar way of thinking to a (sometimes very different) mental frame from a different culture. This can be challenging since the familiar structure of knowledge shapes the person's cognitive and perceptual experiences. Simply said, different cultures cause us to see and understand the world differently. Therefore, culturally informed learning means more than just learning new information about another culture; it also means learning how to perceive, understand, express, and engage with myriad information seamlessly.

## Culture and UDL

The UDL framework (CAST, 2011) is organized around three main principles:

1. provide multiple means of representation,
2. provide multiple means of action and expression, and
3. provide multiple means of engagement (Rose & Meyer, 2002).

For each guideline, the UDL framework provides a series of checkpoints that are recommendations for reducing the barriers inherent in most traditional curricula. From the UDL perspective, the onus for change is placed on the curriculum rather than on the individual learner (Rose & Meyer, 2002). When viewed in this way, cultural bridging should be addressed by the curricula rather than by the learner. The three main categories of facilitation that the curriculum should provide in order to meet the needs of culturally diverse learners are also the three main principles of UDL: *access to representations, means of action and expression, and opportunities for engagement.*

As a way of validating the starting point of all learners (the knowledge and skills they bring to the learning process), the curricula should provide multiple means of accessing the learning content, whether that means providing translations in a learner's first language or providing ways for a learner to understand the reasoning style behind it. The curricula should also provide multiple means for learners to demonstrate their knowledge through familiar means of expression (for example, an accessible and familiar organization structure for composition or a familiar approach to solving problems). Last but not least, the curricula should offer multiple means of creating personal positive rapport with the learning process by providing experiences that align with the learners' identities and confirm their view of the world.

Validating a learner's starting point is only one part of the requirements for effective learning. Good learning design also needs to optimize challenges within the learner's zone of proximal development (Vygotsky, 1978). From the point of view of the cultural context, this means that learners should be exposed to thought systems, perceptual habits, and knowledge patterns that are both familiar and different from their own, accompanied by guidance on how to access, navigate, and eventually incorporate them into their own repertoire of skills and strategies. Such "expert" learners are what UDL posits to be the goal of education: the development of resourceful, knowledgeable, strategic, goal-directed, purposeful, and motivated learners.

Culturally informed educators are aware of the variability in types of knowledge, behaviors, and beliefs that learners bring to the classroom, and they create the cultural bridges or scaffolds that help students link their own thinking systems to those that are unfamiliar by offering multiple means of access into the subject matter, and multiple means to express knowledge and to engage with learning. In this way, the UDL framework can be used as a lens through which to address culturally influenced learning differences.

## THE UDL FRAMEWORK AND PROCEDURES

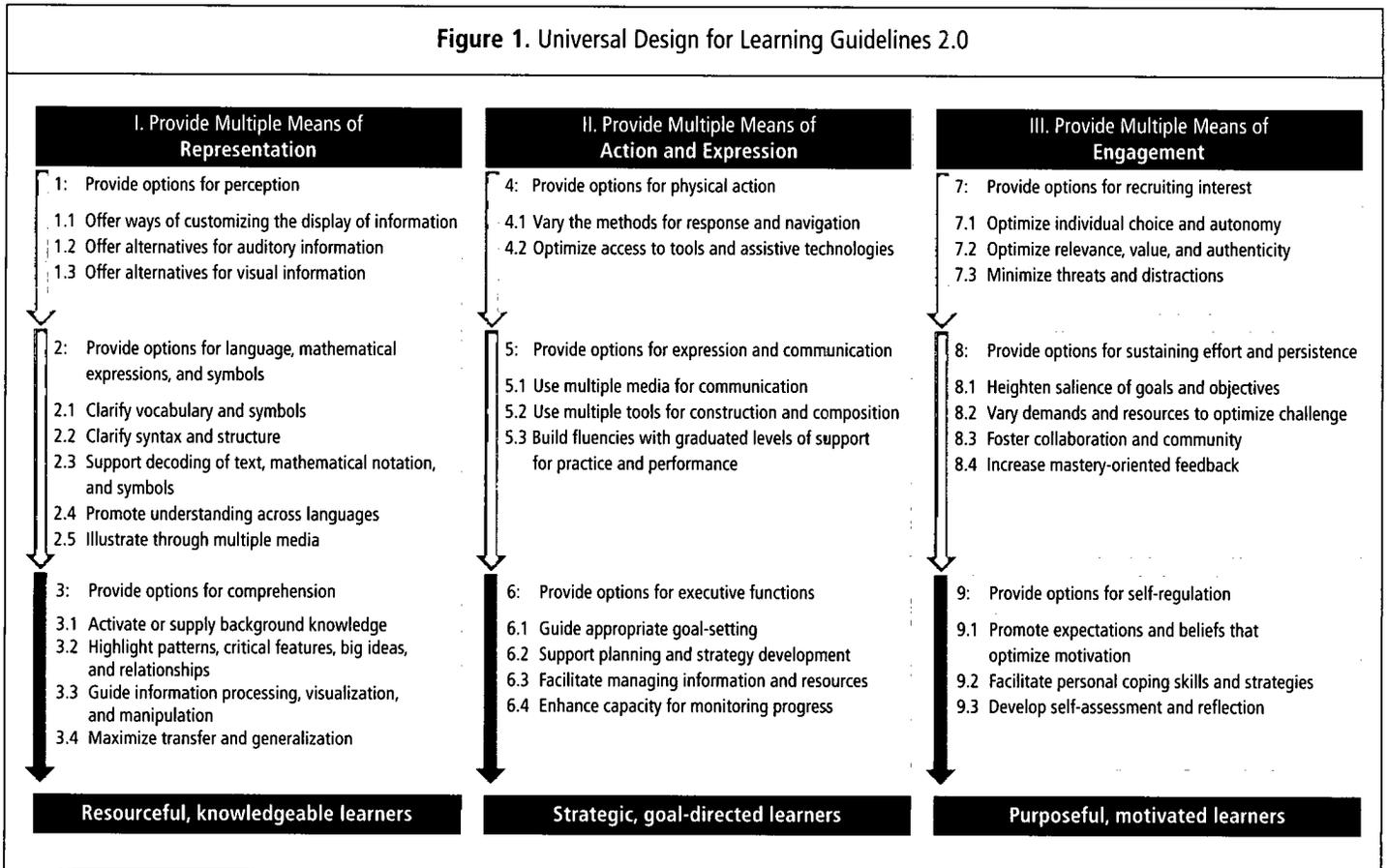
As mentioned above, the UDL framework (CAST, 2011) is organized around three main guidelines: 1) options for representation, 2) options for action and expression, and 3) options for engagement. The examples below illustrate some ways that the UDL framework can be used to design a curriculum that may help learners develop proficiency in a broader range of expressive, analytic, and cognitive styles. One example was chosen for each principle.

In order to illustrate the examples, we refer to specific, often opposite, models of thinking about the world that are shaped by previous social and cultural experience. However, the models of thinking presented here are neither mutually exclusive, nor the only ones that exist—many more valid models of thought can be identified. It is important to point out that these models are not meant to be characterization tools and should not be used for that purpose, since they would offer a reductionist view of individual differences, bordering on stereotyping. In fact, throughout this section of the article, in order to avoid misinterpretation, we have used the researchers' terminology and enclosed their words in quotation marks. It should be noted that these terms are not meant to stereotype or to generalize. Finally, these models of thought are not bound to geographically identified cultures. For example, when discussing analytical and dialectical models of thinking, we acknowledge that the culture and cultural patterns of the East are not exclusively dialectic, just as cultures of the West are not exclusively analytical. In fact, if one thinks of cultures temporally, one can see manifestations of both models of thought in each culture at different times. However, these models of reasoning are useful in helping educators to think about possible points where learners of different cultures (or subcultures) may vary. This article argues that providing multiple entry points not only reduces cultural barriers to learning, but also presents opportunities for enriching the learning experiences, and hence, the thinking potential and reasoning repertoire of all learners.

### Example 1: Highlight Patterns, Critical Features, Big Ideas, and Relationships (UDL Checkpoint 3.2)

Culturally informed educators are aware of the fact that different cultures can have different understandings of what is "critical" and what is "big," and might organize their reasoning models in relation to different types of observable relationships. For example, Nisbett and colleagues (2001) describe how someone from a "Western" culture may show a preference for grouping elements or organize ideas based on membership in a particular category, while someone from an "Eastern" culture may prefer to use functional relationships and part-whole relationships as an organization tool. For example, when given the task to group and organize these three elements—a woman, a man, and a child—Chinese participants tended to group the woman with the child, reasoning that the first takes care of the latter, while American participants tended to group the woman and the man together, reasoning that they were both members of the same category, namely adults.

Figure 1. Universal Design for Learning Guidelines 2.0



These culturally specific understandings are both valid ways of organizing or categorizing. In fact, it is easy to imagine how each could be optimal depending on the situation. However, it is also easy to imagine how a person with little exposure to varied ways of thinking might inadvertently see one as correct and the other as incorrect. Therefore, if an educator accepted only one way of grouping, it would not only present barriers for some culturally varied learners, but would also prevent other learners from being exposed to different ways of thinking. To give learners opportunities to acquire and/or demonstrate knowledge through different cultural frames of reference, the curricula should explore all types of relationships, rather than privileging one type of category or relationship.

Graphical organizers can be used to convey these different types of relationships. For example, tables with headings based on categories, or Venn diagrams, can show category membership relationships. Web-like displays or tree-type organizers, as well as pie charts, can capture part-whole relationships, while tables with headings that organize the elements according to roles, or “oriented” networks that connect elements through arrows, can show functional relationships. Other types of relationships such as similarity, opposition, contradiction, and mediation can be introduced and explored as well.

**Example 2: Build Fluencies with Graduated Levels of Support for Practice and Performance (UDL Checkpoint 5.3)**

In order to help learners build fluencies that encompass a varied repertoire of composition styles and problem solving techniques, a rich culturally informed curriculum will provide entry points that are familiar to the learners and eventually challenge them to develop fluency in those that are unfamiliar.

Indeed, composition structure and preferences for problem solving techniques often vary from culture to culture. For example, Nisbett and colleagues (2001) write about the way in which people from “Western cultures” generally use foundational principles (based on the assumption that two contradictory ideas cannot be true at the same time) and a linear logic style, while those from “Eastern cultures” may employ dialectics (based on the assumption that no statement is completely true or completely false) as a problem solving strategy. Thus, the “Western” frame of thought will aim toward eliminating contradiction. In contrast, the “Eastern” cultural frame of thought will aim to embrace contradiction and find the middle point between opposing statements. For an analytical process to work, it is essential that the reasoning remain at the same level of analysis, while for a dialectical approach, it is important to “zoom out” for a more integrative perspective. While one might want to use the analytical approach when testing a hypothesis, dialectical thinking could be more effective when trying to bridge unconnected ideas.

One can easily imagine how both frames of thought have advantages as well as disadvantages. For example, someone who is accustomed to employing foundational principles for problem solving might find it challenging to integrate diverging ideas into a whole, or to understand a complex causation system. However, the same person might excel at arguing in favor or against a position and may be very good at designing “falsification” tests (Popper, 2005, p. 10) to assess the strength of different hypotheses. In contrast, someone with a dialectical mindset might find it difficult to defend a single position and deal with tasks such as debates, but the same person would probably prove very flexible and creative at bridging seemingly opposite statements or ideas.

It is important to stress the fact that both culturally influenced approaches are equally valid; therefore, a rich, culturally informed curriculum would offer opportunities and options for being exposed to and learning both approaches. For example, instead of formulating the requirements of a class discussion or an essay as defending one position, a culturally informed curriculum would explore a richer array of possibilities: that one position may be true and the other false, that both positions are true or both positions are false. In this way, thinkers using both frames of thought can demonstrate their strengths and, equally important, be challenged to venture beyond their own cultural frame of thought.

These same culturally influenced models of thinking are also reflected in the writing style and the structure of composition. While a person relying on linear logic may organize writing in a linear way—first premise, second premise, and conclusion—a person following a dialectic format might organize writing in a spiral way—a thesis, an antithesis, and a synthesis that in turn becomes the thesis for a new dialectical cycle. In fact, there are many different kinds of logic that one can employ, and these types are also represented in compositions (Kaplan, 1972).

The differences in the structure of a composition are important for educators to understand. What may appear simplistic or disorganized to someone from one culture may actually be a very high-level example of another culture’s preferred logic and composition style. Misinterpretations like this can be seen as educators work with culturally varied groups of learners at all levels, from primary school to the university.

Explicit instruction in both composition formats would broaden the choices and the means of expression for all learners. The curriculum could help learners analyze when each of these formats of writing or patterns of thinking are most appropriate, and how they function within the cultural environment of the learner’s school. In other words, learners can be taught to strategize and use the best option, depending on the context. If multiple options were integrated into the curriculum, they would not only better meet culturally influenced learning differences by valuing and validating non-dominant approaches, they would also help to develop expert learners by enriching and expanding the thinking styles and expressive skill set of all the experiences of all.

### **Example 3: Facilitate Personal Coping Skills and Strategies (UDL Checkpoint 9.2)**

One might say that learning in childhood is the development of personal coping skills and strategies or the development of self-regulation. For those attempting to learn and navigate in an unfamiliar culture, coping skills may already be stressed. Ego depletion, “the condition that arises when the self’s resources have been expended and the self is temporarily operating at less than full power” (Baumeister, 2002, p. 133), has been studied mainly in relation to moral judgments and choice making. There are, however, strong indications that the phenomenon could be true for learning as well. Energy resources are expended in acts of self-control, and in turn affect subsequent decision making processes.

In a study conducted by Baumeister (2002), subjects were asked to regulate their behavior by making and then breaking a habit. The findings suggest that acts of self-regulation depleted the resource used when engaging in active volition. Learners who are being educated in a non-native culture may be in situations where they must constantly choose between competing responses and reactions, inhibit certain behaviors that are culturally inappropriate in the school context, and acquire unfamiliar habits. As a result, it is not unthinkable that they will be affected by ego depletion, and that the mental resources essential for performing certain tasks will be expended in this self-regulation process, leaving them depleted for learning.

In addition, ego depletion could be an important (although not the only) source of some behavioral patterns. When educators are aware of this fact, many of the misunderstandings regarding these behaviors can be avoided. For example, passive attitudes of learners may be a response to limited self-resources and an attempt to conserve mental energy (Baumeister, 2002) rather than an indicator of lack of interest. Rejection of choice and responsibility may be a response to a state of ego depletion and not necessarily a sign of lack of involvement or defiance while, conversely, regulation of emotions and behavior may be affected by tasks that require strenuous choice.

Self regulation can be supported in several ways—for example, “rest and positive affect help restore the self’s resources” (Baumeister, 2002, p. 129). By sequencing the curriculum in a way that optimizes the succession of more challenging and less challenging tasks, ego depletion could be minimized. An important feature of this type of sequencing is flexibility and adaptability to the characteristics of varied learners. Options for pausing and for changing the order of certain tasks, embedded “down time moments,” and structures that support pacing are elements that can contribute to restoring or preserving the self’s resources.

### **CONCLUSION**

In this article, we argue that cultural variability is a source of brain-based learning differences, and we offer an explanation for the mechanism underlying this process. We demonstrate the ways in which the Universal Design for Learning can be extended to

better capture the way that learning is influenced by cultural variations, and illustrate how the UDL framework can be used to create a culturally informed curriculum that is useful to improving education of all learners globally.

UDL does not operate in a vacuum but depends on our ability to recognize difference and ask ourselves the right and relevant questions about difference. The framework is a tool that gains strength by the way it is used. Just like a global positioning tool or GPS, the UDL framework can show what the landscape of good learning looks like. But it would be even more useful if it helps educators to identify some different popular routes (culturally influenced learning patterns and paths), use information on the different benefits and challenges each offers, and understand the points where they intersect and those where they diverge. Most important perhaps, the framework could provide recommendations on how to help travelers (learners) develop a variety of useful strategies (learning tools) that they might need to approach any type of travel.

Much work remains to be done. On the research front, most of the work on culturally influenced learning differences, to date, has focused on cultures of the West versus cultures of the East, and more work is needed on other cultures to develop a more detailed and comprehensive global picture. On the professional development front, it is vital to raise awareness of how specific cultures influence learning in specific ways. It is also important to clarify the benefits of this approach for all learners. On the curriculum development front, appropriate materials need to be developed that cater to culturally influenced learning variations. Further research is needed to confirm and refine the effectiveness of the UDL framework in meeting the instructional needs of students from culturally diverse backgrounds.

Performing this work will be highly worthwhile: as our societies become more culturally diverse, the approach described here offers valuable opportunities to further improve education globally. Understanding other cultures and systems of thought enhances the understanding of oneself and one's own culture and learning process. In a global community, cultural competence, ease of cross-cultural communication, and flexibility in thinking are fundamental. Indeed, if the goal of education is to develop expert learners, the development of cross-cultural fluency is an essential skill. These competencies are developed through learning experiences that value and expose learners to multiple ways of thinking, acting, participating, and problem solving. Such experiences might have a positive impact not only on learners in the "cultural margins" but more broadly, on all learners—helping them to develop proficiency in a broad range of expressive, analytic, and cognitive styles that are crucial to success in the twenty-first century.

## References

- Ambady, N., & Bharucha, J. (2009). Culture and the brain. *Current Directions in Psychological Science*, 18, 342–345.
- Baumeister, R. F. (2002). Ego depletion and self-control failure: An energy model of the self's executive function. *Self Identity*, 1, 129–136.
- Center for Advanced Research on Language Acquisition, University of Minnesota (CARLA). (2009). *What is Culture?* Retrieved from <http://www.carla.umn.edu/culture/definitions.html>.
- Center for Applied Special Technology (CAST). (2011). *Universal design for learning guidelines version 2.0*. Wakefield, MA: National Center on Universal Design for Learning.
- Dehaene, S. (2009). *Reading in the brain: The science and evolution of a human invention*. New York, NY: Viking Penguin.
- Freeman, J. B., Rule, N. O., Adams, R. B., & Ambady, N. (2009). Culture shapes a mesolimbic response to signals of dominance and subordination that associates with behavior. *NeuroImage*, 47, 53–359.
- Kaplan, R. B. (1972). Cultural thought patterns in inter-cultural education. In K. Croft (Ed.), *Readings on English as a second language* (pp. 245–262). Cambridge, MA: Winthrop Publishers, Inc.
- Karmiloff-Smith, A. (1992). *Beyond modularity*. Cambridge, MA: MIT Press.
- Kitayama, S., & Tompson, S. (2010). Envisioning the future of cultural neuroscience. *Asian Journal of Social Psychology*, 13, 92–101.
- Meyer, A., & Rose, D. H. (1998). *Learning to read in the computer age*. Cambridge, MA: Brookline Books.
- Meyer, A., & Rose, D. W. (2000). Universal design for individual differences. *Educational Leadership*, 58(3), 39–43.
- 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* (pp. 13–35). Cambridge, MA: Harvard Education Press.
- Nisbett, R. E., & Miyamoto, Y. (2005). The influence of culture: Holistic versus analytic perception. *TRENDS in Cognitive Sciences*, 9(10), 467–473.
- Nisbett, R. E., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thoughts: Holistic versus analytic cognition. *Psychological Review*, 108(2), 291.
- Popper, K. R. (2005). *The logic of scientific discovery*. London, UK and New York, NY: Taylor & Francis e-Library.
- Rose, D. H., & Meyer, A. (2000). *The future is in the margins: The role of technology and disability in educational reform. A report prepared for the U.S. Department of Education Office of Special Education Technology*. Washington, DC: Department of Education.
- Rose, D. H., & Meyer, A. (2002). *Teaching every student in the digital age: Universal design for learning*. Alexandria, VA: ASCD.
- Tomasello, M. (1999). *The cultural origins of human cognition*. Cambridge, MA: Harvard University Press.
- Vygotsky, L. (1978). *Mind and society*. Cambridge, MA: MIT Press.
- 
- Meia Chita-Tegmark** is a doctoral student in Developmental Science at Boston University. Ms. Chita-Tegmark can be reached at [meia@bu.edu](mailto:meia@bu.edu).
- Maria de Lourdes B. Serpa** is a professor of education and special education at the Graduate School of Education, Lesley University. Dr. Serpa can be reached at [mserpa@lesley.edu](mailto:mserpa@lesley.edu).
- Jenna W. Gravel** is a doctoral student at the Harvard Graduate School of Education. Ms. Gravel can be reached at [jjw358@mail.harvard.edu](mailto:jjw358@mail.harvard.edu).
- Yvonne Domings** is an instructional designer and research associate at CAST. Ms. Domings can be reached at [ydomings@cast.org](mailto:ydomings@cast.org).
- David Rose** is the Chief Education Officer at CAST. Dr. Rose can be reached at [drose@cast.org](mailto:drose@cast.org).

