Understanding Universal Design for Learning

Contributors: Gabrielle Rappolt-Schlichtmann, Marianne Bakia, Jose Blackorby, David Rose
Questions, or want to add to this topic or to a new topic? Contact CIRCL.
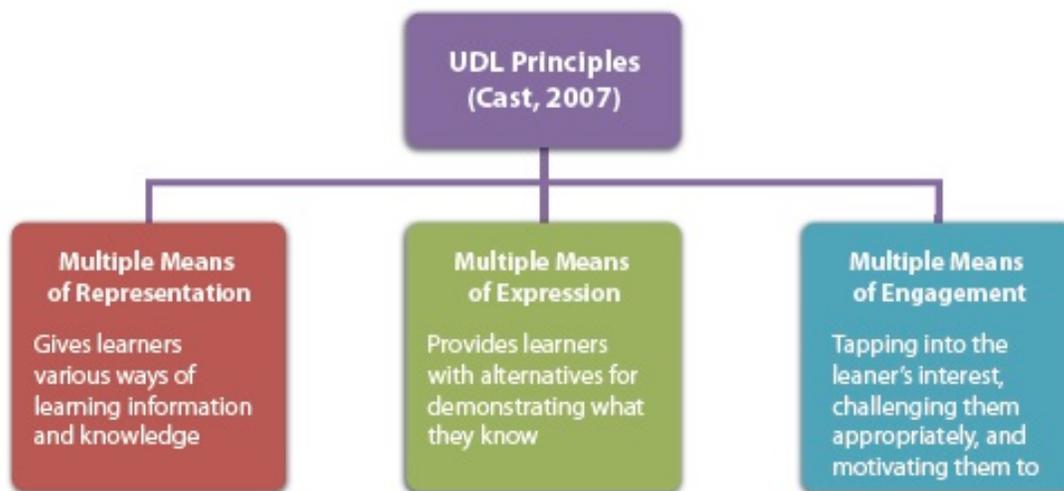
Overview

Universal Design for Learning (UDL) is a research-based framework intended to guide the design of learning technologies that are accessible and effective for all students, including those who are struggling academically and those with special needs. Inspired by the concept of universal design in architecture, the framework was first conceived in the early 1990s and developed over the intervening decades. UDL has entered the public consciousness as many local, state, national and international education settings have moved to adopt the framework. For example, UDL has influenced the design of more accessible museum exhibits and usable K12 curricula for low-vision/blind students. The Higher Education Opportunity Act (HEOA) of 2008 established the statutory definition for UDL, emphasizing that pre-service teacher training incorporate instruction on strategies consistent with UDL. More recently, the U.S. Department of Education's National Educational Technology Plans (2010 and 2015 in preparation), which is meant to guide the use of technologies in transforming education, refers to UDL as a framework that reduces barriers and maximizes learning opportunities for all students.

This attention to UDL within the field of education reflects and leads a broader conceptual shift away from "one size fits all" solutions and toward greater interest in providing "personalized" learning experiences for everyone. The UDL approach takes human diversity as its starting point rather than as an unexpected complication that will later require expensive modification or accommodation. Moreover, by attending early to the challenges of people who may be "in the margins" because they may have a different set of abilities, the UDL approach provides a foundation for educational designs that are powerful and flexible enough to optimize outcomes for all learners.

The theory and practices of UDL depend upon advances in two domains: modern learning sciences and modern learning technologies. From the learning sciences – cognitive neuroscience, affective neuroscience, cognitive science, educational sciences – UDL draws upon research that articulates the consequential differences between learners, differences that must be addressed for a learning technology

to be successful for the full spectrum of learners. From modern learning technologies – such as interactive multimedia and networked learning environments – UDL takes advantage of the enormous capacity for personalization and adaptivity that these new technologies offer but that is usually insufficiently realized.

Just as universally designed buildings provide options that accommodate a broad spectrum of users, tools and curricula that are designed using the UDL framework offer a range of options for accessing and engaging with learning materials. The UDL principles can be applied to design of curricula, instructional practices, and assessments and the following three principles (along with actionable guidelines) address challenges that must be addressed to reach all students, and that can be addressed with modern learning technologies: (1) providing multiple means of presentation (e.g., perception, language, comprehension), (2) providing multiple means of action and response (e.g., action, expression, communication), and (3) providing multiple means of engagement (e.g., interest, persistence, self-regulation). UDL offers a means to provide opportunities for flexible and deep learning through the design of customizable methods, materials, and assessments (Meyer, Rose, & Gordon, 2014; Rose & Meyer 2002; Rose, Meyer, & Hitchcock, 2005).

UDL Principles (Cast, 2007)

Multiple Means of Representation
Gives learners various ways of learning information and knowledge

Multiple Means of Expression
Provides learners with alternatives for demonstrating what they know

Multiple Means of Engagement
Tapping into the leaner's interest, challenging them appropriately, and motivating them to

In the design process, UDL requires close attention to learners with "disabilities" — the framework posits that these students are "canaries in the coal mine" that can alert designers and educators to problems and barriers in their methods, materials and assessments. When people with disabilities experience difficulty in an educational environment, it is often a sign that others without disabilities may also have difficulty, though it may be less readily apparent. By attending to the challenges faced by individuals in the margins early in

the design process, learning environments can be made more accessible, engaging and effective for a wider array of students. Taking this approach results in a profound change in thinking that moves away from the "child as a problem" perspectives that have dominated our view of human diversity (see Dudley-Marling 2004; Albrecht, Seelman, and Bury 2001) and toward social constructivist views of education that recognize that the barriers and limitations of poor design in the environment are the critical problem to address in a democratic society. In this modern, universal design view, it is the "disabilities" and "handicaps" of our learning technologies that must be the first focus of intervention (see Rappolt-Schlichtmann & Daley, 2013; Thaper et al. 2004).

The research base for UDL in practice is growing, with contributions from a wide range of organizations and professionals and includes descriptive, correlational, and experimental studies. A recent review of the research literature suggests that UDL has made significant inroads into a number of educational communities, as measured by journal spread, intended audience, disability categories (including those with no disabilities), describing work affecting students with a wide age range, from early childhood through adulthood (Okolo and Diedrich, 2015). Studies of efficacy have been fewer, but are beginning to provide evidence of the frameworks value in the design of educational tools and environments at scale (for example, see Rappolt-Schlichtmann, et al., 2013 for efficacy trial of UDL science notebook). Further design-based research is needed to explore the many potential approaches (and innovations) to the instantiation of UDL in technology based STEM learning solutions, as well as implementation research that explores and validates the use of UDL approaches in authentic STEM learning settings.

Issues

The **research base on UDL** and the effect on student learning and affect is growing but still emergent, with most of the work done in literacy and inquiry science.

The **impact of the UDL framework** can be difficult to study using traditional research methods because it can be applied in so many different content areas, grade levels, and contexts.

Current approaches to measuring **fidelity of implementation** is an issue for UDL, and personalization generally, because the specific sequence of instructional activities and supports are intended to vary

according to student need. They are not expected all be the same for all students. What works for one students might not work for another.

Kitchen sink perception of UDL. There is a perception that UDL covers too much ground, making technology designs too complicated. We view this as a misconception, but a problem that often emerges when designers first attempt to leverage the framework. When designers start with instructional goals and understand what is flexible and not, the application of UDL principles can be applied consistent with of the needs of learners, and in ways that make the technology less and not more complicated from a user-experience design perspective.

Adaptive learning principles have been applied successfully, especially in mathematics. But from a UDL perspective, some of these solutions miss the forest for the trees – they serve academic learning, but do not necessarily meet the broader, key goal of UDL about preparing students to be expert learners. Many questions persist as to how adaptive learning approaches can be used to support UDL goals, like inclusion and independent self-regulation in learning.

Perception that UDL is only for students with disabilities. UDL design benefits from considering the needs of students with disabilities and they often benefit from UDL solutions. It does not mean that they are designed only for that population. Rather, UDL solutions are intended to provide benefit to all students, as the architectural curb-cuts have done for so many.

Projects

Examples of NSF Cyberlearning projects that overlap with topics discussed in this primer (see project tag map).

Accessibility and learning

- CAP: AccessCyberlearning
- DIP: Collaborative Research: Taking Hands-on Experimentation to the Cloud: Comparing Physical and Virtual Models in Biology on a Massive Scale
- EXP: Exploring Augmented Reality to Improve Learning by Deaf Children in Planetariums

- EAGER: Promoting Algebra Learning Through an Accessible Expression System for Students with Visual Impairments and Blindness

More posts: accessibility-and-technology

Personalized learning

- EXP: Attention-Aware Cyberlearning to Detect and Combat Inattentiveness During Learning
- EAGER: Towards Knowledge Curation and Community Building within a Postdigital Textbook
- Badge-Based STEM Assessment: Current Terrain and the Road Ahead
- DIP: EMBRACEing English Language Learners with Technology
- DIP: Collaborative Research: Impact of Adaptive Interventions on Student Affect, Performance, and Learning

More posts: personalized-learning

Resources

National Center for UDL

UDL Guidelines

Implementation Research Metwork for UDL (IRN)

Office of Education Technology: Ed Tech Developers Guide (see Oppertunity 8)

Higher education UDL course design support

NEA Research Spotlight on UDL

AEM Center, accessibility guidence as related to UDL

DO-IT Center, accessibility gudience related to UDL

CAST

Talk by Todd Rose from CAST, at Cyberlearning 2012 Summit

Readings

This section includes references and key readings documenting the thinking behind the concept, important milestones in the work, foundational examples to build from, and summaries along the way.

Meyer, A., Rose, D. H., & Gordon, D. (2014). Universal design for learning: Theory and practice. Wakefield, MA: CAST Professional Publishing.

Rappolt-Schlichtmann, G., Daley, S. G., Lim, S., Lapinski, S., Robinson, K. H., & Johnson, M. (2013). Universal design for learning and elementary school science: Exploring the efficacy, use, and perceptions of a web-based science notebook. Journal of Educational Psychology, 105(4), 1210-1225.

Daley, S. G., Hillaire, G. and Sutherland, L. M. (2014), Beyond performance data: Improving student help seeking by collecting and displaying influential data in an online middle-school science curriculum. British Journal of Educational Technology. doi: 10.1111/bjet.12221

Vue, G., Hall, T.E., Robinson, K., Ganley, P., Elizalde, E. & Graham, S. (2015). Informing Understanding of Young Students' Writing Challenges and Opportunities: Insights From the Development of a Digital Writing Tool That Supports Students With Learning Disabilities. Learning Disabilities Quarterly

Universal design for learning. Rose, D.H. & Gravel, J.W. (2013). In E. Baker, P. Peterson, & B. McGaw (Eds.).International Encyclopedia of Education, 3rd Ed. Oxford: Elsevier.

Rose, D.H. & Meyer, A. (2002). Teaching every student in the digital age: Universal Design for Learning. Alexandria, VA ASCD.

Rose, D.H., Meyer, A., & Hitchcock, C. (2005). The universally designed classroom: Accessible curriculum and digital technologies. Cambridge, MA: Harvard Education Press.

Dudley-Marling, C. (2004). The social construction of learning disabilities. Journal of Learning Disabilities, 37, 482-490.

Albrecht, G., Seelman, K., & Bury, M. (2001). Handbook of disability studies. Sage Publications.

Okolo, C.M. & Diedrich, J. (2014). Twenty-five Years Later: How is Technology Used in the Education of Students with Disabilities? Results of a Statewide Study. Journal of Special Education Technology, 29(1).