Universal Design for Learning

TAACCCTOn
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CAST is an education research and development nonprofit that works to expand learning opportunities for all individuals through Universal Design for Learning (UDL).

We leverage the learning sciences and technology to create products, promote classroom practices, and inform policy. We design for students at the margins *from the outset.*

Innovations that are essential to some end up being beneficial to many.
Universal Design for Learning (UDL) is a framework that draws upon the latest understandings from the learning sciences to guide the development of improved curricular and instructional strategies that address learner variability.

An instructor or curriculum designer can use UDL to design those flexible environments that respond to learner variability.
Department of Labor

TAACCCT program Solicitation for Grant Applications:

“All online and technology-enabled courses developed under this SGA must incorporate the principles of universal design in order to ensure that they are readily accessible to qualified individuals with disabilities in full compliance with the Americans with Disability Act and Sections 504 and 508 of the Federal Rehabilitation Act of 1973, as amended.”
Universal Design compared to accessibility

Arts Building University of Saskatchewan
Daryl Mitchell, February 14, 2014
https://www.flickr.com/photos/daryl_mitchell/

Ramp and Can
Sam Craig, June 18, 2009
https://www.flickr.com/photos/pirateyjoe/
When it comes to learning, natural variability is the rule, not the exception.


Variability is the rule. The most consistent finding to emerge from the interdisciplinary study of learning is that when it comes to learning, natural variability is the rule, not the exception. Differences exist not only among students, but also within the same student over time as a result of development, contextual support, and (importantly) what the student is learning. Learners are going to look more variable than ever before as new hybrid approaches in the classroom allow teaching and learning to happen in new ways. This variability can be challenging for faculty members and instructional designers trying to teach the same course to a wide range of students.
Grounded in the learning sciences and leveraging multimedia technology, UDL is a framework that guides the design of instructional approaches and curricular materials that scaffold and support learning for all students. UDL provides a systematic framework for addressing the complex, but often-subtle, obstacles that can prevent students’ access to skills, content knowledge, and rigorous learning opportunities. There is now an urgent call for personalized materials that accommodate diverse learners through UDL—both from teachers and through recent federal legislation. For example, the Higher Education Opportunity Act defines UDL as an educational framework 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 (Higher Education Opportunity Act, PL 135-122).
UDL Guidelines

I. Provide Multiple Means of Representation
1. Provide options for perception
   1.1 Offer ways of customizing the display of information
   1.2 Offer alternatives for auditory information
   1.3 Offer alternatives for visual information

2. Provide options for language, mathematical expressions, and symbols
   2.1 Clarify vocabulary and symbols
   2.2 Clarify syntax and structure
   2.3 Support decoding of text, mathematical notation, and symbols
   2.4 Promote understanding across languages
   2.5 Illustrate through multiple media

3. Provide options for comprehension
   3.1 Activate or supply background knowledge
   3.2 Highlight patterns, critical features, big ideas, and relationships
   3.3 Guide information processing, visualization, and manipulation
   3.4 Maximize transfer and generalization

Resourceful, knowledgeable learners

II. Provide Multiple Means of Action and Expression
4. Provide options for physical action
   4.1 Vary the methods for response and navigation
   4.2 Optimize access to tools and assistive technologies

5. Provide options for expression and communication
   5.1 Use multiple media for communication
   5.2 Use multiple tools for construction and composition
   5.3 Build fluencies with graduated levels of support for practice and performance

Strategic, goal-directed learners

III. Provide Multiple Means of Engagement
7. Provide options for recruiting interest
   7.1 Optimize individual choice and autonomy
   7.2 Optimize relevance, value, and authenticity
   7.3 Minimize threats and distractions

8. Provide options for sustaining effort and persistence
   8.1 Heighten salience of goals and objectives
   8.2 Vary demands and resources to optimize challenge
   8.3 Foster collaboration and community
   8.4 Increase mastery-oriented feedback

Purposeful, motivated learners


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Deepening on each principle as you move down the guidelines vertically. Increasingly, UDL is considered foundational to innovations in K-12 and postsecondary education that require the use of technology and that include a range of different learners. This is the case because of its capacity to use technology effectively to address learner variability.
How we gather facts and categorize what we see, hear, and read. Identifying letters, words, or an author's style are recognition tasks.

Provide Multiple Means of **Representation**

Present information and content in different ways

Recognition Networks
the “what” of learning

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Three Representation Guidelines

Multiple Means of Representation

Provide Options for Perception

Provide Options for Language, Mathematical Expressions, and Symbols

Provide Options for Comprehension

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Activate or supply background knowledge
Highlight patterns, critical features, big ideas, and relationships
Strategic Networks

Provide Multiple Means of Action and Expression

Differentiate how learners can act and express what they know

Planning and performing tasks. How we organize and express our ideas. Writing an essay or solving a math problem are strategic tasks.
I. Providing Multiple Means of Action and Expression

- Provide Options for Physical Action
- Provide Options for Expression and Communication
- Provide Options for Executive Functions
Additive manufacturing - 3D Printing

- Wounded veteran finds new way to serve by training for career in 3D printing

The use of AMT clearly has the potential to increase productivity in the manufacturing environment as evidenced by its increased use. This technology also has the potential to significantly reduce the physical demands on manufacturing employees. Corresponding improvements to the processing and quality control strategies employed by manufacturers lead to a more simplified environment. The combination of these provides a unique opportunity for people with disabilities to be employed in a manufacturing environment if issues of safety and accessibility can be addressed adequately. Further research and development must be conducted related to these manufacturing trends so that new job opportunities may be identified. These new job opportunities will lead to the development of universally designed machine control systems and an increased labor pool for employers in the manufacturing environment. Efforts must also be made to revise safety regulations and guidelines to ensure greater accessibility and safety for people with disabilities in the manufacturing environment.

http://www.workplacerc.org/News/04june20_3.php
Additive manufacturing - 3D Printing

“I see a future in this industry, and I can serve my country by learning the technology and software to build 3D-printed exhaust systems for cars and trucks that will save Americans millions in fuel costs someday.”

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http://www.workplacererc.org/News/04june20_3.php
Executive Functions

Set goals
Develop plans and strategies
Manage information and resources
Monitor progress and adjust as needed
Class Progress

Class Progress Visualization

Designed to help instructors easily view and understand a learner’s progress at-a-glance

Customizable display settings

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User Progress

Provides an all-in-one view of interactions users have with a Course

User Progress Report

User Progress Summary Report

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UDL and formative assessment

The promise of UDL is yet to be realized in formative assessment despite more readily available new technologies which enable supports, scaffolds, and options in assessment.
"The always-on nature of the Internet and mobile access devices provides our education system with the opportunity to create learning experiences that are available anytime and anywhere.

When combined with design principles for personalized learning and UDL [Universal Design for Learning], these experiences also can be accessed by learners who have been marginalized in many educational settings: students from low-income communities and minorities, English language learners, students with disabilities, students who are gifted and talented, students from diverse cultures and linguistic backgrounds, and students in rural areas. (p. 23)"

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The findings from the EdTech Plan around UDL are now being used to address the move towards personalization and the use of learning analytics to support personalization. The Learning Analytics Workgroup: A Report on Building the Field of Learning Analytics for Personalized Learning at Scale by Roy Pea, D.Phil., Oxon, David Jacks Professor of Education and Learning Sciences, Stanford University is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

UDL is a theoretical framework developed over the past 15 years that has application to instructional methods, teacher knowledge and skills, and assessment. UDL asserts that learning, instruction, and assessment are most effective in environments that are flexible enough to accommodate individuals according to their particular strengths and needs, which may be physical, intellectual, and/or motivational (Rose & Meyer, 2002). But the promise of UDL is yet to be realized in formative assessment despite more readily available new technologies which enable supports, scaffolds, and options in assessment.
Affective Networks
the “why” of learning

Provide Multiple Means of Engagement

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Affect represents a crucial element to learning, and learners differ markedly in the ways in which they can be engaged or motivated to learn. Some learners are highly engaged by spontaneity and novelty while other are disengaged, even frightened, by those aspects, preferring strict routine. Some learners might like to work alone, while others prefer to work with their peers. In reality, there is not one means of engagement that will be optimal for all learners in all contexts; providing multiple options for engagement is essential.

the principles of UDL explicitly call for the integration of emotion and cognition in the design of highly flexible educational environments that differentiate the level of support, feedback, and challenge that each learner receives. The basic premise of UDL is that barriers to learning occur when learners interact with the environment—they are not inherent solely in the capacities of the learner. Under UDL, the burden of adaptation is placed on the learning environment and materials, not on the learner, so designers anticipate learner diversity by making learning objects, materials and environments flexible to support the effective regulation of emotion and cognition in dynamic educational settings.
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Although affect is the most crucial element for learning, it is sometimes underestimated and disregarded by many educators as they think that learning should happen whether they find it interesting or not. This will be an online course and learners will be the driver of the journey and have a control over the pace of learning. If things do not seem interesting or relevant to them, they may drop out in the middle. Learners’ diverse background, needs, and interests should be considered from the beginning when we design the curriculum. Otherwise, we may end up losing some of our learners.

Here we suggest multiple ways that will stimulate learners’ interest and motivation for learning.
**Education**, in the deepest sense and at whatever age it takes place, concerns the opening of identities—exploring new ways of being that lie behind our current state. Whereas **training** aims to create an inbound trajectory targeted at competence in a specific practice, education must strive to open new dimensions for the negotiated self. It places students on an outbound trajectory toward a broad field of possible identities. Education is not merely formative—it is transformative.

*Wenger, 1998, p.263*

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When we look at education from this vantage point, variability is going to be even greater because the activities, habits, motivations associated with education are far less narrow than when we focus on competence in a specific practice. One reality of this different view of education is that individuals are not independent from one another and they do not all need to learn the same exact things. It is not just about adjusting rate of learning, it is about allowing for different competencies and identities as learners to fit together to create learning at the classroom level. This puts into question how we assess learning and whether or not we should always be assessing at the individual level.
Many of us will call up the proverb “a chain is only as strong as its weakest link” to make the case for a business developing each of its units. The marketing department will only have short-term success if the quality control department is ineffective. Yet, we rarely think about how this proverb applies to education.

Too often we assume that underdeveloping one student’s potential will not negatively impact the development of all other students.

However, research suggests that core beliefs and behaviors that enable a learner to persist when faced with challenge, and that we often think develop intrinsically, in fact develop through social interactions.

For example, the psychologist Albert Bandura, who developed the theory of self-efficacy, found that efficacy expectations develop socially through performance accomplishments, vicarious experience, verbal persuasion, and emotional arousal. He suggests that diverse models are better at improving self-efficacy because: “If people of widely differing characteristics can succeed, then observers have a reasonable basis for increasing their own sense of self-efficacy” (p.82).

Much like strong links in a chain, well-supported students, can reinforce one another’s efficacy expectations, providing a wide variety of models of how to reach learning goals.
Intelligence augmentation
(Fischer & Nakakoji 1992)

Support groups for social creativity
(Fischer et al., 2005)

“Much human creativity arises from activities that take place in a social context in which interaction with other people and the artifacts that embody collective knowledge are important contributors to the process [Csikszentmihalyi, 1996 as cited in Fischer 2012]
Contextualize generic systems through aiding \textit{metadesign, customization, end-user development} (Fischer, 2001)

Exploit \textbf{synergy of co-evolving approaches} to new media, theories about working, learning and collaborating, and creation of learning organizations (Fischer, 1998; Brown & Duguid 2000; Roschelle 2003)

Media and theories of learning are increasingly co-developed within the context of organizations focused on ongoing collaborative learning. This increasingly is where models of learning environments exist, and this may force change in how schools and colleges structure themselves so they may remain learning organizations.
Designed for multiple stakeholders:
- Instructional designers
- Faculty
- Policy makers
- Administrators

Offer understanding of UDL across five categories.

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UDL on Campus was intended to help TAACCCT grantees, but really, it’s for anyone in postsecondary environments—face to face classrooms, distance learning, or blended. The pages on the site are grouped under these 5 categories shown here: Assessment, Selecting Media and Technology, Improving Institutional Policies and Practices, Planning a Course, and Teaching Approaches.
References

Other resources

UDL On Campus http://udloncampus.cast.org
National Center on UDL: http://www.udlcenter.org
WebAIM Articles: http://webaim.org/articles/
WCAG 2.0. http://www.w3.org/TR/WCAG20/