Designing for Inclusive Instruction Based on Universal Design
San José State University Workshop

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Agenda

- Profiles of Diverse Learners
- Traditional Approaches and Innovative Trends for Addressing Diverse Learning Needs
- Brief Overview of ADA
- Universal Design for Learning
- Concluding Thoughts
Diverse Populations of College Students

How many shades of diversity can you see?

U.S. Department of Education (2015): 17 percent of full-time undergraduate students are black, compared with nine percent of professors; 12 percent of students are Hispanic, compared with four percent of faculty.
### Diverse Populations of College Students

#### Diversity Index – ethnic diversity

<table>
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<td>Rutgers University, Newark, NJ</td>
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<td>University of Nevada, Las Vegas</td>
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<td>Stanford University, Stanford, CA</td>
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<td>San Francisco State University, CA</td>
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<td>Princeton University, NJ</td>
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US News and World Report, 2016-17

Diverse Populations – Why Should it Affect Faculty?

- Faculty are content experts, but also purveyors and facilitators of the instructional space
- Faculty care about teaching and learning
- Inefficiencies in not engaging ALL students
- Faculty as part of institutional identity
Diverse Profiles of Learners - Neurodiversity

- A term coined in the late 1990’s by autism advocate Judy Singer
- Sometimes referred to as cerebro-diversity (coined by Gordon Sherman, 2002)
- Used to describe neural differences and the continuum of human competencies
- Refers to the unique ways in which the human brain processes information
- Neurodiversity expands our notion of “different”; and adjusts the discourse to acknowledge strengths, not just weaknesses of our neural differences
- Distinguishing between neuro-typical and neuro-atypical is not a perfect science
Neuro-typical and Neuro-atypical Profiles

- Gene
  - Proteins
    - Brain structure/function
    - Cognitive variability
    - Symptoms (syndrome)
    - Diagnosis (DSM-5)
      [Dyslexia; ADHD; NVLD]

Adapted from Dara Manoach (2012) MGH; Harvard Medical School
Recent research identified common genetic risk variants across 5 major psychiatric disorders:

- ADHD
- Autism Spectrum Disorders
- Bi-Polar Disorder
- Major Depressive Disorder
- Schizophrenia

Smoller, Feb 2013

Current Understanding of Students with Learning and Attention Issues (LAI)

- 1 in 5 students in the US have learning and attention issues (State of LD, 2017)
- Only 24% informed their college that they had a learning disability

Why is there such a gap?
- Stigma/shame
- Sense that academic supports/accommodations are not needed
- Accessing DS can be challenging
- Don’t have documentation to be eligible
- Have out grown the need
- Don’t know how to self-advocate
Traditional Approach to LAI Students

• Provide intervention that addresses individual student needs or “functional limitations”
  - Remedial coursework
  - Content area tutoring
  - Writing labs
  - Academic coaching
  - Accommodations (as mandated under the ADA)
Accommodations are Protections under the ADA

• The ADA is a non-discrimination law which defines an individual with a disability as someone who:
  ▪ Has a physical or mental impairment that **substantially limits** one or more major life activities;
  ▪ Has a **record of such an impairment**; or
  ▪ Is **regarded as** having such an impairment.
    (42 U.S.C. §§ 12101-12213)

• Applies to any postsecondary institution receiving federal funds
Protection under the ADA

• Defines who is eligible for protection
• Supports the use of “reasonable accommodations” as way to ensure equal access
• Accommodation are changes to academic and non-academic protocol and procedures, as deemed appropriate for the student and the institution
• Accommodations are not meant to change “essential requirements” of the program of study or other academic standards
• A student must be otherwise qualified
Determining Academic Accommodations

ACCOMMODATION DECISION MAKING

1. Disability Documentation
2. Student Intake/Input
3. Program Requirements/Technical Standards
4. Faculty/ Course Expectations

Accommodations

MANJU BANERJEE, MARCH 30, 2012
Americans with Disabilities Act Amendments Act
(ADA AA, 2008)

• On Sept 28, 2008 President Bush signed into law the “ADA Amendments Act of 2008” and the law went into effect on Jan 1, 2009
• Expanded description of “major life activities”
  • ... substantially limits one or more major life activities, including reading, learning, concentration ..... 
• An impairment that is episodic or in remission is a disability, if it substantially limits a major life activity when active 
• Determination of whether an impairment is substantially limiting must be made without consideration of the ameliorative effects of mitigating measures
• Students still have to establish that they qualify under the ADA, but ....

• Disability Documentation requirements are now changing:
  • Documentation guidelines are less burdensome
  • Burden of proof is on the institution
  • Self-report has been elevated
  • Increased acceptance of non-traditional documentation
  • Accommodation determination is much more of a discourse/dialogue; focus on accommodations as an interactive process
Potential Sources for Misunderstanding

- No absolutes regarding accommodations; case-by-case and interactive
- Students should not independently negotiate accommodations with faculty; faculty should not make unilateral decisions
- What is discriminatory and what is not may not be clear
- DS personnel are responsible for ensuring accommodation implementation, but ...
- Accessibility is a campus-wide responsibility
Problem with Accommodations

• Are a “retrofit” to the teaching-learning space

• Based in a “deficit model” mindset

• New technologies are blurring the line between assistive technology, accommodations, and mainstream technology

• Many LAI students remain unidentified and they are in your courses
Neurodiversity and Dyslexia
How widespread is dyslexia?

About 13-14% of the school population nationwide are identified as having a handicapping condition that qualifies for Special Education (SPED) services.

One half of all students who are identified for special education are classified as having a learning disability (LD). About 85% of those students have a primary learning disability in reading and language processing.

Up to 15-20% of the population as a whole may have symptoms of dyslexia, including slow or inaccurate reading, weak spelling, and poor writing. Not all will qualify for Special Education, but most benefit from systematic, explicit instruction in reading, writing, and language (AKA, Structured Literacy Instruction).

Find solutions at the International Dyslexia Association (IDA) • eida.org
Source: IDA Fact Sheet, “Dyslexia Basics” • Moats & Dakin (© 2016 Cowen For IDA)
Test Your Knowledge of Dyslexia?

1. What do we know about its etiology?
2. How is dyslexia related to IQ?
3. What are some of the common characteristics of dyslexia?
4. How does dyslexia effect academic behavior?
5. What else can contribute to reading issues?
6. Can you test for dyslexia using a brain scan?
**Etiology**

Dyslexia is neurobiological in origin

- Brocca’s area
- Interior Frontal Gyrus [Articulation/Spoken Language]
- Parieto-Temporal [Word Analysis]
- Occipito-Temporal [Visual Word Form Area - VWRA]

Non-impaired

Dyslexic

LCIRT - Banerjee 2017
Dyslexia and IQ

- Dyslexia can be accompanied with high IQ. A slow reader can also be a fast and able thinker (Shaywitz, 2015)
Common Characteristics of Dyslexia?

Learning Disabilities

Reading Disabilities

Dyslexia

Impairment in Reading Comprehension

Christodoulou, 2017
Simple View of Reading

• Decoding × Listening Comprehension = Reading Comprehension

• Link between Decoding and Reading Comprehension decreases over time

• Link between Reading Comprehension and Listening Comprehension increases over time.

• What do you see in the classroom when this process does not occur as expected?

Christodoulou, 2017
The Many Strands that are Woven into Skilled Reading
(Scarborough, 2001)

LANGUAGE COMPREHENSION
- BACKGROUND KNOWLEDGE
- VOCABULARY KNOWLEDGE
- LANGUAGE STRUCTURES
- VERBAL REASONING
- LITERACY KNOWLEDGE

WORD RECOGNITION
- PHON. AWARENESS
- DECODING (and SPELLING)
- SIGHT RECOGNITION

Skilled Reading—fluent coordination of word reading and comprehension processes

Reading is a multifaceted skill, gradually acquired over years of instruction and practice.
Reading Brain

- Reading leads to rearrangement of neural circuitry
- Existing circuits are “repurposed” for reading
- Neural connections are rearranged according to the **medium of instruction** (Maryanne Wolf, 2016)
- Reading off a digital screen → new normal
  - Skimming
  - Multi-tasking
  - Divided attention and memory
  - In-depth reading – does not always occur
The brain’s ability to reorganize itself in response to stimuli.

Success is often the result of modifying surroundings to match individual and unique learning needs within contemporary expectations of a given culture (positive niche construction); Armstrong, 2015.

Focus today is on designing the learning environment/space rather than deficits (remedial model).
So Let’s Talk About Design

What is so cool about this building?
Universal Design/Universal Design for Learning

• UDL is about designing the learning environment to be inclusive
• Anticipating learner diversity and therefore differences in approaches to learning
• Presenting information in different formats and modalities (Multiple Means of Representation)
• Creating options for engagement (Multiple Means of Engagement)
• Allowing for alternatives in assessment (Multiple Means of Expression)

UDL provides a blueprint for creating instructional goals, materials, methods, and assessment; BUT UDL is more .....
UDL Principles are Grounded in 3 Neural Networks

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<th>Affective Network</th>
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CAST - [http://www.udlcenter.org/aboutudl/whatisudl](http://www.udlcenter.org/aboutudl/whatisudl)
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**WORKING MEMORY**  **EXECUTIVE FUNCTION**  **MOTIVATION**
• Learning is pattern recognition; part of our heritage
• Recognition network help us attribute meaning to patterns we see; and enables us to identify and understand information, ideas, and concepts
• Efficiency in recognition is based on expectations, given the input received through the senses
• There can be significant differences in the recognition networks of individual learners

Source:
http://www.cast.org/teachingeverystudent/ideas/tes/chapter2_3.cfm
Leveraging Pattern Recognition

- Our brains innately seek to recognize patterns and make meaning

Example:

“Courses, courses!” crater stop-murder. “Hoes debt ladle Manx wetter gloss slobbers? Any prance axe lackeys knots a barter! Lucks lackey garner dense wetter oil gnat, wile oil ware during aster set hair an kipper cheers worm! Courses!”

- Highly attuned to be alert to anomalies/differences/novel
Recognition Network

- Specialized and Distributed

“A seemingly simple task may place widely distributed demands on the brain” Meyer et al., (2014)

What we know is that the way a task is perceived is different for different individuals.
Perceptions are varied

What do you see in this image?
Recognition is Facilitated by Prior Knowledge

- What is this formula?

\[ r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}} \]

- “Every day is a new day. It is better to be lucky. But I would rather be exact. Then when luck comes you are ready.”

- “Friends, Romans, countrymen, lend me your ears for I come to bury Caesar, not to praise him.”

Prior knowledge is critically dependent on Memory Capacity
• Working Memory, Short-Term Memory and Long-Term Memory are the work horses of our cognitive abilities
Memory and Working Memory (WM)

• WM is the ability to keep information in memory while working on something else or being distracted

• The amount of WM available at any given time often predicts how well one performs on an academic task

• WM is essential for reading, problem-solving, critical thinking
Which is the Real Penny?
Recognition and Memory (Individual Activity)

- Think of something that students need to memorize or develop recognition fluency with, in your class?

- What are 2 traditional and 2 non-traditional ways in which you can promote recognition/recall of information in your class, among students?
Research and Working Memory - Implications

• Individuals with low WM often adopt a simple approach to problem solving; high WM use more sophisticated approach; but under pressure when high WM individuals tried to use sophisticated approaches or short cuts, their performance suffered. Overthinking something before a high pressure situation can be detrimental (Beilock, 2010)

• Experts and high functioning students with strong WM often “choke” in high pressure situations

• The recognition network and the strategic networks tend to shut down under pressure.
You have a drawer full of socks, each one of which is red, white or blue. You start taking socks out without looking at them. How many socks do you need to take out of the drawer to be sure you have taken out at least two socks that are of the same color?
Further Implications

• “Pausing in the middle of a challenge can prevent you from going down the wrong solution track.” (p. 29)
  Power of taking a step back or pausing
• High WM uses up brain power (glucose); taking a short break even when you feel you don’t have time for it, can make a difference
• Practicing under mildly high pressure situation can improve performance under really high pressure situations
• The key is to have brain power at your disposal, but to be able to turn it off in situations where it may prove disadvantageous. (p. 76)

Beilock, 2010
Design Recommendations for Recognition Systems

• Building in Trial-and-Error opportunities
• Value of Non-Learning time
• Multi-media options
  • YouTube videos - Mitosis
  • Digital flash cards
Strategic Network and Executive Function

• What do successful students do?
  - Set goals and meet them
  - Engage in problem solving and critical thinking
  - Take action independently
  - Manage themselves in challenging situations

Executive Function Skills
What are Executive Function (EF) Skills?

- More than 30 definitions and 33 constructs underlying EF (Barkley, 2011)

- Mental processes used to sustain problem-solving towards a goal (Behkterev, 1902; Luria, 1966)

- EF are cognitive abilities involved in planning, memory, inhibiting or delaying responding, and shifting attention or focusing on something now to achieve something later.
Executive Functioning

Frontal lobe is responsible for much of the executive functioning of the brain.

These functions include:
- Attention
- Working memory
- Planning, organizing
- Forethought
- Impulse control
What are Executive Function (EF) Skills?

“ADHD disrupts the development of inhibition and other self-directed executive functions producing a disorder of self-regulation across time and so interfering with the capacity to choose, enact and sustain actions towards goals”

Barkley, 2011
Executive Function Deficit Model

Executive Function Scaffolds by Design

- **User as Designer** – you decide the scaffolds
- Explicitly bring attention to tasks that require EF regulation
- Create routines as part of your class
- Provide just enough structure
- Provide feedback at the “point of performance”

Boutelle, 2014
Executive Function Scaffolds by Design

- Consider **gamification**
- Verify **foundational knowledge**
- Determine prior knowledge **fluency**
- Create opportunities for **social networking** among class peers
Gamification - Leaderboard

- Primary purpose of leaderboards is to show the players where they stand/rank in a gamified system.
- The opportunity to rise up the ranks is enticing to many students used to playing video games.
- By diversifying the Leaderboard, students get opportunities to excel at different tasks.

Examples:
- “Best Guess” Rewards
- Most Creative Inaccurate Answer
- Pinterest – pins are visual bookmarks
Gamifying your Course - Recommendations

• Make students co-creators of the design of your course

• Make it competitive
  • Competition that is encouraging, without being too competitive
  • Include elements that reward effort, strategy, and have probability/chance

• Capitalize on technology affordances
  • Top Hat Blog: https://blog.tophat.com/gamified-learning/
    (Pros and Cons)
Group Activity – Gamifying your Class

• Can you identify a topic in your course which can be framed as a “quest”

• What kind of leaderboard, badges, points, and level up tracks can you introduce within this quest?

• Other thoughts on gamifying your course?
Affective Network – WHY

• Helps us attach emotion and motivational significance
• Set priorities and engage in certain behaviors
• Developmentally, the affective network develops sooner than the strategic network

Implications for UDL?
Emotional Regulation

• Ability to inhibit inappropriate behavior related to strong negative or positive emotion (response suppression)

• Self-soothe/down regulate physiological arousal

• Refocus attention from emotionally provocative events

• Organize emotions for coordinated action to reach a goal (Barkley, 2011)


Significant variability in the values and reward system of the brain

“I don’t feel that math is that important for me; I am not going to be a scientist.”

“I am scared of group work because I feel my peers will know that I am stupid.”

“For me to be able to sit down to study, I need to feel an adrenaline rush; it has to feel like an extreme sport.”
Self-Regulation Strength is a Limited Resource

S-R fuel tank increases with maturation

Use of ER/SR depletes the capacity temporarily

Barkley, 2011; Bauer & Baumeister, 2011
Reverse Engineering the EF System

• Design “prosthetic environments” around the individual to replenish the SR fuel tank

• Effective intervention is that which occurs at the “point of performance”
  o Feedback vs. Feedforward

Barkley, 2011
Affective Network – Strategies and Interventions

▪ Peer Academic Reputation
  
  *(Stamp, Banerjee, & Brown, 2015)*

▪ Cognitive Reappraisal

Marshmallow test – (Walter Mischel)

https://www.youtube.com/watch?v=Sc4EF3ijVJ8
UDL is NOT ..... 

• A check list of TO DO items
• Does not result in a watering down of the curriculum
• Based solely on technology
• Universal instruction for ALL students
Concluding Thoughts

- UDL is a mindset!
- Implementation requires institutional partnership
- Results in improved student engagement and learning for all!
Question and Answers