

# Preparing for the Variety of Learners' Needs, Abilities, and Interests with Universal Design for Learning

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Link to Resources Folder:

<http://tiny.cc/INCLUDE-UDL>

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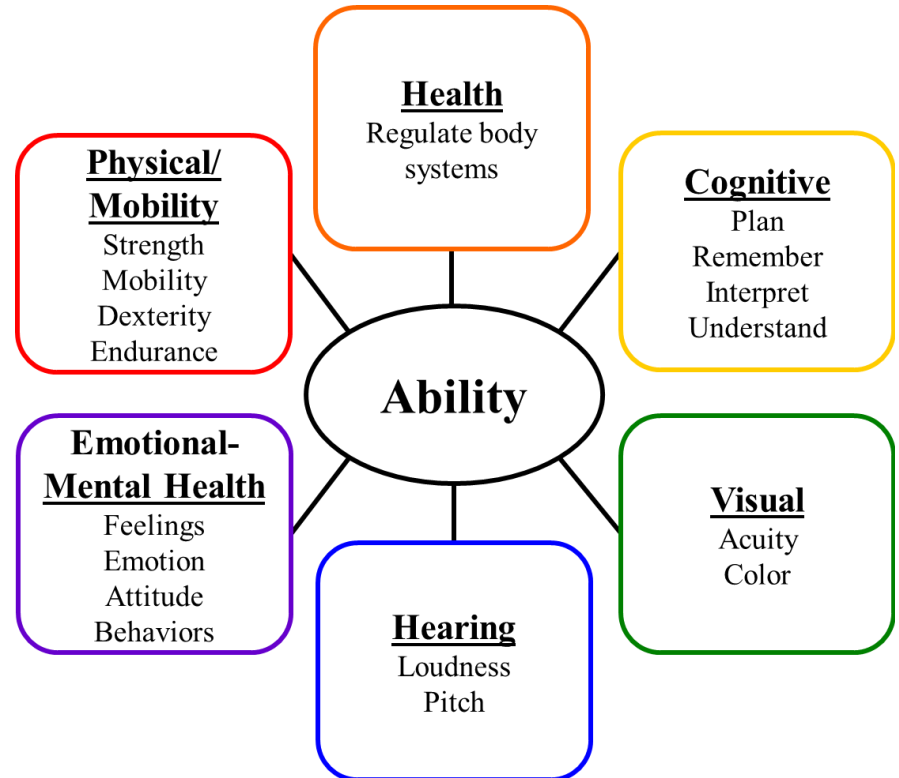
# Punchline

- Who we plan for in our courses shows who we expect and want to participate in our communities
- “Academia powerfully mandates able-bodiedness and able-mindedness, as well as other forms of social and communicative hyperability... In fact, few cultural institutions do a better or more comprehensive job of promoting *ableism*.”<sup>1</sup>
- We need to design our courses to support the variety of students’ needs, abilities, and interests

<sup>1</sup> [Academic Ableism, 2017](#)

# Learner Variation

- People vary in terms of their needs, abilities, and interests
- People have abilities across a multidimensional spectrum<sup>1</sup>
- Abilities can vary:
  - Within a person across these dimensions
  - Between people along the same dimensions
  - Day to day
  - Across contexts



<sup>1</sup> [Scanlon & Chini, 2018](#)

# Universal Design

- Universal Design for Architecture
  - “Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.” - Ronald Mace<sup>1</sup>



Door handles vs. door knobs



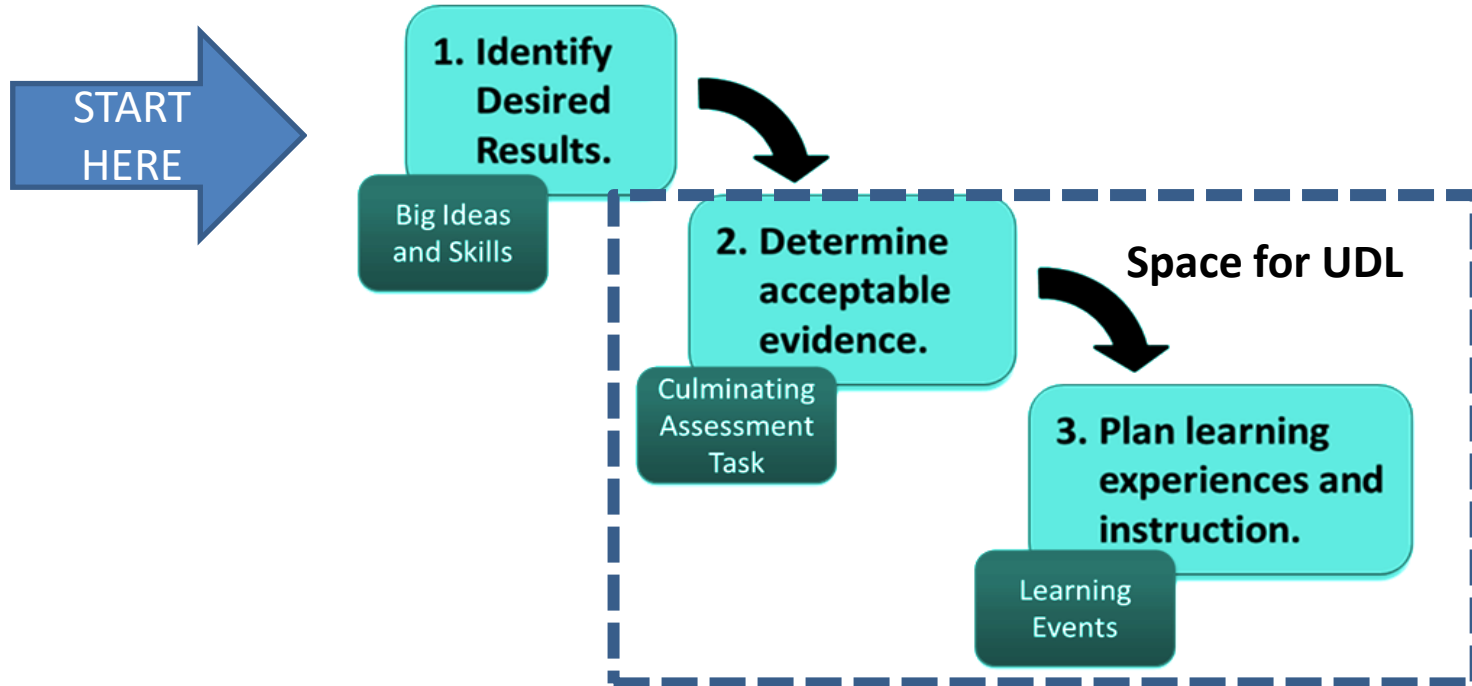
Smart phone

<sup>1</sup> [Mace et al., 1998](#)

# Universal Design for Learning (UDL)

- If a shoe is designed based on the average shoe size, would it be effective for everyone?
  - Who would be the most negatively affected by this?
- If curriculum and courses are designed for the “average” student, will they be effective for everyone?
- UDL recognizes the variability of learners’ needs, abilities, and interests
  - Plans for this variability rather than the “average”

# Backwards Design with UDL<sup>1</sup>



Wiggins, G. P., & McTighe, J. (2005). *Understanding by design*. Association for Supervision & Curriculum Development.

# Universal Design for Learning Framework<sup>1</sup>

Principle	Guideline – Provide options for:	# of Checkpoints
Provide Multiple Means of Engagement	7. recruiting interest	3
	8. sustaining effort and persistence	4
	9. self-regulation	3
Provide Multiple Means of Representation	1. perception	3
	2. language, mathematical expressions, and symbols	5
	3. comprehension	4
Provide Multiple Means of Action and Expression	4. physical action	2
	5. expression and communication	3
	6. executive function	4



# UDL in Teaching

AFFECTIVE NETWORKS:  
THE **WHY** OF LEARNING



RECOGNITION NETWORKS:  
THE **WHAT** OF LEARNING



STRATEGIC NETWORKS:  
THE **HOW** OF LEARNING

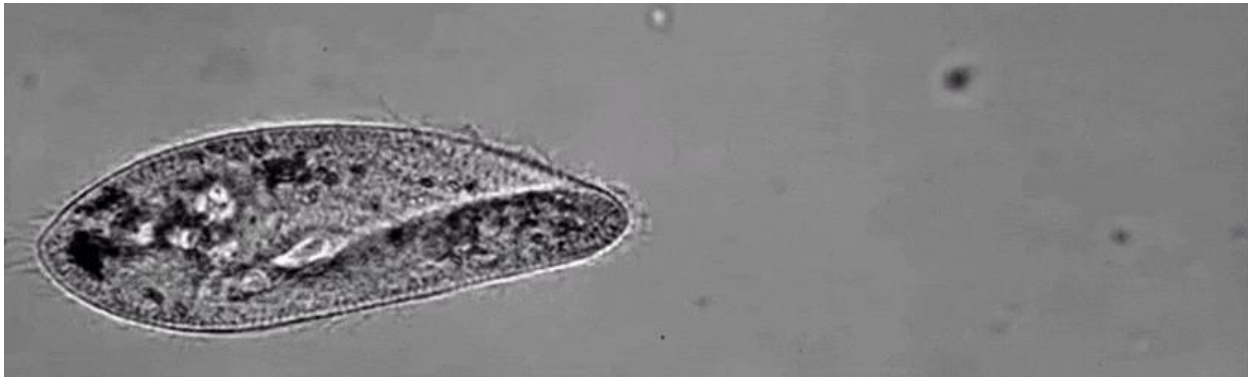


<https://www.celt.iastate.edu/teaching/effective-teaching-practices/universal-design-for-learning-overview/>

What UDL-aligned instructional practices can you think of?

# Multiple Means of Engagement - 7

- Recruiting interest
  - Allow students to choose context in which they learn physics content
  - Choose activities that optimize the relevance of curriculum to students' lives



# Multiple Means of Engagement - 8

- Sustaining effort and persistence
  - Provide and encourage mastery-oriented feedback
  - Create groups with clear roles and responsibilities

<b>Activity</b>	<b>Recorder</b>	<b>Manager</b>	<b>Skeptic</b>
Whiteboard problems	Write down notes and solutions	Direct problem solving steps	Ensures all problem solving approaches are considered
Laboratory	Keeps the lab notebook	Manages time	Suggests alternate methods
Discussions	Keep notes of topics discussed	Ensures everyone has chance to ask questions	Propose multiple ways to interpret solutions

# Multiple Means of Engagement - 9

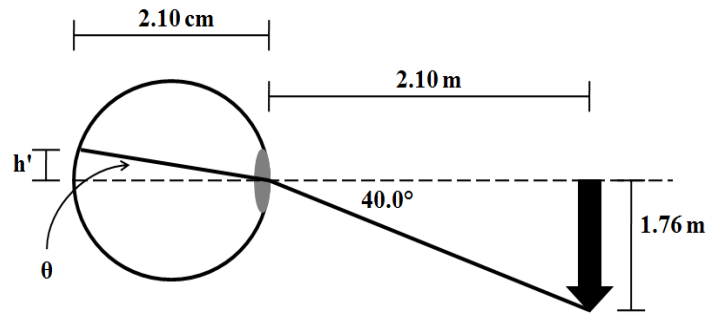
- Self-regulation
  - Promote monitoring of behaviors
  - Provide models and feedback for managing frustration

“Electrostatics is tricky, though, and as at the last checkpoint TAs will need to balance competing concerns (including helping students get closer to a correct model, encouraging genuine inquiry, holding students accountable for consistency and coherence in their explanations, and keeping students from getting frustrated).” (OST, Tutorial 3 Instructor Guide)

# Multiple Means of Representation - 1

- Perception
  - Provide digital copies of course materials
  - Diagrams include descriptions with all salient features to complete problem

Maria is looking at an upside down arrow that is 1.76 m high and 2.10 m away from her eye as shown in the figure below. Maria's lens in her eye is 2.10 cm in front of her retina and her lens has an overall index of refraction of 1.35. The light from the arrow strikes Maria's eye at  $40.0^\circ$  from the normal to the boundary between air and her eye. Some of the light from the arrow is reflected off of Maria's eye and some of the light is refracted and travels at an angle  $\theta$  in her eye.



# Multiple Means of Representation - 2

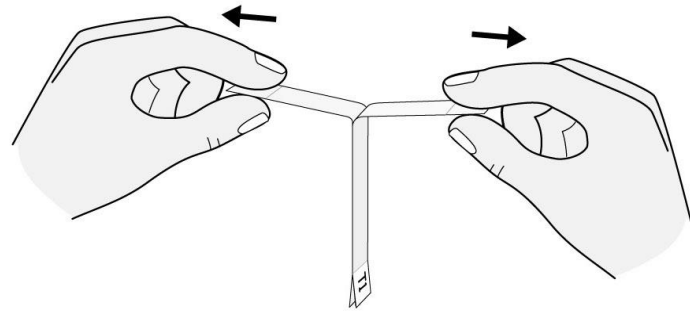
- Language, mathematical expressions, and symbols
  - Link to non-dominant language dictionaries, include definitions in non-dominant language
  - Define vocabulary or symbols

“Some magnetized objects retain their magnetism for very long periods of time, and we call them permanent magnets.” (Unit M, p. 24)

# Multiple Means of Representation - 3

- Comprehension
  - Remind students of previously covered concepts or equations or referring to previous activities
  - Highlight salient information via italics, bolding, or font changes to emphasize key elements

“Now **slowly** peel both pieces of tape, still stuck together, from the table, holding a handle on each piece of tape in each hand, **quickly** rip them apart.” (PET)



# Multiple Means of Action and Expression - 4

- Physical action
  - Provide access to assistive technologies for students
  - Allow students to respond to questions in formats other than writing



# Examples of Expression

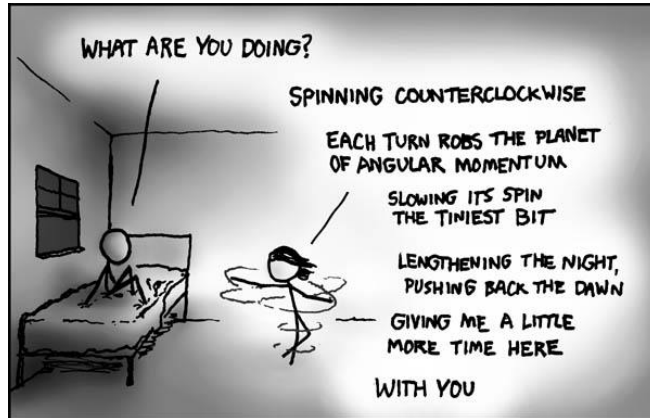


**kinematics**

$$d = v_i t + \frac{1}{2} a t^2$$
$$v_f^2 = v_i^2 + 2ad$$
$$v_f = v_i + at$$
$$d = \left( \frac{v_i + v_f}{2} \right) t$$

0:49 / 6:37

<https://www.youtube.com/watch?v=hpWuZh6oTew>



<https://xkcd.com/162/>



<http://physicsasasecondlanguage.blogspot.com/p/physics-and-art.html>



<https://www.terc.edu/embodyed-learning-through-dance-and-physics/>

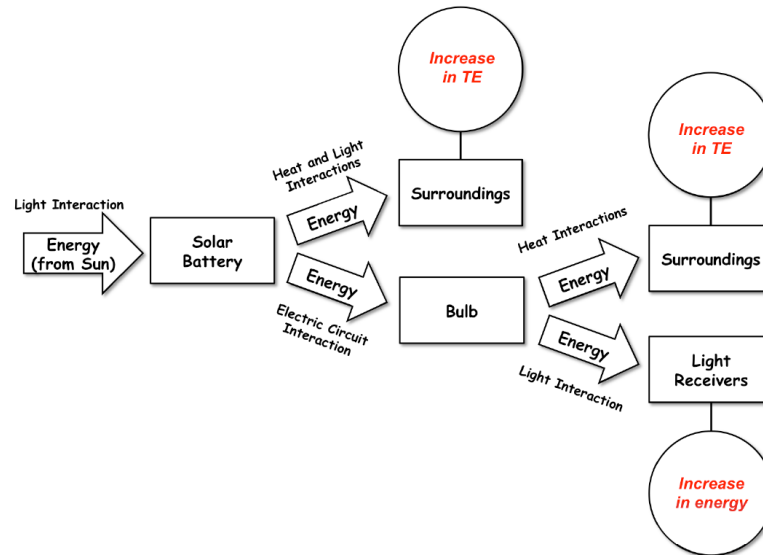
# Multiple Means of Action and Expression - 5

- Expression and communication
  - Request students to show their understanding in a myriad of media such as text, speech, etc.
  - Provide differentiated feedback that is customized to the individual learners

“Make sure they understand what slope is (not to be taken for granted, even for students that have taken calculus!) Be sure to ask each group member questions. Just because one student understands the graphs doesn’t mean that all four students follow that reasoning. Sometimes the quietest students need the most help, and a diagnosis is required.” (OST, Tutorial 1 Instructor Guide)

# Multiple Means of Action and Expression - 6

- Executive functions
  - Prompt students to stop and show/explain work
  - Provide templates for data collection and organization of information



# Practice with UDL Guidelines

- Think of a course (ideally one you teach if possible)
  - In what ways does the course not provide options or supports for how material is received, engaged with, or how content knowledge is evaluated?
  - What UDL checkpoint(s) is relevant to this barrier?
  - What is a strategy that could provide options or supports in this area?

QR Code to Slides:



Who we are prepared to teach and support in the physics community expresses our expectations of whom we want to participate

# Thank you for your participation!

- Email: [Erin.Scanlon@uconn.edu](mailto:Erin.Scanlon@uconn.edu)
- Link to slides: <http://tiny.cc/INCLUDE-UDL>
- Questions or concerns?

QR Code to Slides:

