

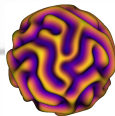
How students learn and how we can support it

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Learning objectives

You will be able to...

- Explain what evidence-based learning is and why we should care
- Describe several ways that people learn
- Distinguish between types of assessments and what they are good for
- Apply principles of universal design for learning



Focusing on what works

- Many people teach by mimicking their past instructors
- Just because something worked for you does not mean it will work for your students
- Focus instead on practices that are **known** to work
- Focus on practices that are informed by how students learn



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Fortunately, cognitive scientists have done the hard work, and some have boiled it down for us non-experts.



Lang: Small Teaching

- Predicting
- Retrieving
- Connecting
- Practicing
- Growth



Even wrong predictions are useful

- Pre-testing students on material they don't yet know improves retention when they do learn it
- The human brain is very good at predicting
- The cycle of prediction, error checking, and correcting is a powerful learning tool
- Soliciting predictions shows students what they don't know



Easy activities

- Simply ask students a question before covering that content
- Pause at a critical step in an example, ask if students know what comes next



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Considerations

- Keep the topics broad
- Provide rapid feedback
- Provide space to reflect on the predictions



Knowing something is different from recalling something

- Long-term memory can hold a fantastic amount of information
- *Retrieving* knowledge from long-term memory can be hard
- Knowledge that gets recalled more often is easier to recall
- “If you don’t use it, you’ll lose it”
- Giving students many chances to retrieve information reinforces what they know



Easy activities

- Before starting on new material, ask students a few questions about previous material
- Ungraded quizzes
- “Retrieval dump”: Have students take a moment to write down everything they know about a topic you’ve covered



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Considerations

- This takes very little time to do, so you can do it often
- Align retrieval practice with students assessments
- Don’t make the retrieval practice too easy/hard



Bridging distinct concepts reinforces them individually

- Students often struggle to see the bigger picture
- How are the different topics in a course related
- Putting a topic into context with the rest of the course requires higher level thinking
- Activating this higher level thinking builds general knowledge *and* reinforces knowledge on individual topics
- We are literally trying to form neuronal connections



Easy activities

- Provide students with a high level overview of the course
- Ask students how a new topic relates to previous topics
- Try out some group based activities (more on this later!)



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Considerations

- The connections you see between things may not be what your students see
- Help your students discover connections, rather than trying to spell them out



Let students do what you're teaching them to do

- Giving students a heap of knowledge is very different from having them use that knowledge
- Lectures are often very one-sided, the instructor presents ideas and students try to absorb that information
- Giving students time to *practice* lets them control the learning
- Practicing in the classroom lets you give immediate feedback
- Guided practice is more effective than homework



Easy activities

- Alternate between showing examples and giving the students questions to try
- Do partial examples and have students work through individual parts on their own
- Try out some group based activities (more on this later!)



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Considerations

- Try to unpack assessments into their core concepts and pieces
- Provide feedback, ensure students practice the right thing
- Ensure students know why they are practicing what they are practicing



Encouragement goes a long way

- We've seen that students need to feel they belong in a class
- Focusing on growth and affirming your belief in a student can keep them engaged
- People learn much more effectively when they aren't stressed
- People learn much more effectively when they believe they are capable of learning
- This is particularly relevant in STEM courses
 - "I'm just not a math person" – Too many of my students
- Recall wise feedback, high expectations *and* belief that students can meet them



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- Large scale assessments to evaluate student learning
- Exams, projects, reports, etc.
- Mostly given by instructors



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Formative assessments

- Smaller, low stakes assessments
- Used to monitor student learning while it is happening
- Easy to use within sections
- Don't even need to be graded, or could be graded just on completion
- Still need to provide feedback, but it could be done in aggregate



Appreciate the different needs of your students

- Equitable teaching means giving everyone what they need to succeed
- Customizing your instruction to each individual is impractical
- *Universal design for learning* seeks to make individual activities/lessons inclusive
- Try to maximize accessibility of each activity or instruction session



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- Provide your students multiple representations of the content
- Repeat concepts a few times, using different language
- Make your learning objectives concrete and explicit (more on this later)



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- Provide your students multiple representations of the content
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The **how** of learning

- Make space for learning in different formats
- Give students a chance to talk through the content for themselves

The **why** of learning

- Try to create relevant and meaningful examples
- Drive students to build connections between the material and their lives



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- Small Teaching by James Lang
- <https://citl.ucsc.edu/resources/supporting-student-learning/>
- <https://citl.ucsc.edu/resources/equity-minded-teaching/udl/>
- <https://www.retrievalpractice.org/strategies>
- https://otl.du.edu/wp-content/uploads/2020/05/Taxonomy_of_Significant_Learning.pdf
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- <https://www.understood.org/en/articles/universal-design-for-learning-what-it-is-and-how-it-works>