The Science of Learning

Using Memory Research as a Classroom Aid

Lauren Bates
March 31, 2014
Lauren.Bates@colostate.edu
Overview

- The “dos and don’ts” of learning and memory
  - What does work?
  - What does not work?

- Putting the research to use as instructors

- Putting the research to use as students
What do we know about memory?

- Except for moments when it fails, our memory is pretty good.
- Memory is reconstructive, not reproductive.
Try to remember these words for a later test
glass
pane
shade
ledge
sill
house
open
curtain
frame
sash
screen
shutter
Count backwards by 3s from 546
Recall the words you saw earlier

- Can you recall many of the words?
- Did you see “glass”?
- Did you see “window”?
Our memory is not a perfect photograph of what we experience

What does this mean for learning?
- Students do not remember everything word-for-word
- Prior knowledge and experience will influence memory
- We don’t always know what is best for ourselves (or our students)
What doesn’t work?
How many of you are familiar with the concept of learning styles?

This is a popular concept that people learn in different ways

- Champions uniqueness
- Removes some responsibility from the learner (e.g. a student is doing poorly because the teacher does not cater to their style of learning)

There is a large industry behind this idea
Learning styles

- The lack of evidence supporting this idea as a viable claim is astounding.

- Many well-respected memory researchers have failed to find significant effects regarding individuals’ styles of learning and how they perform on different tasks.
  - Pashler et al. (2009) – matching students’ learning styles to instructor did not matter.
Is memory improved by the number of times we experience something?
Which penny is correct?
Repetition

- Clearly just being exposed to something numerous times is not enough to remember it well.
- Students: highlighting and/or reading your notes over and over will not help you very much.
- Bottom line: quality over quantity.
What does work?
What comes to mind when you hear the word testing?

Most people view it as a form of assessment.

It can also help learning!
Roediger & Karpicke (2006)

- Not only did people in the test condition remember more on average, but they were slower to forget that information.

What are some ways we could harness these benefits in the classroom?

- Teachers: weekly quizzes, i-Clicker questions
- Students: studying with flashcards, test yourself
Leeming (2002)

- Gave psychology students a short exam at the start of every class
- Results showed better grades, fewer withdrawals, higher retention after the semester was over
- Students believed they studied better for this class
- Students even said afterwards that they liked having frequent short exams
There is one important exception to the earlier claim that repetition is not helpful.

Massed vs. spaced practice

- Massed = “cramming”
- Spaced = studying spaced out over multiple sessions
Participants studied vocabulary words using either massed or spaced practice.

They were also asked to estimate how well they thought they would remember the words.

Results showed that spaced practice produced better results, but people thought they would perform better on massed practice.

Why does cramming feel like it works?
Spacing

- How can you incorporate spacing into your own teaching/studying?

- A few ideas:
  - Teachers – weekly quizzes instead of infrequent point-heavy exams
  - Students – instead of studying 5 hours the night before an exam, try 1 hour every night for 5 days
Summary

- Memory is reconstructive, not reproductive

- Things that do not work
  - Learning styles
  - Repetition

- Things that do work
  - Testing
  - Spacing
Questions?