Designing Engaging In-Class Activities

Petra Bonfert-Taylor
6 January 2017

https://curatedcourses.org/
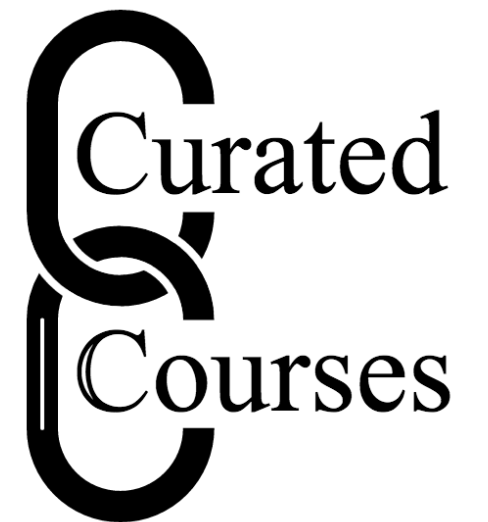
Active Learning

- Rather than passively listening to information being transmitted: students learn through activities and/or discussions

- Large body of scientific evidence asserts:

  – Retention improves significantly if learning is active.

  – Active learning leads to significantly lower failure rates in STEM classes.
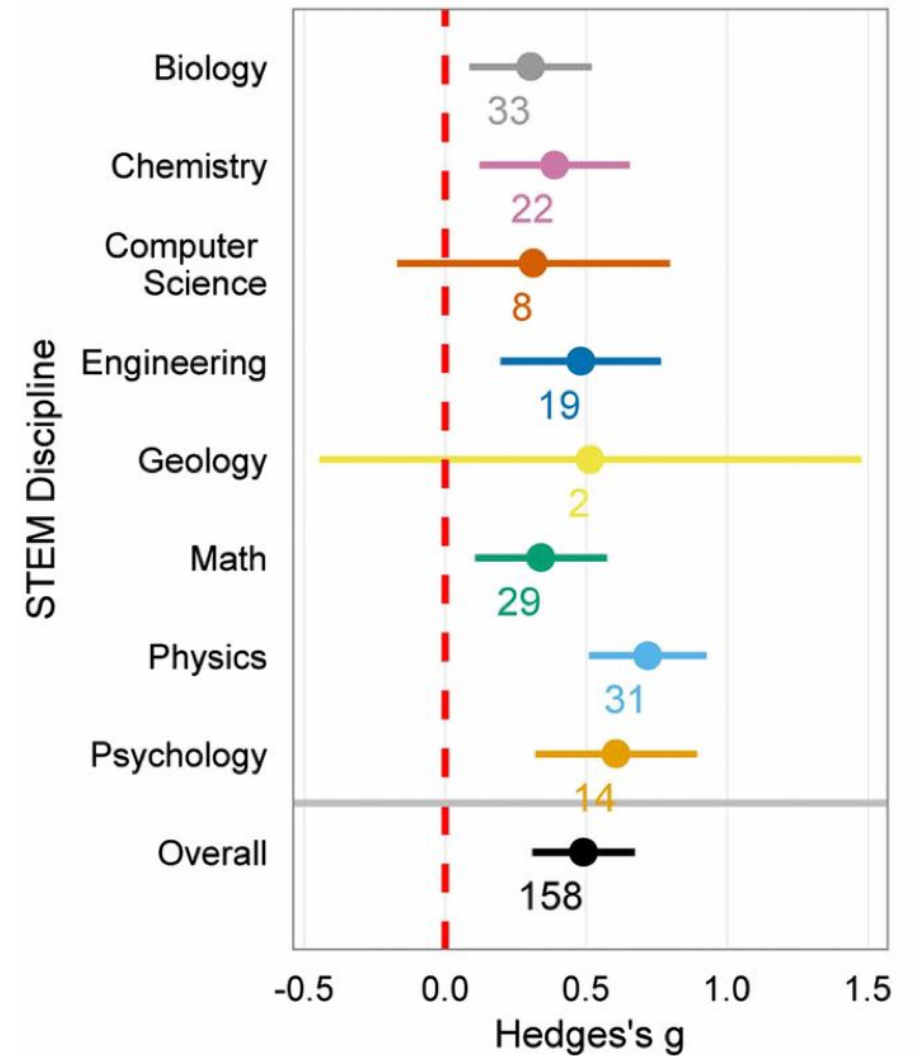
Freeman et al, Proceedings of the National Academy of Sciences, 2014:

Meta-analyzed 225 studies on STEM courses:
- examination scores / failure rates
- comparing traditional lecturing versus active learning
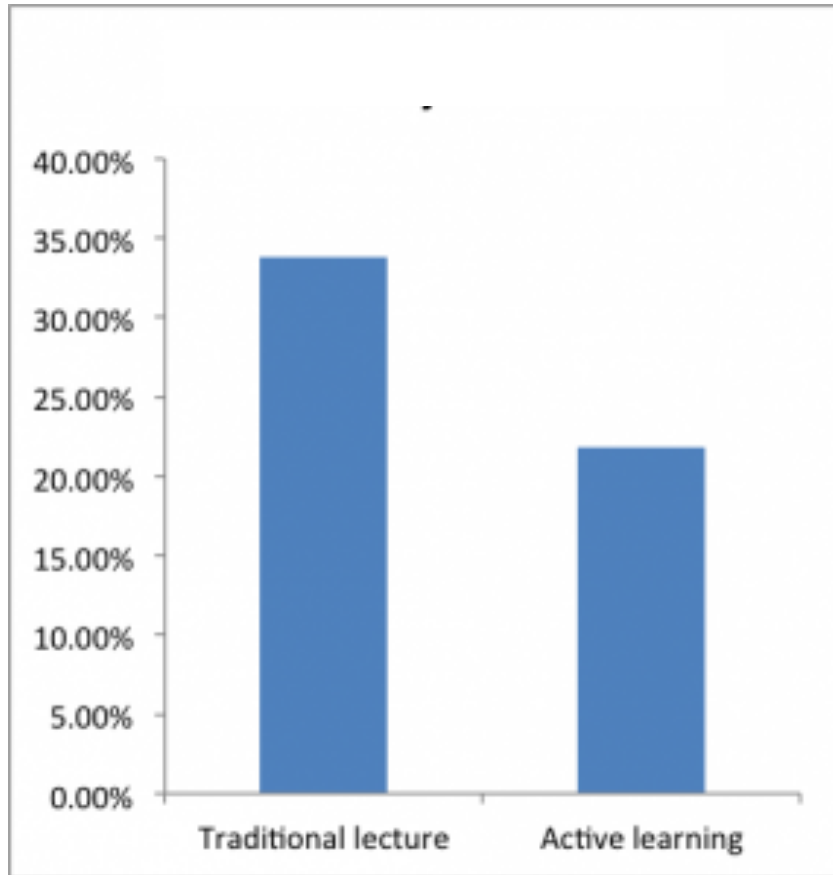
Effect size on examination scores, assessments, etc.

Probability of failure

Let's Now Assume You Believe In Active Learning...

- You have explained the benefits to your students.
- You have assigned pre-class activities.
- You have dealt with knowledge checks.

So what do you do in class?

http://china-cps.com/single/2232130.html

Why You Should NOT REPEAT the Pre-Class Work

- Provide incentive for students to complete the pre-class work.

- Use class time to focus on higher level cognitive activities and deeper learning.

- If class time adds distinctive value to student learning then students will come to class.

Some Active Learning Ideas

- **Think-Pair-Share**
  Pose question to class, have students individually think of and write down answer, then form pairs, discuss responses, randomly call on a few students to share their answers.

- **Jigsaw**
  Break class into four "expert groups", have each expert group study different aspect of a problem; then assemble new groups of four students (one from each expert group); within each group have students teach their expertise to the others.

- **Classroom Response System (Clickers, Polleverywhere, etc.)**
  Can be used for formative assessment, initiation of discussion, peer instruction, contingent teaching, etc. Many question banks available.

Some Active Learning Ideas, cont.

- **Concept Maps**
  Have students create a map connecting the major topic of focus with what they consider its most important features, ideas and concepts that they have learned (in groups or as classroom discussion)

- **Thinking Aloud in Pairs**
  - *Students paired, given series of problems*
  - *Two roles (switch after each problem): Problem Solver and Listener*
  - *Problem solver talks through solution to problem.*
  - *Listener follows all steps, catches errors.*
  - *Listener may ask clarifying questions but not guide the problem solver to solution*
  - *Listener should not explicitly highlight specific error except comment that an error has been made.*

- ***Etc.***
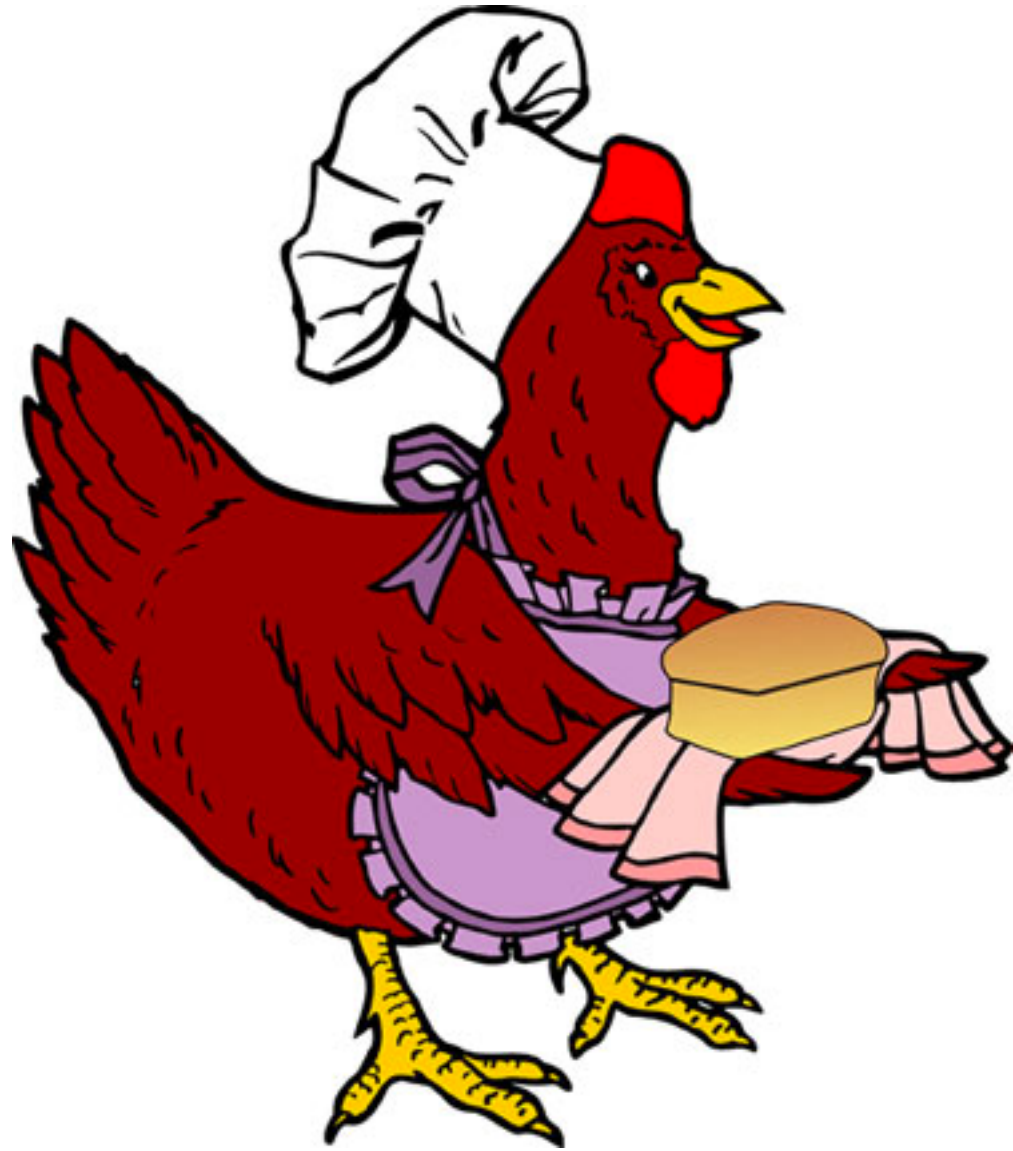
When the bread was finished, the tired little red hen asked her friends, "Who will help me eat the bread?"

"I will," barked the lazy dog.
"I will," purred the sleepy cat.
"I will," quacked the noisy yellow duck.

"No!" said the little red hen. "I will." And the little red hen ate the bread all by herself.

Making Groups Work – Group Tasks

- Create interdependence
    - Make projects sufficiently complex so tasks can't just be divvied up
    - Assign roles
    - Create shared goals

- Devote time specifically to teamwork skills
    - Team contracts, team assessments, process assessment
    - Conflict resolution skills

- Build in individual accountability
    - Assess individual learning as well as group progress
    - Creative grading schemes

Making Groups Work – Forming Groups

- Pay attention to group composition
    - Diversity (gender, prior knowledge, etc.)
    - Scheduling of meeting times
    - Interests

- Group size: typically 3-5 students per group

- Fixed (long-term) versus ad-hoc groups

- Group roles

Great resource:
https://www.cmu.edu/teaching/designteach/design/instructionalstrategies/groupprojects/index.html

What Makes Engaging Problems?

What Makes Engaging Problems?

- It's useful to be perplexed!
- Keep questions concise.
- Use pictures to establish context.
- Set a low bar to get started, a high bar to finish.
- Minimize cognitive load (progressively reveal content).
- Ask for guesses.
- Make it social.

Variety Addresses Different Learning Styles