BIRTH OF AN ACTIVITY

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Overview

- *Common Vision* project (PI: Karen Saxe, Macalester College)
  - AMATYC, AMS, ASA, MAA, SIAM
  - Freeman report (2014): Active learning increases student performance in science, engineering, and mathematics
    - Failure rates under traditional lecturing are 55 percent higher than the rates observed under active learning
- When Monica asked me about this session, I was just finishing up creating a new activity
  - Did I have any "strategies" that might be useful to other teachers?
  - What does a "good" activity look like?

Step One: Pick a topic

- Identify an area in which students consistently struggle
  - e.g. conceptual vs. procedural understanding
- Write out learning goals
  - Make explicit what you want students to be able to do, remember afterwards
  - What is your motivation for the activity?

Step Two: Find interesting data

- Better yet: find interesting research question
  - Need to assess what your students are interested in (e.g., initial course survey)
- Use existing resources as much as possible
  - Data and Stories Library, STEW websites
  - Collect data on your students (anonymously)
- Listen to TV, NPR, news websites
  - Set a time limit to how long you will spend tracking down the article
  - Recent examples: Early exposure to peanuts, Using lotteries to promote safe sex, Experiment investigating effectiveness of programs for the poor, Tylenol also dulls emotional pain

Step four: Classroom context

- Classroom layout, Class size
  - Discussion among students?
- Lecture or Guided exploration or Open ended
- Access to technology
- Individually or in teams
  - Expectation for participation from day one
- Student products/incentive system
- What do/should/might students know about this topic coming into class? (Stat 201)
- Watch for sensitive topics

Step five: Scaffolding

- "Hook" students into the activity
- Start with learning goals
- Start with definitions, new terms?
- Start to build cognitive dissonance
  - Get them to ask the next question?
  - "Habits of mind"
- Surprise students!

Role of technology

- Try to minimize unhelpful by-hand calculations
  - Standard deviation once?
    - Focus on comparing SD across distributions
- Be very conscious of learning curve of technology
  - Added timeplot feature
- Use technology to explore
  - Make more than one graph
  - Histogram bin width
    - Slider
  - Critique, Don't use default settings
  - Discuss limitations (e.g., axis labels)

Step six: Test the activity!

- Play the role of student
  - Read the questions fresh
  - Write out the answers (spacing, enough information, sequencing of ideas, reference)
- Ask another faculty member to review
- Ask a student to review
  - Use R readHTMLtable to scrape data from Wikipedia page

Step seven: Use the activity

- Cross your fingers
  - Advance planning
  - Contingency plans
- Be proactive in monitoring student progress
- Make sure students realize what they are responsible for having learned from the activity
  - Not only fun and games
  - Resist repeating the lessons of the activity in lecture
  - Get students to tell you the big idea
  - Make sure students don't miss the gorilla

Step eight: Make notes

- Take 5-10 minutes to jot down notes to yourself (others?) on how the activity went
  - Where did students get stuck
  - Were students engaged in the context
  - How was the timing
  - What were the common questions
  - How does this tie into previous/upcoming content
  - What "props" do you need to remember to bring next time?

Critiquing the activity

- Did it make the best use of within vs. outside of class time?
  - Multi-tasking, prepared ways to collect data
- Did it use real data?
  - Real scientific question?
- Did it hook students?
- Were students actively involved?
- Were important statistical lessons clear?
  - Does it connect to other parts of the course?
- Did it make effective use of technology?
  - Tactile simulation vs. black box
  - Learning curve
- Is there a clear way of determining whether students 'got it'?

Reminders

1. Active learning $\Rightarrow$ Free-for-all
2. Find engaging contexts (e.g., data on students)
3. Elicit participation, prediction from students
4. Promote collaborative learning
5. Association $\not\Rightarrow$ Causation
   - Get students to tell you the point
6. Provide lots of feedback
7. Follow-up with related assessments
8. Inter-mix with lecture, as needed
9. Do not underestimate the ability of activities to "teach"
10. Have fun!