Active Learning - Implementation
The Good and the Bad Better

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Plan for today:

- Open group problems (& Whole class discussion)
- Skeleton notes (& Worksheets)
- Clickers
- Learning Objectives (casual conversation at end)

Things to keep in mind:

- A lot of this will be my opinion and my experience (math)
- We’ll play some with case studies and artifacts
- In the back of our minds: how to do this in a **bigger** class
Open Group Problems

Case study 1:

- Instructor writes \( \frac{d}{dx} \int_1^{e^x} t^2 + \sin t \, dt \) and says “now solve it”
- Instructor walks around the class for 8 minutes stopping to talk 1on1 with the students sitting in the isles
- Instructor returns to the front of the class and solves the problem
- Instructor asks if there are any questions

What’s good about this implementation?
Open Group Problems

Case study 1:

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What’s good about this implementation?

• Students get to try the problem on their own first
• Some students talk 1on1 with instructor (feedback)
• Students see the solution and can ask questions
What could be better about this implementation?

• Have the students tell you how they started the problem
• Move through the class faster
• Encourage group work!
• "Try the next step and I’ll come back"
• Once the class has (or is stuck on) the first step
  • re-collect at the front of the class
  • have them tell you what to do (or where they are stuck)
  • write it out and ask for questions
  • tell them to continue
• More explicit instructions
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Open Group Problems: Case study 2

Case study 2:

- Instructor produces some lemons, pipe cleaner, ruler, knife
- Asks: “compute the volume of lemon using these tools ... discuss with a neighbour”
- Students work in groups for 2min
- Asks for a: “strategy to share”
- Class is silent for 30sec
- A student responds and describes their method for 1min
- Instructor: “Ok. I heard another strategy over here”
- Student at front: suggests strategy (not audible at back)
- Inst: “Next class volumes and how to slice the lemon”

What is good? What could be better?
Open Group Problems: Case study 2

Good

- Using student input in class
- The theory coming in the next class will be well framed
- Invention activity!
Open Group Problems: Case study 2

Good
- Using student input in class
- The theory coming in the next class will be well framed
- Invention activity!

Better
- More specific line of questioning
  - What would you use the knife for?
- Repeat/summarize student suggestions
- Turn the response into a conversation
  - “ah, so you’ll do this” *prof draws for everyone to see*
  - “and what would you do next?”
Matt’s Discussion Strategies

- Turn questions back to the class
- Could they do this? Why are you telling them then?
- Class can respond in chorus (with training)
- Ask specific questions
  - A couple open/philosophical questions per term
- Don’t take responses right away
  - Water bottle trick
  - combine w/ clicker or GW or think/pair/share
- Repeat/rephrase/summarize questions
- Efficiency is a higher level goal
Handout!
Handout! A few other examples?
Handout! A few other examples?

Tips to keep in mind:

• Leave enough space for students to write
• Explicit instructions about when we are/aren’t using the worksheet
• Avoid it becoming a handout (just post that online)
• Have them fill it out and then tell you what to write
• Worksheet will make it easier to ask a specific question
• Encourage group work
The Clicker “song and dance”
Clickers!

The Clicker “song and dance”

• Display or write the question (don’t read it aloud)
• “Take 1 minute to think about this on your own”
  • or ”feel free to discuss with your neighbour”
• *Instructor can walk around, listens to conversations, facilitates as desired*
• “Ok, click in, I’m going to close the poll”
• Respond
Clickers!

The Clicker “song and dance”

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Handout!
Clickers

A few response strategies

• Validate the correct answer. Brief justification. Move on.
• Validate correct answer. Ask students for an explanation.
• Show results. Narrow the options. “Find a different opinion and come to a consensus”
• “Can I hear an argument from B”
• Exclude an answer: “Lots of B’s … that’s not the answer”
• “Can I hear an argument for why not C?”
Instructor: “I believe active learning is better for the students, but the students don’t like it.”

Me: “That’s because you’re doing it wrong!”

Me: “How could we improve your implementation?”
Other things we could talk about

- Makes it really easy to ask as specific question to start a conversation: “do you like A or B?”
- Great for diagnosing or treating a misconception
- Just for participation (or not for marks at all)
- Talk with your students about why you are using clickers
- Culture: E always means “I have no idea”
- Conceptual vs Computational clicker questions
Clickers: Some Examples

Clicker Q: Can a function cross its horizontal asymptote?
A) Yes
B) No
Clickers: Some Examples

Clicker Q: Can a function cross its horizontal asymptote?
A) Yes
B) No

A) Yes 33%
B) No 61%
C) Don't know

[Diagram of a function crossing its horizontal asymptote at y = -1]
Clicker Q: How many times can a function cross its horizontal asymptote?
A) 1
B) 2
C) a few times (finitely many times)
D) infinitely many times
Clickers: Some Examples

**Clicker Q:** How many times can it cross its H.A.?

A) 1
B) 2
C) a few times (finitely many)
D) infinitely many times

[Graph of a function showing multiple crossings]

\( \cos(\frac{1}{x}) \)

\( \leq 1 \text{ H.A.} \)

\[ \lim_{x \to \infty} \cos(x) = 1 \]

[Graph showing horizontal asymptote at y = 1 and infinite crossings]