

Questioning Techniques & Clicker Choreography

a theme session

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Active Learning - Implementation

Plan for today:

- Open group problems & Whole class discussion
- Polling Qs: set up and react!

Things to keep in mind:

- A lot of this will be my opinion and my experience (math)
- We'll play with some real case studies
- 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 (3 students total)
- 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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- Instructor asks if there are any questions

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

Open Group Problems: Case study 1

What could be better about this implementation?

Open Group Problems: Case study 1

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

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
- Instructor 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

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- 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?”
- Provide initial instructions for later reporting out

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 (bonus points for one word answers)
 - A couple open/philosophical questions per term
 - If you don't get a response ask another (easier) question
- Don't take responses right away
 - Water bottle trick
 - combine w/ clicker or think/pair/share
 - Wait for 5 hands before calling on someone
 - Ask for a response from a certain part of the class
- Repeat/rephrase/summarize questions

To increase class discussion we can (especially in a large class)

- have clear instructions: “how long,” “with who,” “to what extent/end”
- make interactions with individual students accessible to the whole class
- use structure and ritual to lower the barrier to entry

LO: Describe techniques to increase student interaction during large class discussion.

Let's play

Clicker Q: I want to use clickers for:

- A) Checking if the students are following/understanding
- B) Assessing their prior knowledge
- C) Correcting Misconceptions
- D) Encouraging group work
- E) Stimulating whole class discussion

Clickers! (polling in general)

The Clicker “song and dance”

Clickers! (polling in general)

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

Response choices

We have several choices of how to respond:

- Display results to class? y/n
- Reveal answer to class? y/n
- Enter a whole class discussion? y/n
- Exclude some options? y/n
- Ask students to try again in pairs? y/n

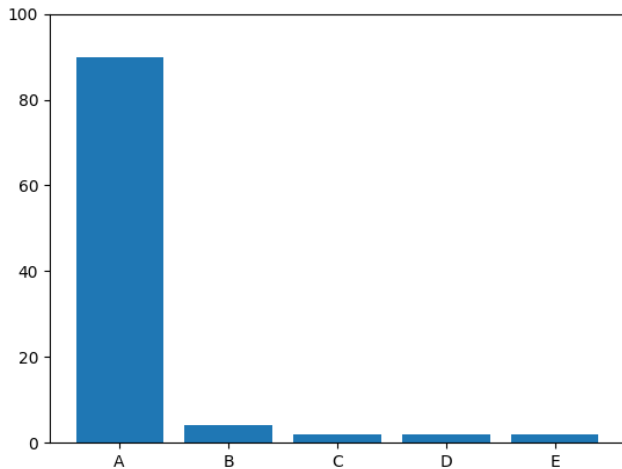
Response choices

In practice some examples are:

- 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 for why one might pick B?”
- Exclude an answer: “Lots of B’s ... that’s not the answer”
- “Can I hear an argument for why not C?”

How to respond when... (A is correct)

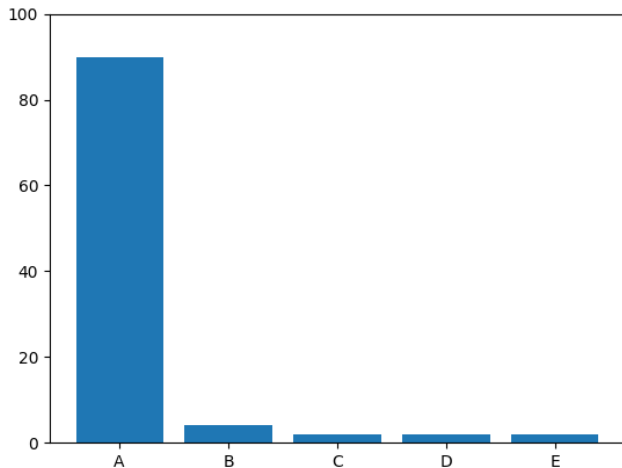
The student responses look like this



Should we enter a whole class discussion?

How to respond when... (A is correct)

The student responses look like this

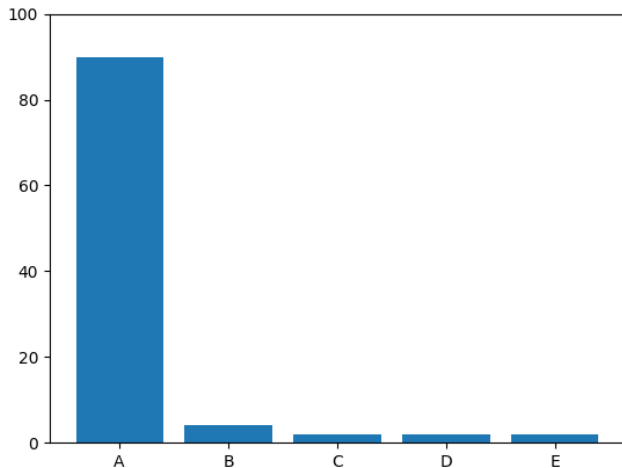


Should we enter a whole class discussion?

- (A) Yes! (confident)
- (B) Yes... (unsure)
- (C) No!
- (D) No...
- (E) No idea??

How to respond when... (A is correct)

The student responses look like this



Should we enter a whole class discussion?

(A) Yes! (confident)

(B) Yes... (unsure)

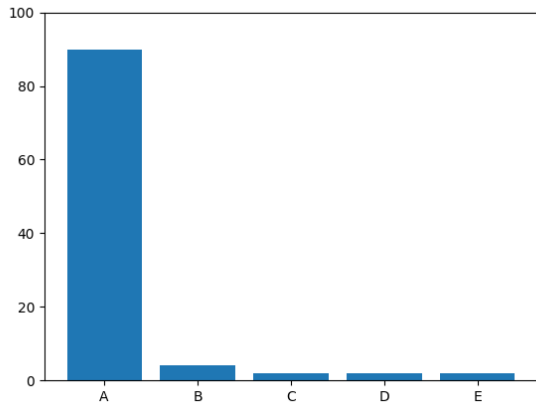
(C) No!

(D) No...

(E) No idea??

How to respond when... (A is correct)

The student responses look like this

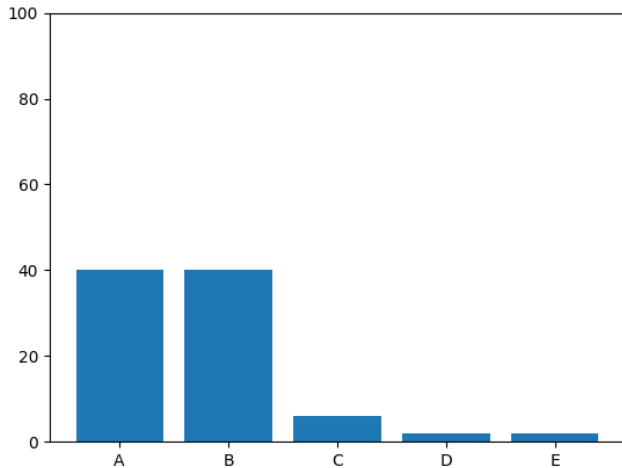


Consider

- Don't show graph
- Validate, explain, move on
- Validate, ask for student explanation
- Validate, ask for questions

How to respond when... (A is correct)

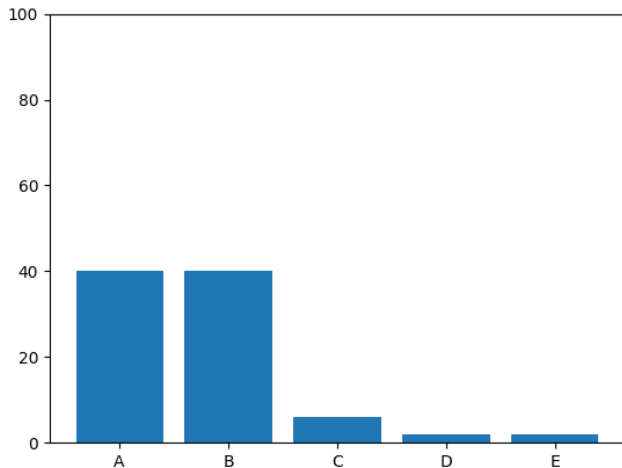
The student responses look like this



Individually, come up with a sentence to respond.

How to respond when... (A is correct)

The student responses look like this

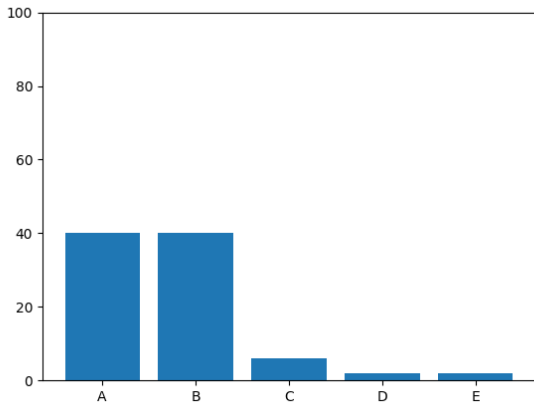


Individually, come up with a sentence to respond.

- (A) Thinking
- (B) Done!
- (C) I'm stuck...

How to respond when... (A is correct)

The student responses look like this

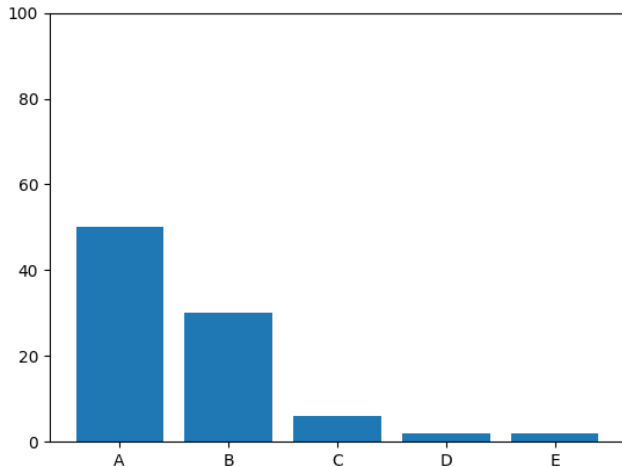


Consider

- Show graph
- “Talk to your neighbours and come to consensus, vote again”
- “Can I hear arguments from both sides?”

How to respond when... (A is correct)

The student responses look like this

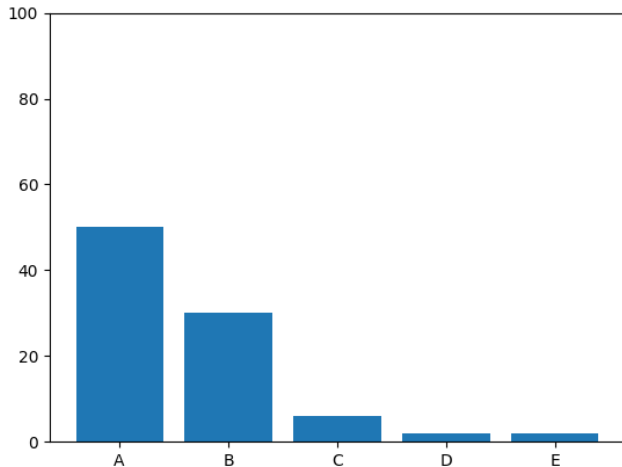


Should we show the class the graph?

- (A) Yes!
- (B) Yes...
- (C) No!
- (D) No...
- (E) ??

How to respond when... (A is correct)

The student responses look like this



Should we show the class the graph?

(A) Yes!

(B) Yes...

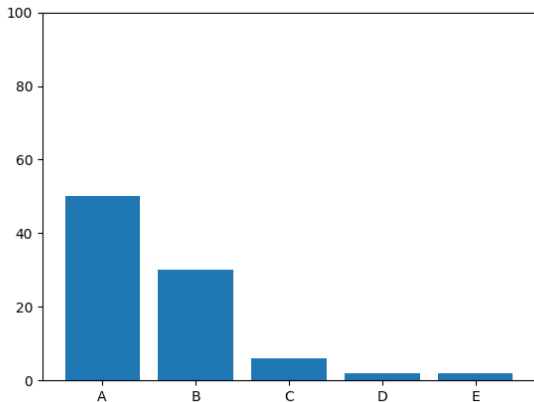
(C) No!

(D) No...

(E) ??

How to respond when... (A is correct)

The student responses look like this

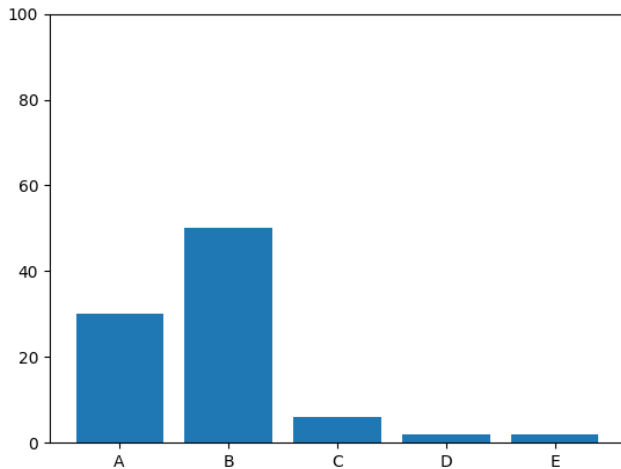


Consider

- Don't show graph
- "Lots of A's & B's. Talk with your neighbours and vote again"
(good at the start of the class for more energy)
- "Can someone who picked A explain their choice?"

How to respond when... (A is correct)

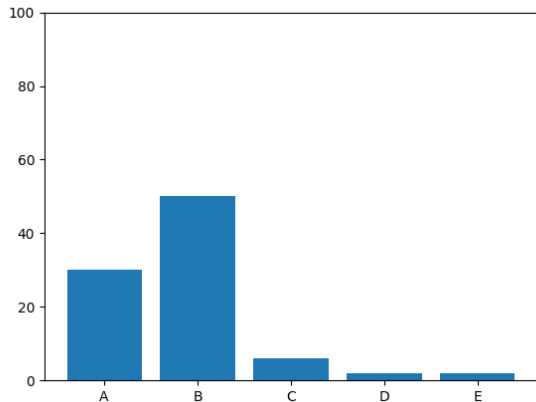
The student responses look like this



What is different about this one compared to the last one?

How to respond when... (A is correct)

The student responses look like this

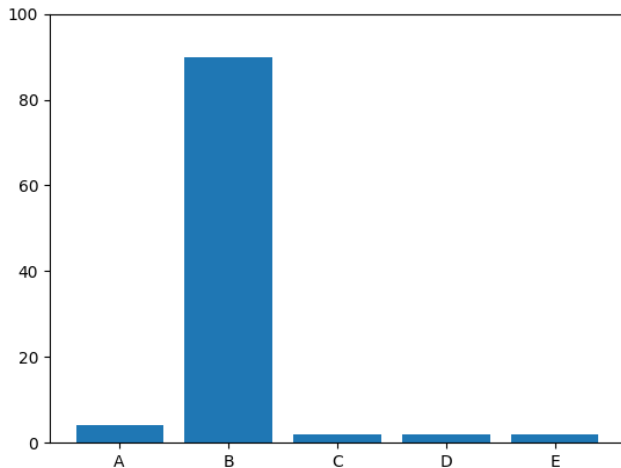


Consider

- Treat as 50% case
- “Can someone who picked A explain why they didn’t pick B?”
- “Can someone (choice aside) explain why B is an attractive answer?”

How to respond when... (A is correct)

The student responses look like this



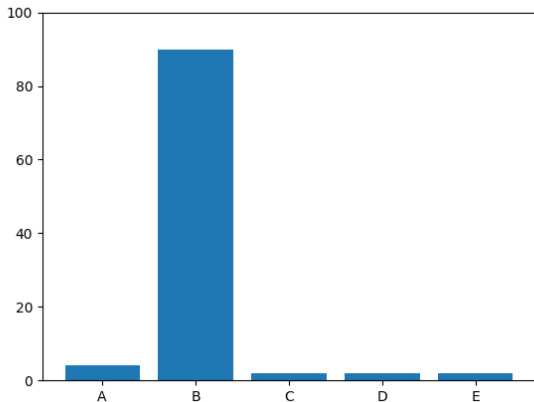
How about this one?

A is still the correct answer!

As an instructor, what's going through your mind?

How to respond when... (A is correct)

The student responses look like this

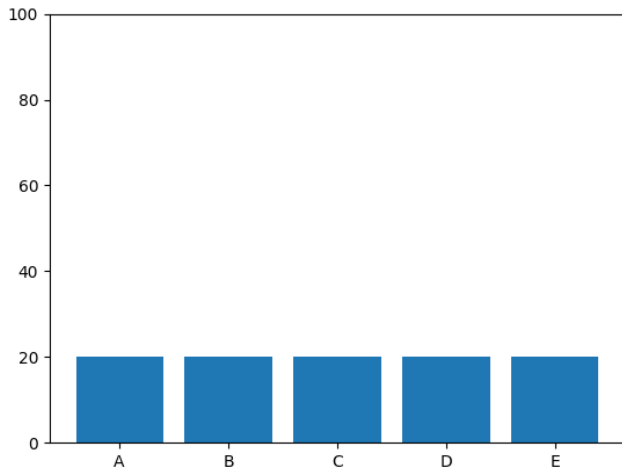


Consider

- Check to make sure you're not wrong
- Show graph
- "Can someone explain their reasoning for B?"
- "B is actually wrong, try again."
- "OK, we need to talk about this..."

How to respond when... (A is correct)

The student responses look like this

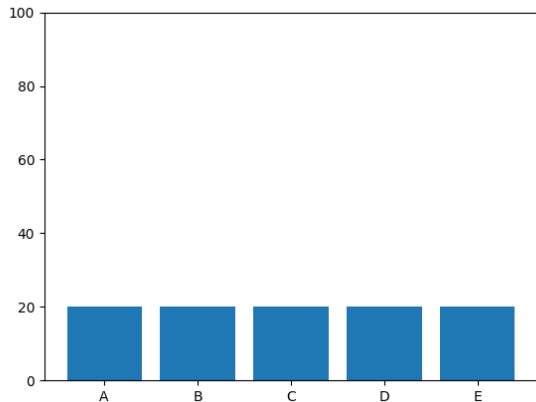


In this last one, they're guessing or very confused?

Many options will work here, let's summarize by naming them!

How to respond when... (A is correct)

The student responses look like this



Consider

- Show graph
- “Is the statement of the question unclear?”
- “Can anyone exclude one of the options?”
- Give hint and try again
- “Starting with A, what are the merits or issues with each choice?”

We can be flexible and react in the moment to make the most of the students effort answering the question.

LO: Given a class response to a polling question, choose a response to enhance learning and discussion.

Thanks!

<https://lthub.ubc.ca/guides/iclicker-cloud-instructor-guide/>

<https://lthub.ubc.ca/guides/iclicker-cloud-student-guide/>

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Some Other Ways to Use Clickers

Student poll

- Set Office Hours
- Informal Student Evaluations

Asses Confidence

- A) True (high confidence), B) True (low confidence)
- C) False (high confidence), D) False (low confidence)
- E) "I don't know"

Gauge progress through a problem

- A) Working, B) Done, C) Stuck

Reflection

- The most important point about today was...

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

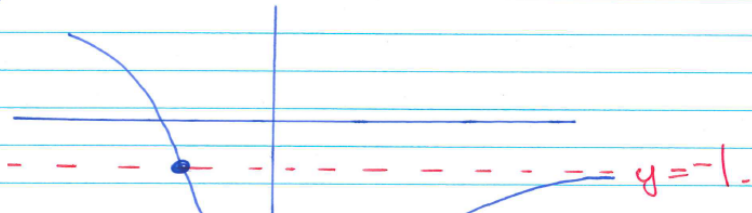
B) No

Clicker Q: Can a function cross its horizontal asymptote?

→ A) Yes 33%

B) No 67%

C) Don't know



Clicker Practice

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

ClickerQ: How many times can it cross its H.A.

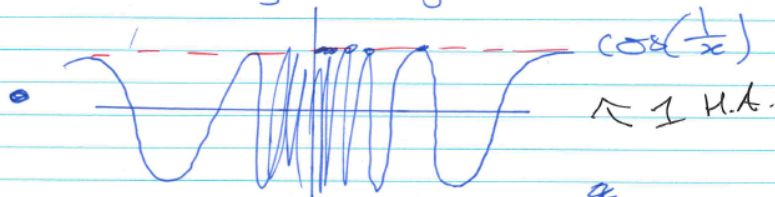
A) 1

B) 2

C) a few times (finitely many).

D) ~~infinitely many times~~

→ infinitely many times.



$$\lim_{x \rightarrow 0} f(x) = 1$$