

Effective Peer Instruction using Clickers

Peter Newbury STLF, Physics and Astronomy
newbury@phas.ubc.ca

Cynthia Heiner STLF, Physics and Astronomy
heiner@phas.ubc.ca

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Schedule

9:00 – 9:30 am	coffee and refreshments
9:30 – 10:45 am	demonstration and discussion of effective peer instruction “choreography”, reacting to students’ votes
10:45 – 11:00 am	coffee break
11:00 am – 12:00 pm	practice running peer instruction episodes
12:00 – 12:30 pm	clicker points, technical support
12:30 pm – 1:00 pm	lunch (provided)
1:00 pm – 2:30 pm	Workshop 2: Creating good clicker questions in physics and astronomy


Typical Peer Instruction Episode

1. Instructor poses multiple-choice question.
2. Students think about question on their own.
3. Students vote for an answer using clickers, coloured cards, ABCD voting cards,...
4. The instructor reacts, based on the distribution of votes. (We'll be discussing different reactions today.)



Peer Instruction

In effective peer instruction,

- students teach each other immediately, while they may still hold or remember their novice misconceptions
 - students discuss the concepts in their own language
 - the instructor finds out what the students know (and don't know) and reacts
- 
- students learn and practice how to think, communicate like scientists

Peer Instruction

Effective peer instruction requires

1. identifying key concepts, misconceptions
 2. creating multiple-choice questions that require deeper thinking and learning
 3. facilitating peer instruction episodes that spark student discussion
 4. resolving the misconceptions (unless leaving the question temporarily unresolved is part of the lesson plan)
-
- before class
- during class

Example Questions

Don't concentrate only on the content
of the example questions.
Watch the "choreography", too.

Clicker question

The amplitude and frequency of 4 light waves are shown. The waves are representative of one instant in time and are all travelling in vacuum. Which wave travels the fastest?



E) all the same speed

Clicker question

Dorsa
Aldrovandi



Mare
Serenitatis

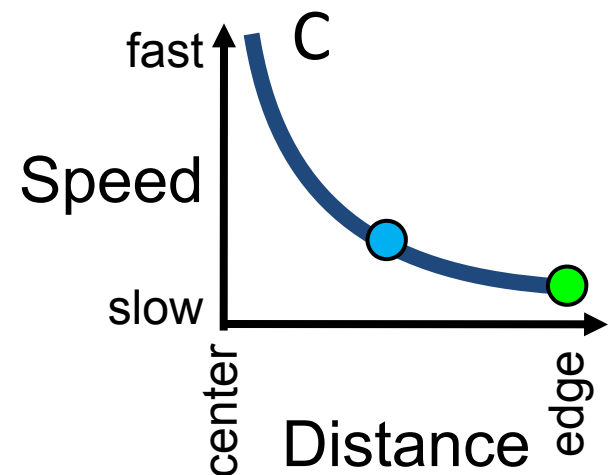
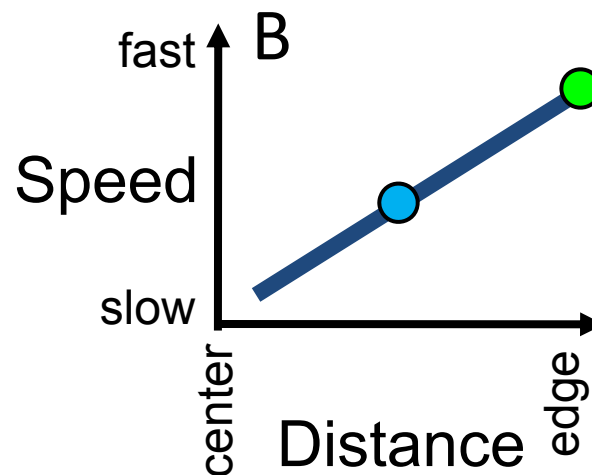
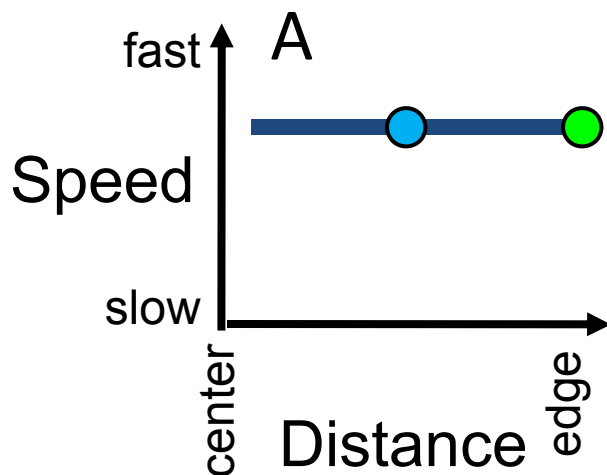
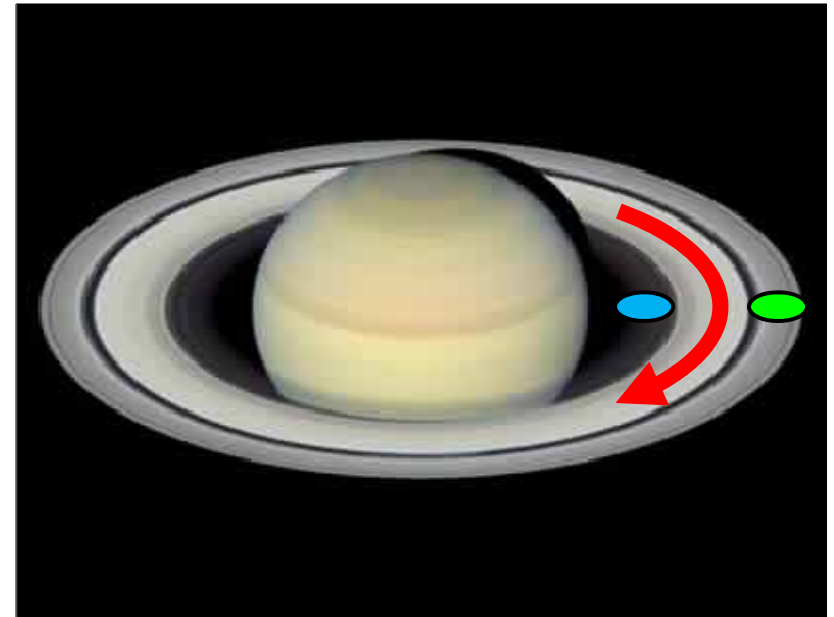


Are features X and Y
ridges or valleys?

- A) X=ridge, Y=valley
- B) X=valley, Y=ridge
- C) both are ridges
- D) both are valleys

Clicker question

Suppose Saturn's ring is a solid ring of material, spinning like a DVD. Which graph shows the how the speed of ring particles depend on their distance from Saturn?



Clicker choreography

To be effective, the instructor needs to run the peer instruction in a way that gives students sufficient time to think about, discuss and resolve the concepts.

We want students to participate without ever having to stop and think, “What am I supposed to do now?”

Clicker choreography

1. Present the question. Don't read it aloud.

Reasons for not reading the question aloud:

- your voice may give away key features or even the answer
- you might read the question you hoped to ask, not the words that are actually there
- the students are not listening anyway – they're trying to read it themselves and your voice may, in fact, distract them

Clicker choreography

2. “Please answer this on your own.”

Goals of the first, solo vote:

- get the students to commit to a choice in their own minds
- get the students to commit to a choice so they'll be curious about the answer
- get the students prepared to have a discussion with their peers, if necessary

If they discuss the question right way:

- students are making choices based on someone else's reasoning
- those students cannot contribute to the peer instruction as they have no ideas of their own

Clicker choreography

2. “Please answer this on your own.”

Students may be reluctant to quietly think on their own. After all, they have a better chance of picking the right choice after talking to their friends.

“Answer this on my own? Yeah, right!”

If you’re going to impose a certain behaviour on the students, getting their “buy-in” is critical. Explain to them why the solo vote is so important. Explain it to them early in the term and remind them when they start drifting to immediate discussions.

Clicker choreography

3. Don't start the clicker poll. Instead give the students sufficient time to make a choice. What is *sufficient*?

- Turn to the screen, read and answer the question as if you are one of your students.
- Another possibility: keep facing the class, helping those with confused stares.
- Another possibility: model how to think about the question by “acting it out.”
- When you notice students picking up their clickers and getting restless, they are prepared to vote.

Clicker choreography

4. When *you* have made a choice or when you see the class getting restless, ask the students, “Do you need more time?”

If many students are not ready to vote, they will not have committed to a choice and will be unprepared to discuss the question.

Some students may be uncomfortable asking for more time. Make it clear, from the first class, that you’ll honour the request with no repercussions to the student who asked.

5. “Yes!” Give them a few more seconds.
“[silence]” Ask them to prepare to vote.

Clicker choreography

6. “Please vote. You have 30 seconds.”



If you’ve given them sufficient time to commit to a choice, the voting should take very little time.

Another option: watch the number of votes and when most of the votes are in say, “Can I have your final answers, please?”.

Having a set routine will help the students recognize “now is the time for thinking”, “now is the time for voting”, “now is the time for discussing”...

Clicker choreography

7. Check distribution of votes on the i>clicker receiver.



Don't show the histogram to the class (yet):

- if there is a popular choice, students are apt to vote for it in a 2nd vote, without reasoning why.
- a student who picked an unpopular choice is very unlikely to participate in peer or class discussion

You can motivate students without showing the histogram, e.g., by saying “there seem to be two popular answers”

The students' behaviours will change when they see the histogram, probably not for the right reasons.

Clicker choreography

8. Depending on the distribution of votes, proceed.

We'll discuss reacting to various distribution scenarios in a few moments.

Clicker choreography

9. At the end, confirm the answer(s) and continue with the class.

Even if more than 80–90% of the students have picked the correct choice, some students are still not sure why that choice is correct.

Briefly confirm the correct choice:

- explain why the correct choice is correct
- if the other choices were carefully chosen, explain why the incorrect choices are incorrect
- allows those who chose the correct answer to make sure they had the correct reasoning

Reacting to their votes

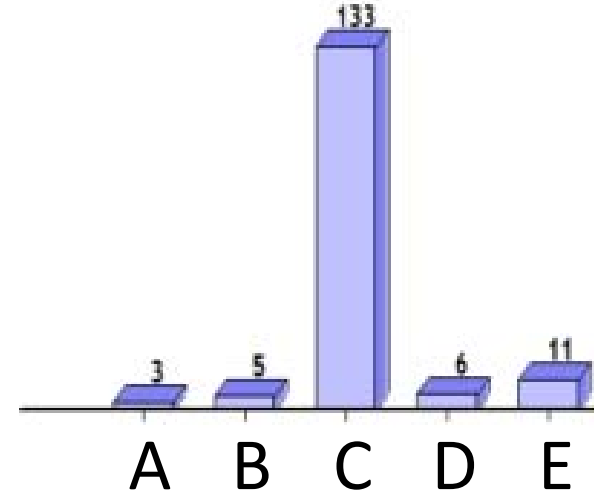
You don't know what's going to happen but you can **anticipate** and **prepare yourself** for the likely outcomes.



When you know the first-vote distribution (but they don't) you have lots of options.

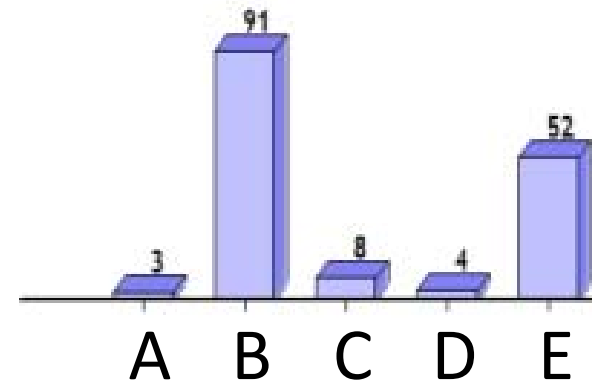
This is where you show your “agility.”

What do you think you should do with this **first-vote** distribution?
(C is the correct answer)



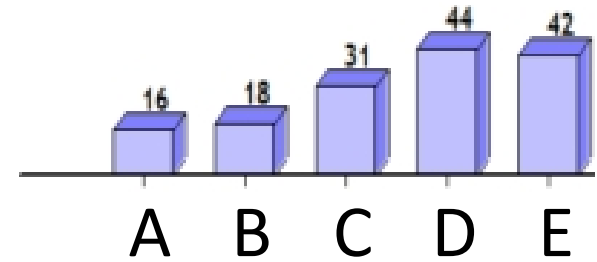
- A) “Turn to your neighbours and convince them you’re right”
- B) move on – everyone got it
- C) confirm correct answer and move on
- D) “Can someone who answered C tell us why they made that choice?”
- E) other

What do you think you should do with this **first-vote** distribution?

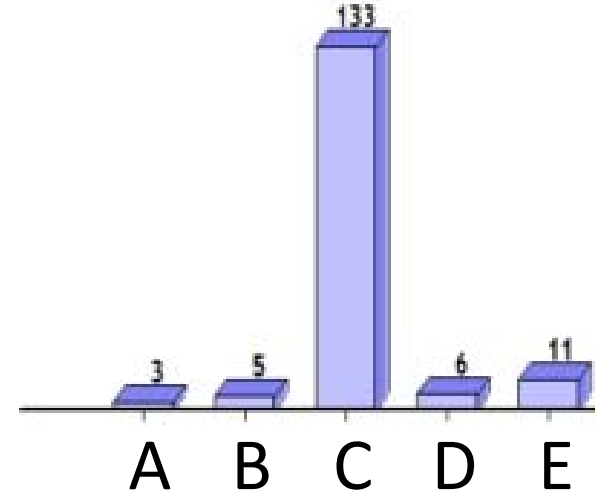


- A) “Turn to your neighbours and convince them you’re right”
- B) confirm correct answer and move on
- C) “Can someone who answered B tell us why they made that choice?”
- D) “Would someone like to explain why they picked the answer they did?”
- E) other

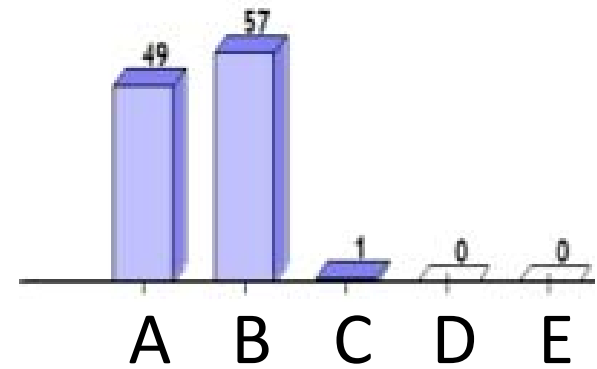
What do you think you should do with this **first-vote** distribution?



What do you think you should do with this **first-vote** distribution?
(C is **not** the correct answer)



What do you think you should do if this is the **second-vote** distribution?



Reacting to their votes

When you know the first-vote distribution (but they don't) there are many options. You can

- confirm and move on
- ask the students to discuss with their peers
- ask students to advocate for the choices they made
- check that the question made sense
- eliminate one or more choices before re-voting
- and more...

This is where you show your “agility”.

Coffee break

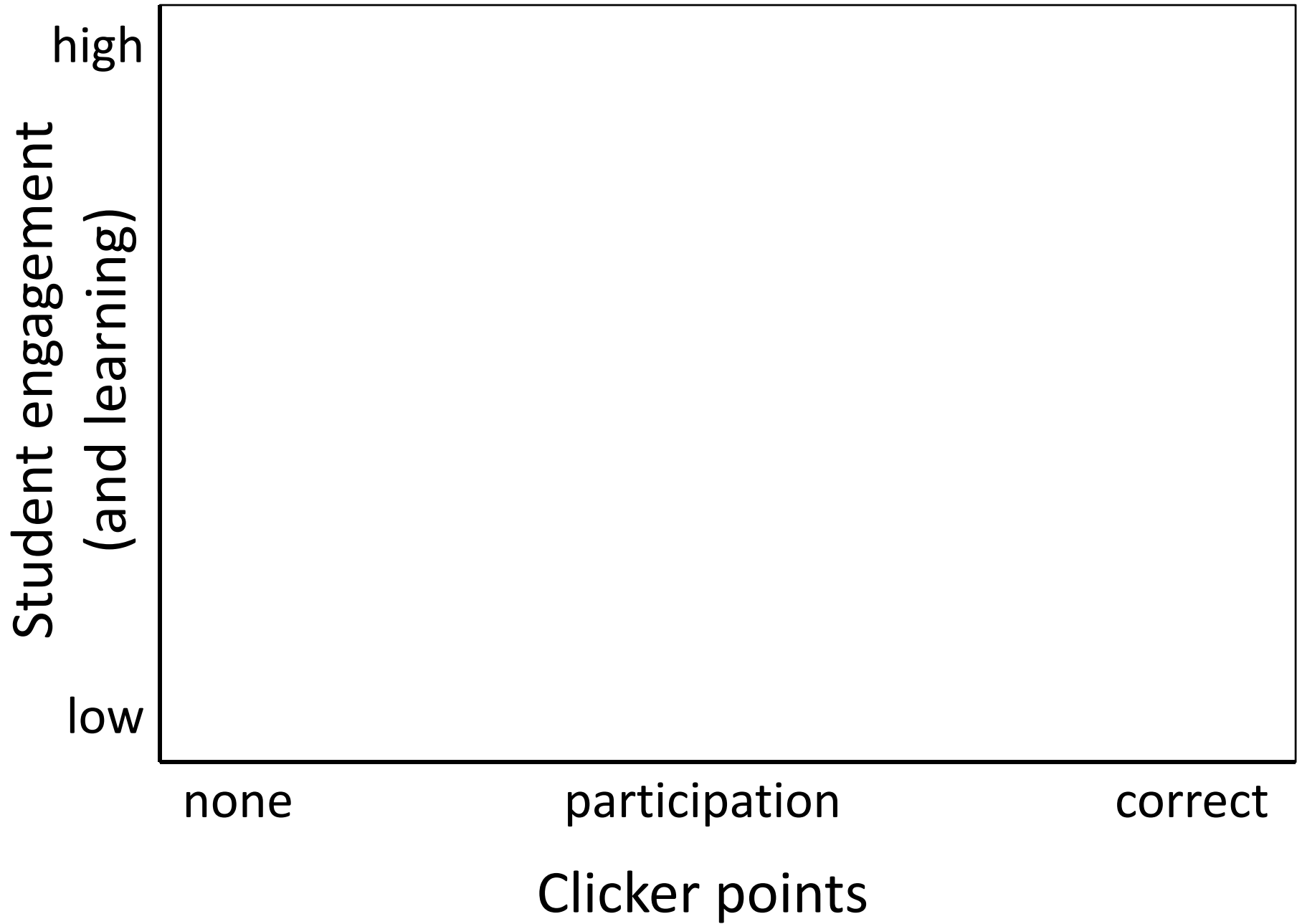
Please select a question if you haven't yet.

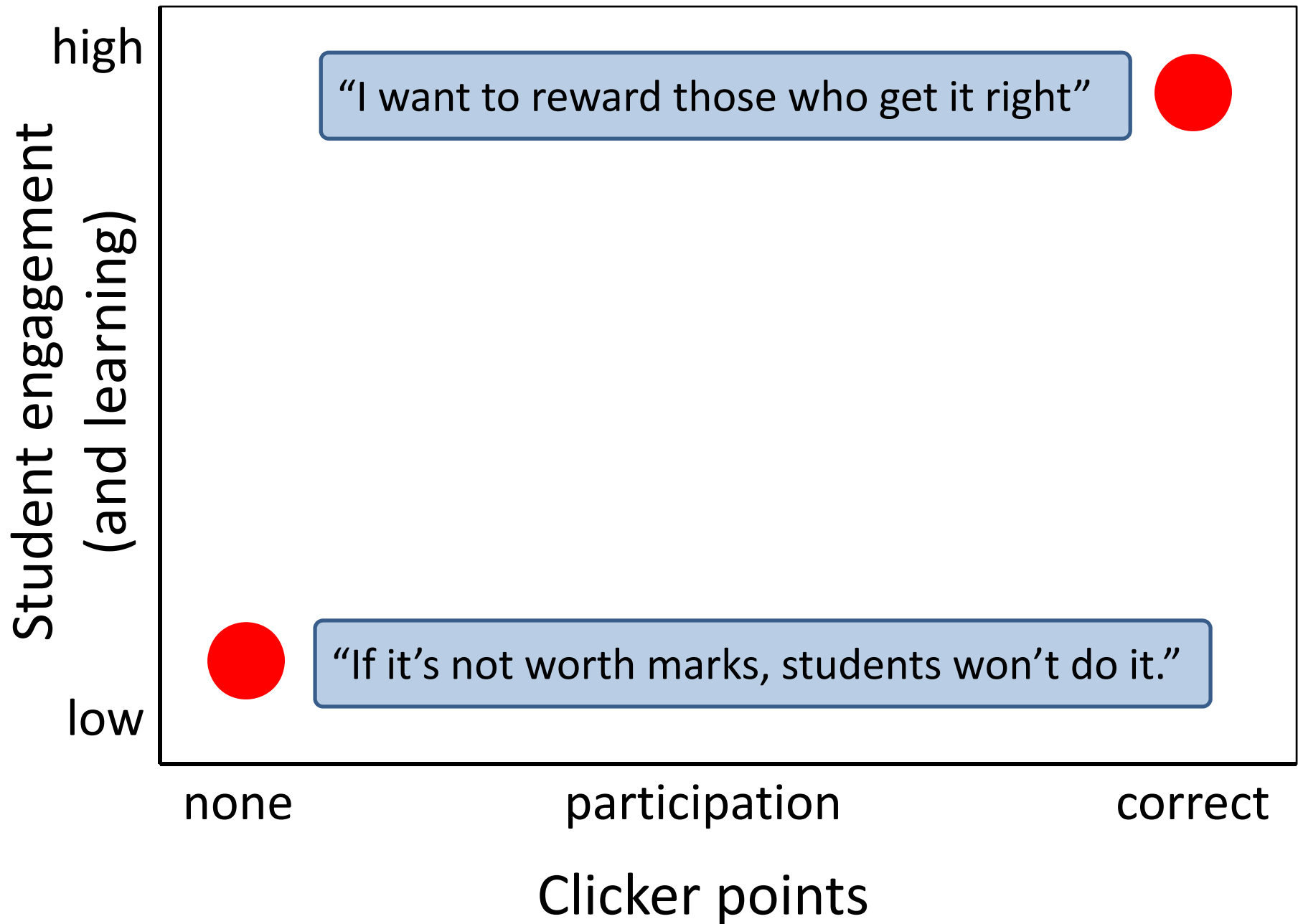
Peer instruction practice

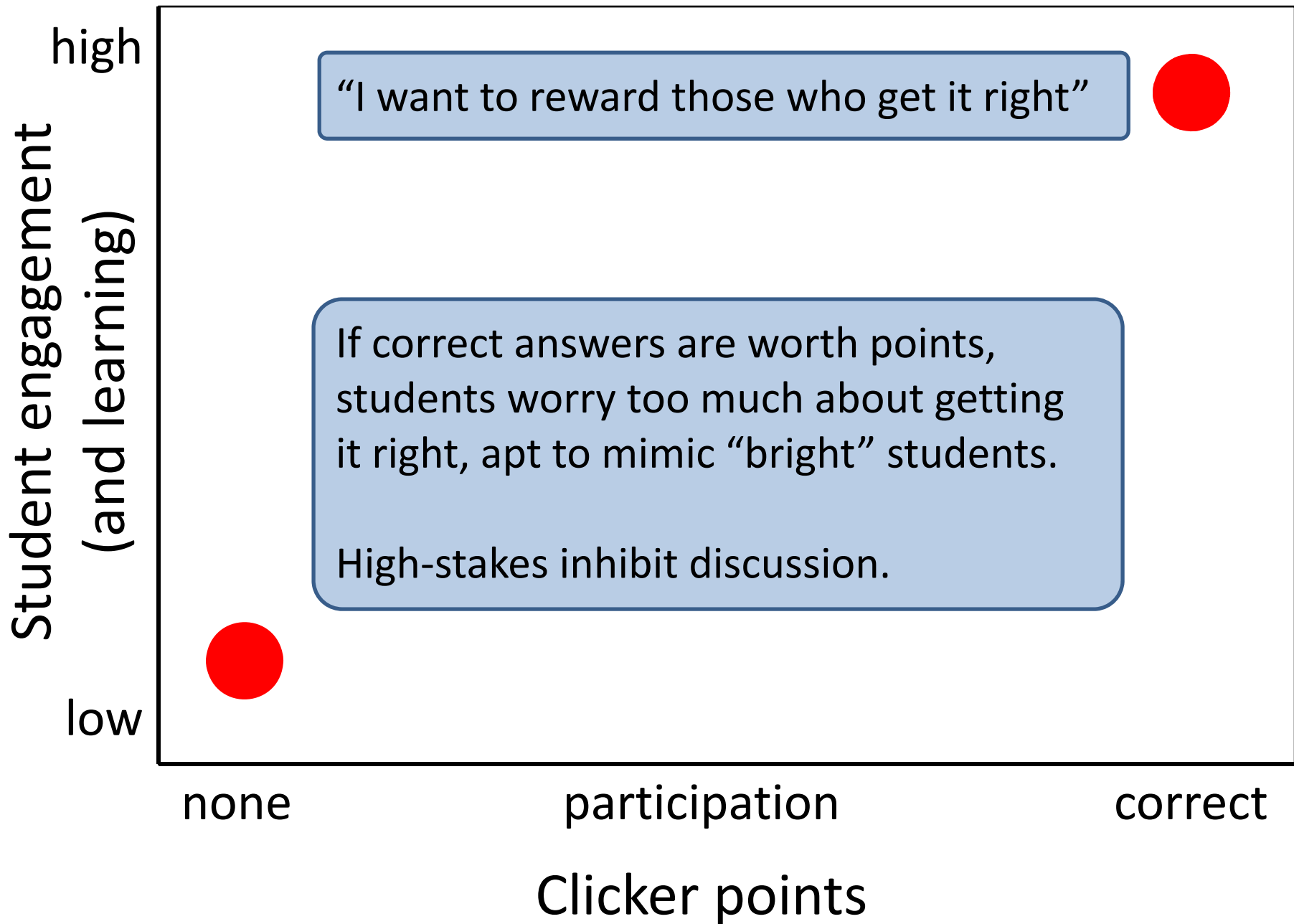
Take 5 minutes to look carefully at your question:

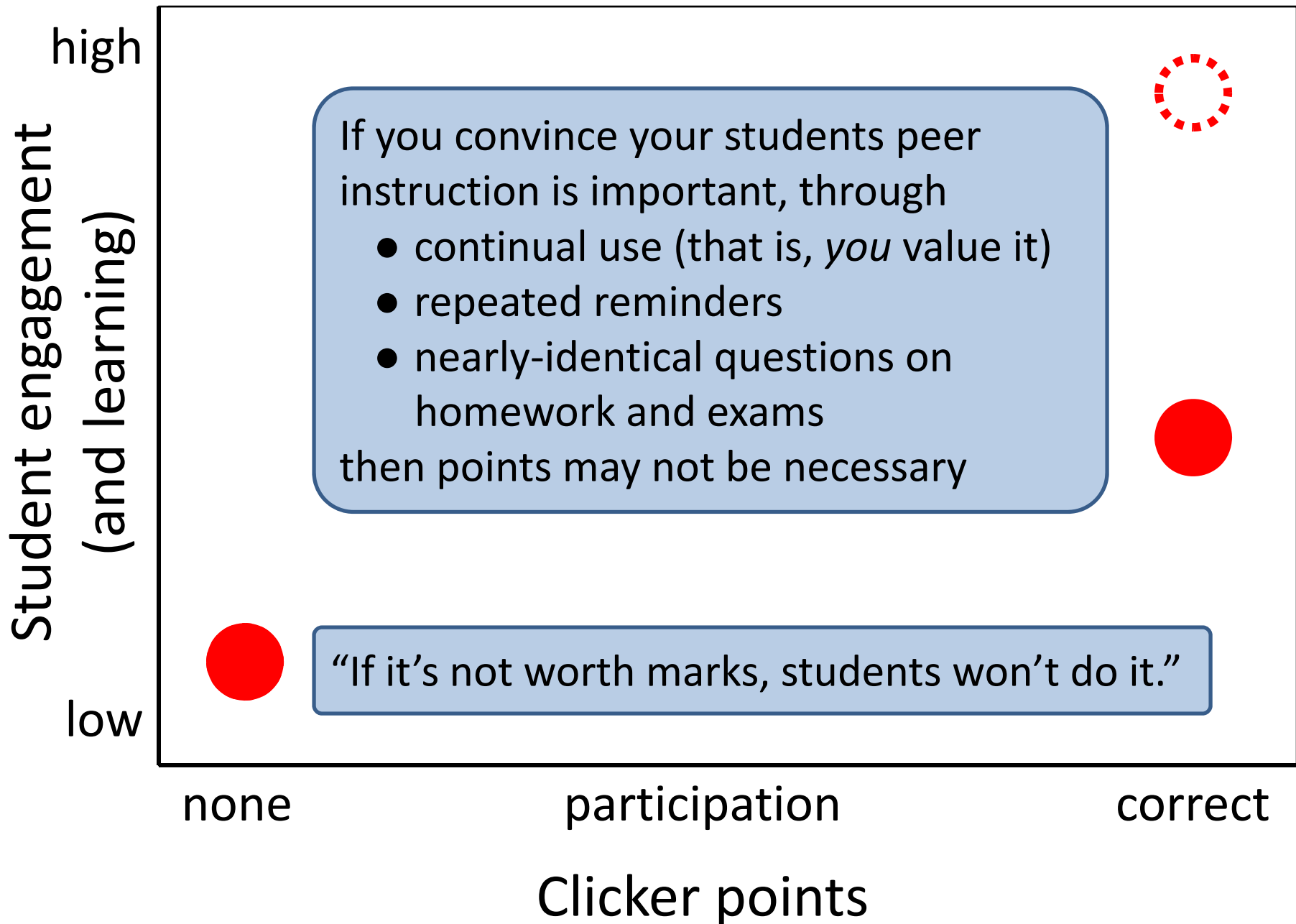
- figure out the right answer (and why it's right)
- try to identify the errors or misconceptions behind each distractor
- anticipate and prepare yourself for possible distributions of votes
- review the choreography

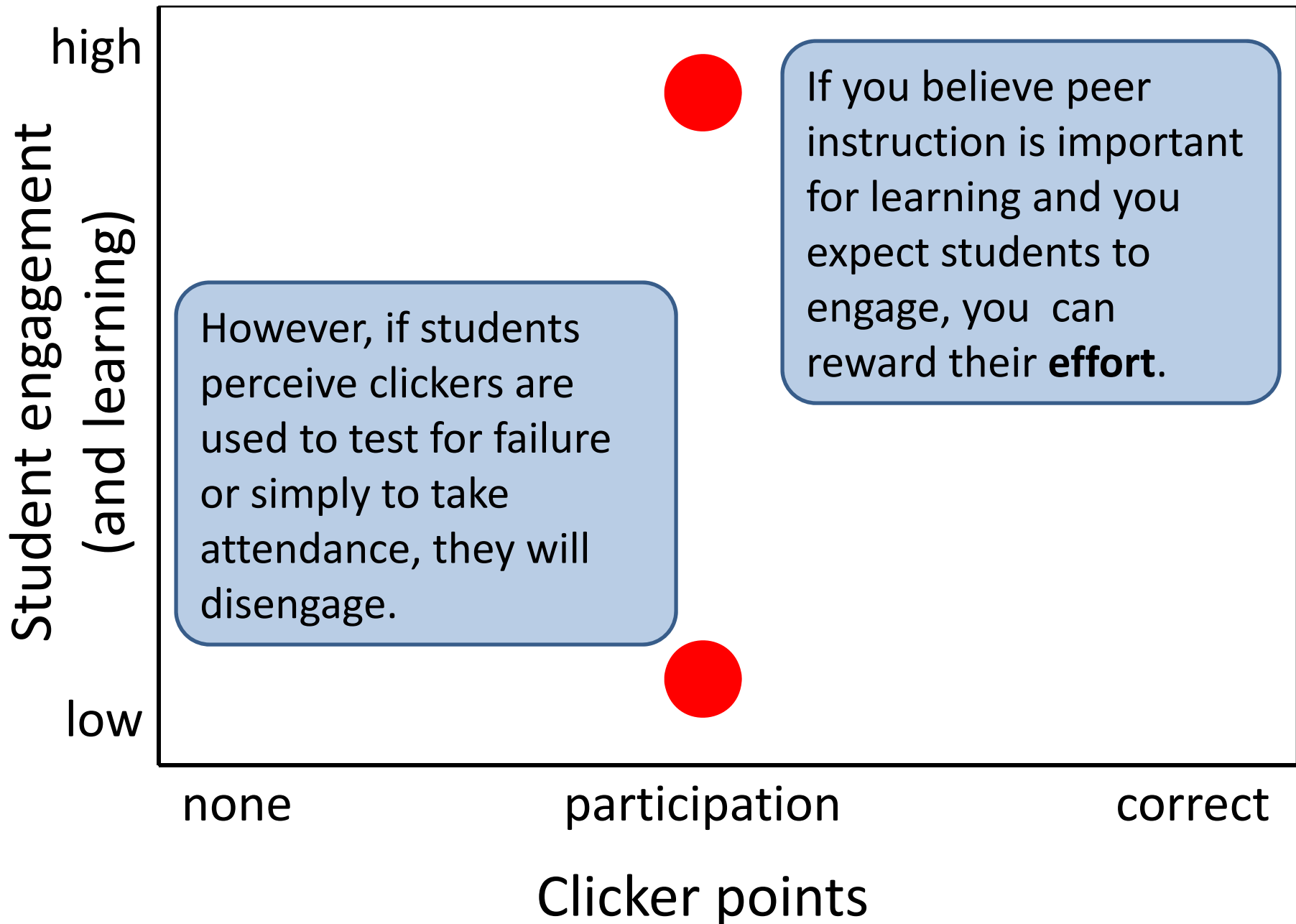
Feel free to write notes on your question and work from those notes – no need to memorize (yet!)



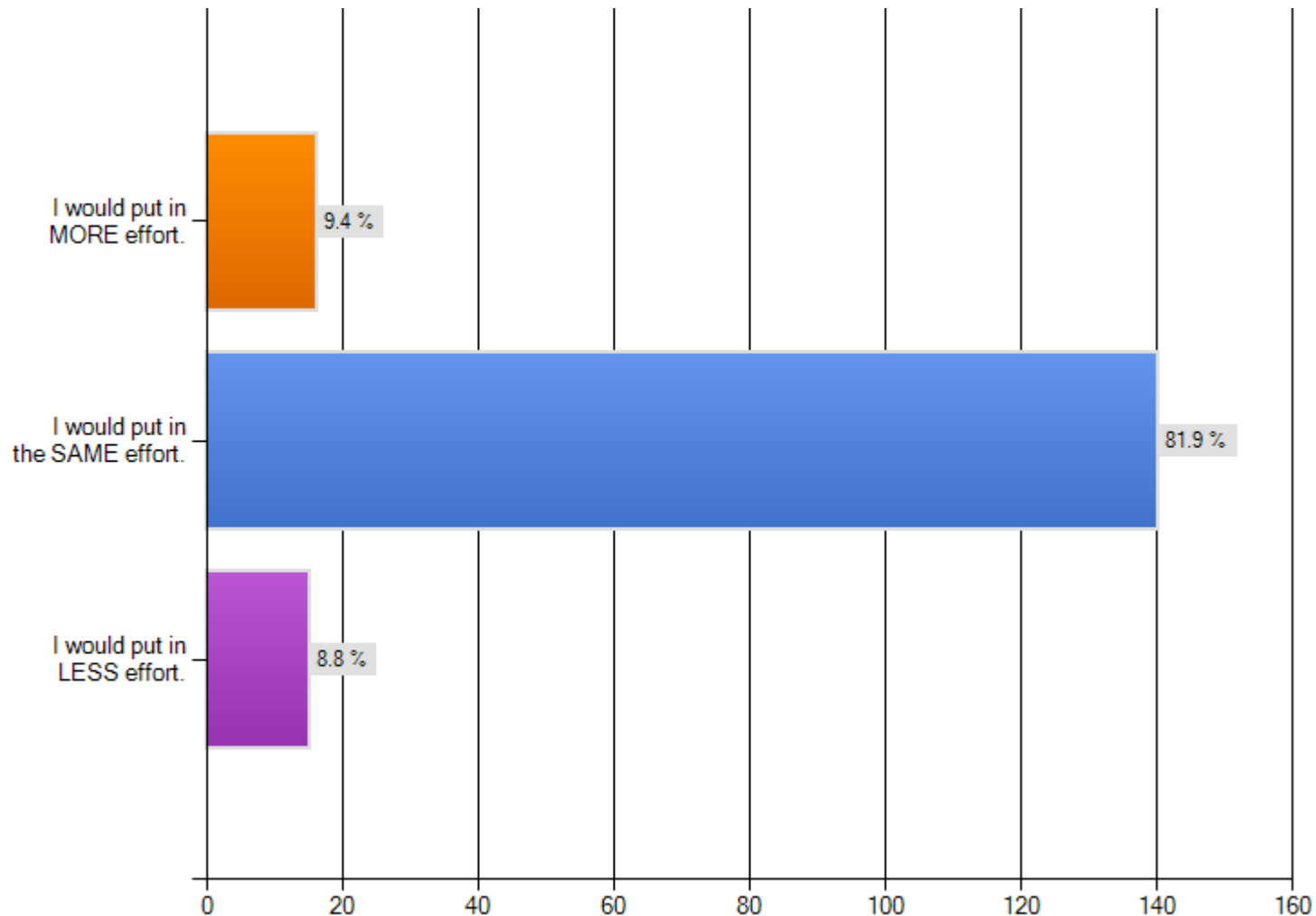




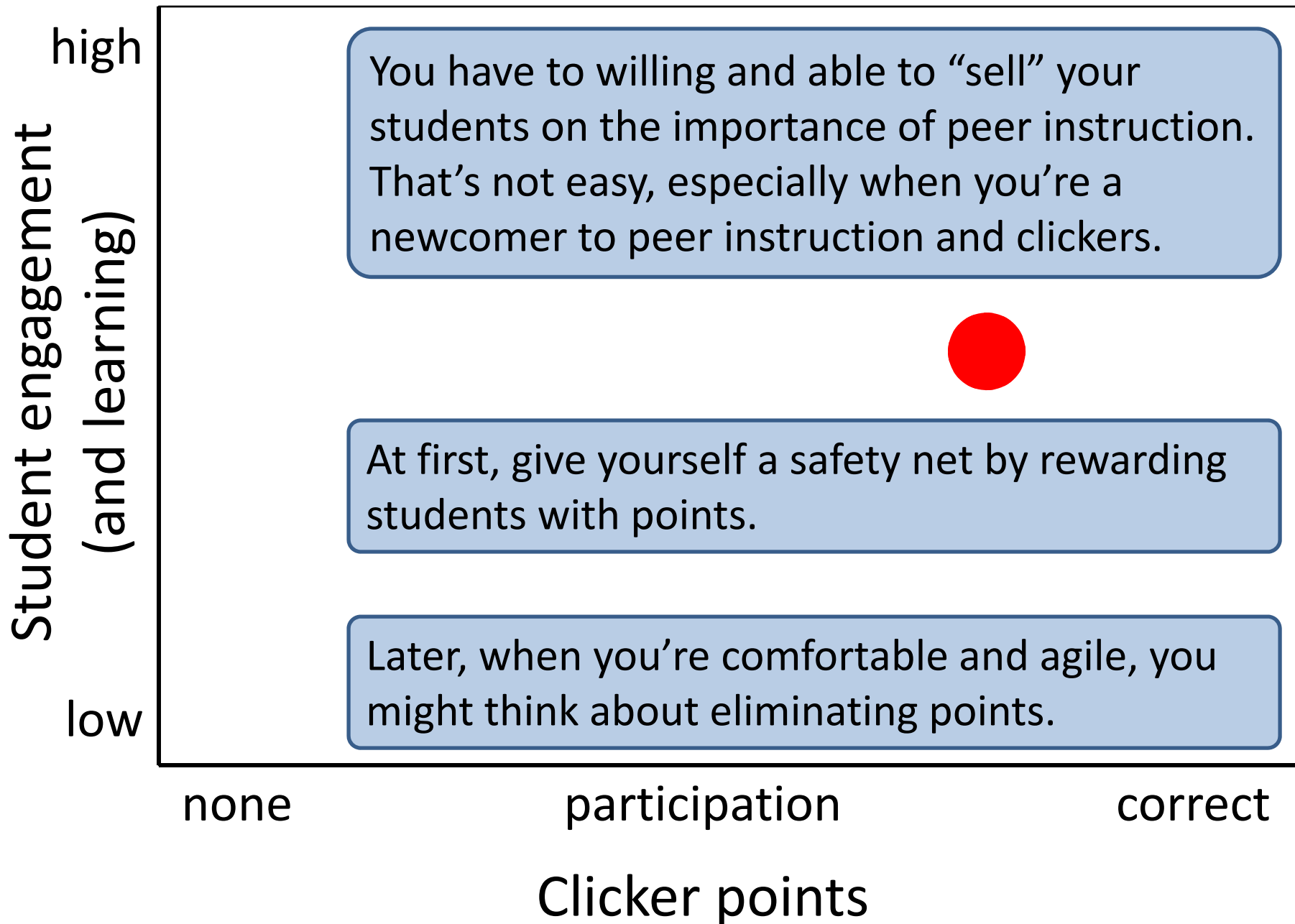




If the clickers were marked for participation ONLY



“Either way I still would try to get the answer I think is most correct. I would still think about the question and would not just guess.”



i>clicker support

wiki.ubc.ca/Clickers

- iClicker/iGrader download for PCs and Macs
- check if your classroom is set up
- learn how the students can register their clicker IDs
- adding a class roster using VISTA (for PCs & Macs)
- sync'ing igrader marks with VISTA

wiki.ubc.ca/Documentation:Clickers/iClicker_FAQ_for_instructors

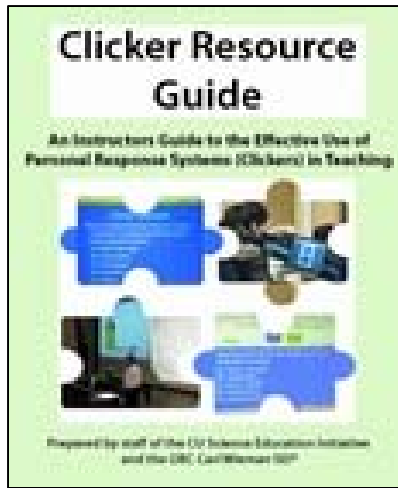
UBC Clicker Support: Michael Tang and Joe Zerdin
<clicker.support@ubc.ca> IKBLC Room 102

Resources

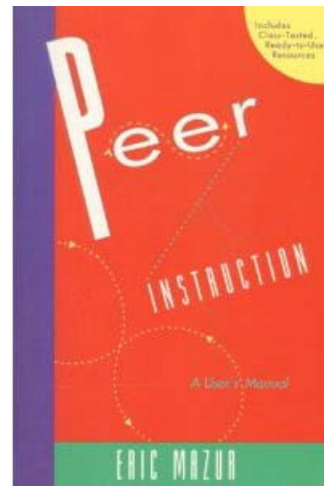
Check the clicker resources pages on the CWSEI website:

<http://www.cwsei.ubc.ca/resources/clickers.htm>

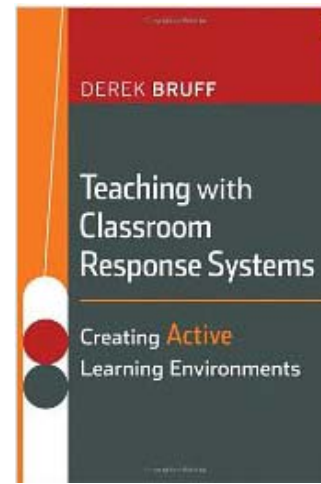
(with links to collections of peer instruction questions)



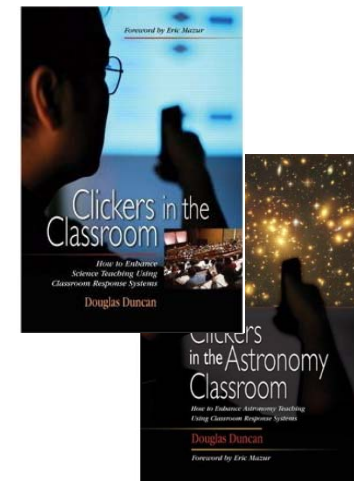
CWSEI



Eric Mazur
(1996)



Derek Bruff
(2009)



Doug Duncan
(2004, 2005)

Thanks

Doug Bonn – Department Head, Physics and Astronomy

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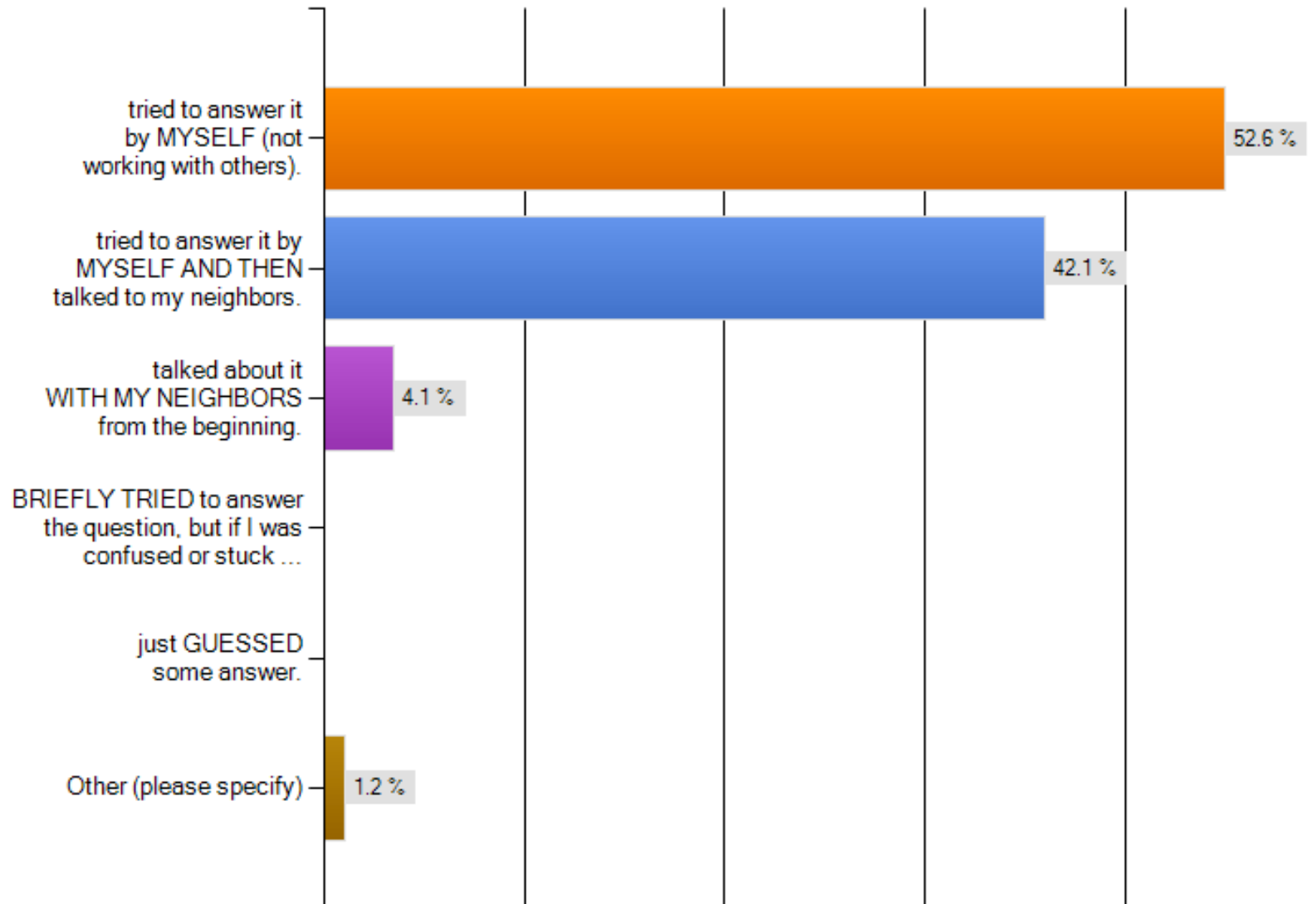
The choreography described here is based on techniques developed at the Center for Astronomy Education at the University of Arizona (astronomy101.jpl.nasa.gov), adapted to using i>clickers.

and you

for investing your time and energy to participate today

PHYS 101 student feedback about clickers

The first time a clicker question was asked in class, I usually ...



When you did try to answer the clicker questions, what MOTIVATED you to do so?

- “I wanted to see if I knew as much as the rest of the class.”
- “They are very helping to understanding concepts.”
- “Get that doubt out of my head.”
- “To check if I was on the right track with my thinking.”
- “It tests my understanding and wanting to get the question right.”
- “The clickers are a good way to stay involved in the lecture material”
- “They're fun! Also excellent practice for concept questions.”

some student comments about clickers

- “I really disliked the idea at first (coming from a small college it was a new thing for me) because I didn't want to pay for it (good old cheap student). But, I really like them now and think they are a great way to reinforce material and promote active listening as a student.”
- “I find using i-clicker useful because the professor would re-explain if she sees that most of the class isn't understanding.”
- “Loved the clicker because it was great to see that other people didn't get it either. Helped me to make friends in the class too.”