Facilitating Clickers Effectively

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Agenda:
Part 1: The Why and How
Part 2: Facilitation Matters
Part 3: Practice (if we have time)

Handouts
http://www.colorado.edu/sei/fac-resources/workshops-clickers.htm

Faculty resources on teaching
http://www.colorado.edu/sei/fac-resources/

Clicker resources and videos:
http://STEMclickers.colorado.edu

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Why Question?

**To Do**

Introduce yourself to your two nearest neighbors, and discuss the following questions. Be prepared

- *Why* do we ask questions in class? *When* in a lecture might we use questions?
- What is the purpose of *clicker questions* in class?

**Notes**
What Are the Challenges?

**To Do**

In your small groups, brainstorm some of the challenges you foresee to using Peer Instruction in your class, or any outstanding questions that you have. What are some possible solutions to these challenges?

**Notes**
**To Do**

On your own, consider: What will you do to implement ideas you heard about in this workshop? OR, what key ideas will you share with a colleague? (See Tips for Successful Use of Clickers handout for a summary)

**Notes**
Clickers help students learn...

BEFORE  DURING  AFTER
setting up  developing  assessing
instruction  knowledge  learning

Adapted from Cynthia Heiner, Peter Newbury, Rosie Piller, Ian Beatty, Stephanie Chasteen

Clickers help teachers teach...

BEFORE  DURING  AFTER
setting up  developing  assessing
instruction  knowledge  learning

Are they ready for the next topic?
What do they already know?
Do they care about this?
What DO they care about, anyway?

Adapted from Cynthia Heiner, Peter Newbury, Rosie Piller, Ian Beatty, Stephanie Chasteen
Clickers help teachers teach...

Where are they in the activity?

Are they getting it?

Do I need to intervene?

Did they notice key idea X?

BEFORE    DURING    AFTER

setting up instruction

developing knowledge

assessing learning

Adapted from Cynthia Heiner, Peter Newbury, Rosie Piller, Ian Beatty, Stephanie Chasteen

Clickers help teachers teach...

Did they get it?

Did that activity work?

Can I move to the next topic?

How did I do?

BEFORE    DURING    AFTER

setting up instruction

developing knowledge

assessing learning

Adapted from Cynthia Heiner, Peter Newbury, Rosie Piller, Ian Beatty, Stephanie Chasteen
Clicker Choreography
Courtesy of Cynthia Heiner and Peter Newbury

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?”

1. **Present the question. Don’t read it out loud.**

   Reasons for not reading the question out loud:
   - 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

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 away:
   - 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

   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.

   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.

   http://STEMvideos.colorado.edu

3. **Don’t start the i>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.

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.

6. “Please vote.”

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?” Don’t wait for every last student to vote. Some may be choosing not to vote.

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 choose it in a 2nd vote, without reasoning why.
- a student who picked an unpopular choice is 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.

8. Depending on the distribution of votes, proceed.

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) 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.”

- What do you do if 90% of the class has the right answer on the first vote?
- What do you do if the class is split between two answers on the first vote?
- What do you do if the class is split between all answer choices on the first vote?
- What do you do if 90% of the class chooses the wrong answer on the first vote?
- What do you do if the class is split between two answers on the second vote?

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
- explain why popular distractors are incorrect
- allows those who chose the correct answer to make sure they had the correct reasoning
## Practices to avoid common challenges:

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<thead>
<tr>
<th>Challenge</th>
<th>Possible solution</th>
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<tr>
<td><strong>Content coverage?</strong></td>
<td>1. Focus questions on key concepts.</td>
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<td>2. Reduce content in class or course.</td>
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<td><strong>Students reluctant to discuss?</strong></td>
<td>1. Make it clear why you’re doing this</td>
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<td>2. Use interesting questions</td>
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<td>3. Circulate during question</td>
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<td>4. Focus on reasoning in wrap-up</td>
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<td>5. Careful about motivating w/ points (can backfire)</td>
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<tr>
<td><strong>Students reluctant to share with class?</strong></td>
<td>1. Circulate and eavesdrop</td>
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<td></td>
<td>2. Give incentives (candy?)</td>
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<td></td>
<td>3. Create a safe environment</td>
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Best-Practices in Clicker Facilitation
Stephanie Chasteen and the CU Science Education Initiative

Clicker Questions (writing and asking them)

Challenges:
- Difficult to write your own questions
- What kinds of questions should I ask?
- How do I write questions that meet the diverse needs of students in my class?

Core Philosophies:
- Questions are integral to lecture
- Students can learn by considering a question

Solutions / Best Practices:
- Find existing questions from other instructors or online question banks (some available at http://STEMclickers.colorado.edu and http://www.peerinstruction.net)
- Ask questions several times during lecture
- Ask challenging, meaningful questions
- Use a variety of pedagogical strategies in your questions (e.g., bringing out a misconception, predicting an outcome, reminding students what they already know, etc.)
- Ask a variety of questions – simpler ones to boost confidence and complex ones to facilitate learning
- Show questions to colleagues to get feedback before class
- Use plausible distractors. Sources of good distractors are homework and exams, student questions in office hours, student responses to an open-ended version of the question, or documented misconceptions.
- Have a challenge question at the bottom for those who finish early

Peer Discussion

Challenges:
- Students will be reluctant to talk to each other
- Students won’t know how to reason through the questions
- There are always students in the back who won’t participate
- Getting students back together after a clicker question

Core Philosophies:
- Students learn through discussion
- Students need to know that you value their ideas
- Students need to feel it’s safe to share their ideas (that they won’t be put down)

Solutions / Best Practices:
- Make it clear why you’re using Peer Instruction (student buy-in). For example, explain the benefits of Peer Instruction and what you expect from students several times at beginning of semester.
- Circulate class, asking questions and modeling good reasoning and Socratic technique.
• Use questions they want to discuss (challenging, interesting questions)
• Allow enough time for the solo vote, and for the peer discussion (2-5 mins)
• Focus on reasoning in wrap-up (this indicates that their job during discussion is to focus on reasoning so they can share it later)
• Use an initial solo vote, so that students are committed to an answer and thus more curious about the answer and more prepared to discuss with one another
• Use the results of the class votes to guide your instruction (so that students see that the results of the activity are being used)
• Do not give points for correctness of response, or give minimal points for correctness. Research has shown that if clicker questions are high-stakes that student discussion becomes focused on correctness rather than reasoning.
• Use a routine to get students back together, such as ringing a bell when time is up.

Whole-Class Wrap-Up Discussion

Challenges:
• Students won’t want to share their ideas in front of the whole class
• How do you deal with a student response that is wrong in a positive way, but making clear that it is wrong?

Core Philosophies:
• The reasoning is more important than the answer.
• Students need to know that you value their ideas & that it’s safe to share

Solutions / Best Practices:
• Circulate class during peer discussion, so that you can gain insight into student thinking and share what you heard if students are reluctant to share (or have a Teaching Assistant do the same)
• Establish a culture of respect, where you identify the merit in an idea or under what circumstances it would be right. Make sure students don’t feel foolish for having erroneous thinking.
• Consider whether to show the histogram immediately (it is often strategic to withhold the histogram results until after discussion so that student discussion isn’t shut-down. If the vote is a split-vote, however, showing the results can motivate discussion).
• Ask multiple students to defend their answers
• Avoid the “rapid reward,” where you nod assent as soon as you hear the answer you are looking for. Instead, withhold judgment on student reasoning until most common ideas are out on the floor.
• Discuss why the wrong answers are wrong and why the right answer is right
• Reward students who speak up – either verbally or, if you wish, with some sort of treat. (We have used candy, NASA stickers, or physics formula books)
• Use non-threatening wording to ask students to share their answers, e.g., “Even if you didn’t answer ‘C’, why might someone have answered ‘C’? What makes ‘C’ a tempting choice?”
Use flexible, agile teaching based on your sneak-preview of the student responses:

- If 80-90% get the right answer, briefly explain why the right answer is right and why the wrong answers are wrong, so that all know the correct reasoning. *Note:* If 80-90% have the correct answer after the solo vote, peer discussion is not necessary.
- If 70% or fewer get the correct response, then solicit reasoning as described above.

**Other**

**Challenges:**
- It takes too much time: Takes a lot of time to develop questions and integrate into lecture, and questions take time out of lecture
- Technical issues

**Core Philosophies:**
- Questions are integral to lecture
- Students can learn by considering a question

**Solutions:**
- Limit the use of Peer Instruction to questions that align with your learning goals for the class and focus on key concepts.
- Don’t spend too much time on a question (but not too little either); about 5 minutes.
- Reduce your content coverage so the class focuses on key, important ideas. Better for students to walk out with a firm grasp of the important ideas rather than a vague understanding of a long list of topics
- Move some content coverage outside of class – e.g., students can do pre-reading, watch video lectures, or do derivations or other long calculations at home instead of watching in lecture time
- Don’t recreate the wheel; use questions that others have written
- For technical issues: Practice before using with students, and decide in advance how you will deal with technical failures (on your end, or the student’s clicker)

A note on content coverage:
While we would like to teach for understanding, many teachers feel pressured to teach for exposure – the classic “mile wide but an inch deep” problem. It’s worth noting that in research studies, some teachers found that they could teach the material more efficiently using question-driven instruction. They found that they had a deeper understanding of students’ difficulties, allowing them to tune their instruction more efficiently. Plus, in later units, students’ grasp of the underlying material helps them progress through the units more quickly.
Question Cycle

Courtesy of Rosie Piller

Before Instruction

❖ Motivate students
  ▪ Why is it important to...?
  ▪ What might we want to...?
  ▪ What kinds of things can go wrong?
❖ Help them discover information
  ▪ What do we have to take into account when we...?
  ▪ What needs to happen when you...?
  ▪ Predict: Since X causes Y, what do you think will happen when...?
❖ Assess prior knowledge or provoke thinking/discussion
  ▪ What do you think about...?
  ▪ Would you/do you...?
  ▪ What do you think will happen if...?

During Instruction

❖ Test knowledge of facts
  ▪ What are the three types of...?
  ▪ Can you define...?
❖ Test comprehension of concepts
  ▪ Which statements support...?
  ▪ What examples can you think of?
❖ Test applications of concepts
  ▪ What would happen if...?
  ▪ Which of the following are X?
❖ Help them analyze what they are learning
  ▪ Based on the symptoms, what would you say is going on?
❖ What is the relationship between...?
❖ Test their ability to evaluate
  ▪ Here are two solutions. Which is more appropriate and why?
  ▪ Which of these is more important?
❖ Provoke them to synthesize their understanding.
  ▪ How would you test...?
  ▪ Propose a way to...
❖ Elicit a misconception
  ▪ Ask questions where a common student misconception will result in a particular response
❖ Exercise a skill
  ▪ How would you...?
  ▪ What is the next step in this problem?

After Instruction

❖ Have students recap what they have learned
  ▪ What steps did you go through to solve the problem?
  ▪ What are the most important things to remember?
  ▪ Exit poll: What did we learn today?
❖ Ask them to relate information to the big picture
  ▪ How does this lead into the next topic?
❖ Demonstrate success and limits of understanding
  ▪ Ask questions that students have built an understanding of during the class.
  ▪ Ask questions that go beyond what was done in class

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