Creating Effective Clicker Questions in Life Sciences

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June 25, 2013

Adapted from workshops developed by: Stephanie Chasteen (CU-SEI), Peter Newbury (UC San Diego) and Cynthia Heiner (Freie Universität Berlin)
Exercise 1: Question Goals

• What *goals* might clickers be used to achieve? Or, put another way, what might you use clicker questions to accomplish in your class?

• Feel free to talk to your neighbour if you finish brainstorming on your own.
Possible Question Goals (and when to ask)

**BEFORE learning**
* Motivate
* Discover
* Predict outcome
* Provoke thinking
Assess prior knowledge

**DURING learning**
* Check knowledge
  * Application
  * Analysis
  * Evaluation
  Synthesis
* Probe misconception
  * Exercise skill

**AFTER learning**
* Relate to big picture
* Demonstrate success
Review or recap
Exit poll

* = best suited goals for peer instruction
When to ask questions: **Before & After Learning**

### 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 and show: We have seen that X happens when we do 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…?

### 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

Credit: S. Chasteen, CU-SEI.
When to ask questions: **During Learning**

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?
Remember components of an effective clicker question*

<table>
<thead>
<tr>
<th>connection to learning goals</th>
<th>Does the question make students do the right thing to demonstrate they grasp the concept.</th>
</tr>
</thead>
<tbody>
<tr>
<td>context</td>
<td>Is this topic currently being covered in class?</td>
</tr>
<tr>
<td>clarity</td>
<td>Students should waste no effort trying to figure out what’s being asked.</td>
</tr>
<tr>
<td>distracters</td>
<td>What do the “wrong” answers tell you about students’ thinking?</td>
</tr>
<tr>
<td>difficulty</td>
<td>Is the question too trivial? too hard?</td>
</tr>
<tr>
<td>stimulates</td>
<td>Will the question engage the students and spark thoughtful discussions?</td>
</tr>
<tr>
<td>thoughtful discussion</td>
<td>Is there potential for you to be “agile”?</td>
</tr>
</tbody>
</table>

*Particularly when using peer instruction

Credit: P. Newbury, C. Heiner,
Exercise 2: Write a Draft Question

• Choose one of the question goals (slide 3 in handouts)
• Begin a draft question that aims to achieve this goal.
• Don’t worry about writing answers or distracters yet.
Exercise 3: Revisit your Question

• Continue drafting your question, using what we’ve just talked about and the “tips” in your handouts.

• If you wish, swap with your neighbor and discuss when you’ve finished.
Bloom’s Taxonomy and using questions at a variety of cognitive depth

*If you original question was about assessing factual knowledge, can you revise or write another that is more intellectually challenging for your students? (see slides 5 and 6 for ideas)*
Other Tips on Question Writing

This space is for you to jot down any ideas you got from discussions, gallery walk, etc.
Action Plan

What will you do to implement ideas you heard about in this workshop?

OR what key ideas will you share with a colleague? (See Goals and Components slides for summary!)

1.

2.

3.