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Women & Science Opening Workshop 2013

Getting Near 100% Class Participation Using Clickers

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Why use clickers?

- Active learning for the students
- Peer instruction
- Boost attendance
- Everybody participates
- Study tool for exams
- Gives you feedback
- It can be fun!



Why not use clickers?

- Consumes lecture time
- Can create “game show” atmosphere
- Students feel time pressure



Is it easy?

- No.
- At least, not at first.
 - Prepare questions
 - Get “participant list”
 - Run the software during lecture
 - Save session information
 - Create report with scores
 - Export to your grade book



Is it worth the effort?

- 😊 Improved attendance
- 😊 Near 100% participation
- 😊 Student satisfaction is high
- 😐 Test scores remain flat



Questions with strategy

- My philosophy: prepare students to complete the homework
- Others:
 - Reveal student misconceptions
 - Probe hidden assumptions
 - Stimulate class discussion
 - Compare and contrast several items



From the University of Maryland:

The clicker slides in this booklet are meant to be used as stimuli to encourage class discussion. They are intended for use in a class that attempts to help students develop a coherent and sophisticated understanding of scientific thinking.

They are NOT intended as items to test whether students are “right or wrong” or “know” the correct answer by one-step recall if enough cues are given.

This has a number of instructional implications that are reviewed in general on the next four slides. The individual slides also contain annotations discussing their intended use.

Usage: 1

- **Feedback**

One of the most important values of a clicker-response system is to provide instructors with some understanding of what students are thinking.

Good clicker questions can be highly revealing (and surprising). But the critical fact is not *that* the students make mistakes but to use those mistakes to probe their thinking and find out *why*.

This raises the importance of a rich subsequent discussion well above “letting the students know what the right answer is.”

Usage 2:

- **Student-student interactions**

The critical value for student learning occurs in what happens *after* a clicker question has obtained a mixed response from the students. The standard next cue is, “Find someone who disagreed with the answer you chose and see if you can convince them.”

After a minute or two of discussion, a second click may show students having moved dramatically towards the correct answer. A brief call for who changed their answer and why can lead to a useful exchange. When they have not moved significantly, more discussion is called for.

Usage: 3

- **Incompletely specified questions**

Some items have questions that are simple if idealized assumptions are made, subtler if they are not. Part of the discussion of these items are intended to include issues of modeling, idealizations, and hidden assumptions.

Usage: 4

- **Cluster questions**

Some questions are meant to be used as part of a group of questions. In this case, resolving the answers to individual questions is better left until the entire group is completed. The value of the questions are often in the comparison of the different items and in having students think about what changes lead to what differences and why.

- **Problem solving items**

In these items (indicated by a pencil cluster logo), the intent is to have students work together to solve some small problem. After a few minutes, ask the groups to share their answers, vote on the different answers obtained, and have a discussion.

Different modes of use

- Standard homework example or conceptual question
- Class quiz question
- Survey or poll question
- Multi-part quizzes



THE THINKER



THE CLICKER

MARLETTE ©2004
TALLAHASSEE DEMOCRAT
dougmarlette.com

Standard example question

- My strategy: 3 points for any answer, 4 points for correct answer
- The following is a conceptual physics question

You push on a railroad car but it does not move. Why not?

- A. Your pushing force cannot overcome inertia
- B. The railroad car pushes back on you with equal force
- C. Another force makes the net force equal to zero
- D. Momentum must be conserved

You push on a railroad car but it does not move. Why not?

- A. Your pushing force cannot overcome inertia
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- C. Another force makes the net force equal to zero**
- D. Momentum must be conserved

Standard example question

- The following is a numerical physics question

What is the resistance of a light bulb that draws 0.50 A at 12 V?

- A. 0.042 Ω
- B. 6.0 Ω
- C. 12 Ω
- D. 24 Ω

What is the resistance of a light bulb that draws 0.50 A at 12 V?

A. 0.042 Ω

B. 6.0 Ω

C. 12 Ω

D. 24 Ω

$$V = IR$$

$$R = \frac{V}{I} = \frac{12 \text{ V}}{0.50 \text{ A}} = \boxed{24 \Omega}$$

Class quiz question

- Use to promote discussion and earn bonus points
- If more than half the class gets the answer correct, everybody gets 3 bonus points on written quiz. If not, the students do not lose any points.

Class Quiz: Why does the Earth cool more quickly on clear nights than it does on cloudy nights?

- A. Clouds reradiate energy back to Earth.
- B. Clouds prevent thermal conduction like a blanket.
- C. Clouds promote thermal convection.
- D. Clouds contain latent heat energy.

Class Quiz: Why does the Earth cool more quickly on clear nights than it does on cloudy nights?

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Survey or poll question

- Use these to learn about your audience

In what branch of science do you teach?

- A. Biology
- B. Chemistry
- C. Geoscience
- D. Physics
- E. Medical-related
- F. Other

Multi-question quizzes

- You need “smart” clickers and different software to pull this off
- Students can answer questions in any order
- When they submit their quiz or test answers, they receive instant score feedback
- As easy to grade as scantron, but not as user-friendly

Summary

- Clickers are an active learning strategy
- They promote positive attitudes but learning gains are modest
- They greatly enhance participation
- Questions?
- Thank you

