



Questioning Strategies

Using student response systems
to think outside the box

Teaching and Learning Technology Round Table

October 2010

Intended Outcomes

A Shared understanding of:

- Current research
- Active learning
- Common uses
- Question types
- Using Bloom's taxonomy to construct questions
- How clickers operate



Research

- Research is suggestive not definitive.
- Too few studies have been done that meet the highest standards of experimental rigor.
 - Too hard to tease apart the effects of the SRS from the effects of questioning strategies themselves.



Research Suggests

Studies suggest:

- Active learning techniques facilitate learning
- Properly implemented SRS improve student grades, increase scientific understanding and improve test scores.
- In some cases it increases learner attendance and attitudes towards school
- They take time and have an opportunity cost for other material or learning.



Why Clickers? Why Questions?

Clickers allow students to respond anonymously

- Safer
- Promotes taking risks

Instructors can track student responses

- Creates accountability
- Increases participation

More students respond honestly

- And are therefore prepared to engage in discussion

Increases motivation for meaningful discussion

- Students are more aware of divergent views
- And see they are not the only ones that have misunderstandings



What is active learning?

- Students participating in activities such as:
 - Reflecting on their experience
 - Applying knowledge
 - Solving problems
- Active learning allows for construction of ones own knowledge



“If you believe that the teacher, not the students, should be the focus of the classroom experience, it is unlikely that clickers will work well for you.”

Duncan, D. (2008) "Tips for Successful Clicker Use"



“... clicker questions can only set the stage for deep learning. It is during the independent thought, small-group discussion, and class wide debates that deep learning actually occurs. Well-designed clicker questions, however, can be effective tools for motivating and preparing more students to engage in those useful activities.”

Bruff, D. (2009) "Multiple-Choice Questions You Wouldn't Put on a Test: Promoting Deep Learning Using Clickers"



Common Uses

- Quiz on the reading assigned in preparation for the class
- Test recall of lecture point
- Do a calculation or choose next step in a complex calculation
- Survey students to determine background or opinions
- **Elicit/reveal pre-existing thinking**
- **Test conceptual understanding**
- **Apply ideas in new context/explore implications**
- **Predict results of lecture demo, experiment, or simulation, video, etc.**
- **Draw on knowledge from everyday life**

The common uses in **bold** have seen the largest direct impact on learning and students reported as having the most value.

Clicker Resource Guide: An Instructors Guide to the Effective Use of Personal Response Systems (Clickers) in Teaching CU Science Education Initiative and the UBC Carl Wieman SEI



Implementation

1. Create a list of high-quality instructional goals.
2. Know your learners' competencies related to each goal.
3. Write high quality questions tailored to each goal.
4. Facilitate high-quality conversations for each question.
5. Utilize feedback to make instructional changes.



Types of Questions

Categories include:

- Factual recall question
- Conceptual questions
- Application questions
- Critical thinking questions

Question design:

Student perspective questions:

- promotes sharing opinions and personal experience.

One best answer questions:

- Promotes the weighing of evidence

Misconception questions:

- Surfaces common misunderstandings

Peer assessment questions:

- Promotes easeful peer critique and critical analysis.



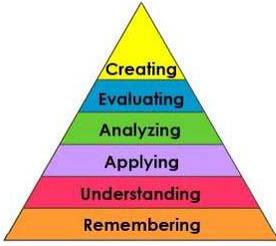
Question Construction

Brief review of handouts:

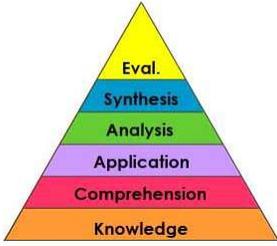
- Constructing questions
- Methods for encouraging class discussion



Using Bloom's Taxonomy to Construct Questions



New Version



Old Version



Connecting Bloom to Question Stems

Bloom's Cognitive Level	Student Activity <small>(Anderson & Krathwohl, 2001, pp. 67-68)</small>	Words to use in Question Stems
Creating	Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.	Define, list, state, identify, label, name, who? When? Where? What?
Evaluating	Making judgments based on criteria and standards through checking and critiquing.	Explain, predict, interpret, infer, summarize, convert, translate, give example, account for, paraphrase
Analyzing	Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.	Apply, solve, show, make use of, modify, demonstrate, compute
Applying	Carrying out or using a procedure through executing, or implementing.	Differentiate, compare/contrast, distinguish from ____, now does ____, relate ____, why does ____ work?
Understanding	Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.	Design, construct, develop, formulate, imagine, create, change, write a poem or short story
Remembering	Retrieving, recognizing, and recalling relevant knowledge from long-term memory	Appraise, evaluate, justify, critique, recommend, which would be better?



Application in the Classroom

Step A: Question

Instructor poses the question, often with some remark about its purpose.

Step B: Peer Discussion

Students have time to think about the question individually (possibly answering individually with clicker), and then discuss the question in pairs or small groups (peer discussion).

Step C: Vote

Students submit answer using clicker.

Step D: Whole-class Discussion

Instructor and students have follow-up discussion, usually emphasizing the “why” of correct options and “why not” for incorrect options. The instructor should also make sure that any residual issues or student questions from the discussion are explicitly addressed before moving on.

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Thought Questions

- Keep learner engaged during the lesson
- Involved with the content
- Encourage reflection
- Recall of prior knowledge or experience
- Provide instructor with insights into learner thinking
- Best use is to apply the idea



Roundtable Activity: Peer Assessment Question

What does an educated person look like today?



Rubric

1. Clarity of opinion

Scale:

- A - Poor
- B - Acceptable
- C - Good
- D - Excellent

2. Cites a personal example

Scale:

- A. No
- B. Somewhat
- C. Yes

3. The presentation expanded my attitudes about the qualities of an educated person.

Scale:

- A Strongly disagree
- B Disagree
- C Neither agree or disagree
- D. Agree
- E. Strongly agree



Practices to Avoid

- Fail to explain why you are using clickers.
- Use them primarily for attendance.
- Don't have students talk with each other.
- Use only factual recall questions.
- Don't make use of the student response information.
- Fail to discuss what learning means or the depth of participation and learning you expect in your class.
- Think of clickers as a testing device, rather than a device to inform learning.

Douglas Duncan (2008), Tips for Successful "Clicker" University of Colorado



Summary

1. Clickers are not a magic bullet – they are not necessarily useful as an end in themselves.
2. Clickers become useful when you have a clear idea as to what you want to achieve with them, and the questions are designed to improve student engagement, student-student interaction, and instructor-student interaction.
3. What clickers do provide is a way to rapidly collect an answer to a question from every student; an answer for which they are individually accountable. This allows rapid reliable feedback to both you and the students.
4. Used well, clickers can tell you when students are disengaged and/or confused, why this has happened, and can help you to fix the situation.
5. The best questions focus on concepts you feel are particularly important and involve challenging ideas with multiple plausible answers that reveal student confusion and generate spirited student discussion.

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Summary Continued

6. A common mistake is to use clicker questions that are too easy. Students value challenging questions more and learn more from them. Students often learn the most from a question that they get wrong.
7. For challenging questions, students should be given some time to think about the clicker question on their own, and then discuss with their peers.
8. Good clicker questions and discussion result in deeper, more numerous questions from a much wider range of students than in traditional lecture.
9. Listening to the student discussions will allow you to much better understand and address student thinking.
10. Even though you will sacrifice some coverage of content in class, students will be more engaged and learn much more of what you do cover.
11. When clickers are used well, students overwhelmingly support their use and say they help their learning.

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The Next Chapter: Cell Phones as Clickers

Polleverywhere.com

1 You ask a question

2 Audience answers using mobile phones, twitter, or web browser

3 Responses are displayed live in Keynote, PowerPoint, or the web

The diagram shows a 'New Multiple Choice Poll' form with the question 'What is your favorite animal?' and options: Lion, Turtle, and Grandpa. A mobile phone screen shows the poll question and the answer 'TURTLE'. A bar chart displays the results: TURTLE (5 votes) and GRANDPA (1 vote).



Next TLTR Topic

Wiki's, Blogs and Forums Oh My!

The November TLTR will explore using these online tools to promote active learning and encourage meaningful online dialogue.

Thursday, November 18th Noon to 1pm
Mac Hall 2201

