



**The Harriet W. Sheridan Center for Teaching and Learning
Brown University**

Box 1912; 863-1219; Sheridan_Center@brown.edu
http://www.brown.edu/sheridan_center/

Tips on Best Practice Use of Clickers

Kathy Takayama, Sheridan Center Director

This “Tips” document has been compiled based on the following paper:

Caldwell, J. (2007) [Clickers in the large classroom- current research and best practice tips](#), Cell Biology Education vol. 6, pp 9-20.

1. Consider the teaching & learning objective of your clicker question. You should design your question and the multiple choice responses to support the objective.

Examples of objectives	Examples of questions that can support the objective
To increase or manage interaction	<ul style="list-style-type: none">• Questions that start or focus discussions• Questions that require interaction with peers• Questions that collect votes after a debate or discussion
To assess student preparation and ensure accountability	<ul style="list-style-type: none">• Questions about reading or homework
To learn more about your students	<ul style="list-style-type: none">• Surveying students' thoughts about the lecture, course, topic, etc.• Polling student opinions or attitudes• Probing students' pre-existing level of understanding
For formative (i.e., diagnostic) assessment	<ul style="list-style-type: none">• Questions that assess students' understanding of material in current lecture• Questions that assess students' ability to apply this understanding to a new situation• Questions that reveal student misunderstandings of lecture, or students' misconceptions• Questions that determine future directions of lecture, including level of detail appropriate for the group• Questions that assess students' understanding of previous lectures• To determine whether students are ready to continue after working on a problem• To allow students to assess their own level of understanding at the end of a class
To provide practice in problem-solving	<ul style="list-style-type: none">• Questions that assess students' approach in analyzing what a question is asking• Questions that provide practice in solving a problem• Questions that provide practice in determining a strategy for solving a problem
To guide thinking, review, or teaching	<ul style="list-style-type: none">• Review questions at the end of a lecture• Review questions for an exam• Questions that lead students through a multistep process by asking which step should come next
To make lecture fun!	



**The Harriet W. Sheridan Center for Teaching and Learning
Brown University**

*Box 1912; 863-1219; Sheridan_Center@brown.edu
http://www.brown.edu/sheridan_center/*

2. Plan all aspects of using clickers before the start of your course.

Planning tips

Plan your grading system in advance and make sure it aligns with your learning goals.

Plan your policy in advance: whether clickers are mandatory, attendance policy, forgotten/broken clickers, etc.

Before teaching your course, watch another instructor who uses clickers.

Be aware that the first time you use clickers in a course, you will need extra time to develop good questions.

Plan sufficient discussion time in your lesson plan in accordance with the nature of the questions and the associated learning goals.

Set up and practice using your clicker system before the semester begins.

3. Communicate clearly with students.

Communication tips

Explain to students why you are using clickers and what you expect them to gain from the experience.

If clicker scores are part of the course grade, make updated scores accessible on a regular basis to reduce student anxiety. To further reduce anxiety and limit cheating, you might consider giving partial credit for any answer and full credit for correct answers.

Spend some time in the first classes training students to use clickers.

Be willing to adapt your lesson plan according to the outcomes of the students' responses. Students have to have an opportunity to learn from their interactive discussions.

If you are incorporating classwide discussion with clicker use, be sure to summarize the discussion afterwards with appropriate explanations of the correct answer.

Discuss cheating with students, and clearly state that use of another student's clicker is unacceptable.



**The Harriet W. Sheridan Center for Teaching and Learning
Brown University**

Box 1912; 863-1219; Sheridan_Center@brown.edu
http://www.brown.edu/sheridan_center/

4. Writing effective questions.

Strategies for developing effective questions

Approach class meetings as learning sessions rather than knowledge-dispensing sessions.

Scaffold learning by designing questions that progressively approach higher levels of thinking:

1. Present a new concept, and ask which ideas (or categories) it is most closely related to.
2. Show an example of a new concept.
3. Apply a mastered concept to a new situation.

Remember that good exam questions are usually not good clicker questions. This is because exams (e.g. mid-term; final) are summative assessments, whereas clicker questions should be formative.

Avoid questions that test memorization.

Good clicker questions should address a specific learning goal, content goal, skill, or reinforce a specific belief about learning.

Questions can:

- Assess students' background, knowledge, or beliefs
- Make students aware of others' views or of their own
- Locate misconceptions or confusion
- Distinguish between related ideas
- Show parallels or connections between ideas
- Explore or apply ideas in a new context

Examples of effective questions:

- Given a graph or situation, match it with the best description or interpretation, and vice versa
- Match a method of analysis with an appropriate data set, and vice versa
- Questions that link the general to the specific
- Questions that share a familiar situation or example with several other questions
- Questions that students cannot answer, to motivate discussion and curiosity before introducing a new topic
- Questions that require ideas or steps to be sorted into order
- Questions that list steps and ask "which one is wrong or misplaced?"
- Questions that apply a familiar idea to a new context

It can also be helpful to identify student misconceptions and include them as answers, plausibly phrased. If you do this, you should follow with an opportunity for extensive pair-share discussion, followed by whole-class discussion.



**The Harriet W. Sheridan Center for Teaching and Learning
Brown University**

Box 1912; 863-1219; Sheridan_Center@brown.edu

http://www.brown.edu/sheridan_center/

5. Additional practical tips.

Practical suggestions

Limit the number of answer choices to 5 or less.

Assess knowledge of jargon separately from concepts to ensure that each is addressed clearly and effectively.

Create wrong answers (distractors) that seem logical or plausible to prevent “strategizing” students from easily eliminating wrong answers.

Include “I don’t know” as an answer choice to prevent guessing (some clicker systems provide the option to select “confidence level” for the response).

Plan to ask some questions twice to allow peer learning. That is, allow students to answer individually, but do not display the correct answer; then direct students to discuss the question with their peers and answer again (think-pair-share).

Additional resources by discipline:

Biological Sciences:

- Smith, M.K. et al. (2009). [Why peer discussion improves student performance on in-class concept questions](#). *Science*, 323 (5910), 122-124.
- Suchman, E., Uchiyama, K., Smith, R., & Bender, K. (2006). [Evaluating the use of a classroom response system in a microbiology course](#). *Microbiology Education*, 7, 3-11.

Chemistry:

- Woelk, K. (2008). [Optimizing the use of personal response devices \(clickers\) in large-enrollment introductory courses](#). *Journal of Chemical Education*, 85(10), 1400-1405.

Computer Science:

- Fan, K.-Y. D., & van Blink, C. D. (2006). [A comparison and evaluation of personal response systems in introductory computer programming](#). Paper presented at the American Society for Engineering Education Annual Conference, Chicago, Illinois.
- Martyn, M. (2007). [Clickers in the classroom: An active learning approach](#). *EDUCAUSE Quarterly*, 30(2), 71-74.

Economics:

- Freeman, M., Blayney, P. & Ginns, P. (2006). [Anonymity and in class learning: The case for electronic response systems](#). *Australasian Journal of Educational Technology*, 22(4), 568-580..

Engineering:

- Boyle, J. (2003). Using classroom communication systems to support interaction and discussion in large class settings. *Association for Learning Technology Journal*, 11(3), 43-57.
<http://www.psy.gla.ac.uk/~steve/ilig/papers/nicol1.pdf>

English:

- Jenkins, A. (2007). [Technique and technology: Electronic voting systems in an English literature lecture](#). *Pedagogy*, 7(3), 526-533.

Geosciences:

- McConnell, D. A., et al. (2006). Using ConcepTests to assess and improve student conceptual understanding in introductory geoscience courses. *Journal of Geoscience Education*, 54(1), 61-68.



**The Harriet W. Sheridan Center for Teaching and Learning
Brown University**

Box 1912; 863-1219; Sheridan_Center@brown.edu
http://www.brown.edu/sheridan_center/

Mathematics:

- Bode, M., Drane, D., Kolikant, Y. B., Schuller, M. (2009). A clicker approach to teaching calculus. *Notices of the American Mathematical Society*, 56(2), 253-256.
- Lomen, D. O., & Robinson, M. K. (2004). Using ConcepTests in single and multivariable calculus. Paper presented at the 16th Annual International Conference on Technology in Collegiate Mathematics, Chicago, IL.

Philosophy:

- Immerwahr, J. (2009). [Engaging the "thumb generation" with clickers](#). *Teaching Philosophy*, 32(3), 233-245.

Physics:

- Crouch, C. H., & Mazur, E. (2001). Peer instruction: Ten years of experience and results. *American Journal of Physics*, 69(9), 970-977.
- Dufresne, R. J., & Gerace, W. J. (2004). Assessing-to-learn: Formative assessment in physics instruction. *The Physics Teacher*, 42, 428-433.

Sociology:

- Mollborn, S., & Hoekstra, A. (2010). ["A meeting of minds": Using clickers for critical thinking and discussion in large sociology classes](#). *Teaching Sociology*, 38(1), 18-27.