

A Practical Guide to Using Clickers in the College Classroom

Angel Hoekstra & Stefanie Mollborn, University of Colorado at Boulder

Audience Response Systems are now being used in many diverse departments on the CU-Boulder campus. Instructors in disciplines such as chemistry, astronomy, physics, communications, and sociology use clickers for a variety of reasons (e.g. to permit in-class application of course concepts; encourage attendance; foster peer interaction; gather data from students useful for critical thinking). This practical guide is designed to help educators who may be considering integrating clickers into their courses.

Socrates proposed that teaching be done by questioning, not telling...

This guide addresses a new form of teaching technology, Audience Response Systems, which instructors can use to engage students while lecturing. Audience Response Systems, also known as “clickers,” are relatively new to higher education. In the fall of 2007, the CU-Boulder campus indicated a preference for all classes using clickers to begin using **i>Clickers**, devices that permit students to respond to a professor's inquiry during class.

Using clickers is, at base, a fairly simple process. The professor posts a question on an overhead projector and instructs students to “click in” (vote) with their answer. As students read the question, the professor may or may not encourage them to work with their peers to figure out the answer, depending upon the professor's learning goals for that particular clicker question. When students are encouraged to discuss a clicker question in small groups, they are given a small amount of time to talk with each other before “clicking in.” This peer talk allows them to process the concepts or theories being learned in class together. A computer software program gathers the responses, and in seconds, a histogram of all student responses is displayed on an overhead screen.

When an instructor decides to use clickers, s/he must realize that clickers are just a tool, not a pedagogical strategy. The pedagogical strategy chosen by the instructor is very important. Clicker questions can be used in a variety of ways. Most commonly, clicker use permits instructors and students to evaluate how well students are grasping the concepts being presented in lecture. In theory, this technique helps students to better learn and retain course material by encouraging them to work together during short episodes of peer teaching. In practice, the use of a pedagogical strategy emphasizing peer teaching results in an informal lifting of ‘the ban on talking to others’ during class that promotes an engaging learning environment. Clickers are also used to encourage students to think critically about course topics, to show them whether their past experiences match research findings, to demonstrate the pros and cons of survey research, and to let students develop and test their own hypotheses about the views (or past experiences) of their peers. Clicker questions can also be used to help students prepare for exams: instructors who use multiple-choice exams may design clicker questions to prepare students for the format of the exams in their particular course. Finally, some instructors use reading comprehension questions to motivate students to read and reward those who come to class prepared.

With clickers, student attendance can now be quickly and effectively taken in large classes, and the educator may choose to tangibly reward students who attend class with “clicker points.” The professor who incorporates clickers into his or her course must decide whether to make clicker points a small component of the student’s course grade, or to assign them “extra credit” status. Whichever method is chosen, instructors using clickers for the first time should be aware that clickers are best received by students when they comprise 10% or less of the student’s grade. My dissertation research with students at CU-Boulder indicates that ascribing too much weight to clicker points results in anxiety, frustration, or anger on the part of some students. It is also easy to cheat by watching which button another student presses or by bringing another student’s clicker to class for them, so giving too much weight to clicker responses can be counterproductive.

Clickers should be used to engage students by having them apply and discuss concepts in small groups or by asking them opinions to “jump start” group discussion. When professors use clickers primarily to take attendance (e.g. using clickers too infrequently; asking questions that are too easy; not fully explaining the answer/s to clicker questions), clickers can be poorly received by students. If you are a professor/instructor using clickers for the first time, I strongly suggest talking with someone who has experience in teaching with clickers before you begin using them in your course. Additional helpful hints are included below.

Information You Can Gather Using Clickers

- Factual knowledge
- Numerical calculations
- Past experience data
- Conceptual knowledge/students’ comprehension of a topic
- Student opinions or feelings about a topic
- Student expectations regarding/predicting future social behavior
- Anything you can dream up that can be divided into up to 5 response options!

The Nuts and Bolts of Implementing Clickers in Class

- Before the semester starts, you will need to order i>Clickers with your textbook adoption. The CU Bookstore sells clickers and students can buy them used.
- Your classroom needs to be set up with a “smart panel,” and you need a laptop to project the clicker questions and responses.
- CU has instructor clickers and i>clicker bases that you can use for free if your classroom does not already contain a base in the media cabinet. Instructor (blue) clickers may not be available in the media cabinet, so check in advance.
- You will need to import a course roster into the i>Grader software, which can be done simply in a number of ways. At CU-Boulder, see the ITS website below.
- The i>Clicker software runs with PowerPoint and automatically collects clicker points for you, it also saves a “screenshot” of every clicker question you use.
- If you want students to get points for a correct answer, you can designate the correct answer to a clicker question during or after class.
- At the end of the semester, you can export students’ clicker scores into Excel. If dropping some sessions, you can sort the scores horizontally and drop the lowest. Create an average of the remaining sessions’ points, and you’re done!

Advice for Educators Considering Implementing Clickers in Class

- Before using clickers in class, explain to the students clearly (and frequently throughout the semester) *why* clickers are being used in class. You need to explain to students the goals for using clickers that are NOT attendance related; many come to class thinking clickers are an “attendance-monitoring device.”
- Use the power of the audience response system to help students learn from each other! Encourage students to discuss concepts and/or work together on problems, through phrases such as: *“Think through your answer, and feel free to talk with a neighbor about your ideas,”* or *“Please talk to your neighbors: most students learn better by doing than by listening.”*
- Remember that students are socialized during their entire educational career to *not* talk to others during class (i.e. to sit quietly, take notes, and not bother fellow students). Using clickers challenges years of educational socialization, so if you want them to work together, you will need to encourage them to do so, regularly!
- Consider “dropping” a few clicker points at the end of the term for all students, so that if a student forgets their clicker one day or theirs is not functioning correctly, they will feel less anxiety. 3-5 sessions’ worth is a good amount to consider trying.
- Ensure that the audience response system is functioning (i.e. your i>Clicker is on and your clicker software is running) before class begins.

Potential Benefits of Using Clickers in Class

- Clickers work to enhance conceptual understanding by testing students for comprehension shortly after they have been taught course material.
- Engaging students in this manner effectively converts undergraduates from passive recipients of information to active participants in the learning process.
- Clicker questions can be used to measure what students know about a subject prior to designing a lecture so that teaching plans can be modified accordingly.
- The use of peer teaching enables students to actively process new knowledge with peers who are likely at similar levels of conceptual understanding, thus increasing the likelihood that new knowledge will be retained.
- Clickers allow for a greater number of students to effectively participate within a large class, by encouraging group learning that is safe for individual students because their responses (knowledge, values, beliefs) are anonymous.
- Clicker questions can be used to jump-start discussion or to generate interest in a topic by presenting a controversial or value-laden question, letting students vote anonymously, and then encouraging discussion of the group’s response.
- Clickers can be used to quickly and effectively get a sense of student values and emotions with regard to a presented issue. The professor can ask students before beginning a potentially challenging (or uncomfortable) lecture what the students are feeling with regard to that particular topic (ex: sexuality, bioethics).
- When clicker data can be collected from the students to test concepts being examined within course material, students report that “they believe the theories more” than just by being told by an instructor or a book that the theories work.
- Many of the students I interviewed who use clickers here at CU report that using clickers makes class more enjoyable and keeps them on task: it is easier to stay awake and pay attention during lectures when clickers are used.
- Most students say that they are more likely to show up for class when clicker points are being collected on a regular basis.

Concerns or Issues with Regard to Implementing Clickers in the Classroom

- The average cost of an i>Clicker, if purchased at the CU bookstore, is ~ \$30/\$40, though many students now own one already. Be sure to explain to your students that they will be able to use their clicker in other courses.
- Students will need to take a minute to register their clicker online (at CUConnect or at www.iclicker.com) so that their points will be tied to their name.
- If the educator chooses to make their students' clicker points a component of their course grade, some students may complain about being "forced to go to class." Consider having a discussion with your students regarding the benefits of attending and doing the reading before they attend. In some courses, students will do poorly on clicker questions if they do not read before class.
- If students do not register their clicker correctly in the beginning of the course, the i>Clicker system will store their data until the clicker is registered to their name in your i>Grader system... so if they are worried, the instructor should assure them that their points are being saved each day (and will be until their name is registered).
- i>Clicker responses are not truly anonymous to the instructor. Students' individual answers are recorded in a separate file that cannot be accessed through the software. To keep students' responses truly anonymous, instructors must promise that they will not open these "session data" files.
- An additional route for ensuring clicker responses are truly anonymous, useful when asking questions regarding sensitive information: direct students to trade clickers with the person next to them, have them respond, and then trade back
- Writing effective clicker questions can be time intensive: questions that are too easy, too difficult, or not engaging do not work as well.

Email and Online Resources

- This practical guide to implementing clickers in the classroom was designed by Angel Hoekstra, who can be reached at Angel.Hoekstra@colorado.edu, and Dr. Stefanie Mollborn, who can be reached at Stefanie.Mollborn@colorado.edu.
- A useful bibliography of articles discussing clicker use in a variety of disciplines can be found at: <http://derekbruff.com/teachingwithcrs/>
- CU-Boulder's ITS clicker page contains lots of helpful information; see <http://www.colorado.edu/its/cuclickers/>.
- Information about i>Clickers can be found at www.iclicker.com. Trainers can set up a remote training session that covers all information needed for instructors who are new to using i>Clickers.
- The website for CHEM 1111, the introductory chemistry course that I have conducted research on, is www.colorado.edu/chem/chem1111
- The Colorado School of Mines offers an outreach program for educators interested in training in how to implement and use clickers in their classes. Facilitators Frank and Susan Kowalski can be reached at: www.physics.mines.edu/classroomcommunicators.
- Basic information and procedures in using H-ITT clickers in the CU Physics department: <http://www.colorado.edu/physics/EducationIssues/HITT/HITTDDescription.htm>.