The Innovative Instructor

Center for Educational Resources

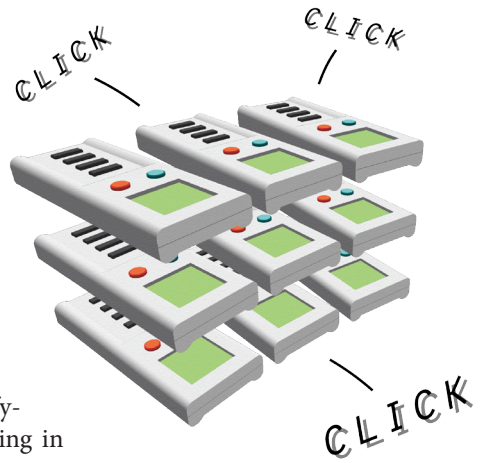
Pedagogy Forum

April 2015

Making Learning Click

Kathryn Tifft, Lecturer, Biology Department

The issue



Clickers, also known as in-class polling or voting systems, can be used in large lecture courses as a way to promote active learning. Using a small hand-held device, students answer questions posed by the instructor. Their answers are recorded by a software application on the instructor's computer and can be shared with the class to provide immediate feedback. Recent educational professional development inspired my colleagues and me to leverage the benefits of clickers by improving, expanding, and diversifying clicker questions to increase student learning in our lecture courses.

Why does it matter

Clickers are a simple and versatile way to implement a variety of pedagogical best practices in a large lecture class, including active learning, formative assessment, and group learning. Clicker questions can be used individually, in related sets, or in combination with other types of classroom activities. Implementing clicker strategies effectively increases the educational impact of lectures.

Faculty solution

I team-teach two large (200 plus students) lecture courses – biochemistry and cell biology. In these classes, clickers are optional and credit is given based on participation, not correct answers. Students receive a small bonus at the end of the semester for clicker participation. Students can miss up to 20% of the lectures and still get full credit, so absences, dead batteries, and forgotten clickers are not a significant stressor for students or administrative burden for instructors. Following are some of our strategies for using clickers.

- Clicker questions can be used to **adjust the lecture content**. Clicker questions can evaluate what students know so that instructors can avoid spending lecture time explaining concepts that are already understood by the majority of the class. If a substantial number of students seem to be struggling with the answer, then the instructor can review the material. It's a good idea to include lecture slides that can be used for review if needed.
- Clicker questions can be used as an **alternative way of presenting information**. For example, ask a series of questions on interpretation of data to lead students to an understanding of the material. This is a more engaging method of content delivery than lecturing.
- Carefully designed incorrect answers to clicker questions can quickly, accurately, and specifically identify **common conceptual difficulties or misunderstandings** among all students in the class. Based on the clicker responses, the instructor can immediately make any clarifications or address unclear concepts.

What this is

The Innovative Instructor is a forum of published articles (www.cer.jhu.edu/ii) and a blog (ii.library.jhu.edu) related to teaching excellence at Johns Hopkins

About the CER

The Center for Educational Resources partners with faculty and graduate students to extend instructional impact by connecting innovative teaching strategies and instructional technologies

For information on how to contribute to *The Innovative Instructor* or to read archived articles please visit

- www.cer.jhu.edu/ii or email
- cerweb@jhu.edu

Forum categories

Pedagogy Forum
Hopkins professors share successful strategies for teaching excellence

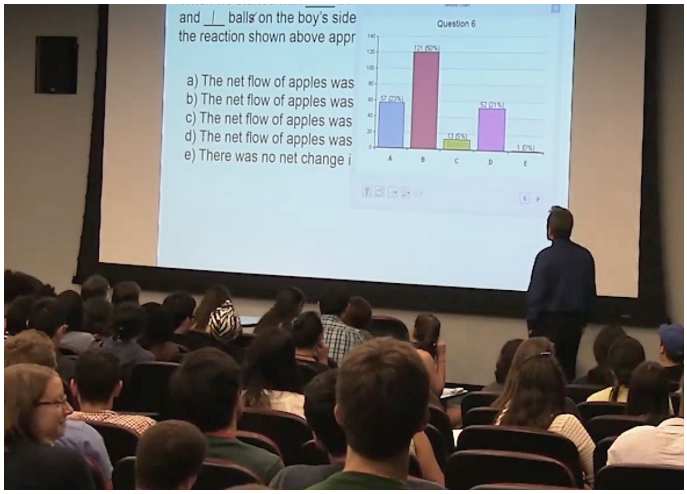
Technology Forum
Information about emerging technologies, who is using them, and why you should know

Best Practice Forum
"How To" workshops on using technologies and applying innovative instructional methods

THE SHERIDAN LIBRARIES

JOHNS HOPKINS UNIVERSITY

- Clicker questions provide an opportunity to give students practice **solving application-type questions**. An exam question from a previous semester can be broken down into several multiple-choice clicker questions. As follow-up, students can compare different approaches to solving the problems, and instructors can model expert-level problem-solving approaches.
- Clicker questions are a great way to **promote discussion**. If a vote on a question results in mixed answers, the instructor can ask students to pair up with the person next to them to dis cuss their answers and then re-vote. The instructor can eliminate specific answers or provide additional information to inform the discussion before a re-vote. Questions with multiple correct answers can be used as a launch point for productive discussions among students or the entire class.



In all cases, **appropriate follow-up** is crucial. If most students select the right answer on a clicker question, little or no follow-up is necessary. However, if a substantial number of students answer incorrectly, it is important to not only provide a correction, but review the reasoning or explanation. In addition, instructors can address the wrong answers and encourage students to examine their misconceptions.

Results

The student response to using clickers in our courses is overwhelmingly positive. Students work hard to answer the questions correctly during class, are engaged in discussions during voting, and study the clicker questions in preparation for exams. On the course evaluations for our courses, students often mention the clicker questions in the "best aspects of the course" section. In one section of the biochemistry class, 92% of the students ranked the use of clickers as "helpful" or "very helpful."

Our observations and class surveys suggest that many students are aware of the benefits of challenging clicker questions, including engagement, formative assessment, practicing problem solving, and working with peers. Students have requested more clicker questions and more challenging questions. In the words of one student: "The more clicker questions, the better! I noticed that if there were more clicker questions, I was more focused and willing to interact with my peers. It also highlighted what parts of the lecture I did not understand and would have to review carefully before the exam. The clicker questions were definitely helpful in preparation for the exam."

In striving to design and implement complex and diverse clicker questions, my personal approach to teaching and my experience in the classroom has changed in positive ways. During the process of designing a lecture, I start thinking about how clicker questions can be used as an integral part of the lecture, rather than as a last-minute addition. I design questions for knowledge assessment, content delivery, and application. I try to predict possible voting outcomes, prepare explanations for answers, and plan appropriate follow-up for various scenarios.

It is hard for students and instructors to stay focused in a traditional lecture. I appreciate the break from lecturing while students are answering clicker questions. I try to plan a clicker question (or other break from lecturing) every 15-20 minutes during class. Clicker questions keep *me* engaged during a lecture. I enjoy the excitement I feel in anticipation of seeing the answers to the clicker questions. I also like the challenge of spontaneously generating an effective and appropriate response to the voting results.

Other thoughts

In our experience, the current iClicker system used on the Homewood campus is easy to set-up, simple to use, and extremely reliable. Outstanding technological support is provided by Brian Cole in the Center for Educational Resources. Due to widespread campus use, students will likely have a registered clicker before arriving in your class. While implementing clicker use does present a range of challenges for the instructor – e.g., writing effective questions, responding appropriately to answers, and predicting the time allotment for each question – I have found that the benefits are worth the effort. Our team's success in incorporating sophisticated clicker questions in large lecture-based classes has inspired me to work towards a blended classroom experience that relies heavily on clickers. I encourage other instructors to do the same.

Author's background

Kathryn Tifft,
Lecturer, Biology Department, JHU

Katie Tifft has taught in the Department of Biology at Johns Hopkins since 2011. She currently co-teaches in the Biochemistry and Cell Biology courses as well as a seminar course for students in the Biology Master's program.