INTRODUCTION: WHAT ARE CLICKERS?

“Clickers” are infrared or radio-frequency (RF) devices that are part of a communication system known variously as a personal response system (PRS), audience response system (ARS), electronic voting system (EVS), student response system (SRS), or classroom response system (CRS). The device itself is much like a remote control, and (in the classroom setting) students use their clickers to respond to a question or other stimulus from the instructor; students’ responses are recorded by the instructor’s receiver unit and can often be reported immediately to the class or the instructor in the form of a chart or graph. Each student’s device is registered to his or her name (or ID number, or other identifier) in order to track responses for grading, participation, or attendance purposes.

There are several companies that manufacture systems of varying sophistication. Instructional Support Services at Oxnard College is encouraging departments and divisions on campus to adopt the i>clicker system (http://www.iclicker.com) as a standard, and it is the system the STEM Center will be using. Hereinafter, while most of the discussion can be applied to all clicker systems in general, we will have the i>clicker system in particular in mind.
The instructor’s i>clicker equipment consists of an instructor’s remote (blue instead of the student’s white, but functionally identical); a receiver or “base unit” that plugs into a USB port on any Windows or Macintosh computer; and the i>clicker and i>grader software programs (compatible with both Windows and Macintosh systems).

**WHY WOULD SOMEONE TEACH WITH CLICKERS?**

Before answering this question, let us mention that clickers are not an end in themselves. That is, the system is a tool to enhance your teaching, and—like any other technology, be it television, PowerPoint presentation, or chalkboard—it will not do you any good if you use it just for the sake of using it. Since it is just a tool, you should consider what it can help you do better or more easily, what challenges it may introduce to your classroom, and the ways in which you might need to adjust your teaching style to get the best results from its use.

Clickers were introduced into classrooms well over a decade ago and have been studied in pedagogical and other research since at least 1998. While there has not been a lot of particularly rigorous study, both the anecdotal and empirical evidence strongly suggest that clickers improve student attendance, increase students’ attention and engagement during class, and may improve learning and performance. They are generally used in large lectures where other forms of student feedback or participation are limited; the most widely mentioned reason to use clickers is to promote an active learning environment in such contexts, although they have also been used and studied in smaller classrooms.

At a very basic level, clickers provide an incentive for students to come to class. They can be used to track attendance, either with a simple “click-in” procedure at some point during class or by giving participation or attendance points for responses to questions
administrated during class (regardless of whether the responses are correct). The automatic tracking of responses, and the ability to assign partial or participation credit for any answer, can make clickers into an administrative boon. The most quantitatively significant results in the literature have to do with the positive effect clickers have on student attendance.

Beyond simply getting students to attend, judicious use of clickers during class seems to increase their attention to the material. When an instructor asks a question in a traditional class, he or she must call on one student at a time to get responses, or ask for a show of hands or some similar method for aggregate response. With clickers, all students can answer every question in a short amount of time. Clicker questions can included as a part of the course grade (that is, there is something at stake for the student outside of just participation), sort of like single-question pop quizzes. If the students know that there will be two to four clicker questions in each session, then in theory they will not just come to class; they will also be more motivated to pay attention (for questions related to the material) and do homework (for questions related to assigned work).

This motivation results in what may be the greatest benefit of clicker use: increasing learning through student engagement. Although the research literature is not yet unequivocal, there is an indication that—as we might imagine—a well-crafted clicker question forces students not only to attend to the material, but also to stop and think about what they’ve been hearing and reading in order to provide the correct answer. In at least one experimental study, this effect ultimately resulted in a performance increase of one-third of a letter grade. As reported by Mayer et al.:

The act of trying to answer sample questions and then receiving immediate feedback may encourage active cognitive processing in three ways: (a) before answering questions, students may be more attentive to the lecture
material, (b) during question answering, students may work harder to organize and integrate the material, and (c) after receiving feedback, students may develop metacognitive skills for gauging how well they understood the lecture material and for how to answer exam-like questions.

(53)

As an explicit way to increase engagement, questions can be used as an impetus for in-class discussion, in which students talk amongst themselves to discuss questions and answers. This is a form of “peer instruction,” an andragogical approach that has been shown to result in significant improvements in engagement, understanding, and critical thinking skills (see Butchart, Handfield, and Bigelow; Crouch and Mazur).

There are other affordances provided by clickers, some of which are incidental. For those students who are reticent about speaking up or raising their hands in class (perhaps for personality-related or cultural reasons), clickers provide a painless way to participate. Any students who are dealing with a language barrier may find visually represented questions easier to respond to, increasing their likelihood of participating as well. Students are also more likely to answer the way they want, rather than (as with a show of hands) raising their hands when everyone else does; in fact, Draper and Brown found that students using clickers were more likely to choose an actual answer rather than a “don't know” response regardless of class size or how well the students knew each other (89-90).

The instantaneous tabulation of results can give valuable feedback. For the instructor, it can be an indication of whether the students understand what’s going on; results can also help spur and shape the discussion. For students, the results can likewise show them instantly whether they really know what they think they know, an effect that students seem to appreciate (see Draper and Brown). Clicker questions can also be made
anonymous, as a simple tabulation of responses without attached student IDs, if the instructor wants to poll the class or ask more sensitive questions.

Finally, many students find clicker use to be fascinating and even fun, which can be a way to enhance the classroom environment. They may also help motivate students both in and out of class, and they may help some students to feel empowered in the educational setting. Prof. Richard Mayer of UCSB’s Psychology Department also reports that he gets higher ratings on evaluations from classes that use clickers, even in that department’s extremely large lectures.

**I’M INTERESTED, BUT HOW DO I MAKE IT WORK?**

There are two major areas to think about when adopting clickers for classroom use: the technical and the andragogical aspects.

The technical side of making the system work is, fortunately, pretty straightforward with the i>clicker system. You need access to a computer with at least one USB port open; the base unit connects to it. While it comes with a plug, the base unit does not need a power supply; it can get its power from the computer through the USB port (be aware of this if you’re planning to use a laptop running on a battery). You’ll also need the i>clicker software package, which is free and can be downloaded from the i>clicker website (http://www.iclicker.com) or can be procured via Instructional Support Services.

Students will purchase their clickers from the bookstore or another source; new, they run between $30 and $40 and can be resold at the end of the quarter. Used ones are generally between $20 and $25. If a student has more than one course using clickers in a single term, he or she can use a single remote for all of the classes. Students will need to register their clickers in your class so that your system can identify each respondent. This
can be done during class (probably very time-consuming in a large lecture) or online at the
students' leisure. Note that the students do not need to have the clickers registered in order
for you to start using the system; once they do register, the i>grader program will
automatically identify their previous responses and connect them with the correct ID.

Instructional Support Services or the i>clicker sales representative can give you a
demo of the system, and there is a quick-start guide available on the i>clicker download
page. Basically, though, make sure the program (i>clicker) is running; then you ask a
question, press "Start" to start receiving responses, and press "Stop" when you've decided
enough time has gone by for everyone to respond. The program takes a snapshot of what
your computer screen was showing when you pressed “Start” so that you can keep track of
the question when you are reviewing things outside of class. There are other things that you
can do with the program, but this is not the place for a tutorial.

Andragogically, there is a lot more to think about. You need to consider what you'd
like to achieve with clicker use, taking into account your teaching style, the points made in
the first part of this document, and your own ideas. Then you have to figure out how to
reach those goals. Experienced users have several recommendations:

- Use the system for more than just taking attendance. While attendance alone will get
the students in the door, they will probably resent having to spend money on a device solely
for that purpose. It’s like making them buy a huge anthology and then only assigning one
work from it. Actually, it’s worse than that, because they may see it as essentially paying for
nothing but a surveillance or tracking system.

- Explain to the students why you’re using the technology. Help them understand the
benefits you’re seeking, which will help justify the cost in their minds. It might even make
them more excited about using the system in class.
• Make the questions count. That is, make sure that some of the course’s credit is based on clicker responses. Unless there is something at stake, the students will not take it seriously. However, don’t make too much of the grade reliant on the clickers. The most common recommendation is that it should be from 5% to 10% of the course grade, and there is almost unanimous agreement that it should never be more than 15%. If the stakes are too high, then there is a temptation to try to cheat the system. In a similar vein, clickers should probably not be used for high-stakes assessments, such as mid-terms and finals. Often, it is enough to give students credit just for being present and answering all the questions posed during class (Freedman).

• Use the system consistently. Try to work questions into the natural flow of your lecture. Experienced users recommend three to five questions per lecture hour, which means that it’s generally used to punctuate or emphasize main points, break the discussion into different “acts,” or open and close the discussion or parts of it with items for the students to think about. If class is stopped more than once every ten minutes or so for a clicker question, students tend to dismiss it as nothing but a gimmick. The literature advises one question (or group of related questions) every ten to twenty minutes on average. This allows you to check in with the students every now and then, or re-grab their attention, while still getting on with the business of the lecture. Some users suggest rethinking the idea of the lecture altogether, with less focus on broad coverage during class and more concern with pursuing depth or “thicker coverage” with the aid of the clicker technology (Freedman).

• “Engineer questions deliberately” (Beatty 9). Question design is as important as organizing lecture notes and other aspects of class preparation. Poorly-designed or unclear questions may confuse students, disrupt your presentation, or simply be irrelevant to the overall discussion.
If you are going to have mid-terms and finals, make at least some of the clicker questions emblematic of exam questions. They do not need to be the exact questions you will use on the exams, but students appreciate questions that are similar in style to those they will see on an exam. There is also some experimental evidence that such practice questions improve exam performance.

Talk about the results. You don't have to show the students what the response results were; there are different strategies and opinions regarding the use of that information. However, rather than just moving on, the consensus is that at least a little discussion of either the question itself, the way the students answered, or the correct answer should follow. You can have students discuss questions and answers among themselves (see the “think-pair-share” method in the Clicker Questions document) or use the question and answer as a jumping-off point for discussion; either method makes the question clearly relevant and more meaningful to students. You can also use the results as feedback to gauge the students’ understanding as a whole; if a large majority get a question wrong, then you can think about adjusting your discussion—or if they all get it right, then perhaps you can move on to another topic.

Also, be patient with yourself. Any new technology involves a learning curve; even if you become quickly comfortable with the clicker system, some outside factor—a disproportionate number of cynical or technophobic students, for example—may cause problems as you introduce it into your class.

Overall, most practitioners advise that you be open, flexible, and creative with your use of the system. See our sister document regarding sample questions and how to think about creating clicker questions.
The i>clicker system in particular has been designed with reliability in mind. Technical problems with the system are rare. There are, however, issues you should be aware of or for which you should be prepared.

Preparation, in fact, is probably one of the most important concerns. While the software is relatively simple, it is important that you become familiar with its use before you begin working with it in class. This will prevent a loss of class time if there’s something you have some trouble with. Be sure that your class roster is set up correctly. If you plan to preprogram your questions (although this is not necessary), this should become part of your regular class preparation. If clicker questions are to be the impetus for class discussion, then you must think about how to manage that discussion, that is, “soliciting and moderating student discussion and directing students’ attention” (Beatty 6). In general, part of your task is to master the technology in order to best create, present, and respond to clicker questions. The i>clicker system is designed to make this as painless as possible, but it is not something to be taken for granted.

The students will also need to make sure their clickers are working before class starts. While a new battery should easily last all semester, students who purchase used clickers should check them to make sure they are working (the clicker has a “low battery” indicator to make this easy).

One limitation of the system that can be a real challenge is that, with the original i>clicker system, questions must be presented in a multiple-choice (or true-false, yes-no) format. However, there are many resources that are designed to guide instructors in the creation of multiple-choice questions that engage students at a variety of levels. We have
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created a companion document that provides sample questions and provides ways to think about how to write questions that fit within this framework. In addition, the slightly more expensive i>clicker 2 device addressed this limitation by allowing for text and numeric answers.

While the process for student registration of the clicker is pretty straightforward, it is still something that students need to know about sooner rather than later. It is recommended that you notify students before the semester begins that the clicker is required for their class and whether or not they will need it on the first day of class. As your experience and confidence grow, so will the successes you have with integrating the technology.

In the end, we must stress again that the technology is not there for its own sake, but rather to enhance your teaching. As Ian Beatty writes, “Technology doesn’t inherently improve learning; it merely makes possible more effective pedagogy” (8). Clickers can serve as a way to bring greater participation into a large classroom, helping to bridge the gap between lecture and seminar. It may take some creativity and practice, but the system offers a lot of promise to anyone who wants to give it a try.
Works Consulted


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