

A REVIEW OF CLICKER USE

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Clickers, or Audience Response Systems (ARS), are being used in classrooms for various reasons: peer instruction, to generate classroom discussions, take attendance, to track attendance in a large lecture hall and more. The system contains three parts: a small remote controlled hand-held device used by students, a receiver that works with the hand-held devices to collect the signals, and a clicker program that is used by the teacher (Hatch, Jensen & Moore, 2005). The instructor forms a series of multiple choice or ranking questions on a PowerPoint type program and links it to the clicker program. The instructor can choose to put a time limit on the voting or end it at the click of a mouse. When the slide is displayed in class, the students will push a button on his or her clicker indicating which answer he or she chooses. When voting is complete, the teacher can publish the results to the class in a design of his or her choosing (e.g. highlighted, bar graph, pie chart or nothing) to generate discussion.

The idea that you can use technology in the classroom not only to gain the attention of the audience of students, but also to provide immediate feedback to an instructor can be very appealing, but the use of technology in the classroom can be daunting for some instructors with technology-phobias. This paper is a review of the recent articles about using clickers in the classroom, from the pros and cons of clickers in the classroom to implementation advice on how you might consider using clickers in your classroom.

Clickers are a Good Thing

According to Osterman (2007), clickers make traditional lectures feel different and students are more actively engaged in the classroom learning process. Students reported that clickers make them feel like they are playing a video game and are therefore more apt to participate in classroom discussions when a teacher employs clickers. Osterman (2007) suggested that clickers force students into making a decision because a teacher will not proceed without received 100% of the vote tally. Although clickers can be anonymous, students don't want to be the only students to get a question wrong and therefore tend to think a little more before making a selection. Students are more likely to actively participate in classroom discussion and interactions when they have a clicker in their hand than when they don't have clickers. Students think about the question posed before posting an answer rather than just waiting for someone to raise their hand and respond to the teacher's question.

At the American University (Osterman, 2007), students are sent to the library for a one lecture class on research and the library instructors have no idea the level of research completed by these faces of strangers in the crowd. These instructors used clickers as a way to gage the level of knowledge of the class and therefore tailor the class to their experience and knowledge levels. As a result, these

instructors felt like they knew more about the students they are teaching and that the students seemed more engaged in their learning.

Most students reported that clickers were very easy to use and an enjoyable experience (MacGeorge et. al. (2007)). Clickers helped students to better understand the instructor's expectations. Students even suggested that clickers helped them learn better, but this was not proven and suggested the perception was from being actively engaged in the learning process. MacGeorge et. al. also found that clickers were beneficial to a wide range of students, from the science and tech-savvy student in the upper-division level courses to the liberal arts major in a lower-division level course held in a large lecture hall.

Student attitude about clickers is affected by how effective instructors are in engaging students in peer discussions. Keller et. al. (2007) reported that students liked clickers more when a large fraction of the class is actively discussing the topic with neighboring peers versus when students were required to respond independently (no interaction).

Approximately 72.3% of the 91 students who used clickers in study conducted by Connor (2009), a librarian at The Citadel, reported that clickers were of some benefit to their learning. In a traditional lecture, instructors often find students catching up on homework, conversing with neighbors or sleeping rather than paying attention to the material being presented. Clickers are a way to keep students interested in the material in a large lecture hall by having students answering questions using clickers and discussing their answer(s) with peers.

The best attribute about clickers is that they provide immediate feedback and assessment to both the instructor and the students (Kenwright (2009)). The immediate response allows teachers to gauge whether the students understand a topic and the teacher can move on to the next topic or whether more time needs to be spent on a particular topic. On the flip side, students can see immediately how well or poorly their peers understand a topic and how he or she compares. If a student sees that 80% of his/her peers understand the material, this might motivate the student to spend more time preparing for class and learning the material. When the class as a whole answers a question correctly, it can add a sense of camaraderie amongst the students and motivate each other to keep performing at a high level.

When a teacher poses a question in a classroom, a few students will raise their hand or shout out an answer, but rarely is the entire class engaged by one question. To get more than just a few students engaged, the teacher might select a student to answer the question who does not have his/her hand raised, the student is often embarrassed by being put on the spot. As per Kenwright (2009), clickers enable a teacher to engage the entire class with a question without putting added pressure on one person to answer and creating more student-teacher interaction.

According to Hatch, Jensen & Moore (2005), clickers allow instructors to assess student knowledge immediately and to help identify problem areas and misconceptions that can be addressed immediately rather than allowing the student to leave the classroom with a misconception. Teachers can adjust their focus of class to those areas that are more problematic.

Not all students are as interactive as other students in a classroom and teachers are constantly trying to get all students involved in classroom discussions. Clickers are a way to provide a voice to those quiet, shy students (Beckert, Fauth & Olsen (2009)). Self-reported quieter students found higher than average satisfaction rate using clickers in a classroom.

Many of the studies about clickers are about the use in large classrooms, while a study by Beckert, Fauth & Olsen (2009) conducted a simultaneous study between a small upper-division level course and a larger lower-division level course and found that the smaller class had slightly higher favorable ratings of the clicker than the larger course. The study could not uncover the exact reason for the difference, but commented that even though smaller upper-division level courses discussions are the norm, students still found favor in using clickers in the classroom to generate a discussion. The lower-level larger classroom still found favor with the clickers. Those who used clickers more frequently or in more than one course reported higher than average favor, suggesting that trendiness or uniqueness was not a reason for the positive feedback, but rather the familiarity.

Clickers make the learning environment more active because students see and hear more actively than in a traditional lecture (Hoekstra (2008)). Clickers also can provide a “perpetual” break in the middle of a lecture without losing motivation. The break actually keeps students engaged and reengages those students who had taken a mental knee. In addition, clickers allow students to use the knowledge they are learning each day through clicker questions instead of waiting days or even weeks for the graded even to see if students can use the knowledge gained in the right way.

Clickers are a Bad Thing

Clickers can be time consuming (Kenwright (2009)) because they require time for teachers and students to learn the software and technology. Clickers can detract from learning if an instructor is uncomfortable with the technology (Osterman (2007)). While clickers are a great way to get students to discuss the material they are learning about, it can take time away from the formal lecture and as a result, less material is covered during the class period (Osterman (2007)). However, although there might be fewer minutes to spend on formal lecture, those few minutes be spent discussing those areas that are most confusing to the student rather than on areas that the readily understood.

Some teachers like to use clickers as a means of tracking attendance or taking quizzes during class (Osterman (2007)). This can be a time saving feature for a very large class, but there is the possibility that a student will cheat with clickers by watching what button the neighbor pressed or a student playing hooky passing their clicker off to a friend in attendance at the lecture.

One of the biggest challenges for teachers using clickers for peer instruction was to craft meaningful, thought provoking questions that are at an appropriate level for the students (Connor (2009)). There is a learning curve for instructors on how to use clickers seamlessly and effectively during class. For most students, traditional learning is sitting in a classroom listening to a teacher and taking notes and are not accustomed to interacting much with the teacher other than maybe asking or answering a question. Getting students to open up and interact can be an initial challenge, but one that is overcome rather quickly through the use of clickers and peer discussions.

In addition to crafting creative, thought provoking questions, the teacher has to figure out a balance of how many questions to ask (Kenwright (2009)). Questions typically need to be prepared ahead of time in order not to detract from the learning objective by typing in the questions during class. If teachers are unsure what questions to ask, they can create a multitude of questions. During class, the teachers can pick and choose which ones they want to use depending on what topics the students want to discuss or are most confusing. Many teachers found their first questions asked during a class were too difficult for the population (Osterman (2007)). Asking the correct question takes practice and is a skilled art.

Cost of the equipment can keep instructors from using clicker technology (Hatch, Jensen & Moore (2005)), but an alternative would be to use multiple choice questions asked to an audience and have pieces of papers used to show a response. The response would no longer be anonymous and students would be able to look around the room to see a consensus, but it would still allow for discussions of the topic and keeping students actively engaged in learning (Osterman (2007)).

Implementation Advice

Make learning clickers as easy to use as possible (Osterman (2007)). Many people, by nature, are hesitant to change. By making learning the technology convenient and less time consuming, it will make the technology more appealing for teachers. Suggestions on learning how to use clickers include “how-to” manuals, training sessions for staff, a demo class for teachers to see students and teachers in action and even providing technical assistance on standby during the first few times a teacher employs the technology.

One of the drawbacks about clickers is that learning the technology can be time consuming. One way to use clickers is in a staff training mode. In a faculty development session, feedback can be provided by the teachers to fellow teachers by asking questions about what students find most confusing about a topic (Osterman (2007)). Using this method allows teachers to see what students need to do to respond to questions (i.e. push a button) and then to be able to discuss the result among peers.

As a guest lecturer on a special topic or a substitute teacher, these lecturers or teachers do not know much about the students they are teaching: previous knowledge on a subject, capabilities, etc. (Osterman (2007)). Using clickers allow guest lecturers to engage the students and make them feel more a part of the learning process. In addition, by posing questions about previous knowledge on a subject or experience using some equipment at the beginning of the lecture, a guest lecturer can tailor the class, adjusting to the knowledge level of the students, reviewing what needs reviewed and glancing over topics already understood. In a new environment, like on the first day of school, clickers can be used as an ice-breaker to get students discussing and interacting from the time the instructor starts the course.

Clickers offer anonymity which provides teachers the flexibility to ask sensitive questions that students would not normally volunteer a response, like monetary demographics, age, stereotypes, biases, religion, etc. This data can be used to create a demographic picture of the class. Another way to

use the information is to save the student responses and use the information for future classes, whether as a sample population in a class or in tailoring future lessons for that class(Osterman (2007)). The use of this information is only limited by the creativity of the teacher (Osterman (2007)). Another use for the anonymity function is to allow students to assess peers when presentations are made (Premkumar & Coupal (2008)).

Clickers are not designed to completely change how a teacher conducts class, but to provide teachers with another tool to reach all the students in a class (Osterman (2007)). Clickers cannot improve a poorly designed lecture (Kenwright (2009)). Make the pedagogy the focus, not the technology (Premkumar & Coupal (2008)).

Creating thought provoking questions is a learned skill and can take time to master. For some subjects, like physics and chemistry, peer instruction books are available to help design thought provoking questions that tend to bring out any misconceptions students might have (Connor (2009)). Another method used by (Connor (2009)) is to ask a definition question followed by a concept question involving the technology. In science based classes, questions could involve predictions on an experiment and what would happen if different variables were changes (e.g. mass or angle).

Hoekstra (2008) studied an implementation technique in which a professor lectures for the first 10-12 minutes of class followed by the use of clickers. The class transformed from a calm, passive learning environment to a noisy, engaging learning experience. Students were given one attempt at discussion and after 2-3 minutes, they vote. The professor explains the correct response as the student responses are displayed in a histogram.

Premkumar & Coupal (2008) describes 12 effective techniques used when employing clickers in the classroom. The rules to always ask yourself when designing questions and using clickers are: what is the purpose of the question, how does the question relate to the learning objective of the class, are clickers the most effective method for enhancing learning this subject in a classroom, how can I use the student responses to improve learning outcomes, and are my students (and I) having fun?

Premkumar & Coupal's (2008) suggests the following employment techniques: Mix up the lecture and the clicker questions; ask a question every 20 minutes as a change up to reengage interest in the subject with the students; be prepared with a contingency plan if the technology fails; only ask 3 to 4 questions during a lecture period otherwise you lose peer discussion time, and time to explain why one option might be better than another; test the questions and the technology - make sure the questions are loaded as clicker questions, the results are displayed as you would like and that the question on the clicker slide is really the question you want the students to answer. Premkumar & Coupal suggested that the best advice is to be creative and have fun with the technology.

In addition to peer instruction and generating class room discussions, clickers can also be used for graded events, taking attendance, providing course feedback, self-assessment, instructor evaluations and in any other way a multiple choice answer might be posed. The use of the technology is only limited by the creativity of the people that use it (Connor (2009), Premkumar & Coupal (2008)).

Conclusion

Clickers provide one method to engage students in an active learning environment, whether it is through peer instruction or to generate classroom discussions. Clickers are just technology and cannot replace poorly designed lectures, but their effectiveness in the classroom relies on solid pedagogical practices.

Planning ahead is a must when using clickers, from learning the technology to creating thought provoking, discussion generating questions. Time needs to be made during the class period to allow for discussion with peers as well as feedback from the teacher on the responses once a clicker question has been answered. Clickers can be used to tailor a class, but the teacher needs to be able to adjust his or her teaching so that more time is spent on confusing topics and less time on topics readily understood.

Students seem to enjoy using clickers and help them stay engaged in both large and small classrooms that cover a wide range of classes. Clickers give teachers a chance to have a productive change up the class every 20 minutes to reengage students with the subject.

The use of clickers is limited only by the creativity of the user. How would you use clickers in your classroom to enhance the learning experience of your students?

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