

CREL 2008

Using Clickers to Increase Student Engagement in Large Classes

Deb Miller, CIRT



What are you most interested in learning about today?

- a) Using clickers to increase engagement
- b) What you can do with clickers
- c) Question construction
- d) Practical considerations
- e) Best practices
- f) All of the above



WHY CONSIDER CLICKERS?

Have you experienced two or more of these issues in your course?

- Low level of student participation
- One way communication
- Difficult to undertake frequent assessment
- Difficult to provide student feedback
- Poor attendance

YES- 1

NO-2



WHAT WE KNOW...

Evidence exists that suggests the use of clicker systems has strong potential to engage learners and improve interactivity, particularly in large lecture classes. Properly implemented, these systems can also preserve class time by automating administrative tasks, such as attendance.



CORNELL STUDY

- Fredricksen and Ames (2004) surveyed 512 students about perceived usefulness and pedagogical value at the beginning and end of a semester. The results indicated a high level of satisfaction overall and an *increase in the perceived pedagogical value over the course of the semester.*



CORNELL STUDY

- Students reported that they were more likely to attend class because of the response system, and the degree to which they came to class because of the response system increased as the course progressed.
- Students also reported that the system caused them to be more actively engaged in the classroom, and that perception remained constant through the semester.



FACULTY AND STUDENT PERCEPTION

- Draper and Brown (2005) report that students "almost always" view clickers as beneficial and that perceived benefits increase as instructors become more experienced in their use.



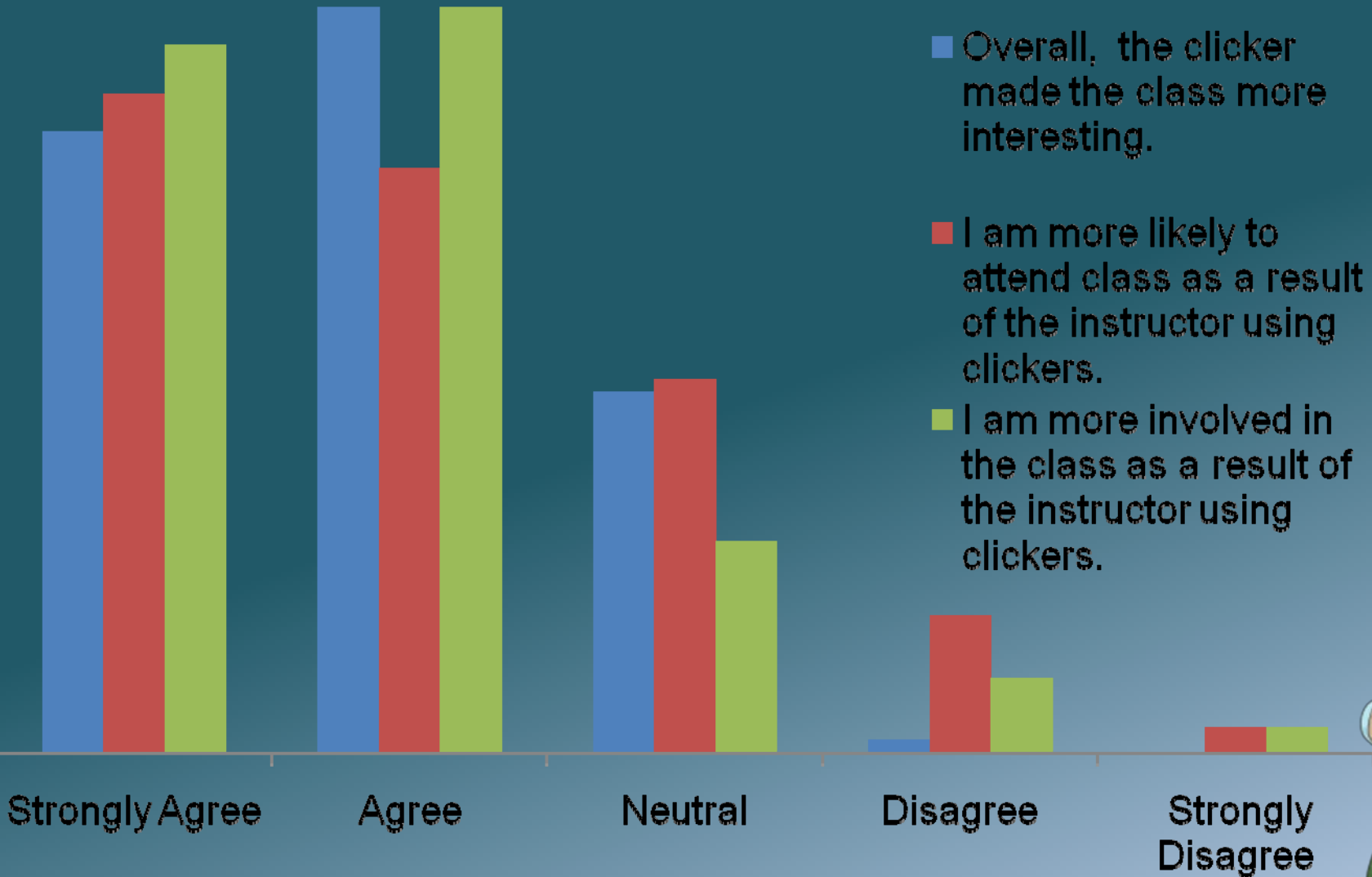
Discussion, anyone?

- Instructors in a political science course at UC Berkley used a clicker system to check for comprehension, to conduct polling, and to ask questions designed to spark discussion.
- 89% of the students in that course reported that using the technology made it easier to express their honest opinion in class and 93% reported that the technology made it easier to discuss controversial issues (Kam and Sommer, 2005)



Clickers @ UNF

Fall 2007 Student Survey



- Overall, the clicker made the class more interesting.
- I am more likely to attend class as a result of the instructor using clickers.
- I am more involved in the class as a result of the instructor using clickers.



UNF ADOPTION



Clickers @ UNF

Term	Instructors	Sections	Students
Spring 07	4	11	392
Summer07	5	11	528
Fall 07	13	32	1577
Spring 08	17	50	2294



Clickers can be used to..

- Ask Multiple choice questions, T/F, Y/N
- Collect numeric responses
- Conduct polling
- Collect predictions
- Take attendance
- Give quizzes
- Administer paper-based tests



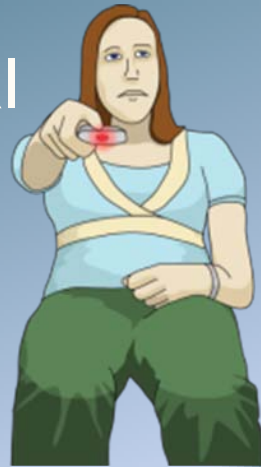
Applications

- Pre and Post Assessment
- Polling: opinion, prediction
- Formative Assessment during lecture
- Instant feedback for students
- Identify misconceptions
- Monitor reading and comprehension
- Engage students in peer discussion
- Have students write clicker questions



Writing Good Questions

- Knowledge - Facts, terms, concepts, definitions, principles
- Comprehension - Explaining/interpreting material
- Application - Using a concept or principle to solve a problem
- Analysis - Breaking material down into its component parts to see interrelationships/hierarchy of ideas
- Synthesis - Producing something new or original
- Evaluation - Making a judgment



APPLICATION EXAMPLE

Example 1:

Which one of the following memory systems does a piano-tuner mainly use in his or her occupation?

- a) Echoic memory
- b) Short-term memory
- c) Long-term memory
- d) Mono-auditory memory
- e) Iconic memory



APPLICATION EXAMPLE

Answer: *A. Echoic memory* (A piano-tuner uses echoic memory, in which auditory information is temporarily stored but not recorded in memory, to compare a note played on a piano to the correct pitch sounded by a tuning fork.)



ANALYSIS EXAMPLE

Mitochondria are called the powerhouses of the cell because they make energy available for cellular metabolism. Which of the following observations is most cogent in supporting this concept of mitochondrial function?

- a) ATP occurs in the mitochondria
- b) Mitochondria have a double membrane
- c) The enzymes of the Krebs cycle, and molecules required for terminal respiration, are found in mitochondria
- d) Mitochondria are found in almost all kinds of plant and animal cells
- e) Mitochondria abound in muscle tissue



ANALYSIS EXAMPLE

Answer: C. *The enzymes of the Krebs cycle, and molecules required for terminal respiration, are found in mitochondria* (The purpose of the Krebs cycle, which occurs in the mitochondria, is to get as many electrons out of food as possible --these electrons drive the production of ATP, the basic fuel of cells. ATP is also produced outside the mitochondria, though far less efficiently--so option A, which also mentions ATP, is not as good an answer.)



“Teaching Interactively”

- Mazur’s Peer Instruction Method
 - Ask Question
 - Allow for Discussion
 - Re-ask Question
- Engages students with each other
- Great for application/analysis questions, case studies



There are several genes in humans in addition to the ABO gene that give rise to recognizable antigens on the surface of red blood cells. The MN and Rh genes are two examples. The Rh locus can contain either a positive or negative allele, with positive being dominant to negative. M and N are co-dominant alleles of the MN gene. The following chart shows several mothers and their children. For the **first** mother-child pair, choose the father of the child from among the males in the right column, assuming one child per male.

	Mother	Child	Males
a.	O M Rh pos	B MN Rh neg	O M Rh neg
b.	B MN Rh neg	O N Rh neg	A M Rh pos
c.	O M Rh pos	A M Rh neg	O MN Rh pos
d.	AB N Rh neg	B MN Rh neg	B MN Rh pos



HOW IT WORKS

- Computer
- Receiver
- Clickers
- Projector
- CPS software
- Bb Integration



Other issues

- Perceived Value
- Rationale
- Grading
- Grade obsession
- Cheating
- Time shift
- Student Anxiety



Best Practices

- Meta-communicate
- Use consistently
- Plan pacing
- Write good questions
- Low-stakes
- Plan for problems



SOME REFERENCES

- Broida, J. (2007). *Classroom Use of a Classroom Response System: What clickers can do for your students*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Duncan, D. (2005). *Clickers in the Classroom: How to enhance science teaching using classroom response systems*. San Francisco, CA: Addison Wesley.
- Draper, S., & Brown, M. (2004). Increasing interactivity in lectures using an electronic voting system, *Journal of Computer Assisted Learning*, 20(2).
- ECAR Study of Undergraduate Students and Information Technology, 2006 . Available at: <http://www.educause.edu/ir/library/pdf/ers0607/ERS0607w.pdf>.
- Fredericksen, E. & Ames, M. (2004). Can a \$30 Piece of Plastic Improve Learning? <https://urresearch.rochester.edu/handle/1802/2474>
- Ohio State University, TELR. *Designing Questions for Clickers*. Available at: <<http://telr.osu.edu/clickers/teaching/guidelines.htm>>.



Planning Questions

- Pre-Assessments
 - What do they already know?
 - What are their misconceptions?
- **Mid-Topic Assessments**
 - Do they understand this concept?
 - Can they connect this concept to others?
 - Can they apply this concept?

