

Classroom Response Systems, an Accessibility Viewpoint

The Premise for our Understanding

Classroom response systems (often referred to as “clickers,” or electronic audience response systems) are rapidly gaining popularity on college campuses, and Michigan State is no exception. In March of 2008, Libraries, Computing, and Technology (LC&T) revised a statement of recommendation and support for two specific classroom response systems, the *iclicker*, and the *einstruction* classroom response system (http://computing.msu.edu/documents/Clickers_at_MSU_4_12_07.pdf). LC&T identified that approximately 11,000 *iclicker* and 1,100 *einstruction* systems were employed at MSU during the 2007-2008 academic year. While MSU does not restrict choice of systems to these two, Libraries, Computing, & Technology at MSU has opted to support these specific clickers. Given this support, the Resource Center for Persons with Disabilities (RCPD) desired an in-depth look at these systems and the possible implications these (and the use of clicker systems in general) may have for students with disabilities. We work from the perception that with increased use of technological learning objects comes increased opportunity for awareness, and that instructional choices should increase ability and participation for all students who learn at MSU.

Our Approach

At the RCPD, we took a comprehensive approach to understanding classroom response systems in higher education by reading recent research and understanding current policy and use on the MSU campus. Existing literature praises clicker use, but also cautions against applying the technology without attending to the larger milieu of pedagogical approach (Beatty, 2004, Preszler et al., 2007). In sum, research indicates that when used within a constructivist approach, classroom response systems may increase student motivation and participation. Simply using the clicker in one’s class does not ensure improved student learning; instructors and professors must adjust to new roles as a designer of learning experiences by planning use of questions within the class structure (Beatty, 2004; Judson & Sawada, 2002). On campus, we communicated with several individuals and departments who have taught with, learned with, and trained the use of classroom response systems. Each person recognized a need to attend to both design and pedagogical use of clicker systems relative to persons with disabilities. Further, we contacted both the *einstruction* and *iclicker* companies to detail how they have addressed accessibility in the design of their respective products.

Very little research addresses the experiences of students with disabilities and classroom response systems. Therefore, at the RCPD, we have considered the various ways clicker use and design may interact with characteristics of the following disabilities: blindness/visual impairment, deafness/hard of hearing, mobility, learning, psychiatric/psychological, brain injury, and chronic health. Talking with students, staff, professors, and various departments on campus confirmed our concern that although beneficial on many levels, classroom response systems should be used with several things in mind.

Possible Benefits for Students with Disabilities

Much of the current research identifies benefits of increased student participation and satisfaction within large college courses. Researchers indicate that clickers carry the most benefit in very large classes, where formative assessment and participation can be limited or difficult due to the high number of students present (Preszler et al., 2007). Further, several studies detail benefits of increased student motivation, interest in course content, and positive emotion as a result of use of clickers (Judson and Sawada, 2002; Stowell and Nelson; 2007). We are interested in what effect classroom response system use may have for students with learning or psychological disabilities for whom participation is a challenge, and whether clicker use allows for increased comfort levels and confidence in participation for those who identify it as a challenge. Some students with registered learning disabilities have mentioned ways clickers aid and increase their desire to participate in large classes.

- As a student with a learning disability (or psychological or anxiety disorder), I often become nervous when I am asked to share answers in front of a large group; clickers help me feel more confident because I am able to remain anonymous.
- With clickers, I feel like part of a community. Often we communicate what we think by using our clickers; I can see that I'm not the only one thinking a particular way.

Possible Challenges for Students with Disabilities

Clicker design may affect participation for many students; certain features of the systems may limit accessibility for certain individuals. This may hold true particularly for those who are blind or visually impaired, have mobility disabilities, or experience chronic health disabilities. Students have also mentioned difficulties concerning particular uses of clickers during class time. Individuals with disabilities and specialists at the RCPD who have interacted with the systems generated examples of questions that may emerge for students with disabilities:

- How do I know if the system received my response and I can't see the display or screen (histogram) in front of class?
- What if I accidentally hit the wrong button and send the wrong response (*and* my submitted data is being used for assessment)?
- I have a chronic health issue and miss classes from time to time; is there a way for me to participate or make up the clicker questions that I missed?
- I use a trackball (joystick, scanning device, etc.) because I have limited mobility and dexterity. Is there a way for me to participate with clicker technology?
- I work with a real-time captioner on my laptop during class, so there is lag time between questions asked and my ability to respond. If responses must be timed quickly, this makes participation difficult for me.
- If a professor only asks a question verbally and does not post it visually, there is a lag time with my sign language interpreter. How can I keep up if I must answer using a clicker?
- As a part of my accommodations, I am typically allowed more time to complete assessments. If an instructor uses clickers in a timed quiz during class, what should I do?

As indicated earlier, many of these issues connect clicker design with pedagogical choices that professors make in their classes; we advocate that instructors be fully aware of how both pedagogy and design impact students.

How Varied Uses of Clickers May Affect Students

Recognizing Underlying Goals and Matching Instruction and Assessment

Many proponents of these systems have worked to understand how particular instructional choices affect student responses. Again, the broader pedagogical approach from which one works informs instructional design, and thus how assessment is used to guide learning. Each of these interconnected functions of learning impacts students and how they might respond to clickers in their class. Two common approaches to using classroom response systems are factual and conceptual questioning, each carrying different implications for learning and assessment (Duncan, 2005). In a transmission approach to education, factual or recall questioning is often used to assess pre-class reading assignments or to “check up” on students, relying on basically low-level recall.

On the other hand, conceptual questions may result in a variety of interpretations, perhaps several “right answers,” and may require student rationale and reasoning for a particular choice. After signaling responses to conceptual or thought-provoking questions, students may benefit from viewing a histogram. Further, students might also discuss with peers why the distribution may have resulted the way it did, may be encouraged to revote or explain answers to peers. Instructors employing these practices often recognize that multiple viewpoints contribute to knowledge and knowing (Duncan, 2005, p. 25). This more closely follows a constructivist approach to education, where students are encouraged to develop their own understanding based on experiences; students become active participants in their own learning. “An instructor must learn to think of herself as an engineer of learning experiences rather than as a dispenser of knowledge. She must learn to plan curriculum around questions and deep comprehension, rather than around lecture notes and content coverage” (Bergtrom, 2006, p.6).

Many variations on questioning practices exist which blend both approaches to educating. For example, students might answer a question alone first to check basic comprehension, but then follow up with a re-vote or related question where students discuss how and why certain answers are chosen (Bergtrom, 2006). Instructors should work from an awareness that particular choices affect students differently, and uses of technology like clickers may highlight some of these differences in students’ learning. Duncan (2005) advocates being clear with students how clickers will be used by providing rationale for using them in a chosen way. As a result, students might experience less anxiety in what may be a new class structure. Further, instructors must consider their respective goals in using clicker technology, and whether assessment matches methods of instruction. A mismatch can result in student frustration and difficulty in the part of students (Duncan, 2005).

Formative or Summative assessment purposes:

Policies of grading should follow learning goals predetermined by the professor. Examples of goals may be increased student participation, increased attendance, increased comprehension, or increased discussion- these very different applications must inform use of

clickers for evaluative purposes. Points can be given for simply submitting an answer, or can be leveled (3=correct, 2=participation). Care should be taken to explain how grading and questions will be used at different times during the class period, whether questions are used to garner points (even if these are just “bonus” points or participation points), or to encourage deeper-level thinking. Lack of clarity may cause increased anxiety or frustration, and make participation more difficult for a wide range of students (Duncan, 2005). This might possibly challenge students with psychological, autism spectrum, or other cognitively-based disabilities who benefit from clear objectives and favor expected procedures during class. Overall, classroom response systems have the potential to be much more than just true/false and multiple choice answer devices. When used with purpose and clarity, clicker technology has the potential to be a tool that encourages deep thinking and participatory learning.

Einstruction Versus iclicker

When discussing use of either product, many individuals indicated that *iclicker* appears more accessible because of its design. *Iclicker* ease of use appears simpler for several reasons. As tactile reference points, a raised battery compartment sits on the left, and ordered buttons are on the right. The *iclicker* company provides Braille stickers that can be placed on the five choice buttons, and also anticipates production of an *iclicker* with vibration to signal when answers have been sent and received (summer 2008).

Design of the *einstruction* response system differs from the *iclicker*. This system allows for student numerical input with a numbered keypad, and also features an LCD screen at the top. Each number and key on the clicker has a raised bump underneath it. For persons with visual and mobility disabilities, the use of this system may prove challenging; the buttons are small and tactilely indistinguishable from one another. Reading the LCD screen on the clicker presents a challenge for those with low vision or blindness.

Both companies anticipate production of a web-based version of their response system in the near future. This could address various accessibility issues for students with disabilities, and might enable those who use adaptive, assistive, or augmentative technology with laptop computers to participate more easily with clicker classroom activities.

Further Thoughts and Recommendations for Future Interest in Classroom Response Systems

The RCPD maintains an interest in further understanding classroom response system use by students with disabilities on MSU’s campus. We believe that there exists opportunity for future research, discussion, or collaboration among members of various departments at MSU, and hope that this document may connect individuals interested in the topic at hand. However, we also recommend that disability awareness become part of the classroom response system training that is currently available on campus for faculty. This training should attend to both best pedagogical practices for students with disabilities and awareness of these systems’ design. This may be especially crucial when professors choose which clicker is most appropriate for use in their course. Classroom response system technology holds promise for engaging students with the content and process of learning; it is our hope that through continued education, instructors will become aware of the challenges and opportunities for ability that come with this technology.

References

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Additional Resources for Classroom Response Systems

- [https://techbase.asu.edu/wiki/index.php/Clicker Resources: Discipline Specific Article S](https://techbase.asu.edu/wiki/index.php/Clicker_Resources:_Discipline_Specific_Article_S)
- Benefits of Electronic Audience Response Systems on Student Participation, Learning, and Emotion
<http://www.informaworld.com/smpp/content~content=a790482090~tab=send>
- Barber, M., Njus, D. (2007). Clicker Evolution: Seeking intelligent design. *CBE-Life Sciences Education*. 6, 1-20.
 - Provides a nice overview and comparison of the design and uses of different clicker systems available, including the einstruction clicker and the iclicker

This document was written for the Resource Center for Persons with Disabilities, Summer 2008
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