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Useful Pedagogies or Financial Hardships? Interactive Response Technology (Clickers) in the Large College Classroom

Su L. Boatright-Horowitz
University of Rhode Island

Interactive response systems "clickers" can provide multiple benefits to the students and faculty who use them, including immediate performance feedback and greater student engagement in learning. My own exploration of this technology has yielded five pedagogically different types of polling questions, specifically measurement of student confidence levels, their comfort levels with various topics, assessment of attitude change due to class discussions, retention of course information, and basic mastery of course content. The present investigation revealed that students acknowledge the possible benefits to the instructor of using these polling questions, yet they were most appreciative of the opportunity to see sample quiz questions. More surprising, these students were unaware of the price of "clickers," despite having purchased them at the start of the semester, suggesting that use of this technology does not constitute a financial hardship for many students.

Several years ago, I watched an episode of "Who wants to be a millionaire?" and was enthralled by a technology that would allow one to ask a question of an audience and immediately tabulate the results for the audience to view. I thought that it would be an exciting technology to use in my large (i.e., more than 700 students) General Psychology course. At the time, I thought that it would make the class more entertaining for students, while increasing their engagement with the course material during my lectures. Since that time, these devices have become widely available and instructors from a variety of fields have published observations about clicker use. For instance, the Ohio Learning Network described the use of clickers as important, stating that their use: 1) helps maintain student attention during class, 2) creates a safe way for shy students to participate, 3) promotes discussion and collaboration, and 4) checks for student understanding of course materials (http://www.oln.org/ILT/prs.php). Others have described the use of clickers in the classroom to stimulate student interest in new topics, test student understanding, and assess student memory of course material (http://www.economicsnetwork.ac.uk/showcase/elliott_prs.htm).

Today, there is a growing body of empirical evidence that this interactive technology can have multiple benefits in the classroom. Morling, McAuliffe, Cohen, and DiLorenzo (2008) reported small, but positive effects on their students' exam scores. Yet, in this study, students in class sections with "clickers" did not report that they felt more engaged in class activities compared to students in sections without "clickers." On the other hand, Johnson, Robson, and Van Scyoc (2007) observed that more than 88% of their students said that using "clickers" helped them to pay attention in class. Some researchers have shown that using "clickers" in the classroom can have a positive effect on students' reported enjoyment during lectures (Stowell & Nelson, 2007). Furthermore, this teaching technology provides real-time feedback to instructors about student learning (Lasry, 2008), as well as immediate feedback to students about class performance (Johnson, Robson, & Van Scyoc, 2007). Despite these potential benefits, some instructors have expressed concerns about the expense for students whose classes use "clicker" technologies (Johnson, Robson, & Van Scyoc, 2007; Ribbens, 2007). This is a justifiable concern because "clickers" can cost each student about $40, which is added to the expensive cost of college textbooks.

When "clicker" technology became available, I began using it immediately, exploring how it could be used in the classroom. Ultimately, I realized that I was using five pedagogically different types of "clicker" questions, although other instructors have suggested additional uses of clickers in the classroom, (e.g., peer assessment, experimentation, see Draper & Brown, 2004). My next step was to assess students' views about this new "clicker" technology. Specifically, I wanted to learn more about student perceptions of the helpfulness of each question type, as well as student views about the cost of this technology.

Method

To achieve these goals, I designed an online WebCT survey, making it available to my class as an extra credit assignment, assuring them that their responses would be confidential and that the content of their responses would have no effect on their grades. Questionnaire items were derived from my own classroom use of clickers, essentially investigating student views regarding the benefits to the instructor and themselves for each pedagogically different question type, student views about potential problems with using clickers for recording student attendance, as well as student reactions to the financial cost of using this technology (see Table 1). Data were then collected

from 398 undergraduate students (60% freshmen, 24% males) enrolled in my large General Psychology course, with some surprising results.

Results

Student Views About "Clicker" Benefits

When asked how likely they were to respond to in-class questions using clickers, 79% of participating students said that they were more likely to do so, compared to raising their hands. Eighty-one percent of participating students indicated that they were more likely to use a clicker than respond to in-class questions by speaking. Survey questions also revealed that 41% of these students thought that privacy was important in class discussions of learning theory, while 57% said that privacy was important to them in discussions of human sexuality, and 60% in discussions of racism.

I was particularly interested in student responses regarding the helpfulness of each different type of "clicker" question (see Table 1). Therefore, I assessed student views about the helpfulness of each question type for both the instructor and the students. Possible responses ranged from "1" (not at all helpful) to "4" (very helpful), giving rise to a forced-choice situation, so that low responses ("1" and "2") could be compared to high responses ("3" and "4"). For instance, one type of "clicker" question can address student *confidence levels about mastery* of course material. A total of 57% of participating students reported that this use of "clickers" was helpful to themselves, while a total of 75% of these students indicated it was helpful to the instructor. A second type of "clicker" question can assess *student comfort levels* during in-class discussions (e.g., about racism). A total of 55% of participating students responded that these questions were helpful to themselves, while a total of 79% indicated that they were helpful to the instructor. Pre- and post-testing (e.g., regarding views on racism) can provide information about *student attitude change*, as a function of class discussions. In this context, students again indicated that these questions were more helpful to the instructor than themselves (76% vs. 61%, respectively). Students can also be asked questions to assess their *mastery of course content*, with questions similar to those that will appear on tests and exams. A total of 81% of participating students indicated that these questions were helpful to themselves, while about the same percentage (80%) indicated that they were helpful to the instructor. In-class questions about course content can also be presented multiple times in order to assess *student retention of information*, even across different class sessions. About half of these students (52%) responded that such repetitive questions were helpful to themselves, and 74% of these students said that they were helpful to the instructor.

Table 1
Student Views Regarding Helpfulness of "Clicker" Questions as a Function of the Type of Question

Question Type	Focus	N	Low	High
Student confidence	themselves	381	43%	57%
	instructor	390	25%	75%
Student comfort	themselves	388	45%	55%
	instructor	386	22%	79%
Attitude change	themselves	392	39%	61%
	instructor	394	24%	76%
Student mastery	themselves	392	19%	81%
	instructor	392	20%	80%
Student retention	themselves	391	48%	52%
	instructor	394	26%	74%

Using "Clickers" to Record Class Attendance

One important function of clicker devices is to record student attendance. Unfortunately, in large classes, there is a possibility that some students will send their "clickers" to class with other students, thereby appearing to be present in class. When asked about the likelihood that other students would engage in this activity, 75% of my participating students indicated that it would be likely to occur, and 47% of my students responded that they would do it themselves. One way to avoid this difficulty would be to use "clickers" with fingerprint scanners, although I personally have never seen such a device marketed. When asked about their comfort levels using a "clicker" that scanned their fingerprints, 71% of students indicated that other students would be uncomfortable about it, while 62% of students reported it would be uncomfortable for them, personally.

Do Students Think "Clickers" Are Too Expensive?

When asked about the financial hardship of purchasing "clickers," 3% of students said that it was a very difficult purchase for them financially. In fact, only 4% of participating students responded accurately that the "clickers" cost $40, rather than $10 (60%), $20 (23%), $30 (8%), $50 (2%), or $60 (2%). On the other hand, 97% of responding students indicated that a reasonable price for "clickers" would be $20 or less. When asked about a reasonable price for "clickers" used in multiple courses, 95% of students still responded that these devices should cost $20 or less.

Discussion

The majority of students who participated in this study indicated that they were more likely to respond to in-class questions by using a clicker compared to either speaking or raising their hands. These results suggest that the use of clickers can increase student participation in college classes, even when class size exceeds enrollments of 700 students. These results are consistent with those of Stowell and Nelson (2007), who observed increased student participation with clicker use during simulated psychology classes. These findings may be the result of the privacy afforded to students as they respond to instructor questions with "clickers." Many of my students said that the privacy afforded by "clickers" was important to them, particularly for class topics such as human sexuality and racism. This may provide an explanation for the Draper and Brown (2004) finding that anonymity of responding was important to students in some courses, but not others. It seems likely that the importance of privacy or anonymity will vary across courses, as well as in a single classroom, dependent upon the topic.

It was disappointing to learn that, from my students' perspectives, the most important use of the "clickers" is that they provide the opportunity to view test questions similar to those presented on quizzes. On the other hand, my students seemed willing to acknowledge that, as the instructor, I can derive benefits (e.g., assessing student attitude change, testing student understanding) from using this technology. Generally, students indicated that these various types of clicker questions were more helpful to the instructor than themselves, except those designed to test *student mastery of course content*. From the student perspective, the most helpful types of in-class questions were those that were similar to items that would appear on quizzes and exams. Thus, my students appeared to be aware that the "clicker" technology can be a useful tool for the instructor (who must help them master course material), yet they viewed the use of "clickers" specifically for quiz preparation to be of the most direct benefit to themselves.

Morling (2008) showed that students in classes with "clicker" technology viewed class attendance to be more important than students whose classes did not use "clickers." While it is feasible to use the interactive response system to record individual student attendance in small classes, students in large classes can easily send their clickers to class with other students, thereby appearing to be present in class. One logical way to prevent this form of cheating is to use clickers with fingerprint scanners that must be activated prior to each response. I am not aware that such devices have yet been marketed, yet the technology exists at this time. While many students view fingerprint scanning in class with discomfort, it is probably inevitable if clickers are to be used to record attendance in very large classes. It is also interesting to note that students responded that others were more likely to cheat by sending their clickers to class with a friend, compared to the likelihood that they would do it themselves. This self-serving bias was predictable, particularly given the low degree of relational closeness to the other students with such a large class (Sedikides, Campbell, Reeder, & Elliot,1998).

Finally, I was very intrigued by my students' responses to the cost of clickers. Although they typically indicated that clickers should cost $20 or less, few students actually knew that their clickers actually cost twice as much. Furthermore, very few students indicated that the purchase of clickers was a financial hardship. It is interesting to note comments by Ribbens (2007) in this context. Confronted with student complaints about "clicker" costs, he pointed out that the use of "clickers" raised his students' grades by 8%, a justification that was easily accepted by his students.

From these data, I should probably conclude that I am more enthusiastic about the use of interactive response systems than many of my students. Yet, it does seem likely that, within a few years, students will be surprised and disappointed when these new technologies are *not* used in the classroom. We are teaching a cohort of students who are quite used to new technologies. In collecting these data, I was particularly concerned about the financial cost to students of purchasing "clickers." Few students even knew how much they had already paid for these devices. Furthermore, more classes on my campus are using radio frequency devices and students can use the same device for multiple classes by changing channels at the start of each class. More important, most of my students indicated that they were more likely to respond to in-class questions with "clickers," compared to speaking or raising their hands. Thus, I am satisfied that one of my original goals has been met. The use of an interactive response system can increase student involvement in large lecture courses. The entertainment value of "clickers" is still in question, yet I suspect that when an instructor is having fun in the classroom, the student experience is likely to be enhanced, as well.

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SU L. BOATRIGHT-HOROWITZ earned the Ph.D. in biopsychology in 1991, investigating learning and cognition in monkeys and chimpanzees. She then joined the faculty in the psychology department at the University of Rhode Island, where she developed a focus on undergraduate teaching and programming. Her current research involves the use of technologies to enhance teaching effectiveness, as well as course design for teaching antiracism. Address correspondence to Professor Su L. Boatright-Horowitz, Psychology Department, University of Rhode Island, Kingston, RI 02881-0808; email: ugpsych@gmail.com.