

---

# Click It and Ticket: Extending the benefits of clickers in small classrooms to increase non-anonymous class participation

Meg Fryling  
mfryling@siena.edu  
Computer Science, Siena College  
Loudonville, NY 12211, USA

## Abstract

This is an exploratory study that investigates the use of student response systems (clickers), as well as additional reward tactics, in small classroom environments to increase non-anonymous student participation, increase overall engagement, and improve comprehension of course material. The tools were introduced in six undergraduate information systems and computer science courses over three semesters, all taught by the same instructor. Data were collected regarding actual student participation as well as student perceptions regarding participation, engagement, and course content comprehension. The resulting data supports previous research on the benefits of clicker use to increase class participation. It also supports the use of a reward ticketing system to enhance an active learning environment by encouraging non-anonymous student contributions. Student feedback showed that the students overwhelmingly supported the use of both the clickers and the ticket system. Furthermore, the students reported that they believe these tools increase engagement, participation, and course comprehension. The preliminary data supports that these tools both add value to the classroom but that the ticket system has the greatest positive impact on non-anonymous class participation.

**Keywords:** Clickers, Student Response Systems, Active Learning, Student Engagement, Classroom Technology, Interactive Techniques

## 1. INTRODUCTION

Modern pedagogical methods stress the importance of interactive learning environments versus the traditional passive lecture-style experience (Powner & Allendoerfer, 2008). Active learning has been a widely discussed topic in higher education (e.g. Freeman et al., 2007; Knight & Wood, 2005; Udovic, Morris, Dickman, Postlethwait, & Wetherwax, 2002) and it has been known for some time that student participation fosters critical thinking (Smith, 1977).

In an effort to achieve a vibrant learning environment in which students actively participate, faculty need to incorporate tools and

methods that will effectively increase class participation (Butler, Phillmann, & Smart, 2001; Essid, 2006). Students often have a fear of appearing unintelligent in front of their peers, which prevents them from speaking up in class (Fassinger, 1995). While engaging supportive professors may help students overcome some fears of active participation in classroom settings, Fassinger (1995) found that course design has a stronger influence.

Student response systems (SRS), also known as Audience Response Systems (ARS), offer teachers the opportunity to successfully engage students with a fairly easy to implement technical solution (Slauson, 2011). While there are different brands of student response systems

their basic functionality allows instructors to display questions (typically multiple choice) to the entire class via the overhead projector or similar device. Students are then able to answer the questions real-time via remotes, often referred to as clickers. Responses are then viewable to the class in aggregate form. Individual responses can be completely anonymous or the clickers can be assigned to specific students. In the latter case, individual student responses are still known only to the instructor.

Student response systems offer an opportunity to help alleviate student fears of participating by offering a way for students to participate without revealing their answers publicly. In addition, the instant feedback affords instructors the opportunity to immediately assess how well the material being covered was understood by the class. Course content and/or pace can then be adjusted as needed (Koppel & Berenson, 2009).

Clickers have been adopted in recent years as a way to foster an active learning environment (Cunningham, 2008; Hoffman & Goodwin, 2006). The immediate feedback that clickers offer has been shown to not only engage students more actively in the classroom but improve performance on tests (Crossgrove & Curran, 2008; Shaffer & Collura, 2009; Stowell, Oldham, & Bennett, 2010; Yourstone, Krayer, & Albaum, 2008). Researchers have specifically investigated the use of clickers in information systems courses and found that students had improved attendance, performance and overall active learning (Nelson & Hauck, 2008).

Generally students in large classroom settings have responded positively to the use of clickers (Barnett, 2006; Judson & Sawada, 2002; MacGeorge et al., 2008; Simpson & Oliver, 2007) and they have been found to improve student participation (White, Delaney, Syncox, Akerberg, & Alters, 2011). Blasco-Arcas, et al. (2013) found that "...students perceive that using clickers in the class facilitates the understanding of the concepts and class materials and significantly improves their learning process." Fassinger (1995) discovered that participation by females is related to their level of confidence. The use of anonymous clicker responses offers an opportunity for students to build confidence.

It is typical for professors to include class participation as part of student final grades.

While faculty often explicitly include participation as part of the final grade calculation and inform students of such via the course syllabus, this knowledge has little impact on getting students to actually participate (Fassinger, 1995). Fassinger (1995, p. 94) explains that "...when students perceive that contributing to class will positively affect their grade, they are more likely to offer comments or raise questions. However, merely knowing student participation is graded does not have the same positive effect." Therefore, Fassinger (1995) suggests offering reinforcement, such as extra credit, for classroom participation.

Clickers can be assigned to individual students, allowing instructors to give participation credit. However, White, et al. (2011) found that there are mixed feelings from students as to whether incentives for clicker use are fair. Some students view this as a great way to get "easy" points, while others view it as simply an underhanded tactic to force higher class attendance (Caldwell, 2007; White et al., 2011). Additionally, it has been found that students will bring fellow classmates' remotes to class in order to give them credit for missed classes (Caldwell, 2007). While prior research clearly indicates that there are a variety of benefits to using student response systems in the classroom, there are also challenges to consider (Kay & LeSage, 2009).

## 2. RESEARCH OBJECTIVES

As discussed in the previous section, researchers have found that clicker use can improve classroom participation and even increase exam grades, but there are some inherent challenges. While more recent research has explored clickers in small classrooms (Slauson, 2011), much of the existing research on clickers has focused on large classroom settings. Therefore, additional investigation on the effectiveness of clickers in small classroom settings is justified.

While clickers can be assigned to students in order to encourage engagement and award participation credit, the "fairness" of awarding credit for simply responding to clicker questions is debatable. Ideally students would also have the confidence to ask new questions and participate in classroom discussion (McKeachie, 2002). Particularly for case study classroom activities, which are frequently used in information systems courses, a more active discourse in the classroom is warranted.

Students advance intellectually when they actively participate in the classroom by posing questions and making comments (Belenky, Clinchy, Goldberger, & Tarule, 1986; McKeachie, 1990). Although student response systems encourage participation, it is often anonymous and does not extend into non-anonymous contributions in the classroom. Consequently, additional tools may be needed to extend the benefits of clicker use.

This is an exploratory study that investigates the use of clickers, as well as additional reward tactics, in small classroom environments to increase individual non-anonymous student participation, increase overall engagement, and improve comprehension of the course material. Research questions include:

- Do clickers increase student engagement and participation? Will this participation extend into non-anonymous questions, comments, and discussion?
- Do clickers increase student comprehension of the course material?
- Are clickers a valuable resource for small classroom environments? What, if any, additional tactics are needed to enhance the benefits of clickers in small classroom settings?

### 3. METHODOLOGY

This research originated out of a desire by the researcher to improve participation in their undergraduate information systems classes. It began with the observation that the number of students that would speak up during any given class session was typically between 15-20% of the total class size. Smaller classes tended to yield a similar number of students willing to participate as larger classes, thus the smaller classes had a higher percentage of participating students. Not surprisingly, typically the same students were willing to speak up in class from session to session and some students tended to completely dominate the discussion. Therefore, a primary purpose of this study was to investigate ways to increase the number of students actively participating in class.

As discussed in the literature review, clickers have been found to increase student engagement and improve learning outcomes. Therefore, a decision was made to adopt the student response system/clickers in a section of

a course previously taught by the same instructor without clickers. Since the institution in which this research took place does not widely use clickers, a decision was made to not require students to purchase the clickers as part of the required course materials. Instead, the students were supplied with clickers at the start of each class, which were then returned at the end of each class. This decision is supported by the research by White, et al. (2011) that found the institution-pays model was most preferred by both faculty and students. It also eliminated the common problem that students simply forget to bring their remotes to class (Caldwell, 2007).

Beginning in Spring 2012, clickers were added to a section of Management Information Systems (CSIS114) and a section of Database Design and Applications for Business (CSIS115). These are both undergraduate courses that are typically taken by undergraduate business majors in their Sophomore, Junior, or Senior year. During the Fall 2011 semester both of these courses were taught by the same instructor and average class participation (i.e. the number of students participating in any given class) was 18.32%. This participation was recorded by the instructor by noting on a student seating chart the classes in which each student spoke up in class. These data were then aggregated by class session and averaged for each course section.

After 5 weeks of classes, clicker participation in both courses was very high at 90%-100%. Nonetheless, in the CSIS114 class participation in the form of speaking publicly during class was averaging only 15%, which was still much lower than desired. For both the CSIS114 and CSIS115 classes, the students were asked anonymously, via the clickers, if they found the clickers helpful and if they wanted to continue using them. For both questions, both classes unanimously voted "yes". Therefore, it was decided to leave the clicker use in place but try a new method to increase more traditional class participation.

At the end of the fifth week of classes, a new participation ticket reward system was introduced in the CSIS114 course only. The reward system worked as follows: Students that spoke up in class to answer a question, pose a question, or simply participate in some discourse were given a ticket, which they would then put their name on and turn in at the end of class. The instructor would then tally the tickets, redact the names, and reuse the same tickets

for the rest of the semester. After the accumulation of five tickets, a student could "cash in" to waive certain course requirements such as post-lab assignments.

Typically, students could only receive one ticket per class, even if they spoke up multiple times. Occasionally, a second ticket would be given to a student that make an extraordinary contribution, including identifying an instructor mistake. Total ticket counts were used to calculate course participation grades and students were given the equivalent number of tickets for an end-of-semester raffle.

At the conclusion of the semester students were asked the following questions via the anonymous student evaluation system, as appropriate:

- How helpful was the use of clickers in increasing your engagement and participation during class?
- How helpful was the use of clickers in increasing your comprehension of the course material?
- To what degree do you believe the blue "Like" tickets increased your classmates' willingness to participate?
- To what degree did the blue "Like" tickets increase your willingness to participate?

Clickers and participation tickets were then implemented in the same instructor's information systems courses (i.e. CSIS114, CSIS115, and CSIS200) in two subsequent semesters. Although clickers were not incorporated into the instructor's Introduction to Computer Science course (i.e. CSIS110), the ticketing system was used. Data regarding the number of students participating in each class were recorded and the same questions listed above were posed to the students at the end of each semester.

#### 4. FINDINGS

Prior to implementing the ticket system, 1/3 of the way into the Spring 2012 semester, average participation in the CSIS114 class was 15% even with clicker use. At the conclusion of the term, average class participation rose to 33.5%. This included 5 class sessions dedicated to student presentations in which the instructor handed out tickets to "audience" students that actively participated. The average participation on the

student presentations was actually higher than the average for the entire semester at 40.67%.

While student participation during instructor-led class topics is challenging, engagement during student presentations is usually non-existent. Although requirements to pose questions to the audience were typically included in presentation requirements, rarely would the non-presenting classmates respond to questions posed by their presenter classmates. Almost never would a non-presenting student ask a question of the presenting student(s). This often made for very dry student presentations, even when the content was valuable and well prepared. The jump in participation from previous semesters strongly supports that the ticket system positively impacted engagement during student-led presentations.

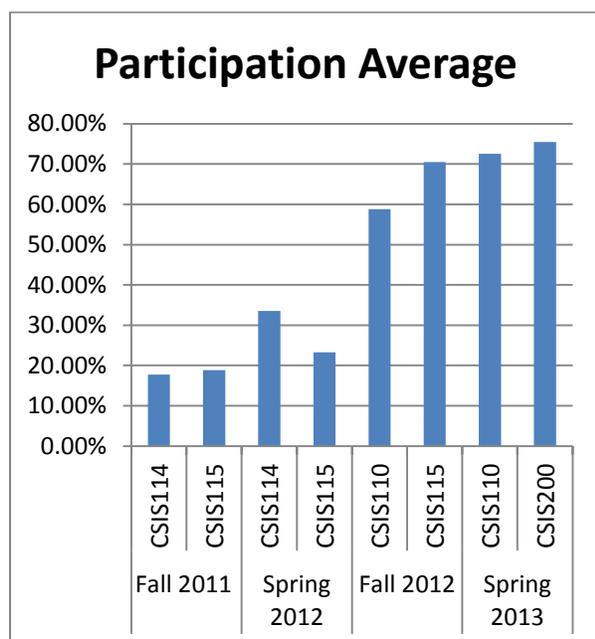
In subsequent semesters students were given the option to use clickers and/or give out participation tickets during their presentations. In Spring 2013, 40% of the students presenting in the CSIS200 course chose to incorporate clicker questions in their presentations and 70% handed out participation tickets. For those presenting that were uncomfortable handing out the tickets themselves, the instructor took care of this task. Additionally, the instructor passed out tickets during guest speaker presentations to further encourage active participation. A presenter later commented how impressed he was at the level of involvement by the students.

The student response system selected does not require a software installation, thus making the system very portable. Thanks to this portability, an additional benefit of owning the clickers is that the entire student response system, including the clickers, can be borrowed by other faculty members and even students. In Spring 2013, a student borrowed the system to use in a presentation for another course. This is an additional indication that students see the benefits of clickers for active participation.

Figure 1 shows the average number of students participating in each class session. These data are excluding days in which a quiz, exam, or student presentations took place. On the two student presentation days for the Society in the Information Age (CSIS200) course, the participation percentages were 57.89% and 71.43%. Quizzes typically took half the class period and the average participation on those days was 42.3%. This course employed team

based learning so groups of 4 were established on the first day of class and worked together throughout the semester. In an effort to encourage shy students and promote team building, teams were given a bonus point if all members of their team received a participation ticket during any given lecture. This class enjoyed the highest percentage of average number of students participating per class (75.45%)

Adding the clickers and the ticket system seemed to have increased overall participation. While participation in the CSIS115 class increased from Fall 2011 to Spring 2012 with just use of the clickers, it jumped from 23.30% to 70.48% in the Fall of 2012 when both clickers and participation tickets were utilized.



**Figure 1:** Average percentage of students participating per class

For all the courses, each ticket counted directly towards the participation portion of the student's final grade. For the CSIS114 and CSIS110 classes participation counted for 5% of the final grade, for CSIS115 it counted for 10% of the final grade, and for CSIS200 it counted for 15% of the final grade. Certainly, one factor potentially influencing the differences in average level of participation between these courses could be the percentage that participation counts in the final grade.

## 5. CONCLUSIONS

Clickers and participation tickets were overall widely accepted and valued by the students in all classes in which they were introduced. Students found clickers decidedly helpful in increasing engagement, participation, and course comprehension. In addition, the students believed that the ticket system increased both their willingness to participate as well as their classmates' willingness to participate (see Appendix B). In the open-ended questions on the student evaluations for these courses, many students provided positive feedback on the clickers, the ticket system, and for the level of encouragement of class participation (see Appendix C).

Despite the high level of student enthusiasm for both the clickers and the ticket system, one student in the CSIS200 class stated, "I didn't like the participation tickets, I thought that it rather pressured me to say something and had more of a competitive edge in class discussion." While this was the only negative comment, it is something to be considered in the future. Perhaps the pressure was particularly high in this class as it had the highest class participation percentage of the final grade at 15%. Future research should consider: What impact does increasing or decreasing this percentage have on student participation? What is the ideal percentage? Would it be better if the tickets counted as "extra" credit versus a participation portion of the final grade? Is there a way to track and analyze the quality of participation? What is the overall impact of increased participation on learning assessments?

It appears from the data collected regarding the average number of students participating in class, that the clickers and the ticket system increase overall class participation and student engagement. This includes active participation during student presentations and invited speakers. Not only did the tickets help encourage participation but they also helped to restrain overly dominate student participates by stating that students without a ticket for the day will be given preference.

Future research will include incorporating clickers into the CSIS110 course to find out what impact that would have on the level of participation. Extended investigation of the use of clickers and tickets in future sections of the CSIS114 course will help identify whether

instructor experience using both these tools will further increase participation. While the students perceived that clicker use increased course comprehension, additional inquiry is needed to determine what these tools have on quiz, exam, and final grades. Finally, use of the combination of these tools by other instructors and institutions will further enhance understanding of their impact.

This study supports previous research on the benefits of clicker use to increase class participation and demonstrates that clickers can be highly valuable even in small classroom environments. It also supports the use of a ticketing system to enhance an active learning environment by encouraging non-anonymous student contributions. The preliminary data supports that these tools both add value to the classroom but that the ticket system has the greatest positive impact on non-anonymous class participation.

## 6. REFERENCES

- Barnett, J. (2006). Implementation of personal response units in very large lecture classes: Student perceptions. *Australasian Journal of Educational Technology*, 22(4), 474-494.
- Belenky, M. F., Clinchy, B., Goldberger, N., & Tarule, J. (1986). *Women's Ways of Knowing: The Development of Self, Voice, and Mind*. New York: Basic.
- Blasco-Arcas, L., Buil, I., Hernández-Ortega, B., & Sese, F. J. (2013). Using clickers in class. The role of interactivity, active collaborative learning and engagement in learning performance. *Computers & Education*, 62(0), 102-110. doi: <http://dx.doi.org/10.1016/j.compedu.2012.10.019>
- Butler, A., Phillmann, K.-B., & Smart, L. (2001). Active learning within a lecture: Assessing the impact of short, in-class writing exercises. *Teaching of Psychology*, 28, 257-259.
- Caldwell, J. (2007). Clickers in the large classroom: Current research and best-practice tips. *Life Sciences Education*, 6(1), 9-20.
- Crossgrove, K., & Curran, K. L. (2008). Using Clickers in Nonmajors- and Majors-Level Biology Courses: Student Opinion, Learning, and Long-Term Retention of Course Material *Life Sciences Education*, 7, 146-154.
- Cunningham, B. (2008). Using action research to improve learning and the classroom learning environment. *Issues in Accounting Education*, 23(1), 1-30.
- Essid, J. (2006). Disengaged Students are the Victims, Not the Culprits. *Chronicle of Higher Education*, 52(25).
- Fassinger, P. A. (1995). Understanding Classroom Interaction: Students' and Professors' Contributions to Students' Silence. *The Journal of Higher Education*, 66(1), 82-96.
- Freeman, S., O'Connor, E., Parks, J. W., Cunningham, M., Hurley, D., Haak, D., . . . Wenderoth, M. P. (2007). Prescribed active learning increases performance in introductory biology. *CBE Life Science Education*, 6, 132-139.
- Hoffman, C., & Goodwin, S. (2006). A clicker for your thoughts: technology for active learning. *New Library World*, 107(9/10), 422 - 433.
- Judson, E., & Sawada, D. (2002). Learning from past and present: Electronic response systems in college lecture halls. *Journal of Computers in Mathematics and Science Teaching*, 21(2), 167-181.
- Kay, R. H., & LeSage, A. (2009). Examining the benefits and challenges of using audience response systems: A review of the literature. *Computers & Education*, 53, 819-827.
- Knight, J., & Wood, W. B. (2005). Teaching more by lecturing less. *Cell Biology Education*, 4, 298-310.
- Koppel, N., & Berenson, M. (2009). Ask the Audience...Using Clickers to Enhance Introductory Business Statistics Courses *Information Systems Education Journal*, 7(92).
- MacGeorge, E., Homan, S., Dunning, J., Elmore, D., Bodie, G., Evans, E., & al., e. (2008). Student evaluation of audience response technology in large lecture classes. *Education Technology Research Development*, 56, 125- 145.
- McKeachie, W. J. (1990). Research on College Teaching: The Historical Background. *Journal of Educational Psychology*, 82, 189-200.

- 
- McKeachie, W. J. (2002). *McKeachie's teaching tips: Strategies, research, and theory for college and university teachers* (11 ed.). Boston: Houghton-Mifflin.
- Nelson, M., & Hauck, R. (2008). Clicking to learn: A case study of embedding radio-frequency based clickers in an introductory Management Information Systems course. *Journal of Information Systems Education*, 19(1), 55-64.
- Powner, L. C., & Allendoerfer, M. G. (2008). Evaluating Hypotheses about Active Learning. *International Studies Perspectives*, 9, 75-89.
- Shaffer, D., & Collura, M. (2009). Evaluating the Effectiveness of a Personal Response System in the Classroom. *Teaching of Psychology*, 36(4), 273-277.
- Simpson, V., & Oliver, M. (2007). Electronic voting systems for lectures then and now: A comparison of research and practice. *Australasian Journal of Educational Technology*, 23(2), 187-208.
- Slauson, G. J. (2011). Using Easy Excel Tools with Clickers to Make Large or Small Classes on Any Subject Immediately Engaging. Paper presented at the Information Systems Educators Conference, Wilmington, North Carolina, USA.
- Smith, D. G. (1977). College Classroom Interactions and Critical Thinking. *Journal of Educational Psychology*, 69, 180-190.
- Stowell, J. R., Oldham, T., & Bennett, D. (2010). Using Student Response Systems ("Clickers") to Combat Conformity and Shyness. *Teaching of Psychology*, 37(2), 135-140.
- Udovic, D., Morris, D., Dickman, A., Postlethwait, J., & Wetherwax, P. (2002). Workshop biology: demonstrating the effectiveness of active learning in an introductory biology course. *Bioscience*, 52, 272-281.
- White, P. J., Delaney, D. G., Syncox, D., Akerberg, O. A., & Alters, B. (2011). Clicker Implementation Models. *EDUCAUSE Quarterly*, 34(4).
- Yourstone, S. A., Krave, H. S., & Albaum, G. (2008). Classroom Questioning with Immediate Electronic Response: Do Clickers Improve Learning? *Decision Sciences Journal of Innovative Education*, 6(1), 75-88. doi: 10.1111/j.1540-4609.2007.00166.x

## Appendix A – Course Demographics

### Fall 2011

Course Name/Rubric	Class Size	Male	Female	Clickers	Participation Tickets
Management Information Systems (CSIS114)	32	16	16	No	No
Database Design and Applications for Business (CSIS115)	16	12	4	No	No

### Spring 2012

Course Name/Rubric	Class Size	Male	Female	Clickers	Participation Tickets
Management Information Systems (CSIS114)	30	15	15	Yes	Yes
Database Design and Applications for Business (CSIS115)	15	7	8	Yes	No

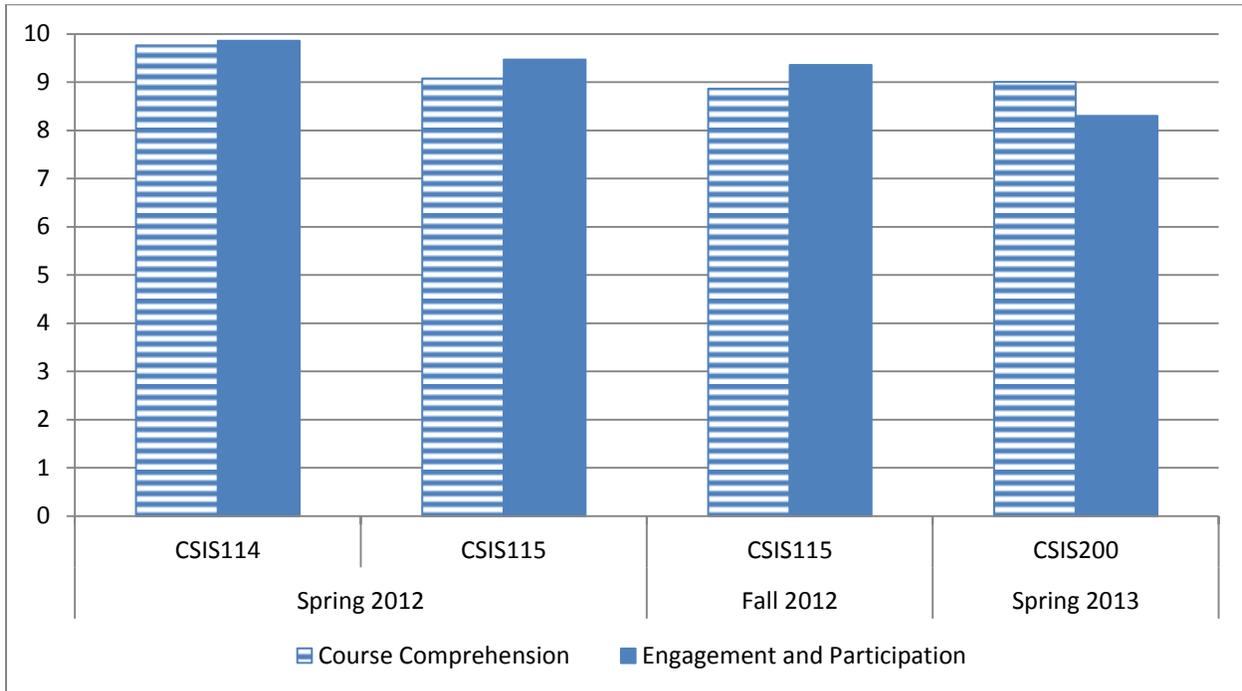
### Fall 2012

Course Name/Rubric	Class Size	Male	Female	Clickers	Participation Tickets
Introduction to Computer Science (CSIS110)	25	11	14	No	Yes
Database Design and Applications for Business (CSIS115)	15	5	10	Yes	Yes

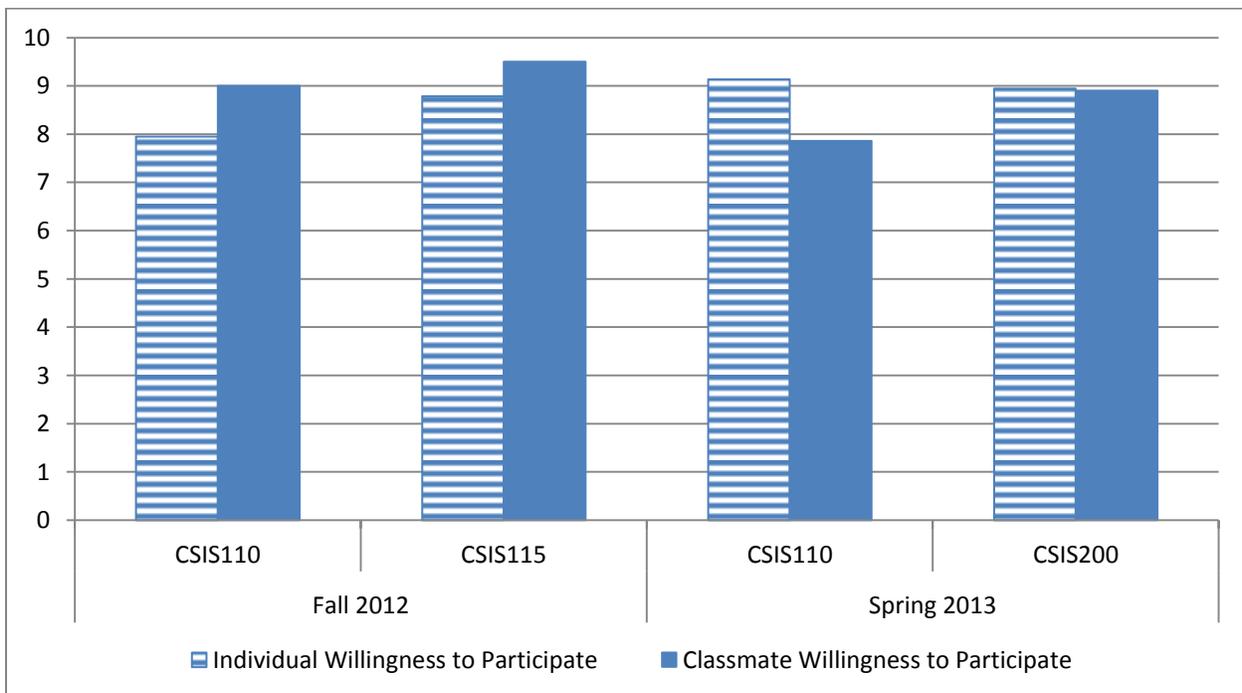
### Spring 2013

Course Name/Rubric	Class Size	Male	Female	Clickers	Participation Tickets
Introduction to Computer Science (CSIS110)	15	6	9	No	Yes
Society in the Information Age (CSIS200)	22	10	12	Yes	Yes

## Appendix B – Student Evaluation Question Responses



**Figure 2:** Degree to which students believed use of clickers were helpful in increasing course comprehension and/or engagement and participation during class (0-Not Helpful; 10-Very Helpful).



**Figure 3:** Degree to which students believed that the blue "Like" tickets increased their willingness and/or their classmates' willingness to participate (0-Not at All; 10-Very Much).

---

## Appendix C – Student Evaluation Comments

### Spring 2012

**Question:** Please list and explain the things that you liked most about this course/instructor.

**CSIS115 Related Responses:**

- "...use of the clickers in class was also very helpful to understanding the material."

**CSIS114 Related Responses:**

- "KEEP THE CLICKERS. Awesome idea."
- "I really liked the involvement of the clickers. I am not a big speaker but the clicker (and of course the blue tickets) got me more involved in the class."
- "The interactive use of the remote response clickers"
- "Clickers were a huge help in making sure I stay engaged in class the whole time."
- "...using the clickers in class"
- "...the clickers were very helpful"
- "The use of the clickers in class was a helpful way in order to engage the entire class in the class discussion. Using the "blue tickets" also was a great way to encourage class participation and helped me exceed in the class, since I am usually a shy person."
- "I really liked her Blue-Ticket strategy to increase class participation within the class."
- "Another thing I liked about this course was using the Clickers to answer questions to also receive class participation. This allowed everyone to participate with an answer to a question, without having to raise your hand in front of everyone."

**Question:** Any other comments?

**CSIS114 Related Responses:**

- "The clicker questions were very helpful. They encouraged me to engage in the class and break up the note taking process with can become repetitive."

### Fall 2012

**Question:** Please list and explain the things that you liked most about this course/instructor.

**CSIS115 Related Responses:**

- "I liked the reinforcement of topic using the clickers. I liked the encouragement for participation."
- "Powerpoints and using the clickers to answer questions also really helped to learn the information."
- "... teaching methods were very encouraging (i.e. blue [participation] tickets)."

## **Appendix C (Continued) – Student Evaluation Comments**

### **Spring 2013**

**Question: Please list and explain the things that you liked most about this course/instructor.**

**CSIS110 Related Responses:**

- “encouraged class participation.”

**CSIS200 Related Responses:**

- “The class had interesting discussions. The use of Clickers was great!”
- “Enjoyed working in groups, and the use of the clickers”

**Question: Please list and explain the things that you disliked most about this course/instructor.**

**CSIS200 Related Responses:**

- “I didn't like the participation tickets, I thought that it rather pressured me to say something and had more of a competitive edge in class discussion.”

**Question: Any other comments?**

**CSIS200 Related Responses:**

- “Definitely keep the clickers as a component of the course. It keeps the class engaged.”