

The Use of a Real Time Online Class Response System to Enhance Classroom Learning

Lulu Sun
Department of Engineering Fundamentals
Embry-Riddle Aeronautical University

Abstract

A real time online class response system was used in class to quickly query student population's grasp of concepts, engage class participation, check their attendance, and clarify any misconceptions. The biggest challenges for the instructor are time needed to learn the new system, creating effective concept questions, adequate coverage of course material, and ability to respond to instantaneous student feedback. Student challenges include increased confusion if inappropriate wording for the questions, and a negative reaction to the approach in general. Overall this is a highly flexible use of interactive technology for engaging students in any discipline during the class time.

Introduction

For many years, lectures in engineering field have been delivered in a traditional mode. The instructor talks and students take the notes. Periodically the instructor will either call on a number of students to answer questions or use volunteers (Caldwell, 2007). Although these means may help move towards the active learning to promote an interactive learning environment in the class, the small sample size or volunteers are normally dominated by the better and candid students. This may mislead the instructor into believing that the majority either understands, or misunderstands, the concept being questioned (Caldwell, 2007). It is not until the periodic quizzes or the examination time that, the instructor can assess the proficiency of the entire class. Previous research also has found that students attention spans during lectures is typically fifteen minutes long and after this time their attention begins to drop dramatically. Therefore, Prince (2014) pointed out that breaking up the lecture into discrete sections can refresh the student's mind and help to keep them engaged. To engage students, and have a real time assessment of student's understanding, Class Response Systems (CRS), "clickers", have been seen increased use in many engineering classroom (Petr, 2005; Premkumar & Coupal, 2008; Siau, Sheng, & Nah, 2006; Trees & Jackson, 2007).

Previous research has shown that CRS can enhance student's participation, promote active learning, and develop their critical thinking skills. It can also generate either neutral or positive learning outcome depending on whether it is combined with other cooperative learning strategies (Caldwell, 2007). The disadvantages of using clickers are the cost added to the students, the administration, management and the high life cycle cost of clickers. To take advantage of the CRS, and avoid its disadvantages, the author used PollEverywhere.com, an online real time service for classroom response without using clickers.

Polleverywhere.com as a Class Response System

Polleverywhere.com is an online real time service for classroom response systems. The instructor can create either multiple choice question, true/false question, or open-ended question before the class. The questions can be embedded into PowerPoint slides and activated during the class time. Students can use either their personal cell phone or a web browser to respond. Bar charts of the results can be generated after the question has been completed. This paper presents a pilot study implemented during the fall semester of 2013 and spring semester of 2014 in a Freshman-level engineering graphics course. It is a required course for all engineering students except electrical and computer engineering students.

The purpose of the study is to see if the PollEverywhere.com can be used engage students in the class, catch their misconceptions, and promote their critical thinking skills. Students are required to register an account on the first day of the class so that the attendance can be obtained once they log in their account along with their responses. In this study during appropriately every 20 minutes of the lecture, the instructor paused to ask students to log into their account to respond the question polled on the screen. Figure 1 shows a snapshot of a true/false question and student responses on PollEverywhere.com. The lectures were punctuated by multiple-choice or true/false conceptual questions to test student understanding of the material. Often the distracters (incorrect responses) reflect typical student misconceptions. Based on the student's response, the instructor can choose to either continue the further instruction or pause to clarify any misconception and promote class discussion. Figure 2 (a), and Figure 3 (a) show snapshots of the concept test questions on a PowerPoint slide. Figure 2 (b), and Figure 3 (b) demonstrate the corresponding student responses on PollEverywhere.com. At the end of the semester, students were asked to complete an anonymous survey on the surveymonkey.com to gage their attitude and experiences with this polling system.

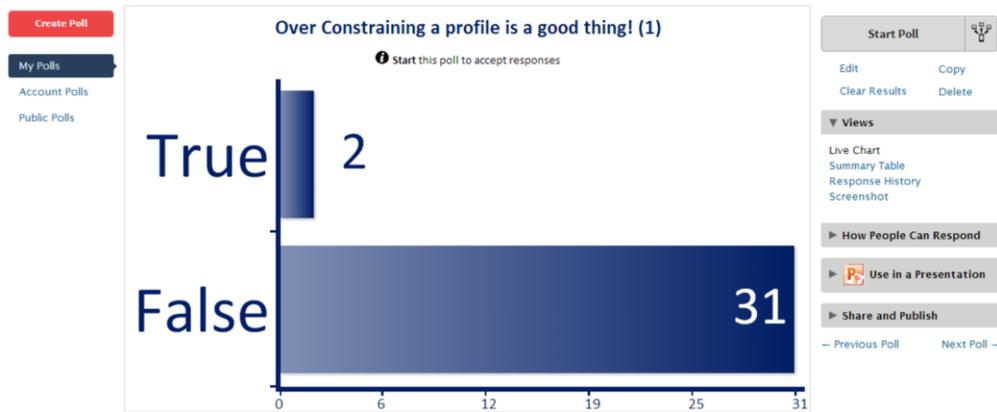


Figure 1. A snapshot of a true/false question and student responses on PollEverywhere.com

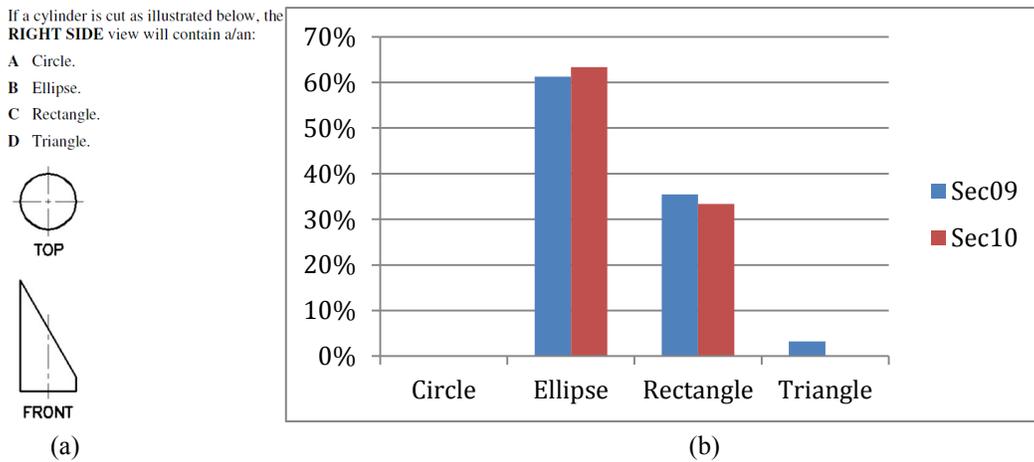


Figure 2. (a) a snapshot of concept test question on powerpoint slide, and (b) student responses on PollEverywhere.com

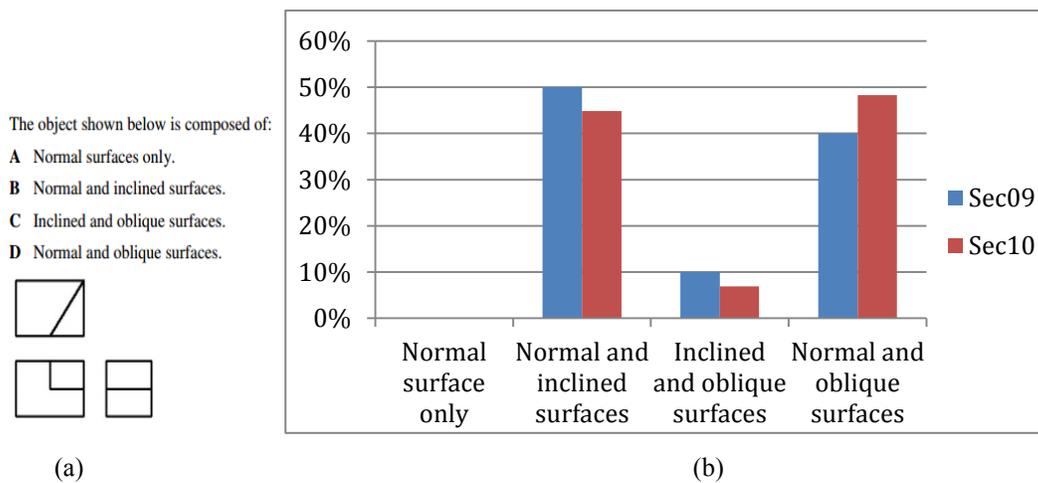


Figure 3. (a) a snapshot of concept test question on powerpoint slide, and (b) student responses on PollEverywhere.com

Assessment

Anonymous surveys were implemented at the end of the fall semester of 2013 and the spring semester of 2014 to gain feedback on the students' attitude towards the use of PollEverywhere.com service. 69% of students in fall 2013 (n=61) and 49% of students in spring 2014 (n=33) completed the surveys. Figure 4 shows the results of student overall experience during these two semesters. The majority liked the PollEverywhere experience and their open-ended comments supported the results as well. In particular they stated that:

"It showed us as we went along how much we knew."

"It gives us a chance to give live feedback to the lesson and for you to correct us if we have errors."

"It was a very intriguing approach to class participation and attendance and I feel it worked very well."

"They let you try out the question yourself, then you go over the answer. That really helps understanding."

"I found it helpful, because discussion usually followed, and the discussions were helpful."

"It gives the teacher a chance to see if there is one thing that all of the students are not understanding, and also lets the students see if they know the content."

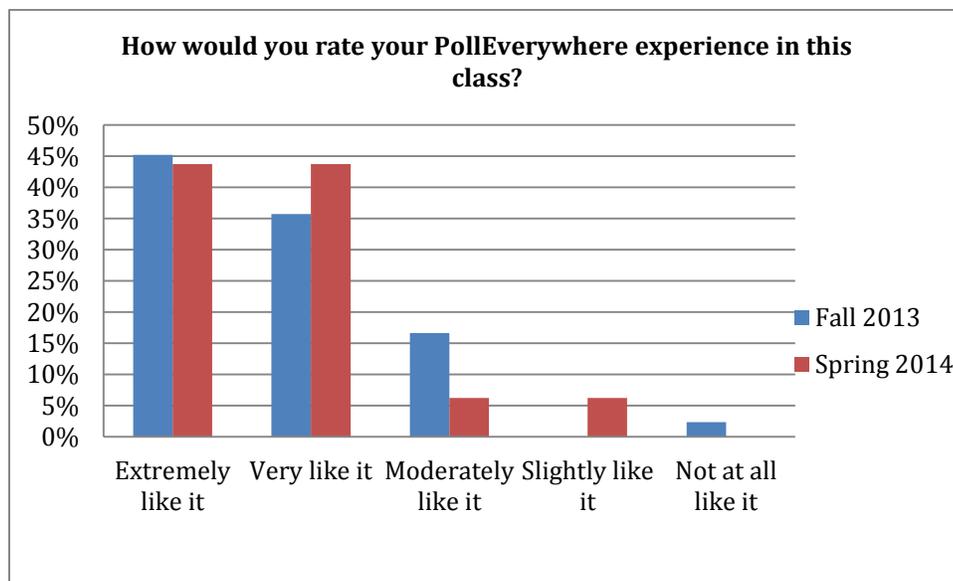


Figure 4. Results of an anonymous survey of student responses in two semesters

The author found that PollEverywhere.com offered a much more cost-effective, convenient, and flexible approach to the instructor and students than the other Class Response Systems that used clickers. For example, the students need not to pay around \$20 for using the clickers in the

semester, as PollEverywhere.com does not charge any fee to the students. Once the university pays the subscription fees for the use of the PollEverywhere.com each semester, any faculty member can use it in any class. The author also learned that it took time to develop good concept questions and multiple choice responses for use in class. The questions need to catch the key concept covered in the class and need to be designed cautiously to prevent misleading students. It also extended the regular class time because of the whole class responses, further discussion and misconception clarification.

Conclusions

A real time online class response system, polleverywhere.com was implemented in the engineering graphics class to query student population's grasp of concepts, engage the class participation, check student's attendance, and clarify any misconceptions. The application received positive feedback from students and did not create negative effects on student learning. However, good implementation could be time consuming and questions need to be designed cautiously to prevent misleading students. Overall it is beneficial to integrate the system into the class time to enhance class interaction and participation.

References

- Bursic, K. M. (2012). *Does the Use of Clickers Increase Conceptual Understanding in the Engineering Economy Classroom?* Paper presented at the ASEE Annual Conference & Exposition, San Antonio, TX.
- Caldwell, J. (2007). *Clickers in the Large Classroom: Current Research and Best-Practice Tips*. Life Sciences Education, 6, 9-20.
- Fies, C. & Marshall, J. (2006). *Classroom Response Systems: A Review of the Literature*, Journal of Science Education and Technology, 15 (1), 101-109.
- Petr, D. (2005). *Experience with a Multiple-Choice Audience Response System in an Engineering Classroom*. Proceedings of the 35th ASEE/IEEE Frontiers in Education Conference, 19-22 October 2005, Indianapolis, Indiana
- Premkumar, K. and Coupal, C. (2008), *Rules of Engagement – 12 tips for Successful Use of “Clickers” in the Classroom*, Medical Teacher, 30, 146-149.
- Prince, M. (2014). *Does Active Learning Work? A Review of the Research*, Journal of Engineering Education, 93(3), 223-231.
- Siau, K., Sheng, H., and Nah, F. (2006). *Use of a Classroom Response System to Enhance Classroom Interactivity*. IEEE Transactions on Education, 49(3), 398-403.
- Trees, A.R. and Jackson, M.H. (2007), *The Learning Environment in Clicker Classrooms: Student Processes of Learning and Involvement in Large University-Level Courses Using Student Response Systems*, Learning, Media and Technology, 32(1), 21-40.