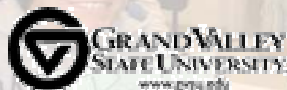


Clickers in the Classroom – Rewards and Regrets of Using Student Response Systems in a Large Enrollment Geology Course



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ABSTRACT

During the Winter 2006 semester, a wireless student response system was utilized in a general education environmental geology course with an enrollment of 140 students. The roughly \$40 cost of the clickers was paid by the university and students checked them out for the semester. Surveys were given to students prior to distribution of the “clickers”, and at the end of the semester, in order to quantify student perceptions of the technology.

Prior to deployment, roughly 60% of students surveyed felt large lecture classes should be more interactive. About 97% responded “true” to the statement, “Having a way to answer questions during lecture and find out if I got them right or wrong immediately would help me to learn.” Over 95% agreed or strongly agreed with the statement “I think having a way to provide real time feedback in a large class would help create a better learning environment.”

The post-semester survey revealed that: 1) 72% of the students felt that the clicker increased their understanding of the material; 2) 96% agreed or strongly agreed that “The clickers made me feel more comfortable responding to questions asked in class”; and 3) Only 35% of the students felt motivated to come to class because of the clickers.

The system chosen: 1) was wireless and used radio frequencies so students did not need to point the clickers; 2) the clicker software was tightly integrated with PowerPoint making conversion of content less time consuming; 3) participation and attendance could be compiled from student responses. Implementation of the clickers in the classroom was made more challenging by two limitations of the student clickers: 1) responses were limited to multiple choices; and 2) the students were not able to review their responses. In general, the level of participation in class was far better than in previous semesters of teaching the same course.



Figure 1. Personal Response System keypads being used in the classroom.



Figure 2. Personal Response System keypads and radio frequency receiver (dark grey). Each keypad was given a unique ID# such as “I-60”.

BACKGROUND

Personal Response Systems (PRS) are an electronic means of obtaining real-time feedback to questions posed by a professor. For small classes, this is probably more efficiently accomplished by direct dialogue between the professor and the students. However, for large enrollment courses (>60), dialogue is hindered by the sheer size of the audience and student inhibitions about speaking out in a large group. Student response systems provide a way for all students to respond to questions posed during a lecture and receive feedback regarding their individual response. The goal of utilizing PRS is to increase student participation and improve performance. Active learning is achieved through student reflection on questions posed during the lecture format.

Studies undertaken by Australian researchers have not reached definite conclusions regarding the effectiveness of PRS in improving exam scores (Sharma et al., 2005).

Questions posed may evaluate student knowledge of a topic just discussed or compile student opinions on a subject as a trigger for further discussion. For example, during my lecture on global climate change I ask the students to respond strongly agree, agree, neutral, disagree, or strongly disagree to the question, “Is global warming occurring?” Student responses can then be evaluated “on the fly” and the lecture can be modified to address opinions in the classroom.

Response systems are good for small group work within a larger audience. Small groups discuss and record their answers using the PRS, allowing the entire class to evaluate and reflect on results.

PERSONAL RESPONSE SYSTEM IMPLEMENTATION AT GVSU

The Information Technology Department (IT) at Grand Valley State University (GVSU) initially investigated PRS at the request of a faculty member who had used a PRS while on sabbatical at another University. This faculty member wanted PRS for a large (140+) chemistry course. Several different vendors of response systems were evaluated through on-site demonstrations given by sales teams.

The IT invited several departments to be present during the demonstrations. Two faculty members used a pilot system in Spring 2005, which did not require monetary investment. Because this system did not work as advertised, we switched vendors for a Fall 2005 pilot. Two Statistics faculty members used the system in Fall 2005. These instructors reported success, as the PRS was both a good tool for judging student understanding and enjoyed by the students.

By the end of Fall 2005, there was excitement among faculty from several departments (Chemistry, Statistics, Geology, Marketing) about using the PRS. In order to meet the most urgent needs, we evaluated faculty who had requested PRS based on their corresponding section size. While cost was an issue, the IT invested in PRS for any course/section over 50 seats. This resulted in the purchase of 720 personal response pads and seven receivers (Figure 2).

The IT worked with the GVSU Statistics Consulting Center to devise a student survey to evaluate perceptions of PRS and its benefits/drawbacks. This short, ten-question survey was given during the courses using the PRS. In addition, students were given access to a survey on Blackboard (the online course management system used at GVSU). In this survey, more detailed response was possible. Students overwhelmingly responded positively, reporting the PRS was useful and gave them anonymity when answering questions in class. Negative comments related to the small size of the keypads, making them easy to lose, and the financial cost involved to students.

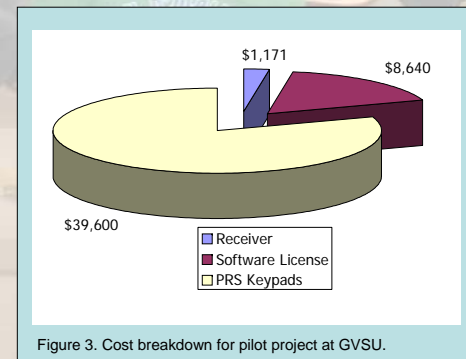


Figure 3. Cost breakdown for pilot project at GVSU.

Six faculty members used the technology during Winter 2006. These courses were smaller in size; the largest being 75 seats. Again, faculty liked knowing if students understood the material as it was presented, rather than after quizzes and tests. And, the students liked being able to participate during class.

Currently, Fall 2006, GVSU has eight faculty using clickers in 12 sections. The largest sections are 150 seats each. Two faculty members are using the technology in different sections of the same course, and another instructor is using one set of 45 PRS keypads in three different sections.

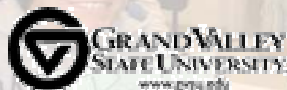
GVSU owns 945 PRS keypads and 11 receivers. One receiver and 30 personal response keypads are on short-term loan. To-date, 19 faculty/staff members have used the technology in their courses or presentations.

Total cost of the keypads and receivers purchased to-date is approximately \$49,500 (see Figure 3).

IT Challenges

- Integration with academic course management systems (Blackboard)
- Getting personal response devices back from students (15 not returned)
- Current technology requires Windows laptop
- Cannot put software on computers in the lecture halls, so laptops are required
- Students do not want to pay for technology
- Bookstore refuses to offer buyback option for keypads
- Time investment for faculty to adapt course materials for PRS

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PRS IN A 100-LEVEL GEOLOGY COURSE

The Geo100 course at Grand Valley State University is an Environmental Geology course geared toward non-science majors. Topics covered in the course include many relevant topics including global warming, air and water pollution, and mining. This course has historically been a large enrollment (150 students) course offered with a smaller discussion section (25 students). It has been a challenge to engage and interest students in the large lecture portion of the course. When offered a chance to pilot the PRS at GVSU, I was excited to try out the new technology as a way to engage students in the large lecture hall. My experience was one of mixed results with the benefits generally outweighing the negative aspects of the technology.

SURVEY METHODS

A voluntary survey was created in a computer software program called Respondus which integrates with Blackboard classroom management software. The survey was uploaded to the course Blackboard site. Students were asked to voluntarily fill out the survey at the beginning of the course. A similar, but not identical, survey was given in class at the end of the term using the clicker system. The response rate for the pre-survey was 110 of 144 students enrolled in the course, and the response rate at the end of the course was 107 of 144 students enrolled in the course.

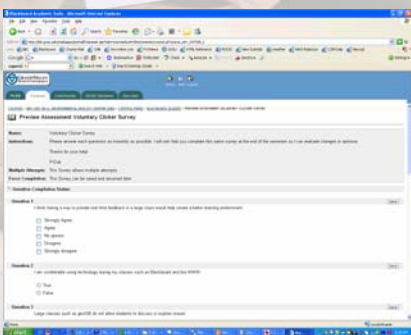


Figure 4. Screen shot of the initial survey in Blackboard course management software.

INITIAL SURVY RESULTS

The initial survey questions were selected to evaluate attitudes toward PRS technology. Student interest in this new technology was strong even though the level of experience was almost non-existent (Figures 5-6). In general, students expressed conformability with technology (Figure 7).

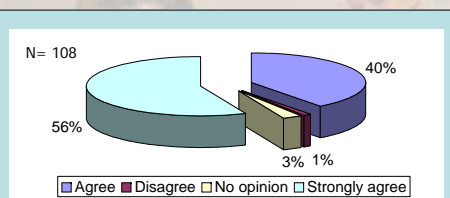


Figure 5. Student responses to the question: "Clickers are a wireless means for each student to provide answers to questions posed on PowerPoint slides during lecture and discussion so that the professor can gauge student knowledge and progress. Clickers sound like a useful tool."

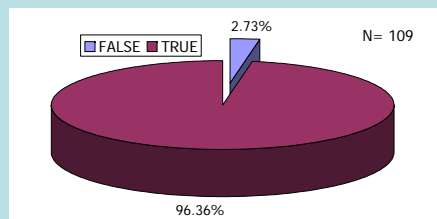


Figure 6. Student responses to the question: "Having a way to answer questions during lecture and find out if I got them right or wrong immediately would help me to learn."

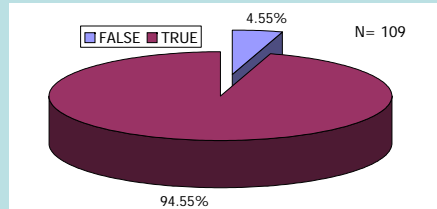


Figure 7. Student responses to the question: "Having a way to answer questions during lecture and find out if I got them right or wrong immediately would help me to learn."

END OF TERM SURVY RESULTS

The post-course survey results revealed a general positive attitude toward the clicker technology (Figure 8). About 28% of the students did not feel the technology improved their understanding of the material. There was a strong sense (96%) that the PRS system gave students a voice in the large lecture environment (Figure 9). Students felt rather strongly that their attendance would not be affected by the use of the PRS system (Figure 10).

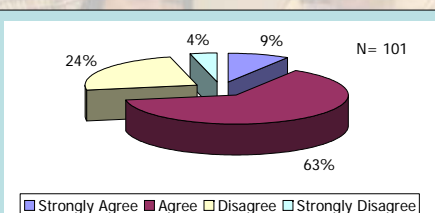


Figure 8. Student responses to the question: "The clickers increased my understanding of the material."

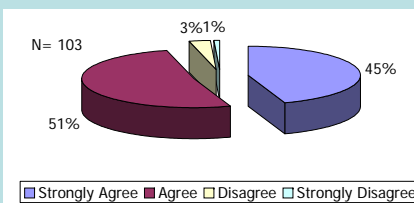


Figure 9. Student responses to the question: "The clickers made me feel more comfortable responding to questions asked in class."

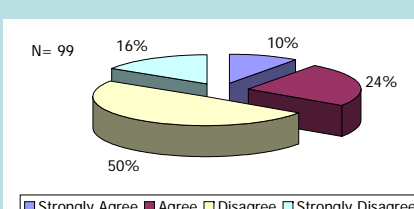


Figure 10. Student responses to the question: "I was more motivated to come to class because of the clickers."

CONCLUSIONS

The positive view of PRS was somewhat lower in the end of term survey than the pre-term survey, indicating that using the PRS system is not a magic means to engage students who are not inclined toward engagement. One of the faculty perceptions going into the PRS pilot was that attendance would improve with the accountability provided by the clickers. Although attendance did improve markedly over previous sections student attitudes toward using the clicker for accountability were negative. This is probably a reflection of student concerns that the clickers represent "big brother" that will actually require them to attend class.

Several difficulties were experienced in implementation of the PRS system. There were numerous times where 5-15 minutes at the beginning of class were lost to due to technical difficulties. It seemed that some sort of technical glitch cropped up every 5-6 times the PRS system was used.

The other challenge of the PRS systems is developing content that is pedagogically sound. There was (and still is) a learning curve to asking the right type of questions that encourage reflection and student participation.

Based on my two years of experience using the PRS system I think the most efficient model for deployment on a large university campus is for students to purchase a PRS keypad from the bookstore as incoming freshman. The PRS keypad could then be used in multiple courses and for the entire time they are at the university.

Future technologies will likely move toward integration of PRS technology with iPods, cell phones, Personal Digital Assistants (PDA), or wireless network devices.

REFERENCES

Sharma, M.D., Khachan, J., Chan, B., and O'Byrne, J., 2005, An investigation of the effectiveness of electronic classroom communication systems in large lecture classes: Australasian Journal of Educational Technology, v. 21, p. 137-154.