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Assessment and Student Response Systems

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While universities are, by nature, information-rich, the campus classroom is one area where immediate feedback on the effectiveness of teaching can be difficult to obtain. Professors often find themselves looking out at a sea of student faces and asking themselves: are the students grasping the content, are they mastering what is important, are they learning anything at all? Although a number of traditional assessment tools, such as response papers, exams, and quizzes, help an instructor answer these questions, some professors at Brown are experimenting with technology that allows instructors to gather that information in an extremely timely and efficient way.

The student response system is a combination of software and hardware that allows students to deliver almost instantaneous feedback to their instructor. Two such systems are being used on campus. "ClassTalk" is a system that is hardwired in a classroom, in this case, a classroom controlled by the Physics department. Physics professor David Lowe used "ClassTalk" last semester in his Physics class, *Foundations of Electromagnetism and Modern Physics*. The Personal Response System (PRS) is a more flexible system, comprised of small student transmitters that look like small remote controls, a receiver about the size of a computer speaker and software that can be installed on any laptop. The PRS software and hardware is owned by CIS and distributed by CIS and the Library. Geological Science professor Terry Tullis used PRS this past semester in his introductory class, *Face of the Earth*.

Both Tullis and Lowe were asked a series of questions about their use of this technology. Below are their responses:

Why did you choose to use a technology-based student feedback system?

Tullis: I wanted the in-class experience to be more interactive. Five years ago I attended a Sheridan Center seminar which emphasized the value of active learning over passive learning. I tried in previous years to generate productive in-class discussion, but I had tended not to persist. This is the first year I really feel like those discussions were a success. The student feedback system makes it easier for the typical professor to get discussion going.

Lowe: The student feedback system was chosen so I could employ Socratic-style teaching methods in a relatively large class. Presenting the students with questions in class and having them respond in real-time helps the students become more engaged with the material. It also helps me zero in on points that need more explanation, as well as identify points that can be skipped.

Were you able to collect different kinds of student feedback with the technology than was available to you before? If so what way were the differences?

Tullis: Yes, because normally you don't get 100% return on how students view the questions you pose in class. Generally, only a few people volunteer answers, but with the feedback system, everybody votes so you get a response from every student to each question. Sometimes I was surprised by a split vote on a question that, in my opinion, had a clear cut right answer, and other times the voting made it clear that everybody was on the same page. It really did help me gauge where the students were and where we needed to focus our attention.

Lowe: For each question the students were shown a histogram of the answers. When a substantial fraction of the students answered incorrectly, I would explain the topic in greater depth and/or ask the students to discuss the answer with their neighbors, before giving them a second chance to answer the question. The correct answer would then be presented along with further explanation to wrap things up. Obtaining this kind of feedback and student participation in large classes is largely impossible without this kind of system. Even in small classes, which can be made highly interactive without technology, this type of system ensures that all the students think through questions, without leaving it to the vocal minority.

How did you use the feedback you collected?

Tullis: Very often, I used [the feedback] immediately in class to make decisions about what we should spend time on. So, in some cases, we spent more time on a topic than I had planned because it was clear that the students hadn't mastered the material yet. The more important way that I used the feedback was to motivate the in-class discussion. I think this is where the student response system was most valuable. Because everybody had voted, they had a vested interest in whether their answer was the right one or not. They also had thought long enough about the question so that when they went to discuss it with other students, they had something to say. They also knew that they were going to have to vote again after the discussion, which motivated them to try and get the right answer the next time. I had tried in previous years to get in class discussion going and the discussions this year were much more animated.

Lowe: 6% of the course grade was based on participation in the "ClassTalk" questions, which I think is crucial to get the majority of students using the system. In future I might consider grading one question per lecture on correctness as well. Obviously the feedback gives a very clear picture of attendance, which can be helpful for identifying, at an early stage, students who are having difficulty.

***In what way did your use of this technology enhance/alter the classroom experience?
How did you assess that change?***

Tullis: My own sense was that it made the in-class experience more of a learning experience and more enjoyable. It drew more people in and was a good motivator for the in-class discussion, which is really what I wanted to do. I tried to ask questions in class that focused on what I knew were subjects that people got hung up on, based on previous years and from questions asked before class. One day we spent the whole class on absolute and relative humidity. I knew in previous years people had difficulty with that topic. I think they really did learn it better this year.

I evaluated the system in a couple of ways. I asked students questions using the voting method and then later had them submit written comments about why they voted the way they did. I asked specifically about the days when we did the in class voting, how often they felt we should do it, and how valuable was voting plus the subsequent discussion. Many of the students' responses confirmed my intuition about the voting and the in class discussions. Excerpts from some of the students' responses are listed below:

"It was fun, it encouraged discussion among students"

"I've changed others' answers and others changed my answers numerous times."

"It helped me learn difficult concepts."

"It makes you really prove your answer, thus making you realize if you know what you are talking about or not."

"At times my neighbors were just as oblivious as I was and discussion didn't help out at all".

Lowe: I think the interactive methods are great for getting the students started in thinking through the material, as well as getting them talking to each other about the material, which often leads to discussions that continue outside class. For example, I think these methods increased the number of students who got together in informal study groups.

It also gives the students instant feedback as to how they are doing -- some students commented this was disconcerting -- but clearly having this information at an early stage is preferable to waiting until after a mid-term. Using these methods leaves one with less time for lecturing, so generally you need to accept that you will cover less material in greater depth than in a traditional lecture format. Since class time is now structured in a more dynamic way, the students no longer get all the basic information from in class note taking (which is certainly common in lecture-style science courses). It is important to have a good text or set of written notes for the students, and to use reading assignments in conjunction with the in-class response system.

As this was my first time teaching a freshman service course, I was not able to get a good assessment of how this changed the classroom experience. The main means of assessment of this method for me was the performance of the students on the written examinations. The majority of the students were able to answer considerably more sophisticated questions than in previous incarnations of the course.