

Program Evaluation: PRS in Pimentel Hall

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OVERVIEW:

The Personal Response System (PRS) was installed in 1 Pimentel Hall over the 2002 winter break. The system is used in every Chemistry 1A lecture this semester. The system is very easy to use, has performed to our expectations and we have had essentially no problems or downtime.

DESCRIPTION OF THE PRS

The Edcue Personal Response System (PRS) is designed for collection and display of real time polling data in a classroom setting. It is composed of a set of receivers (permanently mounted on the walls or ceiling) and individual transmitters for each student. Students use the transmitters (see figure 1) to respond to in-class polls or quizzes. The receivers collect the responses and interface with software on a PC that analyses and displays response data in real time, usually in the form of a bar graph (see figure 2). Systems of this sort are widely used at universities and K-12 schools across the country with pedagogically effective results.



Figure 1: The PRS Transmitter

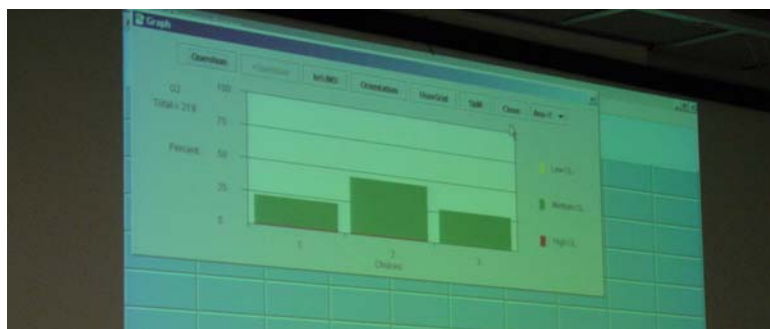


Figure 2: A bar graph result from Chem 1A

INSTALLATION:

The receivers were installed in the ceiling of Pimentel Hall. By coincidence, the ceiling of Pimentel turned out to be an ideal platform for the system, providing not only a simple, completely self-contained platform for the receivers (no wiring was run between the receivers in the ceiling and the lecture hall itself) but a ‘baffling’ for each individual receiver. The baffles around each receiver accelerate data acquisition by limiting the number of transmitters that can trigger each receiver.

USE OF THE PRS:

The PRS system is used in Chem 1A to collect student responses to ChemQuizzes. ChemQuizzes are multiple-choice concept tests presented during lecture and involve two phases; (1) individual consideration, self-discovery and voting and (2) spontaneous formation of small group discussions, peer-instruction and learning.

Figures 3 and 4 show the system in action as students respond to a ChemQuiz. The PRS system output is projected on the upper screen in Pimentel Hall. The lecture content is presented via Flash animation and PowerPoint on the two lower screens and is independent of the PRS system. The multi-colored rectangles in the PRS projection in figure 3 contain the individual student transmitter IDs and appear as students vote to provide feed back to the students. In figure 4, the first phase of voting is complete and the bar graph displays the distribution in student responses.

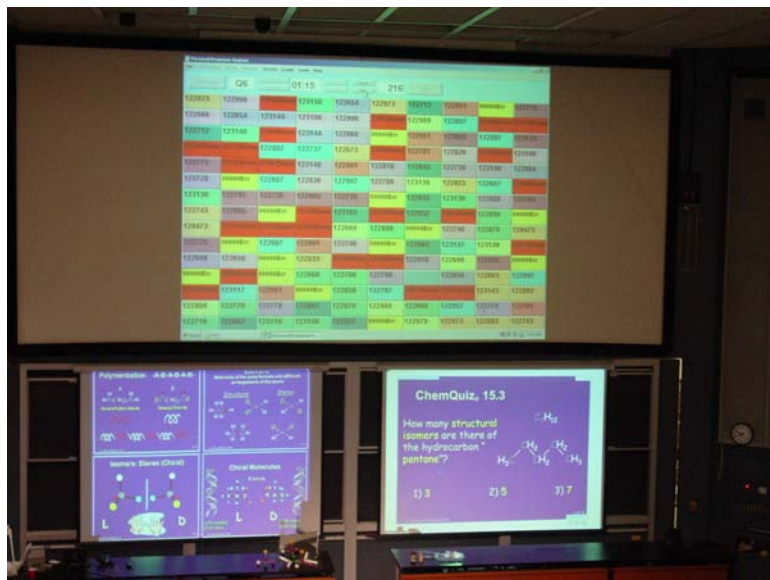


Figure 3: The PRS system in use in Chem 1A.

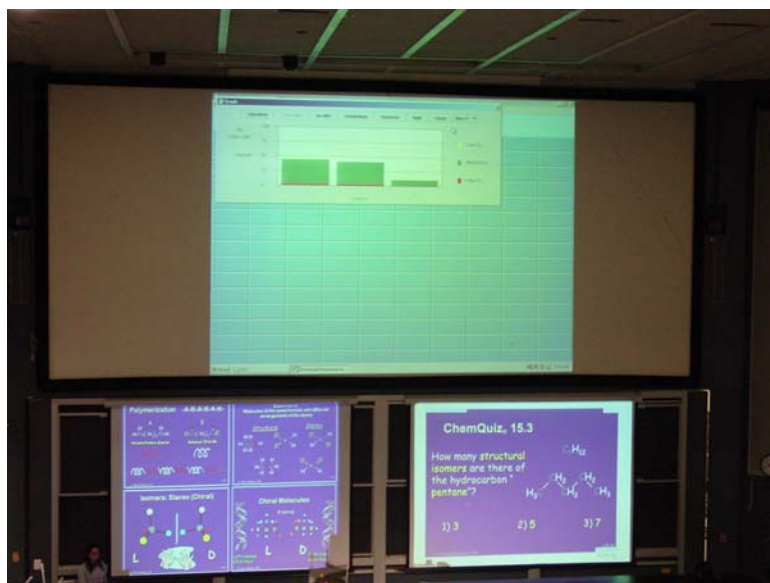


Figure 4: The PRS system output after polling.

The set up of the PRS system before the lecture is very simple and is accomplished by Lonnie Martin and his undergraduate assistants. In Chem 1A, an undergraduate assistant runs the PRS software for the instructor during the lecture, but the system is easy to use and the instructor could run it without assistance.

We did not find that students required any special training to use the system.

IMPACT OF THE PRS:

Figure 5 shows students using the system in Chem 1A. Overall, the PRS has had a positive impact on instruction in Chem 1A and is a very popular feature of the lectures. ChemQuizzes themselves are not new in Chem 1A. In previous semesters the voting was done by show of hands. With the PRS system the response and participation rate among students is approximately twice that observed with the show of hands method. This can be attributed mainly to the anonymity of the PRS, but the novelty is also a factor. The system is just plain fun. This is evidenced by the often audible response to the initial appearance of the bar graph and the ensuing discussions which are made livelier by the increased engagement afforded by the PRS.



Figure 5: Students using the PRS system.

For the reader interested in watching the PRS in action, Chemistry 1A webcast daily at 9 am. A link to the live webcast, and the on-demand video archive of every chemistry lecture this semester can be found on our course website:

<http://www.cchem.berkeley.edu/~chem1a/spring03/> under the “Syllabus” tab.

An unexpected effect of the PRS has been a very high attendance rate for the lecture this semester. The high attendance is due in part to the ‘for-credit attendance’ made possible by the PRS. The credit system works as follows: The complete record of student responses to ChemQuizzes for the entire semester is recorded by the PRS. At the end of the semester, we intend to take the percentage of ChemQuizzes to which a student responds (regardless of the correctness of the response), and multiply that percentage by 1.5. If the result is a number greater than one, we multiply the result by the homework grade for the course.

It is important to note that individual ChemQuizzes are not graded and responses for individual ChemQuizzes are anonymous. This is essential to the pedagogy.

STUDENT COST OF THE PRS:

The attendance-credit system made possible by the PRS was not put in place to increase attendance, but to increase the value of the system to the students. Since the students were required to purchase the transmitters up front, the attendance scheme was designed to add value to the transmitters that students could readily appreciate. Students were required to purchase the transmitters at the bookstore with the course materials. The cost was approximately \$40.

Assessment of the impact of the transmitter cost on students is difficult for several reasons. First, the purchase of the transmitter is a relatively small compared to the cost of the course. In

addition to the transmitter, Chem 1A students are required to purchase the text book, lab manual, discussion manual, lab notebook and a calculator (there is also a lab fee for a total of around \$300). Second, the bookstores have agreed to buy the transmitters back from the students at the end of the semester for use by students in the fall. The buy-back effectively reduces the cost to the student for the current semester and will provide a pool of less expensive transmitters for future semesters.

Initially we did hear some complaining about the transmitter purchase, but it completely disappeared after the attendance credit system was explained. Actually, many more complaints were registered about the calculator. In Chem 1A, a specific brand and model calculator is required for exam security reasons. In the wireless age, we can only allow one approved type of calculator in exam rooms. The calculator cost was only about \$15, but was a source of consternation to students who already own \$100+ calculators.

In the long run, if the PRS system is adopted by other courses, the effective cost will be reduced by volume pricing from the company and availability of used transmitters. If a student can use the transmitter in just two courses, the effective cost per course for a transmitter will be less than \$10. All the transmitters that EduCue provides to Berkeley have unique ID numbers so students can use them in multiple courses and be uniquely identified in each case.

We currently have a reserve of three transmitters that can be used on a case by case basis by visitors to the class room or by students who were unable to afford the initial transmitter cost. These were provided by the manufacturer at no cost. We believe that with wider adoption, we could easily secure up to twenty transmitters at low or no cost that could be assigned on a semester basis to students who cannot afford the initial purchase price. In addition, the computer science department currently has a 'lecture pack' of fifty transmitters.

PRS SUPPORT:

A complete description of how to use the PRS system in Pimentel and contact information for help with the system can be found on the PRS system website at http://www.cchem.berkeley.edu/~demolab/general_txt/prs.htm.