

**Wine Tasting, Physics, and Formative Evaluation: Using Technology For Assessing
Learning in Large (and Small) Classes**

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Introduction

We have all been there, first as a student and then as a teacher. It happens in large and small classes, in elementary school through higher education. The past fifteen minutes have been spent reviewing important and complex material that is essential for the course you are teaching or taking. Upon wrapping up the presentation, the professor asks, “Ok, so are there any questions?” Silence, interrupted by a few coughs, dominates the room as information is spinning through students’ minds. Why don’t students raise their hands and ask questions? Why does the instructor assume that everyone has understood the material and seamlessly moves on to the next lesson? Is there a way to quickly and efficiently gauge student understanding of material in real-time? The answer to all three questions is “yes” and technology is something that can help you.

Since I am a second year doctoral student working on a dual degree in science education and natural resources, I do not have a classroom of my own. Instead I rely on my experience as a student, my knowledge of how people learn, and my time as an instructional technology manager for a university prior to entering my doctoral program. In 2002 at the University of New Hampshire, I was introduced to the world of using technology in large lecture classes to facilitate formative evaluation and student learning. After a rather extensive evaluation of available products, we chose eInstruction’s Classroom Performance System (CPS) technology and installed it in two of the larger lecture halls on campus.

The sections that follow in my essay will serve three purposes:

- Briefly describe the history of using CPS at the University of New Hampshire highlighting lessons learned and results that may be useful to those interested in exploring the use of this technology in your teaching.
- Provide an introduction to using CPS for formative evaluation in the classroom including some theoretical and practical reasons for utilizing this strategy.
- Conclude with some possible applications of using CPS in the geosciences.

What is a Classroom Response System?

For purposes of this short essay, I will use the term Classroom Response System as the overall description of technology used to solicit, collate, and measure responses from students in the classroom setting using technology. CPS or Classroom Performance System referred to in the previous section is an example of one product available on the market presently. My experiences have been with CPS, therefore, this essay will refer to

it specifically. However, it should be noted that there are several other classroom response systems available that you can use to facilitate formative evaluation.

In general, a classroom response system consists of three major components:

- Some kind of remote control-like or handheld device possessed by the students.
- Hardware installed within the classroom to collect the responses from the handheld devices.
- Software possessed by the instructor that collates the responses and displays them in some kind of useful form via a graphical user interface.

Setting the Stage for Formative Evaluation Using Technology

Here's the scene: The instructor displays a question via laptop and LCD projector to a lecture hall clamoring with about a hundred students. She "starts" the software by clicking a button and students point their handheld devices at several receivers mounted strategically throughout the classroom. On the screen, boxes numbered 1-100 (assuming 100 students are in the course) is changing from white to blue as students begin answering the multiple-choice question. After two minutes, the instructor "closes" the question and triggers the software compilation features. In a matter of seconds, a pie chart or bar graph is displayed to the students and instructor revealing only 18% of the students answered the question correctly. Taking into account this information, the instructor realizes that this lesson needs to be re-taught either in today's lecture or in the lab sections. Without this information, what are the chances that the instructor asks, "Are there any questions," and moves on to new material?

Obviously, I have provided an oversimplified account of using this technology and there are logistical and administrative issues that are beyond the scope of this essay. I should also let you know (if you are reading this before the workshop) that I plan to have a demonstration system available during the poster sessions so you can try it out for yourself and see it in action.) If you are interested in the details of our installation at the University of New Hampshire, I'd be more than willing to talk with you and/or put you in touch with the right people.

Will a classroom response system make me a better teacher?

The answer to this is "no." Like any other tool, the technology itself is not going to improve your teaching or students' learning automatically. Instructors that have been successful using a classroom response system all have three key characteristics:

- 1) They have redeveloped a lesson to incorporate the use of this technology. Instead of inserting questions within a 150 slide PowerPoint presentation, they take advantage of the technology's features and redesign their approach to delivering the content.
- 2) Closely related to this is the need for a pedagogical foundation that drives the uses of this technology. A great example of this is using something like Peer Instruction facilitated by a classroom response system for your large class. In other words, grounding your use of this technology with some type of learning theory will increase your chances of success.

- 3) Knowing how and when to ask questions is key to using this approach. Avoid asking “yes/no” questions or even multiple-choice. I have seen successful instructors present two solutions to a problem and ask students to convince the person sitting next to them that one of them is correct. After they come to a resolution, they then answer the question using their handheld devices and the instructor can immediately assess their initial level of understanding.

How does wine tasting fit into this?

In the following section, I will briefly describe a few of the courses at the University of New Hampshire that have successfully integrated CPS into their courses. I judge success by relying on anecdotal evidence from the professors, however, several of them have collected feedback from students during the first two years of the initial pilot project.

Beverage Management

CPS was used in an advanced business class in the hospitality management department. As part of this course, students (all 21 years of age and over) participate in wine tasting as part of their practical experience. The instructor solicits feedback anonymously via CPS as a way for students to safely make mistakes and errors in their evaluations of the many wines presented for review. The instructor has been teaching this course for many years and reported unprecedented levels of activity and discussion after using CPS. This is a medium-size class (50 students) and historically difficult to engage all students due to time and logistical constraints.

Nutrition

All sections of the Nutrition 401 course, the largest undergraduate course at UNH with enrollments regularly exceeding 275 students, have adopted CPS. The technology is mostly used as a “check for understanding” tool with questions strategically placed throughout the lessons. Before CPS, instructors were not able to accurately assess students’ understanding of the material in class. This course also used the technology for administrative tasks such as taking attendance. Administrative uses of CPS have uncovered interesting issues such as cheating and loss/theft of remote devices.

Physics 101

CPS was used by one of our most experienced professors in the delivery of Physics 101 to approximately 100 students. This professor truly used a peer instruction approach to the teaching of this large lecture class and utilized CPS to gather data on student understanding. Most of his questions presented 2-4 solutions to problems. Students would collaborate in small groups to work on the problems and record their answers using the handheld devices.

Conclusion/Resources

A classroom response system has the potential to impact the assessment of learning in the geosciences in several ways. First and most practically, something like CPS can help you, as the professor, gain perspective into how student learning is progressing in the classroom. If you teach a field course in addition to a lecture, this understanding of foundational material can be critical as students attempt to apply this knowledge to real-

world research situations. Second and more complex, CPS could potentially be utilized in the field as students could share field notes, observations, and answer questions all from a handheld device or cell phone. In fact, a previous workshop sponsored by this same group included work being done at the University of Michigan where this is quickly becoming a reality (see Peter Knoop's Geopad page at <http://geopad.org/>). However you choose to utilize a classroom response system in or out of the classroom, you will most certainly open new possibilities for real-time formative evaluations which can lead to better student understanding and an overall improved learning experience for all.

Resources mentioned in this paper:

eInstruction CPS

<http://www.einstruction.com>

Mazur and Peer Instruction

<http://mazur-www.harvard.edu/education/educationmenu.php>

University of New Hampshire eInstruction project

<http://at.unh.edu/idc/peerinstruction/>

Wiley Higher Education Classroom Response System FAQ Page

<http://he-cda.wiley.com/WileyCDA/Section/id-103706.html>

Geopad

<http://geopad.org/>