

December 31, 2001

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Dear Ed & Cliff,

RE: Advisory Board for NSF DUE Project EMD-0088904

Classroom

I think your plans for the classroom layout are fine. The RPI studio format where students work in pairs and turn 180 degrees to either face the instructor or their computer monitor is ingenious. It will work fine for problem-based learning activities, simulated laboratory activities, and for on-line quizzes, but is not ideal for real time concept testing (where everyone sees the results of the concept test survey), although each student could submit his or her answer to the question and then turn to see the overall results.

Faculty will need quite a bit of training to use the facilities. It is especially challenging for many faculty to deal with the real-time information about student understanding (especially when there is a vast range). I'll address this below under strategies for JiTT.

Course

The on-line quiz tool that is most often mentioned at engineering education conferences, and that I hear about during my consulting visits is Computer-Assisted Personalized Approach (CAPA) developed by Ed Kashy and colleagues at Michigan State University. They have presented many papers at engineering education conferences and have won awards for their papers. For example <http://fie.engrng.pitt.edu/fie2000/papers/1045.pdf>. Also, you could visit the CAPA homepage -- <http://capa4.lite.msu.edu/homepage/>

I vaguely recall a talk by Burks Oakley (University of Illinois Urbana-Champaign) where he described on-line electrical engineering quizzes. I suggest that you contact Burks for details.

Sudhir Mehta at North Dakota State University has been using "learning readiness quizzes" in his statics class. They are concept-type tests and their purpose is to ensure (or at least increase the likelihood) that students come to class prepared. Sudhir might be a good person to contact since he's actively involved implementing problem-based learning. His e-mail address is "Sudhir Mehta" <sudhir.mehta@ndsu.nodak.edu>

I'm not familiar with the three on-line quizzing software packages you described. I am familiar with two real time survey tools – Classtalk and Personal Response System (PRS). These two packages are used in conjunction with concept tests. The concept test

questions developed by David Hestenes (included on disk in Eric Mazur's *Peer Instruction*) address several basic EE concepts.

Suggested JiTT with concept tests

A common strategy used with real-time concept testing is as follows:

1. Faculty poses concept test question
2. Each student provides an individual response to the question
3. Students discuss answers in pairs and may change their individual response
4. Faculty displays histogram of student responses
5. Faculty vary response depending on student responses:
 - a. If over 80% select "correct response" faculty asks for an explanation and moves on (noting that a few students didn't choose correct answer and refers them to text or tutor)
 - b. If less than 20% select "correct response" faculty member explains the concepts again in a different way
 - c. If 40-60% select the "correct response," the faculty member turns the task back to pairs of students and asks them to dig a little deeper to come up with a choice of the best answer and an explanation as to why it is the best.

Assessment

I recommend using a variety of course assessment strategies in addition to the individual student learning assessment strategies. For example, you might want to use a mid-semester course evaluation form, or interviews to selected students, or perhaps focus-groups.

Overall

I recommend that you check out Wiggins and McTigue's (1998) *Understanding by Design*. They outline a backward design procedure for course design and it's one of the best procedures for course design available. The three stages of the backward design procedure are:

1. Identify Desired Results
2. Determine Acceptable Evidence
3. Plan Learning Experiences and Instruction

They suggest some wonderful filters for Stage 1:

1. To what extent does the idea, topic, or process represent a "big idea" having enduring value beyond the classroom?
2. To what extent does the idea, topic, or process reside at the heart of the discipline?
3. To what extent does the idea, topic, or process require uncoverage?

4. To what extent does the idea, topic, or process offer potential for engaging students?

I'll send Corel Presentation slides (as a pdf) I developed on their approach (and on course design in general).

Best wishes with your project. I look forward to learning more.

Sincerely,

Karl A Smith
Morse-Alumni Distinguished Professor