

office of **Academic Planning & Assessment**
University of Massachusetts Amherst

Faculty Focus on Assessment

This issue: Steven Goodwin, Professor of Microbiology, and Randall Phillis, Associate Professor of Biology, describe how their Pew grant-funded team used assessment tools to inform the redesign of Biology's large-enrollment introductory course.

The Project Initiative

"We wanted to work practice/feedback cycles into a large-lecture course, which people think of as being the least likely place to achieve such a thing."

– Randall Phillis
Associate Professor of Biology

Before applying for the Pew grant, Goodwin and Phillis had been experimenting with various methods for making their large-lecture classes (200+ students) more participatory for students. They were also interested in incorporating the learning goals developed by the Biology Department*. They were particularly interested in fostering students' ability to "apply problem-solving to learning." As Phillis notes, "We weren't happy teaching students a bunch of facts and not teaching them the skill of using those facts to solve real biological problems. For students to learn skills they need opportunities to practice and receive feedback on their efforts. We wanted to work practice/feedback cycles into a large-lecture course, which people think of as being the least likely place to achieve such a thing." Elizabeth Connor, Associate Professor of Biology, had been experimenting



Biology Course Redesign Project members Randall Phillis and Steven Goodwin

with ClassTalk, a technology that allows students to engage in problem-solving activities in class and get immediate instructor feedback. The Pew Center for Academic Transformation allowed the Department to continue this work by providing a two-year grant to redesign Biology 100 to incorporate technology in ways that would lower costs and improve student learning. Goodwin, Phillis, Connor, and Assistant Professor Steven Brewer were co-principal investigators for the project.

*See Faculty Focus on Assessment, *Spring 2001*, at http://www.umass.edu/oapa/assessment/fac_focus_spring2001.pdf

The Assessment Component

"We were going to compare everything to everything when we first started, and that quickly got out of hand."

– Steven Goodwin
Professor of Microbiology

Assessment question: How effective are tools such as ClassTalk and interactive course websites in engaging students in meaningful problem-solving practice within a large-introductory-class format? Three sections of Biology 100 were offered in the project's first year: one a traditional lecture format; one a partial redesign using ClassTalk; and one a full redesign using ClassTalk and interactive web pages. The analyses focused on possible differences in student outcomes across these courses. "We were going to compare everything to everything when we first started," Goodwin says, "and that quickly got out of hand." Differences

in teaching style and the non-random assignment of students among the classes introduced too many variables to make section-to-section comparisons useful.

While these comparative analyses were not particularly enlightening, the assessment focus did uncover an important pedagogical connection. Phillis and Goodwin noted a disconnect between what students were doing in class and how they were being evaluated on exams. As Phillis says, "Given that we were engaging in significant in-class problem-solving, it seemed crazy to go back to the original exams and ask very *continued*



The Office of Academic Planning and Assessment (OAPA) provides service to the campus community in evaluating student learning and program effectiveness. OAPA can assist departments and individual faculty members in several areas: ■ **Developing evaluation plans** for new programs, grant proposals, and externally and internally funded projects ■ **Exploring and articulating** student learning outcomes appropriate to a course or program ■ **Finding useful ways** of assessing student success in achieving program goals ■ **Developing strategies** for ongoing reviews of program effectiveness for quality improvement, accreditation, and other purposes.

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The Assessment Component continued

memory-laden sorts of questions.” As a result, they revised their assessment strategy, using the data to develop a different set of exam questions. They

focused on students’ performance on the problem-solving questions used during class time and used this to shape improvements to the course.

How the Data Were Used

“The confidence to [focus, right from students’ first course, on problem-solving exercises] has only come because we had the assessment piece behind it that said yes, this is working for the students.”

– Steven Goodwin

One set of data tracked attendance, class website usage, and exam grades for each student. Attendance in the redesigned sections and website use were consistently high, and students performed considerably better on the new problem-centered exams compared to old exams based on recall of facts.

The researchers also used a pre/post test to measure student skill development during the course. On the test, students worked on problems using causal models, responding in both multiple-choice and open-ended formats. Goodwin remarks, “When we went into this we were worried that if we asked students to think in a more critical way, they might not be able to handle it.” But on the post test, students’ scores for problem-solving skills had shifted significantly higher.

Student comments on course and mid-semester evaluations gave specific input on how the website design and in-class feedback were working, and how students were coping with the technology. Instructors spent considerable time

evaluating and revising the questions they wrote for use throughout the course and the kinds of feedback they were offering based on how students were responding. All of this information feeds an ongoing course redesign, including how the website is being revised and how PRS, a wireless system, will replace ClassTalk. The goal is to use the data to inform course changes, evaluate how effective those changes are, and make further adjustments as necessary.

The redesign has evolved into a philosophy of involving students in problem-solving exercises right from their first course, using classroom technology and interactive web pages. “The confidence to do that,” Goodwin notes, “has only come because we had the assessment piece behind it that said yes, this is working for the students.” Phillis says it’s not clear what cost savings were achieved, but it’s clear that “the course has become more interesting and more challenging, and the students are performing better.”

Advice for Other Faculty

“We kept our eyes on the pedagogical goals.”

– Randall Phillis

Goodwin notes, “Don’t be overly ambitious. Start small and ask a few questions about what you’re doing and how it’s working. Then be prepared to listen to what the assessment says. Be willing to say, ‘Okay, I’m going to put the effort into doing this assessment, and I’m going to put the effort into responding to it’.” Phillis adds, “We kept our eyes on the pedagogical goals.

We wanted to push this problem-solving/learning/conceptual understanding issue fairly hard, and we didn’t let go of that. I think that if you keep your assessment goals consistent with your teaching/learning goals, then that serves you best.”

For more information, visit the Biology Course Redesign Project website at <http://bcrc.bio.umass.edu/pew/>

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