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## Introductory Course Makeovers

Intermediate algebra at the University of Alabama used to be your basic introductory class — lecture format, little interaction.

When Joe Benson, senior associate dean in the College of Arts and Sciences, looked at the grade distribution in the Math 100 course in 1999, he was displeased. Fewer than 40 percent of the 1,500 students who enrolled during that academic year received a C- or higher, and many were unable to move onto the next course in the math sequence.

“It was a situation where students, particularly at that level, had a difficult time learning the math in that format,” Benson said. “Their engagement in the course wasn’t as high as we would have liked.”

By fall 2004, the grade distribution was markedly different. Seventy-five percent of students received either A, B or C grades in the course.

What gave?

Early in 2000, Alabama was selected to take part in a course redesign project set up through the National Center for Academic Transformation. The nonprofit organization consults with colleges across the country on how they can improve student academic performance while reducing costs. It advocates more use of technology in large-enrollment, introductory courses, and in some cases replaces lectures with lab time that allow for more individual interaction between professors and students.

With an \$8.8 million grant from the Pew Charitable Trusts, the center provided grants to 30 two- and four-year institutions to take part in its program in course redesign from 1999 to 2004. NCAT reported that student learning, measured through tests before and after, improved at 25 of the institutions and remained equal at the other five. All colleges involved reported cost savings — money that goes back into a department’s general fund, according to the center.

The center is now on its third round of grants. Money is being distributed to roughly 60 institutions for course redesign projects. And several large university systems — including the Arizona Board of Regents, the State University of New York System and the University System of Maryland — have signed on to participate through at least 2009.

NCAT's growth in visibility can be attributed to a confluence of factors. As some of the early grantees have reported results from their redesign projects, word of mouth has spread at meetings of both trustees and faculty.

At the same time, the center's core mission of helping higher education produce more degree holders while becoming cost efficient has been affirmed by the Secretary of Education's Commission on the Future of Higher Education. A report released by the Making Opportunity Available project last week also cited NCAT's efforts.

### **A Menu of Models**

NCAT has identified several redesign models, all of which adhere to the principle that students need more than just traditional lectures. One model reduces the number of in-class meetings and increases lab time. Some simply supplement lectures with out-of-class activities — CD-Rom assignments, online simulations and interactive workshops.

The models stress online assessment that provides immediate feedback to instructors. Administrators can monitor tests given to students before the course redesign and after to measure their subject knowledge.

The idea, says Carol A. Twigg, president and chief executive of NCAT, is to structure courses so that both student and instructor time is best used. Face-to-face time with students is valuable, but sometimes independent learning is more sensible, the NCAT theory goes. Twigg, a former academic administrator and vice president of Educom (the higher education technology association now known as Educause), said the models are meant to give colleges flexibility.

Alabama used NCAT's "emporium" model, which eliminates all class meetings and replaces them with a learning resource center featuring online material and on-demand faculty assistance.

Colleges typically begin with a pilot project and then bring changes to a class over a three-year period. Alabama began its pilot program in spring of 2000, abandoning the traditional three-times-a-week blackboard instruction that accommodated sections of 35 students in favor of a new software program and one-on-one tutorial assistance. The university created a math technology learning center dedicated exclusively to students in the course.

Students work through online math problems, largely going at their own pace and seeking help from an on-site instructor whenever they come across questions. There is generally one required lab time per week.

While some students and parents were initially skeptical, Benson said test scores gradually rose. He was so pleased with the results that Alabama signed on to use NCAT to help with other math courses.

"Math courses are particularly amenable to computer-based instruction," Benson said. "If you walk by a lab and look at the classes, at any point there are people sitting there doing math. If you walk past most college classes, they are sitting there watching an instructor doing a problem. It doesn't translate."

The NCAT Web site lists a number of cost-reduction strategies for colleges that are participating in a redesign: Reduce the number of sections of a course, increase the size of each section, bring in several adjuncts to teach sections of a course that were previously taught by full-time instructors.

Some who read the redesign proposals wonder about staffing implications: Would a college choose to cut faculty jobs as a result of structural changes to a course?

Twigg says none of the models call for eliminating instructor positions, and that replacing faculty with graduate instructors or part-timers is not a predominant technique.

“People naturally think, if you talk about saving money, you’re going to lose jobs,” she said. “We’re talking about changing the way in which faculty work to free them to do other things.”

But Roy Fechner, a math instructor at Alabama, said since several courses have gone to the new model, he is asked to teach fewer sections, which means less income. Other instructors have also reported a workload decrease, he said.

Fechner listed other problems with the redesigned courses. It’s more difficult to check if students are using the correct method to solve problems because process is hard to track with the software. Because instructors now see students once a week in lab instead of three times in lecture, they are asked to disseminate more information in one sitting than many students can digest, he said. And class size has doubled, from 30 to 60 in some cases, making it difficult to tell if students are prepared, Fechner added.

Colleges have reported problems while implementing the course changes. According to the NCAT Web site, in some cases early on, faculty and parents were upset that courses would require less class time and face-to-face interaction. It said students at some institutions were concerned about lack of faculty availability in learning centers. Some teaching assistants weren’t prepared to handle the online technology, and faculty members said teaching in lab setting took adjustments.

Sam Evers, an instructor at the University of Alabama who has taught in the math department for more than a decade, said the redesign has changed the way faculty there look at math courses.

“The human element isn’t gone; if anything it’s more hands-on now,” he said. “Before, if students wanted to ask me a question, they’d have to e-mail me with a question or set up a time during my office hours. Now, they may not get me specifically, but someone will be on site immediately.”

Evers said most of the concern has been from instructors, (introductory math courses aren’t taught by full-time professors) but that most now understand the change simply means a shift in routine, with more time now spent walking the floor of the lab. “You need as many or more instructors to make this work right,” he said.

And then there’s the question of cost savings. NCAT stresses that reshaped courses save institutions money by freeing up faculty time and reducing per-student costs.

Stephen C. Ehrmann, vice president of the nonprofit Teaching, Learning and Technology Group, says that while projects that the center highlights report lower operating costs, the newly designed courses tend to be more capital intensive.

Ehrmann said there is a “loose relationship” between money spent to redesign a course and the educational outcome — in other words, a costly course can be less effective than one that is less expensive to reshape. Models that emphasize materials as a substitute for what he calls “live transmission or interaction” tend to be more rigid, he said.

“It’s harder to adapt to the teaching preferences of faculty A and faculty B, or to changing current events that might affect a course,” he said.

Ehrmann said NCAT’s model also focuses too heavily on redesigning individual courses rather than a sequence or cluster.

### **Working with State Systems**

Large state university systems, many of which are seeing rapid enrollment increases, are signing on to work with Twigg.

This spring, the State University of New York is expected to begin work with NCAT to reshape at least 10 courses systemwide.

The University of Maryland System hired Twigg as a consultant for the next three years to work with 11 colleges. The project coordinators, Donald Spicer and Nancy Shapiro, both associate vice chancellors, said the project will focus on courses that serve as transitions from high school to college work.

“Students who are struggling can get the help they need, and those ready to launch ahead aren’t held back,” Shapiro said of the new course models.

Maryland wants to accommodate more students and add sections. Spicer said some courses are growing in size without the physical space or enough instructors. Twigg is providing feedback to faculty there who are submitting proposals.

Both Shapiro and Spicer said they will measure success by cost savings, dropout rates and major declarations (how many students participating in the pilot courses end up declaring a major in the field where the project took place.)

The University of North Carolina at Chapel Hill is using a grant to rethink how to structure Spanish courses. Half the sections of an introductory class are moving from four hours of classroom time per week (plus office hours) to a setup that is weighted more heavily toward independent work online and virtual office hours, during which time a faculty member will be available online.

Glynis Cowell, director of the UNC Spanish language program, said the change could help accommodate more students. The university — because of lack of physical space

and budget constraints — hasn't been able to meet its student demand in Spanish. She said students will also be able to move at their own pace.

Larry King, a UNC Spanish professor, said those who support the changes say technology provides more flexibility in instruction, gives immediate feedback and allows students to hear authentic language on demand. Critics say it's not sensible to replace face time with an instructor and that cultural context is impossible to pick up over a video.

NCAT has also finished consulting with the Ohio Learning Network. Ohio University was one of the institutions that participated in an orientation that explained the model system. (NCAT didn't follow the progress of a course redesign there.)

Scott Titsworth, associate director for graduate studies in the School of Communication Studies, said changes to an introductory-level communications course has greatly reduced grading time. He said for every hour of class instruction, the professor and two teaching assistants spent four hours grading reflection papers in the 400-person course.

Students now respond to homework assignments in class by answering questions using a clicker system. Titsworth says those responses help spark class discussion. Class attendance is up and there is only a need for one teaching assistant, he said.

Maryn Boess, grants program manager with the Arizona Board of Regents — which began working with Twigg in January — said she hopes to support 10 to 15 projects overall at the University of Arizona, Northern Arizona University and Arizona State University.

"Faculty may not even be aware of the level of discontent with a large lecture course," she said. "Some are still wedded to the large lecture model and haven't become aware of how different it can be. We're riding the coattails of this movement."

— Elia Powers