



THE NATIONAL CENTER FOR  
PUBLIC POLICY AND  
HIGHER EDUCATION

# Policy Alert

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## QUICK LOOK ...

### Key Message

In partnership with 30 colleges and universities, the National Center for Academic Transformation (NCAT) has proven that it is possible to improve quality and reduce cost in higher education.

Course redesign using information technology is key.

### Primary Findings

- ★ Twenty-five of the 30 projects showed a significant increase in student learning. (The other five showed learning equivalent to traditional formats.)
- ★ Eighteen of the 24 projects measuring retention reported a decrease in drop-failure-withdrawal rates, and an increase in course-completion rates.
- ★ All reduced costs by 37% on average (ranging from 20% to 77%) and produced a collective annual savings of about \$3 million.
- ★ Collectively the 30 courses enroll about 50,000 students annually.
- ★ Other positive outcomes included improved student attitudes to the subject matter and increased student and faculty satisfaction with the mode of instruction.

## COURSE REDESIGN IMPROVES LEARNING AND REDUCES COST

By Carol A. Twigg

AMERICAN COLLEGES AND UNIVERSITIES are continuously challenged to increase access to higher education, improve the quality of student learning, and control or reduce the rising cost of instruction.

These challenges are interrelated. As tuition costs continue to rise, access is curtailed. When high failure rates prevent students from successfully completing courses and programs, promises of increased access become hollow.

Solutions to these challenges appear to be interrelated as well. Historically, either improving quality or increasing access has meant increasing costs. Reducing costs, in turn, has meant cutting quality, access, or both.

In order to sustain higher education's vitality while serving a growing and increasingly diverse student body, it must find a way to resolve this familiar—and seemingly intractable—trade-off between cost and quality.

Many colleges and universities are discovering exciting new ways of using information technology to enhance teaching and learning and to extend access to new populations of students. For most institutions, however, new technologies represent a black hole of additional expense.

*“Many colleges and universities are discovering exciting new ways of using information technology to enhance teaching and learning . . .”*

For more information on course redesign and associated cost savings, please visit:  
[www.theNCAT.org](http://www.theNCAT.org)

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## COURSE REDESIGN *(continued from page 1)*

Many campuses have simply bolted new technologies onto an existing set of physical facilities, a faculty already in place, and an unaltered concept of classroom instruction.

Under these circumstances, technology becomes part of the problem of rising costs rather than part of the solution. By and large, colleges and universities have not yet begun to realize the promise of technology to improve the quality of student learning, increase retention, and reduce the costs of instruction.

*“ . . . NCAT has demonstrated how colleges and universities can redesign their instructional approaches using information technology to achieve greater learning success and cost savings.”*

The National Center for Academic Transformation (NCAT) has created a verified course redesign method that addresses these issues. Partnering with 30 institutions\* and supported by an \$8.8 million grant from The Pew Charitable Trusts, NCAT has demonstrated how colleges and universities can redesign their instructional approaches using information technology to achieve greater learning success and cost savings.

The course-redesign projects focus on large-enrollment, introductory courses that reach significant student numbers. Lowering costs in these courses can generate substantial savings. These courses are targeted because undergraduate enrollments in the United States concentrate in only a few academic areas. In fact, just 25 courses generate about 50% of student enrollment at the community college level and about 35% of enrollment at the baccalaureate level.

The insight that these figures point to is simple and compelling: To have a significant impact on large numbers of students, an institution should concentrate on redesigning the 25 courses in which most students are enrolled instead of putting a lot of energy into technology investments in disparate small-enrollment courses. By making improvements in a restricted number of large-enrollment courses, a college or university can literally affect every student who attends.

NCAT offers persuasive data that shows how course redesign using information technology can offer a broad solution to higher education’s historic cost/quality trade-off. Specifically, NCAT’s redesign methodology can address higher education’s primary challenges: enhancing quality, improving retention, expanding access, and increasing institutional capacity.

\*The 30 institutions include research universities, comprehensive universities, private colleges, and community colleges in all regions of the United States.

## ENHANCING QUALITY

Our country takes great pride in the fact that close to 70% of American high school graduates go on to college. But high failure rates in freshman courses—15% at research universities, 30 to 40% at comprehensive universities, and 50 to 60% at community colleges—are costly to both institutions and students. NCAT’s redesign methodology produces consistent improvements in the quality of student learning.

For example:

- ★ At Tallahassee Community College, students in a redesigned English composition course scored significantly higher on final essays, with an average score of 8.34 compared to 7.33 for traditional students. The cost-per-student was reduced from \$252 to \$145, a savings of 43%.
- ★ At the University of Massachusetts, in spite of more difficult questions, scores on exams in a redesigned biology course averaged 73% vs. 61% in the traditional course. Attendance averaged 90% in the redesign vs. 67% in the traditional. The cost-per-student was reduced from \$199 to \$124, a savings of 38%.

*“NCAT’s redesign methodology produces consistent improvements in the quality of student learning.”*

## IMPROVING RETENTION

Many students who begin postsecondary education drop out before completing a degree. An estimated 60% of students at public institutions fail to complete degrees within five years, and half of these students leave during the freshman year. The first year of college is the most critical to a college student's success and to degree completion, and successful completion of introductory courses is critical for first-year students. NCAT's redesign methodology produces increases in course completion and student retention.

*“... students [taking redesign courses] outperformed ... and outscored ... on 29 of 30 items ...”*

For example:

- ★ With an undergraduate minority student population of approximately 46.4%, the University of New Mexico leads the nation's research universities in student diversity. Prior to redesign, 41% of traditional psychology students received a C- or below. This percentage was reduced to 23% after redesign. In addition, the cost of the course was reduced from \$161,184 to \$82,340, a 49% reduction.
- ★ The University of Iowa reduced the rate of Ds, Fs and Withdrawals in its introductory chemistry course from 25% to 13%. Redesign students outperformed (mean score 24.7) traditional students (mean score 19.2) and outscored them on 29 of 30 items on a common chemistry exam. At the same time, the cost-per-student was reduced from \$286 to \$191, a 33% savings.

## EXPANDING ACCESS

*“... institutions [are able] to increase enrollments and provide greater access while maintaining the same or even a reduced level of investment.”*

A widespread problem in many states is that the demand for higher education is greater than what can be met through existing delivery modes. NCAT's redesign methodology enables institutions to increase enrollments and provide greater access while maintaining the same or even a reduced level of investment.

For example:

- ★ Anticipating continued enrollment growth, Florida Gulf Coast University created a redesign model for its required introductory fine arts course that will scale. As course enrollment grows, the cost-per-student will continue to decrease. The cost-per-student for 2,400 students (the projected enrollment in five years) is \$50 compared to \$132 for enrolling 800 students in the traditional format. At the same time, redesign students have achieved a much higher level than traditional students on content knowledge exams (85% vs. 72%). On assessments of critical thinking skills, the percentage of Ds and Fs dropped from 21% to 7%.
- ★ The redesign of introductory psychology at the University of Southern Maine reduced the number of faculty teaching the course and freed faculty to offer a new off-campus version of the course enrolling more than 130 additional students. At the same time, redesign of the on-campus course resulted in significant improvements in overall understanding of course content and a smaller percentage of students who received failing grades (19% vs. 28% in traditional sections).

## INCREASING CAPACITY

Many institutions face escalating demand for particular subjects that they cannot meet because they cannot hire enough faculty members, thus creating academic bottlenecks for students and slowing graduation rates. NCAT's redesign methodology enables institutions to increase student enrollment in such courses without increasing associated costs.

For example:

- ★ Portland State University and the University of Tennessee-Knoxville doubled the capacity of their introductory Spanish courses. PSU maintained section size at 20-24 and doubled the number of sections offered, increasing the number of students from 690 to 1,270. UTK increased the number of students served from 1,500 to 2,000 while reducing the cost-per-student by 74%. At both universities, student learning rose in some skill areas and remained equivalent to traditional formats in others.

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## WHAT ARE THE POSSIBILITIES?

What would be the impact on higher education if all U.S. colleges and universities adopted NCAT's methods to redesign their top 25 courses? The *cost of instruction would decrease* by approximately 16% annually, and *student learning and retention would improve*.

Here's how that 16% cost reduction figure is derived:

- ★ About 42.5% of all higher education enrollments in the U.S. are in the top 25 courses.
- ★ The average cost reduction of the 30 projects that used NCAT's redesign methodology is 37%.
- ★ 37% of 42.5% = 16%.

Here's one way of estimating the dollar impact on all higher education spending\*:

- ★ Enrollment in the top 25 courses by sector in Fall 2003 (IPEDS):

1,412,851 at two-year publics	138,109 at two-year privates
722,478 at four-year publics	542,982 at four-year privates
807,014 at public universities	175,005 at private universities

- ★ Average cost of top 25 courses by sector in Fiscal Year 2003:

\$5,792,689,100 at two-year publics	\$945,078,861 at two-year privates
\$3,702,701,800 at four-year publics	\$4,644,670,594 at four-year privates
\$8,271,896,063 at public universities	\$2,993,983,829 at private universities

- ★ Total cost of top 25 courses = \$26,351,020,246 (sector enrollments times sector lower-division cost per FTE).
- ★ Savings = \$9,749,877,491 per year (total cost of top 25 courses multiplied by 37%).

\* Estimates vary on the total higher education expenditures on lower-division instruction, making it difficult to pin down the exact dollar value of the savings.

*“A billion here, a billion there, and first thing you know you're talking about real money.”*

*— Senator Everett Dirksen  
on the Federal budget*

## INCREASING CAPACITY *(continued from page 3)*

- ★ Facing a classroom space squeeze, the rapidly growing University of Central Florida redesigned its political science course by delivering parts via the Web as a substitute for face-to-face classroom instruction. Two or three courses can now be scheduled in the same classroom where only one could be scheduled before. At the same time, redesign students outperformed traditional students on a content exam, and course retention increased by 7%.

*“NCAT's redesign methodology enables institutions to increase student enrollment . . . without increasing associated costs.”*

## WHAT'S NEXT?

NCAT's goal is now the widespread adoption of its redesign methodology throughout the broader higher education community.

- ★ NCAT has launched a second-phase national redesign program, “The Roadmap to Redesign.” Twenty-two additional redesign projects are underway in math, psychology, Spanish, and statistics.
- ★ Supported by a grant from Lumina Foundation, NCAT is identifying the most effective redesign techniques that improve learning and increase retention for low-income students, students of color, and adults.
- ★ The University of Hawaii System and the Ohio Learning Network have joined with NCAT to establish course redesign programs in their respective states. Twelve additional redesign projects are underway.
- ★ NCAT is engaged in discussions with the Minnesota State Colleges and Universities and the states of California and Florida about replicating the national redesign program locally.



## KEY QUALITY IMPROVEMENT STRATEGIES

Redesigned courses move students from passive note-taking to active learning. As one math professor puts it, “Students learn math by doing math, not by listening to someone talk about doing math.”

### ★ *Online Tutorials*

Interactive tutorials and exercises that give students needed practice and support greater engagement with the material replace standard presentation formats. Students can access information as often as needed.

### ★ *Continuous Assessment and Feedback*

Redesigned courses include automated (computer-based) assessment and feedback that enable both repetition and frequent feedback, techniques that research has consistently proven to enhance learning. Students especially like the instant feedback they receive when doing homework and the guided solutions available when their answers are incorrect.

### ★ *Increased Interaction Among Students*

Courses are restructured to increase discussion among students. Small forums established online let students participate in discussions more readily than in a crowded classroom.

### ★ *On-Demand Support*

An expanded support system enables students to receive assistance from a variety of different people and to feel that they are a part of a learning community, which is critical to persistence, learning, and satisfaction.

### ★ *Mastery Learning*

Redesigned courses add flexibility for students, but they are not self-paced. Student progress is organized by the need to master specific learning objectives according to scheduled milestones for completion.

Good teaching has nothing to do with technology. What is significant about the redesigns is that the faculty involved are able to incorporate good teaching practice into courses with very large numbers of students—a task that would have been impossible without technology.

## ABOUT THE AUTHOR

Dr. Carol A. Twigg is an internationally recognized expert in using information technology to transform teaching and learning in higher education. She serves as President and CEO of the National Center for Academic Transformation.

## ABOUT NCAT

The National Center for Academic Transformation (NCAT) is a national, not-for-profit organization that serves as a resource for colleges and universities, providing leadership in how effective use of information technology can improve student learning while reducing instructional costs.

## KEY COST REDUCTION TECHNIQUES

Since the major cost item in instruction is personnel, reducing the time that faculty and others invest and transferring some of these tasks to technology is key.

### ★ *Online Tutorials*

Instructional software allows much of the time faculty spend preparing lectures, introducing content, and reviewing homework to be transferred to the technology.

### ★ *Automated Assessment*

Automated grading of homework exercises and problems, low-stakes quizzes, and exams for subjects that can be assessed through standardized formats increase the level of student feedback and offload these rote activities from faculty.

### ★ *Course Management Systems*

Sophisticated course-management systems enable faculty to monitor student progress and performance, track time on task, and intervene on an individualized basis.

### ★ *Shared Resources*

When the whole course is redesigned, substantial amounts of time that individual faculty members spend developing and revising course materials and preparing for classes can be reduced by eliminating duplication of effort.

### ★ *Staffing Substitutions*

By constructing a support system that comprises various kinds of instructional personnel, institutions can apply the right level of human intervention to particular kinds of student problems. Highly trained (and expensive) faculty members are not needed to support all tasks associated with delivering a course.

In each case, the whole course—rather than a single class—is the target of redesign. Faculty begin by analyzing the amount of time spent on each activity, which often reveals duplication of effort among faculty. By sharing responsibility for course development and delivery, faculty save substantial amounts of time while achieving greater course consistency.

## RECOMMENDATIONS

We need to change the national conversation about what is possible. Once we break the higher-quality-more-money nexus, we can unleash the creative energies of hundreds—indeed thousands—of faculty, professional staff, and administrators to work on redesigning courses.

- ★ **Establish redesign programs** in states, higher education systems, and community college districts; provide a framework and incentives for institutions to begin the redesign process; partner with NCAT to develop internal capacity that can support the redesign process on an ongoing basis.
- ★ **Demand accountability.** Policymakers and the public need to know what kinds of investments in higher education produce the most effective results. Institutions need to measure both student learning and instructional costs in order to answer the question: *How much learning for how much cost?*
- ★ **Build incentives** into the ways in which higher education is funded—at national, state, and local levels—that will accelerate an ongoing redesign process focused on improving learning outcomes and reducing instructional costs; reward those who make constructive changes, and penalize those who do not.

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