

AN OVERVIEW OF COURSE REDESIGN

by
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In partnership with more than 200 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.

Course redesign is the process of redesigning *whole courses* (rather than individual classes or sections) to achieve better learning outcomes at a lower cost by taking advantage of the capabilities of information technology. Course redesign is not just about putting courses online. It is about rethinking the way we deliver instruction in light of the possibilities that new technology offers.

KEY FINDINGS

- NCAT and its partner colleges and universities have initiated 195 redesign projects, 80% of which were completed.
- Of the 156 completed projects, 72% improved student learning outcomes; 28% showed learning equivalent to traditional formats.
- Of the 156 completed projects, 153 reduced their costs by 34% on average (ranging from 4% to 81%).
Institutions participating in *Changing the Equation*, an NCAT program focused on developmental math at community colleges, reduced their costs by 20% on average; all other redesigns reduced their costs by 37% on average.
- Collectively, the 253 courses that have been redesigned enroll about 250,000 students annually.
- Other positive outcomes include increased course-completion rates, improved retention, better student attitudes toward the subject matter, and increased student and faculty satisfaction with the new mode of instruction.

INTRODUCTION

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 issues 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 are 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. Most

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.

The National Center for Academic Transformation (NCAT) has created a proven course redesign method that addresses these issues. In partnership with more than 200 institutions—with support from private foundations, government agencies and systems of higher education—NCAT has demonstrated how colleges and universities can redesign their instructional approaches using information technology to achieve quality enhancements as well as cost savings. The 200 institutions include research universities, comprehensive universities, private colleges, and community colleges in all regions of the United States.

Most course redesigns focus on large-enrollment, introductory courses that reach significant student numbers. Lowering costs in these courses can generate substantial cost 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 show 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 completion, expanding access, and increasing institutional capacity.

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 Central Missouri, the average Intermediate Algebra final exam score was 63% in the traditional format and 85% in the redesigned format. Student success rates (final grade of C or better) increased from 68% to 85% while the cost-per-student was reduced from \$118 to \$103 per student, a 13% savings.
- 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%.

IMPROVING COMPLETION

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 six 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.

For example:

- Leeward Community College increased its developmental math completion rates from 62% to 67% in Whole Numbers, from 45% to 75% in Pre-algebra and from 56% to 64% in Algebra. The overall cost of the developmental math program was reduced by 18% after full implementation of the redesign, and the cost-per-student was reduced from \$319 to \$287, a decrease of 10%.
- At the University of Maryland Eastern Shore, the number of students who earned a grade of C or better in the traditional chemistry course was 54.5%. In the redesigned course, that number was 69.4%. The average cost-per-student in the traditionally offered course was \$268. That cost decreased to \$80 per student in the redesign, a 70% reduction. The university was able to enroll 30% more students per semester than before.
- 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.

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 course materials 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.

Monitoring and intervention. 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 pedagogy 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.

EXPANDING ACCESS

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 and, at the same time, increasing quality and course completion.

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 go down. The cost-per-student for 2400 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%.
- At rapidly expanding Arizona State University, the number of students served in a redesigned Organizational Behavior course increased from 270 to 360 students, thus reducing the cost-per-student from \$373 to \$154, a 59% decrease. As new larger classrooms are built, ASU will be able to increase annual enrollment to ~500 from the current 360 without needing additional resources. Students in the redesigned course performed better on common content items selected from exams than students in the traditional format. Exam scores in the traditional course averaged 67.4%, whereas in the redesigned course, scores averaged 76%. Student success rates (a grade of C or higher) remained in the 90th percentile.

INCREASING CAPACITY

Many institutions also 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 course without increasing associated costs.

For example:

- At Manchester Community College in Connecticut, section size in developmental math was doubled from 25 students in the traditional format to 50 students in the redesigned format. The cost-per-student decreased from \$255 to \$165, a 35% savings. Instructor time needed to grade homework and prepare materials was significantly less. In addition, instructors were assisted in each redesigned section by two or three tutors, allowing ample time to provide the assistance needed for all students. Comparative student scores on a series of questions embedded in tests and exams showed improved learning outcomes in both courses, from 34% to 50% in Elementary Algebra and from 49% to 57% in Pre-algebra.
- Frostburg State University reduced its cost-per-student in general psychology from \$89 to \$26, a 71% decrease, by tripling section size from 50 to 150 and changing the ratio of full-time to part-time instructors. The redesign reduced the number of in-class meetings by half, replacing them with online activities that included quizzing and small discussion groups. Twelve highly trained undergraduate learning assistants provided support for the online activities. Comparative performance on 43 common questions on a final examination showed

that students in the redesigned course performed significantly better (mean = 77%) than traditional students (mean = 65%). Redesign students also performed significantly better (mean = 2.85) than traditional students (mean = 1.09) on an essay exam graded by a common rubric.

KEY COST REDUCTION TECHNIQUES

Since the major cost item in instruction is personnel, reducing the time that faculty members 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 increases the level of student feedback and offloads 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.

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.

To learn more about course redesign and associated cost savings and how you can create a redesign program of your own, visit www.theNCAT.org.