The **National Center** for
Academic Transformation

Experts in improving learning and
reducing cost in higher education.

HOW TO REDESIGN
A COLLEGE COURSE
USING
NCAT'S METHODOLOGY

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Note: The documents listed below, most of which are interactive forms, are not included in this pdf but are available on NCAT's website at http://theNCAT.org/Guides/AllDisciplines/TOC.html.

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Introduction

From working with large numbers of students, faculty, and institutions since 1999, the National Center for Academic Transformation (NCAT) has learned what works and what does not work in improving student achievement while reducing instructional costs in undergraduate college courses. We call that process *course redesign*.

What does NCAT mean by *course redesign*? Course redesign is the process of redesigning whole courses (rather than individual classes or sections) to achieve better learning outcomes at lower costs by taking advantage of the capabilities of information technology.

The pedagogical techniques leading to greater student success and the cost reduction techniques leading to more-productive learning environments are equally applicable to all disciplines (mathematics, social science, humanities, natural science, and professional studies); to both introductory and advanced-level courses; to on-campus and distance-learning courses; to small, medium-size, and large institutions both two year and four year; and to both traditional-age and working-adult students.

This how-to guide is designed for those of you who want to improve learning and reduce costs in a single course. The guide makes three basic assumptions:

- We assume that your course faces:
  - ✓ Some kind of academic problem such as poor student performance, poor completion rates, or lack of consistency among sections of the course
  - ✓ A financial problem such as budget cuts, the need to serve more students on your current resource base, or difficulty in finding qualified full-time and/or adjunct faculty
  - ✓ Perhaps both

- We assume you have chosen to redesign a course wherein improvements would have a high impact on the curriculum and on large numbers of students. For example, undergraduate enrollments in the United States concentrate in only a few academic areas. In fact, just 25 courses generate about 50 percent of student enrollment at the community-college level and about 35 percent of enrollment at the baccalaureate level. These courses include introductory studies in English, mathematics, psychology, sociology, economics, accounting, biology, and chemistry. By making improvements in a restricted number of large-enrollment courses, a college or university can affect literally every student who attends.

- We also assume you have heard about course redesign and its spectacular track record of proven success. NCAT and its partner colleges and universities have initiated 195 redesign projects, 80 percent of which were completed.
  - ✓ Of the 156 completed projects, 72 percent improved student learning outcomes and 28 percent showed learning equivalent to traditional formats.
  - ✓ Of the 156 completed projects, 153 reduced their costs by 34 percent on average (ranging from 4 percent to 81 percent).
  - ✓ Institutions participating in Changing the Equation, an NCAT program focused on developmental math at community colleges, reduced their costs by 20 percent on average; all other redesigns reduced their costs by 37 percent 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.

This guide focuses on redesigning all sections of a *single* course in any academic area other than mathematics. Two other NCAT how-to guides have been produced: "How to Redesign a Developmental Math Program Using the Emporium Model" describes how to redesign the entire developmental math *sequence* rather than a single course, and "How to Redesign a College-Level or Developmental Math Course Using the Emporium Model" describes how to redesign all sections of a *single* math course at both the developmental and college levels. Although there is substantial overlap between the two guides, there are also substantial differences.

We at NCAT could not have produced this guide by ourselves. It represents a compendium of the good ideas created and actions taken by hundreds of faculty and administrators working on this issue since 1999. In particular, we thank the following colleagues who graciously took the time to review this guide, assuring us where we went right and correcting us where we went wrong: Megan Bradley, Frostburg State University; John Broida, University of Southern Maine; Elizabeth Connor, University of Massachusetts Amherst; Toni Farley, Arizona State University; Ron Gutberlet, Salisbury University, John Harwood, Penn State University; Jennifer Hearne, University of Maryland Eastern Shore; Gordon Hodge, University of New Mexico; Michelle Miller, Northern Arizona University; Eileen O'Brien, University of Maryland, Baltimore County; Sally Search, Tallahassee Community College; and, Jim Wohlpart, Florida Gulf Coast University.

In the coming pages, we tell you how to replicate this success.

I. The Essential Elements of Course Redesign

From working with large numbers of students, faculty, and institutions since 1999, NCAT has learned what works and what does not work in improving student learning while reducing instructional cost. In conducting redesign programs, NCAT's approach has been first to establish a set of broad parameters (e.g., redesign the whole course, use instructional technology, reduce cost) and then to let experimentation bloom within them. From that iterative process, a number of redesign solutions have emerged—some anticipated, some not.

Although all successful course redesigns at NCAT's partner institutions embody the Essential Elements of Course Redesign discussed later, each has chosen a redesign model that implements the elements in ways that vary according to the discipline involved, the particular student audience, and faculty preferences. After examining the similarities and differences in the ways those common elements are arrayed in the various redesigns, NCAT has identified six distinct course-redesign models that are fully described in Chapter III. A key differentiator among them is where each model lies on the continuum—from fully face-to-face to fully online interactions with students.

NCAT has identified eight elements that are essential to successful course redesign. If *any* of those eight elements are absent, it is unlikely that student success rates will improve at reduced instructional cost. If *all* of the elements are present—and you select an appropriate cost-reduction strategy as described in Chapter V—we guarantee that student success rates will improve and costs will reduce. Through the years, faculty members have said to us, "We've done course redesign"—by which they mean they use some form of technology in their classes. Course redesign is not, however, one or two of the following elements; the combination of and interaction among *all eight* are what make course redesign so successful.

Element #1: Redesign the whole course and establish greater course consistency.
Element #2: Require active learning.
Element #3: Increase interaction among students.
Element #4: Build in ongoing assessment and prompt (automated) feedback.
Element #5: Provide students with one-on-one, on-demand assistance from highly trained personnel.
Element #6: Ensure sufficient time on task.
Element #7: Monitor student progress and intervene when necessary.
Element #8: Measure learning, completion, and cost.

#1: Redesign the whole course and establish greater course consistency.

In each course redesign model, the whole course—rather than a single class or section—is the target of redesign. The course is treated as a set of learning materials and activities that can be continuously worked on and improved by all faculty rather than as a one-off that gets reinvented by individual faculty members each term. The collective commitment of all faculty teaching the course coupled with the capabilities provided by information technology leads to success. Information technology enables best practices to be captured in the form of interactive, Web-based materials supported by sophisticated course-management software. Faculty can systematically incorporate feedback from all involved in the teaching and learning process, thereby adding to, replacing, correcting, and improving an ever-growing body of learning materials and best practices.

In the traditional format, consistency among different instructors or different campuses within the same institution is typically lacking. Any course taught by multiple instructors faces the problem of course drift, especially when large numbers of adjunct faculty members are involved. The phrase *course drift* refers to what happens when individual instructors teach the course to suit their individual interests rather than to meet agreed-upon learning goals for students. Course drift results in inconsistent learning experiences for students and inconsistent learning outcomes. Students are usually assessed not in one single way but in a variety of ways, which in turn leads to overall grading differences and grade inflation. Contributors to grade inflation in the traditional format include (1) having no clear guidelines regarding the award of partial credit, (2) allowing students to fail a required final exam yet still pass the course, (3) failing to establish common standards for topic coverage (in some sections, entire topics are not covered, yet students pass), and (4) failing to provide training and oversight of instructors, especially part-time ones.

Course redesign creates consistency of course content and course delivery. A team of faculty is responsible for course development and course delivery strategies to ensure that all students have the same learning experience regardless of the instructor or campus location. And students are assessed on common outcomes by means of common assessment methods. Redesign that ensures consistent content coverage and consistent learning experiences for students produces significant improvements in course coherence and quality control. Training and ongoing monitoring of all instructors (full-time faculty and adjuncts) and other instructional personnel also contribute to consistent student learning experiences and outcomes.

#2: Require active learning.

In the traditional format, students spend a lot of time watching or listening to a lecture given by someone else. The three hours that students spend listening to lectures each week are three hours that could be spent actively engaged with course content.

Each redesign model makes significant shifts in the teaching-learning enterprise so that it becomes more active and more learner centered. Lectures and other face-to-face classroom presentations are replaced with an array of interactive materials and activities that move students from a passive, note-taking role to an active-learning orientation. As one math professor put it, "Students learn math by *doing* math, not by listening to someone *talk* about doing math." Course redesign obligates students to become actively involved in learning the course material. And the role of the faculty moves from one of dispenser of knowledge to one of partner or helper in the learning process.

Instructional software and other Web-based learning resources assume important roles in engaging students with course content. Resources include tutorials, exercises, and low-stakes quizzes that provide frequent practice, feedback, and reinforcement of course concepts. Students may be required to spend a minimum number of hours each week online or in a lab using interactive software for instruction and practice with support from instructors and other instructional personnel.

Online tutorials present course content with links to a variety of additional learning tools: video lessons, lecture notes and exercises, animated examples, step-by-step explanations, electronic textbooks, study plans, homework assignments, quizzes, practice tests, and posttests. Navigation is interactive; students can choose to see additional explanations and examples along the way. The software gives students multiple resources (hints on how to solve problems and exercises, videos, animations, solutions to frequently asked questions, and links to the e-

textbook) to correct their understanding if they do not master a skill. Instructional software supports auditory, visual, and discovery-based learning styles. All resources are in the same online location and can be accessed anywhere, anytime. And students can work on assignments from any computer with Internet access.

Software both provides support and frees up in-class time for other active-learning practices such as in-class or online team-based learning and use of personal response systems, which are discussed in Chapter 6. In moving from an entirely lecture-based to a student engagement approach, learning becomes less dependent on words uttered by instructors and more dependent on interaction with the content undertaken actively by students.

#3: Increase interaction among students.

Students in lecture classes large or small tend to be passive recipients of information, and student-to-student interaction is often inhibited by class size. Course redesign restructures courses explicitly to increase discussion and group work among students. Small-group interaction can be created in large lecture halls, in labs, online, or in a combination of formats.

It is possible to create an active learning environment within a large lecture hall setting by using a combination of group work and student-response systems (clickers). Class time can be divided into 10- to 15-minute lecture segments followed by sessions in which students work in small groups applying concepts to solve problems posed by the instructor. Group responses can be reported through a student-response system. The instructor moderates the discussions and draws out key issues to reinforce specific ideas or reveal misconceptions. Students can peer-mentor each other during in-class discussions. More-knowledgeable students can quickly answer questions from less-knowledgeable ones in their groups, thereby preventing the latter from falling behind.

Lecture time can also be replaced with individual and small-group activities that take place in computer labs staffed by faculty, graduate teaching assistants and/or peer tutors. Increased lab hours enable students to receive more one-on-one assistance. Students welcome the reduction in lectures and the opportunity to work in groups to apply what they have learned from resource materials. Students learn from each other, and they increase their skills in working collaboratively on projects. In addition, peer pressure within groups is a powerful incentive for students to keep up with their work.

Small online discussion groups provide useful and convenient opportunities to increase discussion among students. In smaller discussion forums, students can participate actively. For instance, groups can read and comment on a relevant article in response to questions posed by the instructor, collaborate on homework assignments, and work on group projects. Software enables instructors to more easily and more carefully monitor the frequency and the quality of students' contributions to discussions than they can in a crowded classroom.

Increasing the interaction among students is a well-accepted pedagogical principle that leads to improved student learning. As Arthur W. Chickering and Zelda F. Gamson note in their 1987 *Seven Principles for Good Practice in Undergraduate Education*, "Learning is not a spectator sport. Students do not learn much just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves. Working with others often increases

involvement in learning. Sharing one's own ideas and responding to others' reactions sharpens thinking and deepens understanding."

#4: Build in ongoing assessment and prompt (automated) feedback.

Increasing the amount and frequency of feedback to students is a well-documented pedagogical technique that leads to increased learning. In the traditional model, students typically turn in homework that is hand graded and then returned days after they do the homework and make mistakes. By the time students see the graded homework, they are not sufficiently motivated to review their errors and correct their misunderstandings.

Course redesign utilizes computer-based assessment strategies. A major advantage of using interactive software is the immediate feedback provided for students. Students receive individualized help from the tutorials, practice exercises, and guided solutions that are built into the software. Instant feedback lets students review their errors at the time they make them. A large bank of quizzes for each course topic is built into instructional software, and assignments are graded on the spot. When working a homework assignment, students get immediate feedback that tells them whether an answer is correct or incorrect. Automation of the feedback process grades every problem or question, and students receive specific information about their performance. That automated process in turn leads to more-efficient and more-focused time on task and higher levels of learning.

Course redesign also shifts the traditional assessment approach from one that relies on midterm and final examinations to one of continuous assessment. Students can be tested regularly on assignments via short quizzes that probe their preparedness and conceptual understanding. Such low-stakes quizzes motivate students to keep on top of the course material, structure how they study, and encourage them to spend more time on task. Quizzing encourages a do-it-till-you-get-it-right approach, meaning that students can be allowed to take quizzes as many times as they want to until they master the material. Automation of assessment facilitates repeated practice and provides prompt and frequent feedback—pedagogical techniques that research has consistently shown to enhance learning.

#5: Provide students with one-on-one, on-demand assistance from highly trained personnel.

The traditional model increases the likelihood that students will get discouraged and stop doing the work for two reasons: First, they have to do most of their work (homework) without immediate support, and those who are unable to receive help at the time they need it will too often give up and not complete the assigned task. Second, in traditional lecture and classroom formats, students are usually unlikely to ask questions because of having to admit in front of fellow students what they do not understand. Most students would rather remain invisible than interact with the instructor in that public way—to protect themselves from embarrassment—and so they usually do not get answers to their questions. Office hours attempt to mitigate that problem, but students notoriously do not take advantage of them. Students need help at the time they are stuck rather than during fixed times or by appointment.

Course redesign either replaces or supplements lecture time with individual and small-group activities that take place in computer labs or help rooms staffed by faculty, graduate teaching assistants, and/or peer tutors and/or online, which enables students to access more one-on-one assistance. Highly trained instructional staff are available to provide individual assistance if students encounter difficult concepts while working on course work. The availability of on-

demand individual assistance in the lab or in the computer classroom or online ensures that students receive immediate help when needed.

Offering students help when they need it rather than according to a schedule not only addresses the particular problems they encounter but also helps keep them on task. Students cannot live by software alone. When they get stuck, the tutorials built into most software programs are not enough to get them moving again. Students tune out less when they receive targeted information to meet their perceived needs. They need human contact as well as encouragement and praise to assure them that they are on the right learning path. Helping students feel they are a part of a learning community is critical to persistence, learning, and satisfaction.

An expanded support system enables students to receive help from a variety of people. The varying levels of personnel let students seek help from someone with whom they are most comfortable and whose teaching style is best suited for their individual learning needs. So-called teachable-moment opportunities in the lab or classroom enable instructors and students to build relationships and further foster learning. In addition to providing individualized assistance for students, faculty and others responsible for the course can learn which areas are most difficult for students and can continuously improve the learning activities included in the course.

By constructing support systems comprising various kinds of instructional personnel, course redesign applies the right level of human intervention to particular student problems. Highly trained, expert faculty members are not required for all of the tasks associated with a course. By replacing expensive labor (full-time faculty members and graduate teaching assistants) with relatively inexpensive labor—less expert (adjunct faculty members, undergraduate peer mentors, and course assistants) when appropriate—it is possible to increase the person-hours devoted to the course and the amount of assistance provided for students.

#6: Ensure sufficient time on task.

As Chickering and Gamson note in *Seven Principles for Good Practice in Undergraduate Education*, "Time plus energy equals learning. There is no substitute for time on task. Learning to use one's time well is critical for students and professionals alike. Students need help in learning effective time management." Even though we know that time on task is essential to effective learning, it is difficult for faculty members in traditional formats unaided by technology to first ascertain how much time on task each student is actually spending and to then take corrective action.

NCAT has learned that student participation in all course activities—whether in the classroom, in the lab, or online—*must be required*. As NCAT's Redesign Scholars have repeatedly said, "Don't even bother to redesign if you are not going to require participation in all learning activities." It is absolutely necessary to have an incentive for attending lab or class as well as for participating in online activities and to have a penalty for not attending lab or class and not participating in online activities. At successful institutions, attendance/participation counts as 5 to 10 percent of the final grade, which provides sufficient motivation for most students to attend lab or class and participate online. Some institutions penalize students for lack of attendance (e.g., students who miss, say, 12 hours of class are administratively withdrawn from the course). Since 1999, NCAT has repeatedly seen that when institutions have neither an attendance/participation policy nor a reward (points) for meeting that policy, most students do not attend or participate consistently. "Freshmen don't do optional" is another mantra of successful course redesign. Whenever optional activities are offered, the vast majority of students fail to take advantage of them. When students participate and do the work, they

become able to master the concepts and succeed. Students participate more, score higher, and spend longer amounts of time on learning activities when course credit is at stake.

Even though course redesign may add greater flexibility to the times and places of student engagement with the course, the redesigns are *not* self-paced. Some institutions initially thought of their designs as self-paced, open entry/open exit, but they quickly discovered that students need structure (especially first-year students and especially in disciplines that may be required rather than chosen) and that most students simply will not succeed in a self-paced environment.

Course redesign ensures student pacing and progress by requiring students to complete learning activities and master specific learning objectives according to reasonably established milestones for completion. Students need a concrete learning plan, especially in more-flexible learning environments. Weekly, achievable schedules provide a guideline for students in terms of the pace of work necessary to complete the course on time. Such schedules are of significant value in helping students see what they have left to accomplish in the course and in ensuring that each course can be finished within one semester.

#7: Monitor student progress and intervene when necessary.

Requiring attendance and awarding attendance points are essential, but they are only the starting points. Two additional steps need to be taken: First, someone—typically, the instructor but sometimes another person—must monitor each student to see who is and who is not meeting the attendance policy. Which students are lagging behind? Which students are not coming to class and not doing the work? Second, once those students have been identified, follow-up is crucial. Someone must consistently contact them—by e-mail, telephone, text, or tweet or in person—and indicate clearly that they are expected to come to class and do the work.

Most software packages have excellent tracking features, enabling faculty members and others to monitor the time each student spends using the software and completing assignments plus how well the student performs on quizzes and exams. Record keeping is made easy through an online Gradebook. Instructors who require that students spend hours in an open lab can be provided with logs in which they indicate the dates and time intervals that students visit the open labs.

Other options for monitoring student progress include use of (1) a weekly score sheet that shows points for staying up-to-date with videos, worksheets, homework, and quizzes as well as points for class and lab attendance and (2) a paper workbook or notebook that students are required to maintain that contains class notes, notes from the software's learning tools, and solutions to exercises and that facilitates working through the steps of problems by hand. By recording the progress of all students every week in each student's respective workbook or notebook, instructors can knowledgeably discuss progress in the course with each student.

At many institutions, instructors or other personnel meet weekly with each student individually to assess the student's progress and help the student design a course of action for the next week. That face-to-face meeting helps students develop a sense of personal responsibility for their work. Such weekly meetings enable both students and instructional personnel to become more comfortable with each other, and they provide additional support and encouragement for students. Whatever the method, instructors must monitor each student's progress as well as time on task and take appropriate action when needed.

#8: Measure learning, completion, and cost.

Very few institutions consistently measure student learning under the traditional model. Almost none measure instructional costs. Some may know their "pass" rates based on final grades, but few have examined whether or not those grades are awarded fairly. National statistics show that exit rates from many introductory courses are not what they should be at most institutions, yet few are changing how they teach; and even fewer are measuring the impact of any changes they try to implement.

An important element of course redesign is measurement—both initially and on an ongoing basis. To demonstrate that course redesign (1) increases student-learning outcomes, (2) improves student success rates, and (3) reduces instructional costs, NCAT's redesigns measure those three factors under the traditional format and again after a redesign is fully complete. As a result, we have hard data that demonstrate conclusively that course redesign accomplishes those three goals.

Measurement of whether redesign has in fact met the three aforementioned goals provides clear evidence of course redesign's efficacy for those who feel uncertain about whether redesign is a good idea. Having data that demonstrate that students learn more content and complete courses in greater numbers while costing both students and the institution less is persuasive to both faculty and administrators. Data that show no change or poor results are clear signals to the redesign team that something has gone amiss in the implementation.

Measurement of the three factors must be ongoing. NCAT has found that over time, initial learning and completion results after the first term of full implementation have continued to improve at higher rates. The only way to know that such improvements occur and continue— and the only way to know whether the results do not continue—is to consistently collect data and analyze the results. By annually assessing student-learning outcomes, course completion rates, and instructional costs, an institution can assure all stakeholders that redesign continues to work as initially conceived and implemented.

II. Getting Ready to Redesign

Before they begin a course redesign, most institutions have found it extremely useful to think through their readiness to engage in the endeavor. An institution has two categories of issues to consider when assessing its readiness to undertake course redesign: institutional support for the redesign and available resources to support the redesign. Successful redesign requires that both institutional support and needed resources be in place before a redesign begins.

Assess Your Institution's Readiness to Redesign

<u>Campus Support</u>

Do you have sufficient support on campus to initiate a redesign? If not, you need to develop a plan to secure that support before beginning an actual redesign plan.

- *Faculty Support.* This guide assumes that those who wish to initiate a course redesign have identified the academic and/or resource problem(s) that course redesign can correct. You need to clearly specify the problem and gather data that supports the need for change— such as student pass rates for the past several years and the percentage of students who successfully complete the course. The question then becomes, Do all faculty members in the department understand the nature and extent of the problem? Even though many of the institutional teams that have worked with NCAT believed that the scope of their identified problem and the need to solve it were well-known among their peers, they subsequently learned that others did not share that understanding. That's why you need to be sure that all department members are aware of the problem and supportive of the need to correct it. Most faculty members are not familiar with course redesign and will need assistance in understanding it.

- *Administrative Support.* Do academic administrators (department chairs, deans, vice presidents, provosts, and presidents) understand the nature and extent of the problem? Have they seen the data? Even though many administrators do understand the scope of the problem the course faces (indeed, it may be the administration itself that initiates the redesign), others, surprisingly, do not have that understanding and will need to be informed. Most administrators are not familiar with course redesign and will need assistance in understanding it. Administrative issues will need to be addressed throughout the redesign process, and campus resources will be needed; consequently, having solid administrative support is extremely important to the success of the redesign. In addition, administrators may need to step in to support the redesign effort when colleagues or other departments or divisions question the redesign. Senior administrators must be prepared to provide that support.

- *Unionized Campuses.* Faculty unions strive to ensure that faculty members work in a secure and productive working environment with a reasonable workload. On some campuses, work rules may seem to be obstacles to redesign. Because one of the goals of course redesign is to reduce instructional costs, unions sometimes conclude that faculty will automatically lose jobs or be required to carry heavier workloads. NCAT has successfully worked with institutions in many states that have faculty unions, including Massachusetts, New Jersey, and New York. The campus administration and those initiating the redesign need to take into account the specific union contract under which the redesign will occur.

NCAT's Scope of Effort Worksheet (see Appendix D) has been designed to help campuses document that the number of hours faculty devote to the redesigned course will be the same as or fewer than the number of hours devoted to the course's traditional format, even if class size grows or the number of sections that faculty carry increases. This is possible because course redesign off-loads to the technology certain tasks like monitoring student progress and grading. Explaining how this occurs and documenting the changes by using the Scope of Effort Worksheet enable redesign leaders to help union leadership understand the benefits of redesign for both students and faculty. Having union support is crucial to successful change on a unionized campus.

Financial Support

Do you have sufficient financial resources available to support a redesign? If not, you need to develop a plan to secure that support before beginning an actual redesign plan. Financial resources may be needed to support three things depending on the nature of the redesign.

- *Faculty Released Time.* To focus on planning the redesign, a subset of full-time faculty will need released time from some or all of their teaching responsibilities. Financial resources will be needed to pay qualified adjuncts to teach those sections so that faculty who are key to the redesign can have time to do the work. Not all faculty involved in the redesign need released time. Those granted released time should hold pivotal roles in the planning and development of the redesigned courses.

  NCAT does not recommend using extra service or overtime pay rather than released time. Because faculty members were presumably fully employed prior to the beginning of the redesign process, paying overtime means that faculty must work on the redesign after hours or on weekends. The use of overtime payments also means that faculty may incur difficulty in scheduling important meetings with team members or others on campus. The overtime payment method of remuneration forces faculty to place the redesign lower on their priority list because their current classes and students must come first.

  If the planning schedule permits, paying stipends during the summer may work. Some faculty cannot be released during the year for various reasons, which prohibits their participation in the redesign project. If you decide to pay summer stipends, it is important for all participants to be on campus with a regular meeting schedule and set tasks to complete as part of the redesign's development.

- *Technological Infrastructure.* Some institutions have robust infrastructures, but many need to expand their infrastructures to support larger labs or to equip small classrooms. Typically, course redesign means more students will be using on-campus computers and accessing the campus network. Thus, an institution's technological infrastructure will need to be examined and may need expansion as new demands are placed on it and the volume of student engagement increases. Again, senior administrators are typically those who make such important infrastructure decisions. As noted earlier, they must understand the reason for the redesign and the anticipated benefits for students and the institution.

- *Computer Labs/Classrooms.* Some institutions have existing computer labs/classrooms that are underutilized and can be rescheduled and repurposed. Other institutions will need to expand the labs/classrooms they have because more students will be using them than were using them before the redesign. Still others will need to build new labs/classrooms. When repurposing or expanding existing labs/classrooms or creating new ones, senior

administrators are typically those who make such important space decisions. As noted earlier, they must understand the reason for the redesign and the anticipated benefits for students and the institution.

Even though all successful redesigns will reduce instructional costs over time, some financial resources are needed up front. (Funds that will be needed as an ongoing feature of the redesign to buy software or technology-based services such as grading assistance or tutoring should be included in overall redesign planning.) Where do those financial resources come from? Some institutions have redirected internal funds to support redesign. Other institutions have received outside funding from Title III or Title V grants or from private foundations that seek to improve student retention and success. The ability to articulate clearly the problem the institution is trying to solve by implementing course redesign will go a long way to enabling funders (either internal or external) to understand and support the redesign effort.

Prepare to Develop a Plan

Once the institution has a clear understanding of its goal and believes it has the necessary support and resources to move forward in the development of a redesign plan, both faculty and administrators need to learn more about course redesign, what its strengths are, and how it actually works.

Establish a Course Redesign Team

The first step in developing a redesign plan is to form a course redesign team. Successful course redesign is the product of a team effort. It is neither a faculty project nor an administrative project nor a professional staff project. It takes *all* of those people—because it is a team effort. In evaluating prior redesign programs, we have found that taking a team approach always receives the highest possible rating from participants.

Institutions should establish institutional teams that include the following types of people.

- *Faculty Experts.* Course redesign requires that faculty experts explicitly identify a course's desired learning outcomes and agree on course content. Most courses appropriate for course redesign are typically taught by more than one faculty member. To ensure course consistency, faculty experts must work together on the redesign—resolving any differences in how the course will be offered—and must collaboratively plan the most effective way to accomplish the redesign goals.

- *Administrators.* Because redesigns affect multiple sections, large numbers of students, and academic policies and practices, it is important that the team involve academic administrators. The level of those administrators will depend on the organization of the institution and the institution's size. For some, it will be the provost/academic vice president or designee; for others, it will be a dean or department chair. Those team members play important roles when institutional issues arise such as changes in scheduling or the use of classroom space. If unexpected issues arise in the process of redesign implementation, administrators can help the team resolve them quickly and effectively across institutional offices.

- *Technology Professionals.* These team members provide expertise so that the redesign goals are accomplished in ways that make the technology as easy as possible for students to use. Technology professionals contribute ideas about how to increase interaction with

content as well as with other students. They also suggest design approaches that ensure that the technology will not limit students' learning options.

- *Assessment Experts.* In Chapter VII, NCAT sets forth straightforward methods whereby student learning in the redesigned course can be compared with student learning in the traditional course. It is, however, useful to include on the team a member who is knowledgeable about assessment and research design—especially if the institution seeks to measure additional facets of the redesign such as performance in downstream courses or student satisfaction. Such expertise may be found in a department of education or a department of psychology or in offices of institutional research.

- *Instructional Designers.* If your campus is fortunate to have instructional designers on staff, you may wish to add one to the team. An instructional designer can help guide the re-sequencing of instruction and provide insight into learning theory and modularization. Subject matter experts are not always learning experts, and such guidance can be crucial.

Take Advantage of NCAT Resources

- *Background Reading.* Following is a short bibliography of NCAT articles about course redesign. Distributing the articles among the redesign team and other colleagues on campus and discussing them as a team and with others are good activities to pursue in preparing to develop a redesign plan.

    <u>An Overview of Course Redesign</u>
    This article provides a brief overview of NCAT's course redesign methodology and outcomes.

    <u>Increasing Success for Underserved Students: Redesigning Introductory Courses</u>
    This report examines the impact of the redesign techniques developed by the Program in Course Redesign on the success of adult students, students of color, and low-income students.

    <u>Improving Learning and Reducing Costs: New Models for Online Learning</u>
    This is an edited version of a September/October 2003 *EDUCAUSE Review* article that describes the six redesign models that have emerged from NCAT's Course Redesign programs.

    <u>Lessons Learned</u>
    Each of the following three monographs offers an in-depth analysis of Program in Course Redesign projects, with a focus on the most important quality improvement and cost reduction techniques used in the redesigns, the implementation issues they encountered, and the projected sustainability of the course redesigns.

    <u>Round I Redesigns: Lessons Learned</u>
    <u>Round II Redesigns: Lessons Learned</u>
    <u>Round III Redesigns: Lessons Learned</u>

- *Redesign Case Studies.* NCAT has provided the higher education community with almost 200 case studies of redesigns that both improved learning and reduced costs (see <u>http://www.theNCAT.org/PCR/Proj_Success_all.html</u>). The case studies are sorted by

discipline, redesign model, and degree of success. The NCAT Web site has an array of free resources for those seeking to implement a successful redesign, including those at both two-year and four-year institutions.

Campus Visits. The redesign team should consult with and visit institutions that have successfully implemented this model. Visiting multiple institutions is a good way for teams to observe exactly what occurs in a course redesign and to see actual interaction between students and instructors. The team can also discuss issues that may have arisen during the planning stage. Campus visits have been definitive in convincing faculty and administrators who may have hesitations about course redesign or who cannot envision either exactly how it would work in practice or its effectiveness.

It is also important that senior administrators understand the benefits of course redesign. After some explanation from faculty and the department chair, senior administrators might find it useful to talk to or visit colleagues at institutions that have redesigned a course by using the NCAT model. Same as in the case of faculty, when senior administrators see course redesign in action, talk to students, and talk to their colleagues, they tend to understand that course redesign is a viable way to solve both academic and resource problems at their institutions.

- *Redesign Scholars.* In 2006, NCAT established the Redesign Scholars Program to link those new to course redesign with more-experienced colleagues whom they can turn to for advice and support. Trained in NCAT's course redesign methodology, Redesign Scholars have led successful redesigns that have been sustained over time. Only exemplars in course redesign are selected to be Redesign Scholars.

  Individual institutions that want to initiate course redesigns may wish to invite a Redesign Scholar to visit their campuses. Site visits focus on issues of curriculum and pedagogy, administrative matters, assessment and evaluation efforts, and implementation issues. Redesign Scholars are also available to campuses via telephone and e-mail for ongoing consultation. Redesign Scholars are engaged on a per-event basis and determine their consulting fees individually.

  Follow the links at http://www.theNCAT.org/RedesignAlliance/ScholarsList.htm to read about each Redesign Scholar's background and redesign project in order to choose someone who would make a good fit with your particular redesign idea. Contact information is also provided.

Readiness Checklist

- Have you clearly identified the problem the redesign will solve? Do you have data to support the extent of the problem? Do others on campus also acknowledge the problem?
- Do you have sufficient resources to support the redesign? Have you identified sources of external or internal funds to support the redesign?
- Do the senior administrators who make funding and space decisions understand the needs of the redesign? Do they have sufficient information to make appropriate decisions?
- If your campus is unionized, has the redesign plan been discussed with union leadership? Have you shared the Scope of Effort Worksheet to document that the redesign will not increase workload?

- Have you formed a redesign team that includes faculty, administrators, technology professionals, and assessment experts? Does the team understand the scope of the task?
- Have you established specific assignments for team members and others for the planning period?
- Have the team and others read about successful redesigns on the NCAT website and discussed them?
- Have you visited other campuses that have implemented successful redesigns, or have you had telephone discussions with their faculties and administrators? Were others who might have reservations about the redesign invited to join the visits or the phone calls?
- Have you considered asking one or more NCAT Redesign Scholars to visit your campus and provide advice about the redesign?

IIIA. Six Models for Course Redesign: Those Most Frequently Used

Although all successful course redesigns at NCAT's partner institutions embody the Essential Elements of Course Redesign discussed in Chapter I, each has chosen a redesign model that implements the elements in ways that vary according to the discipline involved, the particular student audience, and faculty preferences.

In conducting redesign programs, NCAT's approach has been first to establish a set of broad parameters (e.g., redesign the whole course, use instructional technology, reduce cost) and then to let experimentation bloom within them. From that iterative process, a number of redesign solutions have emerged—some anticipated, some not.

After examining the similarities and differences in how those common elements are arrayed in the various redesigns, NCAT has identified six distinct course-redesign models: supplemental, replacement, emporium, fully online, buffet, and linked workshop. A key differentiator among them is where each model lies on the continuum: from fully face-to-face to fully online interactions with students.

The models are not intended to constrain those beginning a course redesign, nor are they the only possible options for improving learning while reducing costs. In the initial stages of trying to improve courses, redesign teams face a multitude of different ideas about things they might do. Beginning the redesign process by identifying the model that seems right for their redesign ideas helps them rapidly move from being presented with a seemingly overwhelming menu of choices to focusing on a few that are best matched to their goals for the course.

In this chapter we discuss the first three of the six models: supplemental, replacement, and emporium. Slightly more than 90 percent of NCAT redesigns have used one of these three models. Following are summaries of the characteristics of the first three course redesign models that have emerged from NCAT's course redesign programs.

The Supplemental Model. The supplemental model retains the basic structure of the traditional course. It either supplements lectures and textbooks with technology-based, out-of-class activities or also changes what goes on in class by creating an active learning environment within a large-lecture-hall setting.

The Replacement Model. The replacement model reduces the number of in-class meetings and either replaces some in-class time with out-of-class, online, interactive learning activities or also makes significant changes in the remaining in-class meetings. Although in some ways this model resembles what is often referred to as a *blended* or *hybrid* model, the key differentiator is that the replacement model *replaces* in-class time with technology-based activities rather than simply *adding* technology-based activities to the traditional course.

The Emporium Model. The emporium model replaces lectures with a learning resource center model featuring interactive computer software and on-demand personalized assistance.

Full descriptions of the three models with examples of each follow. Each example includes links to full case studies of the redesigns.

The Supplemental Model

- Retains the basic structure of the traditional course, particularly the number of class meetings.
- May simply supplement lectures and textbooks with technology-based, out-of-class activities to encourage greater student engagement with course content and to ensure that students are prepared when they come to class.
- More frequently also changes what goes on in class by creating an active learning environment within a large lecture setting.

Example That Adds Out-of-Class Activities and Does Not Change In-Class Activities

Carnegie Mellon University redesigned the laboratory portion of its introductory statistics course while leaving the lecture portion intact. The redesign used StatTutor, an automated, intelligent tutoring system that monitors students' work as they go through lab exercises. StatTutor provides students with feedback when they pursue an unproductive path, and it closely tracks and assesses individual students' acquisition of skills in statistical inference—in effect, providing a personal tutor for each student. After using StatTutor, students increased their scores on a test of skills and concepts by 3.65 out of 16 items, for a 22.8 percent increase—a significant improvement: $t(19)=5.877$, $p < .001$. In addition, StatTutor helped students achieve a level of statistical literacy not deemed possible in the course before its redesign. Carnegie Mellon reduced course costs from $195 to $171 per student, a decrease of 12 percent.

Examples That Add Out-of-Class Activities and Change In-Class Activities

To increase consistency and increase student engagement, the redesign of General Chemistry at the University of Arizona combined the lecture and the laboratory into one course and integrated discussion sections with laboratory work. Learner-centered modules were created to involve students in collaborative group work during lecture, laboratory, and discussion sessions. Laboratory activities were modified to create more opportunities for students to pose their own research questions, design experiments to solve problems, and reflect on the validity of their claims based on the experimental evidence they collected. The smaller discussion sections provide more-individualized attention and support for students, and they open avenues for active, inquiry-based learning. Graduate teaching assistants and undergraduate learning preceptors ran the discussion sections. Based on standardized American Chemical Society final exams, students in the redesign performed significantly better ($p < .05$) than their counterparts in previous years. The average final exam grade in the first two semesters of the course's offering was 59.3 plus or minus 15.1 percent compared with an average of 54.0 plus or minus 16.3 percent in the two previous years. The cost per student was reduced by 13 percent, generating a savings of about $100,000 per year.

The goal of the redesign of Introductory Biology at the University of Massachusetts Amherst was to create an active learning environment within a large-lecture-hall setting supplemented by a variety of out-of-class activities that ensured students were prepared when they came to class. Before class, students reviewed learning objectives, key concepts, and supplemental materials posted on the class website. As an assessment of their preparation for class, students then completed online quizzes, which provided immediate feedback for students and provided data for instructors to assess students' knowledge levels. Instructors became able to reduce class time spent on topics that students clearly understood, increase time spent on problem areas, and target individual students for remedial help. Class time was divided into 10- to 15-minute lecture segments followed by sessions in which students worked in small groups

applying concepts to solve problems posed by the instructor. Group responses were reported through a student-response system. The instructor moderated the discussions and drew out key issues to reinforce specific ideas or reveal misconceptions. At UMass, attendance in the traditional format averaged 67 percent; in the redesigned course, attendance averaged 90 percent, which correlated significantly with performance on exams. In the traditional course, exam scores averaged 61 percent; in the redesigned course, exam scores averaged 73 percent, a significant increase. In addition, exams no longer emphasize recall of factual material or definitions of terms; 67 percent of the questions now require reasoning or problem-solving skills, compared with 21 percent previously. The cost per student was reduced from $199 to $124, a savings of 38 percent.

At Northern Arizona University, the goal of the redesign of Introduction to Psychology was greater student engagement. The traditional format consisted of large lecture sections and two to four multiple-choice exams. The redesign incorporated a student-response system to make the large lecture periods more engaging. The in-class student response system provided real-time feedback about students' understanding and identified gaps that needed to be closed. Team teaching enhanced course quality by giving students the opportunity to learn from faculty with the greatest expertise in a given topic area. Four required out-of-class Web activities, each related to a specific topic in psychology; and 14 practice quizzes complemented course lectures and further engaged students with course material, which had previously been limited primarily to reading the textbook. Students received automated feedback to gauge their own progress and achievements. They were permitted to retake the quizzes, prior to a deadline, with the highest grade counting toward the course grade. An early-intervention system targeted students who were struggling as indicated by attendance taken by the response system, in-class responses, Web activities, and online practice quizzes. A pretest/posttest comparison of psychology knowledge revealed that performance improved by .72 of one standard deviation, the second best ever obtained for a face-to-face section since the department started using the knowledge assessment in 2005. The cost per student was reduced from $62 to $42, a 30 percent decrease.

The supplemental model has been used predominantly in social science and natural science courses. See http://www.theNCAT.org/PCR/model_supp_all.htm for case studies of course redesigns that used the supplemental model.

The Replacement Model

- Reduces the number of in-class meetings but does not eliminate all in-class meetings.
- Replaces rather than supplements some in-class time with online, interactive learning activities.
- Gives careful consideration to why and how often classes need to meet face-to-face.
- Assumes that certain activities can be better accomplished online—either individually or in small groups—than in a face-to-face class.
- May keep the remaining in-class activities more or less the same.
- May make significant changes in the remaining in-class meetings.
- May schedule out-of-class activities in round-the-clock computer labs or totally online so that students can participate anytime, anywhere.

Examples That Substitute Out-of-Class Activities for Some In-Class Time and Do Not Change In-Class Activities

The redesign of Introductory Statistics at Pennsylvania State University involved reducing lectures from three to one per week and changing two traditional recitation sections to two computer-studio labs. In the computer-studio labs, students worked individually and collaboratively on prepared activities. Approximately 30 percent of the lab time was used for elaboration of concepts, 60 percent for computer-related work and class discussion of the results, and 10 percent for online quizzes on concepts related to the activities. Students were tested regularly on assigned readings and homework via Readiness Assessment Tests (RATs), which were short quizzes that probed students' conceptual understanding. Constituting 30 percent of students' grades, RATs were given five to seven times during the course. Students prepared themselves to take the RATs outside class by reading the textbook, completing homework assignments, and using Web-based resources. Students then took the tests individually. Immediately following their individual efforts, students took the same test in groups of four. In addition to motivating students to keep on top of the course material, RATs have proved very effective in detecting areas in which students were not grasping the concepts, which enabled faculty to take corrective actions in a timely manner. Students in the redesigned course outperformed traditional-course students at a statistically significant level on a content-knowledge test: 60 percent correct in the traditional format, and 68 percent in the redesigned format. In addition, students in the redesigned course demonstrated greater understanding of a number of crucial statistical concepts. Penn State reduced the cost per student from $123 to $98, a 44 percent savings.

At the University of Maryland Eastern Shore (UMES), the redesign of Principles of Chemistry replaced three traditional 50-minute lectures per week with one 75-minute lecture per week and two required hours in a chemistry computer lab where students worked with a chemistry tutorial software package. Coordinated with the textbook, the software monitored student time spent working with the software and student progress; assigned and graded homework; randomly generated and graded quizzes; and assigned, graded, and compared pre- and postmodule assessments. Undergraduate learning assistants and tutors offered on-demand, personalized assistance in the lab. Students could also attend an optional recitation session once a week to review the concepts covered in that week's learning module. The recitation sessions were mandatory for students scoring less than 75 percent on quizzes and/or exams. The changes in the structure of the course were validated when the UMES team compared students' final grades by using the same grading criteria. In the traditional format, 54.5 percent of students earned grades of C or better. The percentage rose to 66 percent in the redesigned course. The cost per student decreased from $268 to $80, a 70 percent reduction.

Examples That Substitute Out-of-Class Activities for Some In-Class Time and Change In-Class Activities

The redesigns of introductory Spanish at the University of Tennessee, Knoxville (UTK), and at Portland State University (PSU) exemplify the second type of replacement model, in which some classes are replaced with online activities and the remaining classes are changed. The most significant academic problem in traditional Spanish courses is that about 85 percent of in-class time is spent explaining and practicing grammar and vocabulary instead of practicing the expressive skills of speaking and writing. Both UTK and PSU reduced class-meeting times from three to two per week and moved to an online environment those course aspects that could be better accomplished using technology. UTK online activities included grammar, vocabulary, and listening exercises; PSU's included testing, writing, and grammar instruction as well as small-

group activities focused on oral communication. Students received immediate feedback and detailed explanations in response to their online work, and class time was freed for interactive and collaborative learning experiences. Online grading has given instructors more time to prepare their classes and to focus on meaningful communicative and collaborative tasks in class. By making those changes, both universities have been able to increase the time that students spend in oral communication. Furthermore, they have been able to increase the number of students who can be served with the same personnel resources.

Tallahassee Community College (TCC) redesigned its entire college composition course by moving many of the instructional activities online while using in-class time to focus on activities that require face-to-face interaction. Like most other colleges, TCC traditionally taught writing in small sections of approximately 30 students each. Considerable class time was spent reviewing and re-teaching basic skills, thus reducing the amount of time during which students could engage in the writing process. TCC's redesign—which shifted to technology many of the basic instructional activities that can be readily individualized—enabled students and faculty to focus on the writing process in the classroom. TCC used technology to provide various resources: diagnostic assessments resulting in individualized learning plans; interactive tutorials in grammar, mechanics, reading comprehension, and basic research skills; online tutorials for feedback on written assignments; follow-up assessments; and discussion boards to facilitate the development of learning communities. Those resources were accessible to students at any time. Students also met in computerized classrooms with flexible configurations three times per week. However, since so many online activities were individualized and accessible out of class, class time on all three days could be used for students to work individually or in small groups on a wide range of writing activities that fostered collaboration, proficiency, and higher levels of thinking. TCC students in the redesigned course scored significantly higher (p = 0.04) on final essays, with an average score of 8.34 compared with 7.33 for students in the traditional course. The redesign resulted in a planned reduction in the cost per student from $252 to $145, a savings of 43 percent.

The replacement model can be implemented in any discipline. See http://www.theNCAT.org/PCR/model_replace_all.htm for case studies of course redesigns using the replacement model.

The Emporium Model

- Eliminates all lectures and replaces them with a learning resource center model featuring interactive software and on-demand personalized assistance.
- Depends heavily on instructional software, including interactive tutorials, practice exercises, solutions to frequently asked questions, and online quizzes and tests.
- Uses a staffing model that combines faculty, graduate teaching assistants, peer tutors, and others who respond directly to students' specific needs and direct students to resources from which they can learn.
- May require a significant commitment of space and equipment.
- Enables more than one course to be taught in an emporium, thus leveraging the initial investment.

NCAT's partner institutions have found that three versions of the emporium model have been successful: a flexible version, a fixed version, and a combination of a fixed version and a flexible version. In all versions, mandatory attendance (e.g., a minimum of three hours weekly) in a

computer lab or computer classroom ensures that students spend sufficient time on task and receive on-demand assistance when they need it.

Examples of Flexible Attendance

A minimum number of lab hours are mandatory, but they may be completed at any time at the student's convenience. In addition, mandatory weekly group meetings outside a computer lab enable instructors to follow up when testing has identified weaknesses, make connections among concepts, emphasize particular applications, and build community among students and with instructors.

- <u>Louisiana State University</u>: College Algebra
- <u>The University of Alabama</u>: Intermediate Algebra

Examples of Fixed Attendance

Mandatory laboratory hours are scheduled by the institution. Students are divided into course sections and meet at fixed (scheduled) times—in the laboratory or in a computer classroom with an instructor—equivalent to meeting times in the traditional format: two to four times a week.

- <u>Jackson State Community College</u>: Basic Math, Elementary Algebra, and Intermediate Algebra
- <u>Nashville State Community College</u>: Basic Math, Elementary Algebra, and Intermediate Algebra

Examples of Fixed/Flexible Attendance

<u>Cleveland State Community College</u> developed the third version, which is a combination of fixed and flexible hours. In this version, three to five mandatory hours are required each week, but represent a combination of one fixed classroom meeting, flexible hours in the lab, and additional hour(s) spent working with the software from anywhere (e.g., from home.)

- <u>Leeward Community College</u>: Basic Math through Problem Solving, Introductory Algebra with Geometry, and Algebraic Foundations I and II
- <u>Northern Virginia Community College</u>: Arithmetic, Algebra I, and Algebra II

NCAT has published the following two guides, which describe in great detail how to successfully complete a course redesign in mathematics by using the emporium model.

- <u>How to Redesign a College-Level or Developmental Math Course Using the Emporium Model</u>
  This guide focuses on redesigning all sections of a *single* math course at both the developmental and college levels.
- <u>How to Redesign a Developmental Math Program Using the Emporium Model</u>
  This guide focuses on redesigning the entire developmental math *sequence* rather than a single course.

Although there is substantial overlap between the two guides, there are also substantial differences.

Example of Using the Emporium Model in Other Disciplines

The emporium model has most commonly been implemented in mathematics, but it can also be implemented in other disciplines. <u>Northeast State Technical Community College</u>, for example, used the emporium model to redesign Developmental Reading. The traditional reading course had been a three-credit-hour, lecture-based course taught annually in 24 small sections of about 17 students each; 12 sections were taught by full-time faculty, and 12 by adjuncts. In the redesigned course, one large section of all students replaced the multiple, small sections. Instead of meeting as a class, students were required to spend two hours in a reading center lab working with a high-quality, interactive, modularized-learning software package. The software produced individualized study plans by using a diagnostic assessment. Thus, each student focused on what he or she needed to master rather than studying all topics equally. Instructors and tutors were available in the lab to provide personalized assistance for students when needed. Students and the instructor also met once weekly as a reading group. In addition to working required hours in the lab weekly, students could access the learning software on the Web at other times or could come to the lab to spend additional time with assistance. Analysis of pretest and posttest Nelson-Denny scores revealed that students in the redesigned course achieved greater gain in their learning and reading skills. In the traditional course, the average gain was 11 points; in the redesigned course, the average gain was 21 points. The total cost of offering the traditional course had been $80,832. The total cost of the redesigned course was $39,639, a 51 percent reduction.

IIIB. Six Models for Course Redesign: Those Less Frequently Used

Although all successful course redesigns at NCAT's partner institutions embody the Essential Elements of Course Redesign discussed in Chapter I, each has chosen a redesign model that implements the elements in ways that vary according to the discipline involved, the particular student audience, and faculty preferences.

In conducting redesign programs, NCAT's approach has been first to establish a set of broad parameters (e.g., redesign the whole course, use instructional technology, reduce cost) and then to let experimentation bloom within them. From that iterative process, a number of redesign solutions have emerged—some anticipated, some not.

After examining the similarities and differences in how those common elements are arrayed in the various redesigns, NCAT has identified six distinct course-redesign models: supplemental, replacement, emporium, fully online, buffet, and linked workshop. A key differentiator among them is where each model lies on the continuum—from fully face-to-face to fully online interactions with students.

In this chapter we discuss the following three models: fully online, buffet, and linked workshop. Although only about 10 percent of NCAT redesigns have used one of these three models, we believe they are among the most innovative and effective of all of the redesigns conducted. Following are summaries of the characteristics of these three course redesign models that have emerged from NCAT's course redesign programs.

The Fully Online Model. The fully online model eliminates all in-class meetings and moves all learning experiences online, using Web-based multimedia resources, commercial software, automatically evaluated assessments with guided feedback, and alternative staffing models.

The Buffet Model. The buffet model customizes the learning environment for each student based on background, learning preference, and academic or professional goals and offers students an assortment of individualized paths to reach the same learning outcomes.

The Linked Workshop Model. The linked workshop model provides remedial or developmental instruction by linking workshops that offer students just-in-time supplemental academic support to core college-level courses.

Full descriptions of the three models with examples of each follow. Each example includes links to full case studies of the redesigns.

The Fully Online Model

- Eliminates all in-class meetings and moves all learning experiences online.
- Adopts successful design elements of the supplemental, replacement, and emporium models, including Web-based multimedia resources, commercial software, automatically evaluated assessments with guided feedback, links to additional resources, and alternative staffing models.
- Software and other Web-based materials present course content; instructors do not need to spend time delivering content.

- Software increases the amount and frequency of feedback to students. Assignments can be graded on the spot.
- May combine multiple sections into a single online section organized around modules, each taught by faculty who are expert in the module topic.
- Eliminates duplication of effort because faculty can divide tasks among themselves and aim their efforts at particular aspects of course delivery.

NCAT's fully online model differs significantly from the *traditional* online model which:

- Expects individual faculty members to design and deliver multiple course sections, each of which is relatively small in size.
- Uses Web-based materials as supplemental resources rather than as substitutes for direct instruction.
- Makes instructors responsible for all interactions, personally answering every inquiry, comment, or discussion.
- Requires faculty members to spend more time teaching online and interacting with students than they do in classroom teaching.

<u>Examples</u>

The redesign of Computing and Information Literacy at <u>Arizona State University</u> (ASU) moved a large lecture course of about 2,200 students to a fully online course. Projects and assignments were completed online with support via a discussion board forum and a laboratory. Even though only one optional lecture was provided each week, very few students attended it. The lab sessions, too, were optional for most students but mandatory for students at risk of failing the course. Course quality was enhanced by focusing on problem solving by using the kinds of technology resources that students would continue to use in school and on the job. Feedback on students' individualized progress was provided continually. Other than a textbook, no paper-based resources were used in the course. Projects, assignments, and quizzes all were completed using modern teaching technologies. Students had access to multiple options for learning with tools that included discussion boards, wikis, screencasts, video demonstrations, automated grading, feedback programs, and interactive tutorials. In the six prior terms of the course taught in the traditional format, an average of 26 percent of students earned a C or better. In the redesigned format, 65 percent of students earned a C or better in a demonstrably more difficult course. The cost per student was reduced from $50 to $35, a 30 percent savings.

<u>Rio Salado College</u> based its redesign of four precalculus mathematics courses on using mathematics software and adding a nonacademic course assistant. The software presented the content of the course so well that instructors did not have to spend time delivering content. The software's large bank of problems and answers for each topic increased the amount and frequency of feedback to students. All assignments were completed within the context of the software and were graded on the spot. Because of that immediate feedback, students knew which course aspects they had not mastered and were able to take corrective actions. The software enabled each student to work as long as needed on any particular topic. The addition of a course assistant to address non-math-related questions (which constituted 90 percent of all interactions with students!) and to monitor students' progress freed the instructor to concentrate on academic rather than logistical interactions with students. As a result, one instructor was able to teach 100 students concurrently enrolled in any of four math courses. Before the redesign, the instructor typically had taught 35 students in one section. By using these techniques, Rio

Salado increased completion rates from 59 percent to 65 percent while tripling the number of students taught by one instructor.

Florida Gulf Coast University (FCGU) originally redesigned its required fine arts course by using the buffet model. Twenty-five sections of 30 students each were consolidated into a single section using a common syllabus, textbook, set of assignments, and course Web site. Students were placed into cohort groups of 60 and, within those groups, into peer learning teams of 6 students each. The redesigned course consisted of six modules, each designed by a faculty expert. A structured buffet of learning experiences tied to each content module was developed to meet the varying needs of students with different learning styles as measured by the Myers-Briggs Type Indicator instrument. Options for learning included live lectures and discussions, taped lectures, labs and other hands-on experiences, textual-based material, practice exams, commercially produced videos, Web-based resources, and learning experiences related to the arts in the students' home communities. FGCU discovered two things: that students did not attend any of the live learning experiences, sticking instead with the textbook and online materials and that they did very well—better than students who attended lectures in the face-to-face courses. The average score on standardized exams in the traditional course was 70 percent versus 85 percent in the fully implemented redesign, and the percentage of D and F grades decreased from 45 percent in the traditional course to 11 percent in the redesigned course. As a result, FGCU eliminated some of the live course elements and built on the strengths of the online materials. In addition, FGCU reduced the cost per student from $132 to $81 in the first year of implementation.

Arizona State University (ASU) redesigned Emergent Literacy, a graduate course required for state certification in early childhood education. Previously taught in small face-to-face sections of 30 students each, the traditional course required faculty to travel among the school's three campuses, amounting to a major time commitment for them. Further, providing access for practitioners in rural parts of state was difficult. The online model enabled the team to combine all sections into one—regardless of which campus the students were enrolled on. Duplication of effort and inconsistencies across campuses were eliminated. Students were placed in small learning teams of 10 to 12 students to engage in collaborative learning activities directed by graduate teaching assistants and adjunct faculty. Students received individualized assistance in both content and technology issues as well as ongoing assessment and immediate feedback through automated comprehension checks, peer feedback, and written and oral comments from the instructor. Adjunct faculty and graduate teaching assistants monitored student participation and assignment completion and were available to help with content issues. The team was in the fortunate position of redesigning a high-quality traditional course with high student success. The primary concern was whether students would continue to meet the stated learning objectives once the course was fully online. The team found that students in both the traditional and redesigned formats performed the same on different assignments within the course and in the overall course. There was no significant change in drop, failure, or withdrawal rates. Once the redesign was fully implemented, total enrollment increased from about 100 to about 300 to 500 students; and the number of full-time faculty involved in the course was reduced from three to one. The result of these actions decreased the cost per student from $556 to $145, a 74 percent reduction.

The fully online model can be implemented in any discipline and at any academic level. See http://www.theNCAT.org/PCR/model_online_all.htm for case studies of course redesigns using the fully online model.

The Buffet Model

We know that students bring different academic appetites and backgrounds, interests, and abilities to college courses, yet what do we offer them most of the time? A fixed meal! The meals may be different from course to course in that some may be lecture based and others fully online, but most courses employ single strategies. One way to avoid either/or choices in course redesign is to offer students a buffet of learning opportunities or a menu of choices that enable them to take different paths to achieve the same learning outcomes.

- Customizes the learning environment for each student based on background, learning preference, and academic/professional goals.
- Requires online assessment of a student's learning styles and study skills.
- Offers students an assortment of individualized paths to reach the same learning outcomes.
- Provides structure for students through an individualized learning contract.
- Includes an array of learning opportunities for students—in the forms of lectures, individual discovery laboratories (in class and Web based), team or group discovery laboratories, individual and group review both live and remote, small-group study sessions, videos, remedial/prerequisite/procedure training modules, contacts for study groups, oral and written presentations, active large-group problem solving, homework assignments either graded by graduate teaching assistants or self-graded, and individual and group projects.
- May modularize course content.
- May allow students to earn variable credit based on how many modules they complete successfully by the end of the term, thus reducing the number of course repetitions and letting students complete the remaining modules in the next term.
- Enables the institution to evaluate the choices students make vis-à-vis the outcomes they achieve (e.g., if students do not attend lectures, the institution can eliminate lectures).

Example of a Buffet Model

The Ohio State University (OSU) redesigned its introductory statistics course, which enrolls 3,250 students each year. OSU created a buffet strategy that offered students an assortment of interchangeable paths that matched their individual learning preferences at each stage of the course. Because students learn in different ways, even the best fixed menu of teaching strategies will fail for some students. In contrast, OSU's buffet of learning opportunities included the array described earlier. Thus, for a specific objective, students could choose to hear and discuss a familiar vivid example in lecture, view and read about a real example in an annotated video presentation, encounter an example in a group problem-solving session, or generate an example through a group project. Students could elect to explore a concept by working in a data analysis laboratory, by participating in an individual Web-based activity, by attending a facilitated study session, or by explaining the concept to others.

Students were initially given a set of default, software-generated study options to match their learning styles and study skills. The finished contract gave each student a detailed listing of what needed to be accomplished, how the list related to the learning objectives of the unit, and by when each part of the assignment had to be completed. Based on their own experiences in the initial unit and on reading students' testimonials from earlier academic quarters, students could decide to make changes in their contracts for subsequent units. Course software monitored students' progress on an individualized basis throughout each unit, suggesting alternative learning strategies when needed.

OSU redesign students had greater success on common exams than traditional daytime students and about the same scores as students in the evening class, which had smaller class sizes and older students and had previously outperformed the daytime class. OSU's redesign reduced the cost per student at the main campus from $190 to $142, a 25 percent reduction.

<u>Example of a Modified Buffet Model</u>

The goals of the redesign of General Psychology at <u>Chattanooga State Community College</u> were to provide greater consistency in the course and greater flexibility for students. The school modified the buffet model to give students choice—but not as much choice as at Ohio State. Students were offered two different ways to take the course: online or face-to-face. But the key idea is that they could choose which option to employ on any particular day of the course. The face-to-face sections were taught consistently: the same lecture was given at different times on the same day; schedules of the topics and times were provided on the course website. Students could go to any lecture session that was offered—regardless of the section in which they were enrolled. All students had access to the course website, to classroom lectures and activities, and to faculty team members. They could attend as many or as few classes as they chose with any team faculty member. Some students always attended the face-to-face classes; some viewed the lecture as an online video on some days and attended face-to-face lectures on other days; and some students took the entire course online. Thus students could choose the option that suited their schedules on any given day. Similarly, they could submit assignments and take exams either online or in the classroom. Certain interactive activities—like online simulations that illustrated concepts, theories, and research methodologies or low-stakes quizzes—were completed by all students online.

Students evaluated their learning styles by using the North Carolina State University Index of Learning Styles Questionnaire. Student learning styles were addressed by multimodal teaching materials such as PowerPoint presentations, online discussions, open-book quizzes, an audience-response system, class activities, lectures, and Web resources.

Comparative student learning was measured by using pre- and posttests. Students in the redesigned courses showed significant improvements in content knowledge as well as significantly better absolute posttest performances. Students in the traditional course had a pretest mean of 21 and a posttest mean of 26. Students in the redesigned course had a pretest mean of 25 and a posttest mean of 36, which is significant at the .01 level. The cost per student decreased from $130 to $42, and the total semester course cost decreased from $67,857 (serving 522 students) to $25,311 (serving 600 students).

The buffet model can be implemented in any discipline. See http://www.theNCAT.org/PCR/model_buffet_all.htm for case studies of course redesigns using the buffet model.

The Linked Workshop Model

- Retains the basic structure of the college-level course, particularly the number of class meetings.
- Replaces the remedial or developmental course with just-in-time workshops designed to remove deficiencies in core course competencies.
- Uses computer-based instruction, small-group activities, and test reviews to provide additional instruction on key concepts in workshops.

- Assigns students software modules individually based on results of diagnostic assessments.
- Employs students as workshop facilitators who have previously excelled in the core course and are trained and supervised by core course faculty.
- Comprises workshop activities that are just-in-time—that is, designed so that students apply the concepts during the next core course class session, which in turn helps them see the value of the workshops and motivates them to do the workshop activities.

Austin Peay State University (APSU) redesigned two developmental math courses—Elementary Algebra and Intermediate Algebra—by eliminating them entirely. Enhanced sections of two core college-level courses—Fundamentals of Math and Elements of Statistics—were created for students whose admissions test scores placed them in developmental mathematics. These core courses did not change in content but were linked to structured learning assistance workshops. Students requiring developmental instruction enrolled in the core course required for their majors and received supplemental academic support on a just-in-time basis to remove deficiencies in the mathematical competencies required for success in the core course. The workshops consisted of computer-based instruction, small-group activities, and test reviews to provide additional instruction on key mathematical concepts within the courses. Structured learning assistance workshops were facilitated by students who had excelled in math and been recommended by math faculty. During the initial meeting of the workshop, students were assessed to determine their specific math deficiencies. Only the deficiencies deemed necessary for success in the core mathematics course were addressed during the workshops. Just-in-time instruction on prerequisite competencies was designed so that students could apply the concepts during the following class session, which in turn helped them see the value of the workshops and motivated them to do the exercises. Prior to the redesign, 33 percent of developmental students who enrolled in Fundamentals of Math successfully completed the course (earned grades of C or better.) After the redesign, that rate averaged 71 percent. Prior to the redesign, 23 percent of developmental students who enrolled in Elements of Statistics successfully completed the course. After the redesign, that rate averaged 54 percent. In addition, APSU reduced the cost of offering developmental math by 52 percent.

The linked workshop model appears to be most appropriate for developmental courses. See http://www.theNCAT.org/PCR/model_linked.htm for a full description of APSU's course redesigns using the linked workshop model.

Conclusion

All six NCAT course redesign models—supplemental, replacement, emporium, fully online, buffet, and linked workshop—treat a course not as a one-off but, rather, as a set of products and services that can be continuously worked on and improved. Two factors in the design strategies used by each model are key: (1) the collective commitment of all faculty teaching the course, and (2) the capabilities provided by information technology. Would it be possible for a single instructor conducting an online class to develop such creative, comprehensive, learner-centered designs as exemplified by the redesigns described here? Perhaps—if the instructor spent the greater part of a career working on the class. Would it be possible for institutions to offer buffets of learning opportunities to thousands of students annually without the aid of information technology? Most certainly not. Information technology enables the capture of best practices in the form of interactive Web-based materials and sophisticated course-management software. Faculty can add to, replace, correct, and improve an ever-growing, ever-improving body of learning materials. Sustaining innovation depends on a commitment to collaborative development and continuous quality improvement that systematically incorporates feedback from all of those involved in the teaching and learning process.

IV. New Instructional Roles

Are highly trained faculty members needed to conduct *all* tasks associated with delivering a course? By constructing an instructional support system that comprises various kinds of personnel, an institution can apply the right level of human intervention to particular kinds of student problems. By replacing expensive labor (full-time faculty members and graduate teaching assistants) with relatively inexpensive labor, less expert (adjunct faculty members, undergraduate peer mentors, and course assistants) when appropriate, it is possible to increase the person-hours devoted to the course and the amount of assistance provided for students. Rethinking instructional roles within large courses can lead to innovative approaches to staffing.

Q: Who are these new instructional personnel?

A: Large-scale course redesigns have created new kinds of positions—such as undergraduate learning assistant, course assistant, early intervention specialist, preceptor, and course coordinator—which have specific roles within a course, leaving faculty free to concentrate on the tasks that specifically require their level of expertise.

Undergraduate Learning Assistants

Undergraduate students make excellent peer tutors or learning assistants. The use of undergraduates can radically increase the amount of personalized assistance available to students—and cost-effectively. When properly trained, undergraduate learning assistants (ULAs) have turned out to be far better at assisting their peers than graduate teaching assistants are. Because students regard ULAs as peers, they tend to be more open about their comprehension difficulties than they would be with graduate students, which leads to better feedback to the instructor. Using undergraduates as such assistants has turned out time and again to be one of the most successful ingredients of redesigned courses.

Q: What responsibilities do ULAs have in the redesigned course?

A: The ULA role needs a formal definition so that the duties and responsibilities are clear to all interested parties: the ULAs themselves, students, faculty, and others on campus who may have the impression that ULAs are "mini-professors." Faculty members must both carefully structure ULAs' specific roles and then train the ULAs, meet with them repeatedly throughout the semester, and provide overall supervision to be sure they are carrying out their assigned roles.

Examples

- The redesign of The Economic System at Buffalo State College relied significantly on ULAs. Each semester, six to eight trained ULAs monitored the course's online activities. Each ULA supervised the activities of approximately 35 to 40 students. The work of the ULAs included managing small-group activities; communicating, updating, and releasing content on the course website for students; and holding office hours in a computer lab to give students the one-to-one assistance that they needed.

- The redesign of Public Speaking at Arizona State University tripled course capacity—with no diminution in quality, in large part due to the use of ULAs in speech labs. The ULAs worked in pairs and evaluated student speeches by using a rubric developed by the supervising

faculty member. ULAs received training in using the rubric and met weekly as a group with the faculty member to discuss any issues that had arisen. All speeches were videotaped so that the faculty member could intervene if there were any question about the ULAs' evaluations.

- Frostburg State University used ULAs extensively in its redesign of General Psychology. These highly trained students ran computer labs designed to help students complete work successfully. ULAs delivered brief PowerPoint presentations describing the online work to be completed for the week, and they described the grading rubric for the activities. After the presentation, ULAs were available to help students with their work. In addition, the ULAs were involved in all aspects of the online portion of the course, including moderating student discussions and monitoring students who were struggling with the course.

- At the University of Colorado Boulder, students met once a week in learning teams of 10 to 15 supervised by a ULA to collaboratively prepare answers to discussion questions and to carry out inquiry-based team projects. Each ULA (or coach) supervised two learning teams. In meeting with their learning teams, ULAs were expected to help students understand use of the course technology and to guide the students' collaborative work. They were instructed specifically not to tell the students "the right answers" but were given guidelines to teach students how to find the answers for themselves. For example, if a student was having difficulty with a concept or procedure, a coach might simply refer the student to another student on the team who had mastered the problem. The ULAs were also expected to attend the discussion session of the class—where they would help keep score of the verbal answers—and to continue to guide students to collaborate asynchronously by monitoring and encouraging their work on the team home page.

Q: What qualifications and backgrounds do ULAs need to have?

A: Selection as ULAs typically includes students who have taken the course and scored in the top 20th percentile, students who understand the goals of the redesigned course and are eager to help make it work, and students who are mature and display leadership skills.

Some redesign teams have found that ULAs do not need expert subject knowledge to carry out their duties effectively. They need good learning skills and the ability and desire to impart those skills to their fellow students. For example, in the redesign of Introductory Astronomy at the University of Colorado Boulder, only about one-third of the students who applied and were hired as ULAs were science or engineering majors. Then, about one-third of the ULAs subsequently changed their majors from humanities and social sciences to natural sciences as a result of the experience.

Q: How should we identify potential ULAs to work in the course?

A: It has turned out to be surprisingly easy to hire students of exceptional talent as ULAs. Here are two examples.

At the University of Colorado Boulder, an astronomy professor:

- Asked colleagues who taught other sections of the same course to provide him with lists of students who met the recruitment criteria so he could supplement his own list of such students who had taken the course from him.

- Sent a detailed job description and invitation to apply to about 20 students on the lists.
- Provided the redesign plan describing the goals and methodology of the course for the 15 who responded that they were interested.
- Invited them to read the plan and make an appointment to discuss their interest and qualifications to participate in the project.
- Assessed via brief interviews whether applicants had understood the proposal, would be enthusiastic participants, and had the interpersonal skills to be good team leaders.

At Buffalo State College, ULAs were recruited in two ways.

- By encouraging good students who had taken the course in the previous semester to participate.
- By working with teacher education students whose majors were social studies education and elementary education with a social studies concentration. Economics is a required topic for both majors, and the pedagogical nature of the candidates' ULA participation would be valuable to their career preparation.

Q: After initial training, how often should the instructor meet with ULAs?

A: In general, redesign teams have found it important to meet with ULAs at least once a week. During the meetings, the instructor(s) and the ULAs discuss the work to be done during the coming week and review the successes and failures of the redesign implementation thus far.

For many instructors, the weekly meeting is one of the most satisfying and enjoyable experiences in teaching the course. The learning assistants develop a strong esprit de corps. They are assertive and provide much creative and detailed advice about how to improve the course. With exams and quizzes, the instructor can to some extent measure how well students are learning the material in the course; but the scores do not tell the instructor how to help students improve their comprehension. The feedback that instructors gain from the meetings gives them a much better sense of how to improve the course than they could ever get from exams alone.

Q: What about offering ULAs a course for credit in lieu of payment?

A: Most redesigns begin with paying ULAs on an hourly basis for their work in the course. But as course redesigns became more sophisticated, team leaders developed the idea of offering a concurrent seminar course in pedagogy that augments ULAs' formal training and provides opportunities for them to increase their technical expertise, refine their teaching techniques, and develop new material for the course. Thus, they receive course credit for their participation instead of pay.

In the seminar, the participants read and discuss literature on inquiry-based education, collaborative learning, and the design and appropriate role of information technology in education—all issues closely related to the ULA experience. In addition to reading the materials and participating in the discussion, ULAs are expected to produce final papers or portfolios that relate some aspect of the literature that has been discussed to their experiences as ULAs.

Q: What are some other ideas of creating incentives for undergraduates to participate as ULAs?

A: One way to add an incentive to being a ULA and to reward returning ULAs is to create a track, certificate or area of emphasis within the major. For example, Frostburg State University created a leadership in psychology emphasis for students majoring in psychology that included an upper-level seminar as described above and other courses considered to be leadership-oriented. The courses satisfied the psychology major and helped students get closer to earning a minor in leadership studies. The emphasis was shown on their official transcript upon graduation and provided students with a unique, resume-enhancing learning experience. Students had the option of repeating the ULA seminar to provide an incentive for already trained ULAs to return, thus decreasing the need to train a completely new group of ULAs. Making the opportunity to repeat the seminar an option allows you to prevent ULAs who were not successful from returning or to lower the number of ULAs if you do not need as many to return in a given semester.

Other Examples of New Instructional Personnel

NCAT's partner institutions have developed a variety of new instructional personnel to take on specific responsibilities within the overall course structure. Following are examples.

Course Assistant. In redesigning a number of introductory math courses offered fully online, Rio Salado College created a new position called *course assistant* to troubleshoot technology questions, monitor student progress, and alert instructors to student difficulties with the material. Approximately 90 percent of questions students asked were non-instructional in nature. Adding the course assistant at compensation of $12 per hour enabled Rio Salado to increase the number of students that could be handled by one instructor from 30 to 100. The position was filled first with a math tutor, but the responsibilities of the course assistant did not require math skills; therefore, there was no reason to pay a tutor rate when tutoring skills would be underutilized—or never utilized. The "permanent" assistant was a very advanced high school student who found the hours, compensation, and responsibilities satisfactory.

Early Intervention Specialist. In redesigning Introduction to Psychology at Northern Arizona University, the team created a position called *early intervention specialist* (EIS). The EIS monitored students' performance throughout the semester and alerted those with low scores to resources available for extra course help. The EIS contacted low-scoring students by e-mail after each exam, encouraging them to visit during office hours—in order to review exam questions and learn study skill strategies—and serving as a personal contact for students having difficulty in the course. The most-senior and most-skilled graduate teaching assistant was assigned to serve as the EIS.

In addition, the EIS worked with study skills specialists to develop and hold workshops throughout the semester based on pilot results showing that lack of such skills was a major barrier to success in Introduction to Psychology. The workshops instructed students on the topics of test taking, lecture styles, effective note taking, and textbook reading. The workshops were well attended, and their success has led to their continued inclusion in the course.

The EIS role evolved somewhat from the original conception. The team found that the EIS got a great deal of student interest in office hours and the study skills workshop without having to pursue students with low grades or poor attendance. In keeping with the goal of promoting individual contact in a large-class setting, much of the EIS's efforts are now directed toward

reviewing exams and assignments with individual students. The EIS succeeded in recruiting more than a hundred students, mostly first-year students, to attend workshops led by a Northern Arizona University study skills specialist. This way, the EIS is promoting student success and engagement not just in the Introduction to Psychology course but also in students' course work at large.

Preceptor. Florida Gulf Coast University reduced the number of sections in its introductory fine arts course from 31 to 2 and increased the number of students served from 800 to 950 in the first year of the course's redesign. In the traditional course, 20 percent of the instructors were full-time and 80 percent were adjuncts. In the redesign, the university eliminated adjuncts completely. The redesigned course was taught 100 percent by full-time faculty supported by a new position called *preceptor*. Preceptors, most of whom had BAs in English, interacted with students via e-mail, monitoring student progress, leading online discussions, and grading critical-analysis essays. Each preceptor worked with 10 peer learning teams or a total of 60 students. Replacing adjuncts independently teaching small sections ($2,200 per 30-student section) with preceptors assigned a small set of specific responsibilities ($1,800 per 60-student cohort) in the context of a consistent, faculty-designed course structure enabled the school to accommodate ongoing enrollment growth while steadily reducing its cost per student.

Course Coordinator. Prior to the redesign, 50 percent of a world literature course at The University of Southern Mississippi was taught by full-time faculty and 50 percent was taught by adjuncts. The university replaced 16 minimally coordinated sections with a coherent, single online section of 1,000 students and reduced the number of faculty teaching the course from 16 (8 full-time faculty and 8 adjuncts) to the equivalent of 2 full-time faculty supported by four graduate teaching assistants, thereby eliminating adjuncts completely. A course coordinator directed the team teaching of four faculty members and four graduate-teaching-assistant writing-assignment graders. Each faculty member taught a module in his or her area of expertise for four weeks. Faculty experts also collaborated on the designing of quizzes and exams and the selection of complementary materials. The course coordinator kept the entire team working in concert.

Training for New Instructional Personnel

Q: How much training is needed for new instructional personnel?

A: Many institutions experience problems in course redesign because they underestimate the degree of training—both initial and ongoing—that is required in order to implement their redesigns successfully. The new format inevitably requires certain kinds of interactions with students that are very different from those under the traditional teaching format. Developing a formal plan for initial and ongoing training of all personnel rather than assuming they will pick up the new methods on their own will go a long way to ensuring a successful redesign. Those working in a redesigned setting for the first time need enough training to understand the new philosophy of teaching.

Q: What should training include?

A: All new instructional personnel need to be trained in how to facilitate problem solving and how to engage students in that problem solving rather than resorting to lecturing or providing answers for students. Training should include:

- A full explanation of the redesign, including its rationale and benefits
- Clear guidelines on responsibilities under the new model
- Instruction in the use of course technologies and instructional software
- Discussion of all course policies and procedures
- The importance of maintaining consistency in implementation of all of the elements of the redesign

Q: How often do we need to train new personnel?

A: As new personnel are brought into the course over time, it is important to help them go through the same steps of accepting a different learning model and to point out ways of creating the type of connections attributed to the traditional lecture format. We recommend holding at the beginning of each semester a workshop for tutors new to redesign and then monitoring their work throughout that initial term of working in the redesign model. Ongoing mandatory training of new personnel is the only way to ensure that success will be achieved.

Q: How often do we need to train experienced personnel?

A: The desire to go back to old ways of doing things has to be overcome. All personnel need periodic reminders of the policies and procedures and need to learn about changes in the software and other technologies used in the course. We recommend holding a meeting with all experienced personnel at least once each semester to review old policies and point out any new ones.

V. How to Reduce Instructional Costs

The traditional course format requires instructors to carry out all of the development and delivery aspects of a course on their own. The traditional format often assumes that small classes are necessary in order to produce positive learning results because the instructor is responsible for all interactions. Responding to every inquiry, comment, or discussion personally; preparing lectures; and the hand grading of assignments, quizzes, and examinations are labor-intensive.

Course redesign involves substituting technology for much of that effort, often with assistance from different kinds of personnel. Making the substitutions discussed in the following sections enables each instructor to teach more students than before—without increasing the workload.

Q: How can redesign lead to reduced instructional costs?

A: Redesigning a whole course eliminates duplication of effort on the part of instructors and creates opportunities for using alternative staffing patterns. Faculty begin the design process by analyzing the amount of time that each person involved in the course spends on each kind of activity, which often reveals duplication of effort among multiple faculty members. Faculty members teaching the course divide their tasks among themselves, and their efforts target particular aspects of course delivery. By replacing individual development of each course section with shared responsibility for both course development and course delivery, faculty can save substantial amounts of their time while achieving greater course consistency.

When redesigns reduce the number of lectures or other classroom presentations that faculty members must prepare for and present and replace those formats with interactive learning resources and team-based learning strategies, faculty time can be reallocated to other tasks either within the same course or in other courses. Moving away from viewing instructors as the sole sources of content knowledge and assistance and instead toward greater reliance on interactive learning materials and greater student-student interaction offers many opportunities for reducing instructional costs.

Replacing hand grading with automated grading of homework, quizzes, and exams makes it possible to reduce the cost of providing feedback while improving its quality. Online weekly practice quizzes can replace weekly homework grading, and all grading and record keeping can be automated. Replacing time-consuming human monitoring of student performance with course management software makes it possible to reduce costs while increasing the level and frequency of oversight of student progress. Using instructional software also radically reduces the amount of time that faculty members typically spend on nonacademic tasks like calculating and recording grades, photocopying course materials, posting changes in schedules and course syllabi, sending out special announcements to students, and documenting course materials like syllabi, assignments, and examinations so that they can be used in multiple terms.

Q: How can we calculate the number of hours instructors will spend on the redesigned course compared with the traditional course?

A: NCAT has developed a Scope of Effort Worksheet (see Appendix D) to help campuses document that the number of hours faculty devote to the redesigned course will be the same as or fewer than the number of hours devoted to the traditional format of the course, even if class size grows or the number of sections that faculty carry increases. This is possible because the course redesign off-loads to the technology certain tasks like grading and monitoring student progress. Explaining how this occurs and documenting the changes by using the Scope of Effort

Worksheet enable redesign leaders to help others on campus understand the benefits of redesign for both students and faculty.

Q: Do cost savings equal saved instructor hours?

A: Planning for cost reduction as a part of redesign consists of two steps. The first is to complete the Scope of Effort Worksheet for the traditional and redesigned formats of the course, which lets you demonstrate how the number of hours spent by each person involved in the course can change. The second step is to translate those "saved" hours into one of NCAT's Cost Reduction Strategies described later. If you stop at the first step, you might create what NCAT calls *paper savings*. By *paper savings* we mean savings that represent a workload reduction for individual faculty members or others but do not produce cost savings to the department or institution.

Reducing time spent by individual faculty members and others as displayed on the Scope of Effort Worksheet is an *enabler* that allows you to choose a cost savings strategy. For example, a faculty member or TA who spends half the time on the redesigned course that that faculty member or TA did on the traditional course could increase section enrollment or carry two sections without an increase in workload. That then produces real savings for the institution.

Q: Does it matter whether our course enrollment is growing or remains stable?

A: If the course enrollment is relatively stable (and accommodating more students is not a goal), you must reduce the number of people involved in teaching the course and/or change the mix of personnel in order to produce cost savings.

If accommodating more students is a goal, you do not have to reduce the number of people involved in teaching the course in order to produce cost savings, although you can do this. You can reduce the cost per student (total resources devoted to the course/total course enrollment) by teaching more students with the same staffing.

Q: How can we re-structure the course to reduce instructional costs?

A: There are three ways to re-structure the course that will reduce costs.

1. Have each instructor carry more students by
   a. increasing section size, or
   b. increasing the number of sections each instructor carries for the same workload credit.
2. Change the mix of personnel from more expensive to less expensive.
3. Do both simultaneously.

Each of these strategies can be used whether your enrollment is growing or stable. When enrollment is stable, cost reduction means fewer resources are devoted to the course. When enrollment is growing, cost reduction means more students can be served on the same resource base. In each case, the cost per student is reduced.

Q: Are there examples of having each instructor carry more students by increasing section size?

A: Here's a calculation showing how this works:

Stable enrollment: If your enrollment is stable, this will allow you to reduce the number of sections offered and the number of people teaching the course.

> *Traditional*: 800 students: 40 sections of 20 students each taught by 40 instructors. Student-faculty ratio = 20:1
> *Redesign*: 800 students: 20 sections of 40 students each taught by 20 instructors. Student-faculty ratio = 40:1

Growing enrollment: If your enrollment is growing, this will allow you to serve more students with the same number of people teaching the course.

> *Traditional*: 800 students: 40 sections of 20 students each taught by 40 instructors. Student-faculty ratio = 20:1
> *Redesign*: 1,600 students: 40 sections of 40 students each taught by 40 instructors. Student-faculty ratio = 40:1

Chattanooga State Community College: The college reduced the cost of offering General Psychology by decreasing the number of sections (18), which ranged in size from 18 to 95 students annually, to 6 sections of 100 students each. Capacity was increased from 522 students in the traditional format to 600 students in the redesign. The traditional lecture format of the course, which met three times per week, was replaced by one face-to-face meeting and a variety of online activities. The number of full-time faculty teaching the course was reduced from 10 to 6, and all adjunct instructors were eliminated, with the added benefit of providing greater consistency among sections. One adjunct faculty member led two optional one-hour discussion groups per week, monitored mandatory threaded discussions, and provided technical support for students. Overall, the cost per student decreased from $130 in the traditional format to $42 in the redesign. Because each faculty member was responsible for three rather than nine hours of lecture per week, faculty had time to develop and teach new upper-level courses. In addition, classroom space was made available for other uses.

Arizona State University (ASU): The redesign of Organizational Management and Leadership enabled the university to increase section size from about 45 students to about 90 and to reduce the number of sections from six to four each term. Those changes reduced the cost per student by 59 percent, from $373 per student in the traditional format to $153 after the redesign. The traditional lecture format of the course, which met twice a week for 70 minutes each, was replaced by one face-to-face meeting and one online meeting. After the initial redesign, the course could accommodate 360 students rather than the 270 under the traditional format. The team believes that once the course is being taught in a new building with larger classrooms, enrollment can increase to as high as 250 students per term because one classroom will hold 150 and a second classroom will hold 100. This means that the annual enrollment can be increased to about 500 (from the current 360) without additional resources.

Q: What are examples of increasing the number of sections that each instructor carries for the same workload credit?

A: Here's a calculation showing how this works:

Stable enrollment: If your enrollment is stable, this will allow you to offer the same number of sections and reduce the number of people teaching the course.

Traditional: 800 students: 40 sections of 20 students each; instructor time spent per section = 200 hours; each instructor teaches one section for the same workload credit. Student-faculty ratio = 20:1
Redesign: 800 students: 40 sections of 20 students each; instructor time spent per section = 100 hours; each instructor teaches two sections for the same workload credit. Student-faculty ratio = 40:1

Growing enrollment: If your enrollment is growing, this will allow you to serve more students with the same number of people teaching the course.

Traditional: 800 students: 40 sections of 20 students each; instructor time spent per section = 200 hours; each instructor teaches one section for the same workload credit. Student-faculty ratio = 20:1
Redesign: 1,600 students: 80 sections of 20 students each; instructor time spent per section = 100 hours; each instructor teaches two sections for the same workload credit. Student-faculty ratio = 40:1

Cleveland State Community College: Under the traditional model, Cleveland State's math program comprised 55 sections of 24 students each in fall and spring, 45 of which were taught by full-time faculty (82 percent) and 10 by adjuncts (18 percent). Each course met three times per week. The total cost of the traditional course was $270,675. In the redesigned model, Cleveland State offered 77 sections of 18 students each in fall and spring, all of which were taught by full-time faculty at a cost of $219,258. Each section had one class meeting per week in a small computer lab, and students were required to spend two additional hours in a larger lab staffed by faculty and tutors. The total cost savings was $51,417, a 19 percent reduction. The full-time-equivalent teaching load per faculty member went from 21.2 to 26.0 with no increase in workload. Faculty had been teaching five sections each per semester. In the redesign, faculty members each taught 10 or 11 sections, which met once per week, and they worked 8 to 10 hours in the lab.

The University of Alabama (UA): The redesign of UA's introductory Spanish program substituted a portion of class time with pedagogically tested and sound instructional technology components. As a result of replacing one face-to-face class hour per week with online components in Introductory Spanish I and II and two hours per week in the Intensive Review of Elementary Spanish, UA was able to accommodate 349 more students—a 33 percent enrollment increase—without increasing spending. Those changes were made possible by increasing the student load for a graduate teaching assistant from three to four sections per academic year. Due to replacement of a portion of class meeting time with online components, the teaching load increased but the amount of time graduate teaching assistants spent on the courses remained the same. The redesign enabled UA to offer 60 sections of introductory Spanish courses, an increase of 15 sections over prior offerings and thereby meeting more of the actual demand. The cost per student for each course was reduced from $245 to $183, a 25 percent decrease.

Q: What are examples of changing the mix of personnel from more expensive to less expensive?

A: Here's a calculation showing how this works:

Stable enrollment: If your enrollment is stable, this will allow you to offer the same number of sections and reduce the total cost of the people teaching the course because adjuncts, tutors

and undergraduate tutors are paid less than full-time faculty, and tutors and undergraduate tutors are paid less than adjuncts.

>*Traditional*: 800 students: 40 sections of 20 students each; 30 sections taught by full-time faculty; 10 sections taught by adjuncts.
>*Redesign*: 800 students: 40 sections of 20 students each; 10 sections taught by full-time faculty; 30 sections taught by adjuncts.

Growing enrollment: If your enrollment is growing, this will allow you to serve more students, offer more sections and reduce the cost-per-student since adjuncts, tutors and undergraduate tutors are paid less than full-time faculty, and tutors and undergraduate tutors are paid less than adjuncts.

>*Traditional*: 800 students: 40 sections of 20 students each; 30 sections taught by full-time faculty; 10 sections taught by adjuncts.
>*Redesign*: 1600 students: 80 sections of 20 students each; 20 sections taught by full-time faculty; 60 sections taught by adjuncts.

Tallahassee Community College: In its redesign of English Composition, the college reduced the number of full-time faculty involved in teaching the course from 32 to 8 and substituted less-expensive adjunct faculty without sacrificing quality and consistency. In the traditional course, full-time faculty taught 70 percent of the course, and adjuncts taught 30%. In the redesigned course, full-time faculty taught 33 percent of the course, and adjuncts teach 67%. Further savings were realized by reducing the amount of time and resources that the Writing Center staff had traditionally spent in working with students on basic skills. Mid-stage drafts were outsourced to Smarthinking, an online tutorial service. Overall, the cost per student was reduced from $252 to $145, a savings of 43%. Full-time faculty were freed to teach second-level courses, for which finding adjuncts was much more difficult.

University of Central Missouri (UCM): The redesign of Human Anatomy at UCM changed the mix of personnel to accommodate an increase in enrollment from 336 students to 480. Lab section size increased from 25 students in the traditional format to 40 students in the redesign. Non-tenure-track faculty replaced tenure-track faculty. The supervised lab sessions supplemented the one large weekly lecture session by engaging students through a team-learning approach. Graduate teaching assistants assisted by undergraduate learning assistants rather than faculty members managed the labs. Those changes reduced the cost per student by 68 percent, from $345 in the traditional format to $111 in the redesigned course. UCM plans to invest the cost savings in additional upper-level and graduate course offerings or in reassigned time so that faculty can become involved in the graduate research program, a long-standing desire of the UCM administration.

Q: What are examples of doing both simultaneously?

A: Most redesigns employ both strategies simultaneously as the following examples illustrate.

Arizona State University: The redesign of Women's Studies at the university achieved cost savings by increasing class size from 150 or 200 to 400 and reducing the number of sections from nine to four annually. The instructional mix was changed to include fewer regular faculty and more graduate teaching assistants and undergraduate learning assistants who worked with small groups online, monitored online discussions, and provided individualized feedback for students on quizzes and participation. The cost per student was reduced from $78 in the

traditional course to $57 in the redesign. The cost savings enabled the department to accommodate new student growth and meet the demands of a new graduate program.

Frostburg State University: The redesign of General Psychology reduced its cost per student in general psychology from $89 to $26—a 71 percent 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. Fewer instructors were needed to teach the course because the number of sections was reduced by a third, from 18 to 6, and required as few as one full-time faculty member (versus nine) and three adjuncts (versus nine) to teach the course. That change freed full-time faculty to teach upper-level courses.

Q: What does reducing costs mean in practice?

It is important to understand the context for reducing costs. In the past, cost reduction in higher education meant loss of jobs, but that's not the NCAT approach. In the vast majority of NCAT course redesign projects, the achieved cost savings remained in the department that generated them and were used for instructional purposes. NCAT thinks of cost savings as a reallocation of resources that helps faculty and their institutions achieve their wish lists of things they'd like to do if they had additional resources.

Institutional participants have used cost savings in the following ways.

- To offer additional or new courses that previously could not be offered
- To satisfy unmet student demand by serving more students with the same resource base
- To break up academic bottlenecks—courses that delay students' progress within a subject area or program because the areas or programs are oversubscribed
- To increase faculty released time for research, renewal, or additional course development
- To fund undergraduate research programs
- To deal effectively with budget cuts without diminished quality
- To apply to combinations of these

Q: Are there further opportunities for cost savings beyond these strategies?

A: After several terms of full implementation of your redesign strategy, you may achieve further savings through such things as improved retention (increased course completion rates), the impact of modularization and/or reduced space requirements. There are, however, a number of variables that may influence whether or not you are able to realize those additional savings such as the number of students who accelerate versus the number who move at a slower pace and scheduling complexities. Because it is difficult to predict how these various elements will play out until you have some experience with the redesign over time, your plan for cost reduction should include one of the strategies listed previously which will result in immediate savings during the first term of full implementation.

VI. How to Create Small within Large

When most people think about the relationship between size and educational quality, they more or less take for granted that small is better. Whether it's Mark Hopkins sitting on a log with his single student or the *U.S. News & World Report* rankings, a low student-faculty ratio—and its corollary, small class size—is assumed to be an indicator of high quality. In the ideal world, all classes would be small. In the real world, offering small classes inevitably increases instructional costs. Is it possible to resolve this familiar trade-off between cost and quality?

One of the key characteristics of most course redesigns is large class size. Some redesigns begin with large lecture sections and retain those large sizes in the redesign; others reduce the number of sections offered and create larger classes; still others combine all sections into one large section. As discussed in Chapter V, larger sections can reduce costs because fewer faculty are needed to prepare and deliver the course, yet course redesign also increases student learning. The idea that it is possible to increase learning while increasing class size (or maintaining already large sections) goes against common assumptions about quality that are held by most in higher education as well as by the public at large. Because that idea is counterintuitive for most, we address this issue specifically in this chapter. The main idea is to create small within large, to focus on individual students within a large class.

<u>Teams and Group Work</u>

Q: What are examples of using teams or small group work in large lecture sections?

A: The main idea is to divide large lecture sections into small groups and involve students in active-learning, collaborative activities during and/or outside class time both face-to-face and online. Following are examples.

- To facilitate active learning in large geology lectures of more than 150 students, students were given many opportunities to solve problems collaboratively with students around them in the forms of think-pair-share questions, graded work, and graded in-lecture assignments. The activities greatly improved attendance and encouraged active participation in class, as the students were given the opportunity to collaborate with other students before turning in their work for grades. The assignments consisted of easy-to-grade, multiple-choice questions, but they relied on students' interpreting information as opposed to memorizing facts. Often, the questions involved data and plots, images, and scenarios the students had to interpret before selecting their answers.

- Students in a large, 220-student astronomy class were divided into small learning teams of 10 to 15 students each. The instructor provided an overview of the week's activities at a weekly meeting of the full class. Then about a dozen discussion questions were posted online, ranging from factual questions testing basic knowledge to complex questions requiring that students draw conclusions, to questions intended to elicit controversy. Midweek, students met in teams for one hour to prepare answers collaboratively and to carry out inquiry-based team projects. Each team was supervised by an undergraduate learning assistant. Teams posted written answers to all questions on the course website. At the third weekly class meeting, the instructor led a discussion session directing questions not to individual students but to the learning teams. Before the meeting, the instructor reviewed all of the posted written answers to a given question, thereby allowing the discussion time to be devoted to questions with dissonant answers among teams.

- Small-group activities provided a strategy for exposing students to psychology course concepts. Working in pairs, students could use their books, could dialogue about questions, and could reinforce learning with other students. Faculty and undergraduate learning assistants observed that small-group work was more productive when students worked in dyads. More in-depth discussions occurred and more completed worksheets were submitted. The worksheets included essay responses so that students did more than answer simple questions or blindly choose responses. More discussion and comments arose from the essay format for small-group assignments.

- All 930 students enrolled in a fine arts course were divided into peer learning teams of six students each. The teams engaged in online discussions that required students to analyze two short essays in preparation for producing their own short essays. The discussions increased interaction among students, created an atmosphere of active learning, and developed students' critical-thinking skills. Newly created positions called *preceptors*, most of whom had BAs in English, interacted with students via e-mail, monitored student progress, led online discussions, and graded critical-analysis essays. Each preceptor worked with 10 peer learning teams, or a total of 60 students. When asked how it felt to be a student in a large, online class, students responded, "I'm not in a large class; I'm in a class of six."

- Required weekly discussion posts demanded engagement with primary source readings that was both broader and deeper than in the traditional offerings of a history course. Students were required to make a minimum of three discussion posts each week in response to questions and comments pertaining to assigned primary source readings. This meant that each student had to "speak up" every week and offer a set of coherent thoughts in a virtual discussion group. It represented great improvement over the traditional classroom format in which a minority of students engaged in discussion. Moderation of the discussion groups by virtual preceptors and the instructors of record enhanced the quantity and quality of instructor feedback. In addition, transforming the colloquial English of oral interventions in the classroom into standard written English improved the quality of student discussion, sharpened writing skills, and increased the amount of written work students submitted during the course of a semester compared with traditional courses. Because discussion groups focused on the analysis of primary sources and the integration of those interpretations into textbook and lecture material, students were exposed to a more sophisticated style of learning.

- Class size in women's studies was increased from 150 or 200 to 400. In the traditional 200-student sections, group discussions were very difficult. In the redesign, part of the lecture time was replaced with required online student activities and discussion. Students in the large lectures were broken into smaller, 40-person communities. Each group was administered by an undergraduate learning assistant and a graduate teaching assistant. The redesigned course enhanced quality by increasing student engagement with the course. Students were asked to actively interact with the material and with their peers and to apply course concepts to real-life examples. Working in small groups, students had to complete a series of five discussion boards, which involved participating in discussions around course topics, completing individual and group activities such as taking virtual field trips, and examining real data on women's issues. Students had a series of three experiential assignments that required them to learn by doing. For example, during a unit on gender roles, students were asked to play "toy store detectives" in order to analyze the messages about gender embedded in children's toys. Talking in front of a group can be an intimidating

experience for many students, but the online format allowed them anonymity. It also let them compose their thoughts before making a post.

- Students from large lecture sections of about 90 students in a management course were divided into groups of 3. Each group participated in 10 online discussions throughout the semester. The discussions pertained to the slides that had been posted for the coming week's assigned text chapter. Each group contributed to the discussion by asking two questions regarding the slides and by answering the two questions posed by each of the other group members. Two days prior to the class meeting on the chapter, the group was responsible for sending a group report to the instructor electronically. The report summarized the group's decision as to which question and answer best described the discussion they had had on the topics. Additionally, students were advised to be prepared to discuss their questions and answers if called upon in the face-to-face class session. During the large lecture, students took group quizzes to increase student-to-student exchanges and discussed more actively with the entire group because of their pre-class interactions online.

Q: How do we ensure that all members of the group participate equally—that is, make the same contributions to the group work?

A: Although plenty of literature shows that collaborative learning can be very effective, it does not follow that students will engage in the practice automatically. A few will, but many students need prodding to overcome their ingrained habit to study alone.

Here is an example of a successful plan that ensures equal participation. To ensure that learning team members actually worked together, 40 percent of a student's score in the course was attributed not to the student's individual performance but to the team's performance. (The remaining 60 percent was based on the student's performance on quizzes and examinations.) The scores for written and oral answers to discussion questions were attributed not to individuals but to the team. Thus, every student on a team had an incentive to help every other student prepare good written and oral answers to the discussion questions. Likewise, grades for collaborative homework projects were assigned to teams, not individuals.

Members of the learning teams were permitted to divide the cumulative team score among themselves as they saw fit. A password-protected facility on the team home page allowed each team member to rate each teammate on performance. Each student could see his or her average performance rating by the rest of the team (but not ratings by individuals) and could compare that rating with the average rating of all members of the team. Then the team scores were divided among the members according to a simple algorithm based on the ratings.

The system worked remarkably well. Before posting results of the team ratings, the instructor asked supervising undergraduate learning assistants whether the students had rated each other fairly, and 90 percent of the time the assistants said the students' mutual ratings conformed almost exactly to their own perceptions of the students' performance. (Ten percent of the time, the coaches recommended that the instructor mitigate a low rating for one or two individuals, which the instructor did.) Because the students within a learning team knew each other personally, they could and did exert powerful peer pressure to perform. The students perceived the system as fair.

Student-Response Systems (Clickers)

Q: What are examples of the effective use of clickers?

A: Student-response systems (clickers) provide two important benefits: they increase student engagement with the course, and they provide immediate feedback for the instructor about how well students comprehend the course material. Following are examples of the effective use of clickers.

- A student-response system (clickers) was used in large psychology lecture sections (400 students) to promote participation and regular attendance in the redesign. Ten percent of the course grade was based on class participation, calculated as the number of times a student clicked in out of the total number of opportunities to do so. Instructors incorporated three to five clicker questions into each day's PowerPoint slides. The questions were created to be in a style and at a challenge level similar to the exam questions. Students viewed the clickers favorably, with a majority of respondents agreeing "somewhat" or "strongly" that clickers were useful by promoting understanding of course material, enabling them to connect with the instructor, and enabling them to connect with course material. Focus groups revealed that clickers were most effective when they were used for soliciting student feedback to challenging questions in class.

- To facilitate active learning in large physics lecture sections (100 or 250 students), a classroom response system (clickers) was used to pose conceptual questions that students answered after consulting with a small group of peers. Among other things, the technology enabled instructors to troll for and correct student misconceptions. The team had a you-need-to-be-there-and-you-need-to-be-engaged attitude with regard to the use of the system, and it had a positive impact on attendance and student attitude. The use of a classroom response system made the course more interactive and had a positive impact on class attendance (responses contributed toward the course grade).

- All students in a psychology course were required to purchase a clicker and were instructed to bring the clicker to each seated class. The instructors incorporated questions from future tests into the lecture, and students provided answers during the class via their clickers. The results provided the instructor with immediate feedback as to whether or not students' understanding of the identified difficult material improved after classroom demonstrations and discussion. If needed, the instructor could then employ peer instruction or other demonstrations and discussion until students were performing at an acceptable level on quiz items by using the clickers. Clickers were also used for monitoring participation during each class period, which counted in the overall course grade. This information was also used for following up via e-mail with students who were not in class, as well as for reaching out to students who had not been attending class on a regular basis.

Individualized Instruction via Online Tutorials

Q: How can online tutorials transform a large course into a class of one?

A: Interactive tutorials that include simulations and exercises replace standard presentation formats, thereby giving students needed practice and supporting greater engagement with the material. Students can access course materials as often as needed. Tutorials allow the learning

experience to be individualized for each student—something impossible to achieve with the one-size-fits-all lecture model.

The selection of online learning materials needs to be a thoughtful process. There are dozens of commercial and noncommercial products that claim to be interactive and cutting-edge but end up being a glorified set of PowerPoint presentations or flashcards. Unless the quality of online tutorials is high, they can be seen as an unchallenging waste of time by students. We address criteria for choosing software at greater length in Chapter X.

Following are examples of effective online tutorial use.

- A chemistry redesign made heavy use of Web-based tutorial modules in a large course comprising 350 to 450 students per section. Each module led a student through a topic in 6 to 10 interactive pages. When the student completed the tutorial, a debriefing section presented a series of questions that tested whether the student had mastered the content of that module. Students found the online tutorials to be very helpful; they particularly liked the ability to link directly from a problem they had difficulty with to a tutorial that helped them learn the concepts needed to solve the problem. Many reported they found the online material much more accessible than the textbook material. Because students came to class prepared to ask questions after completing the tutorials and because they helped structure the discussion sections, less instructors' preparation time was required. Tutorials also provided an effective substitute for faculty time otherwise spent preparing and delivering lectures. When the team did less lecturing and counted on the tutorials to provide a major fraction of the instruction, students were not at a disadvantage.

- Spanish redesign projects universally employed the strategy of using technology when prior research indicated it was most effective and using class time when it was most effective. The result was a combination of class sessions focused on oral skills development and online tutorials that taught with reading, listening, writing, grammar, and vocabulary. Putting such exercises online left more time in class for communicative activities. Students came to class having already studied and completed various mechanical and self-grading exercises. That preparation let instructors focus on directing various interactive activities instead of teaching grammar and other skills. All videos accompanying the elementary Spanish textbook were placed online. Not having to show the videos in class was another important improvement over the traditional course. In the redesigned course, the students had already watched the video before coming to class, thus leaving more time to discuss the videos during class. The textbook and workbook exercises previously in a paper format were moved online along with directions for use and model answers. Students received immediate (automated) feedback and detailed grammatical explanations about their work. Exercises were divided between practice exercises that could be taken as many times as needed and quizzes that could be taken only once for a grade.

- Almost all NCAT mathematics redesigns were built around a commercial instructional software package. The availability of the software enabled each institution to avoid spending funds on software development and instead to direct all resources toward support of student learning. The software was versatile—supporting verbal, visual, and discovery-based learning styles—and could be accessed anytime at home or in a lab. Students found the software easy to use and achieved a comfort level in a short amount of time. They especially liked the instant feedback they received when working problems and the Guided Solutions available when their answers were incorrect. Tutorials have taken over the main

instructional role in most math redesigns. The software also let instructors see the work that students were actually doing and they could therefore easily monitor students' progress.

- Easy online access to materials and resources increased learner time on task in an English composition redesign. Grammar review sites and quizzes—including the support site for the *New Century Handbook*, the CLAST online textbook, Cttc.comnet.edu/grammar, Academic.com, and the Texas Information Literacy Tutorial (TILT)—provided individualized remediation based on diagnostic information. Students also had access to textbook companion website materials that assisted with writing principles, writing mechanics, and reading comprehension. Students could access information around the clock and as often as they needed to do so. By conducting some instruction online instead of in class, faculty increased the amount of class time spent on the writing process. Outside class, students could submit midstage drafts to tutors at commercial online tutoring service Smarthinking and/or to college e-responders. Those round-the-clock services provided students with prompt, constructive feedback on writing assignments. The fast feedback and online assistance let students make the right changes and improved the quality of student writing. During class, the labor management aspects of the course website let the faculty provide students with individual assistance throughout class time, focusing on the needs of each student and supporting a diversity of learning styles.

- A statistics redesign used StatTutor, an automated, intelligent tutoring system developed at Carnegie Mellon University. StatTutor facilitated understanding of statistical ideas and analytical techniques by helping students construct useful knowledge representations and thereby develop effective problem-solving skills. It contained a specific outline of steps, or scaffolding, to follow in solving problems and gave immediate feedback, tracking individual students as they went through lab exercises. StatTutor provided feedback when students pursued an unproductive path, and it closely assessed individual students' acquisition of statistical-inference skills—in effect providing an individual tutor for each student. StatTutor also supported a dynamic model of problem solving in lab exercises by asking students to choose and categorize relevant variables and select the appropriate statistical package tools, thus making labs and homework more open-ended, exploratory, and active.

Mastery Quizzing

Quizzing is an effective tool that compels students to review material. Used by many teachers in a variety of disciplines from the primary grades through graduate school, the quizzing tool is perhaps the most universally recognized way to get students to prepare for class. Quizzing deals with students individually and lets them correct their individual misunderstandings in the process. We have found that when used appropriately, Web-based quizzing is an effective and efficient pedagogical tool and a major contributor to improved student learning.

Q: What is the most effective way to use quizzing?

A: Quizzes should be required rather than voluntary. If students do not have to take quizzes, many of them will not bother—if only because students do not like the idea of being evaluated. If students do not take the quizzes, they cannot benefit from the feedback that tells them which aspects of their learning are incorrect.

Quizzes should be low stakes. They should be treated as interactive exercises rather than evaluations. In addition to reducing the level of anxiety associated with evaluation, students can use quizzes as an index of what they need to study. The point value associated with taking

quizzes should be less than that associated with other evaluative tools such as exams and papers. This reduces the stressfulness of quizzing, making a quiz less like an evaluation and more like an opportunity to gain feedback on what students need to study more carefully.

Students should be allowed—in fact, encouraged—to take quizzes repeatedly so that they can master the material. Consistent with the idea that a quiz is a learning tool rather than an evaluation tool, repeated attempts facilitate student mastery of the material. Students should be encouraged to take quizzes as often as necessary to demonstrate their mastery of the material. Then the highest grade—not the first, most recent, or average grade—should be accepted as evidence of ability: If students are graded based on their first attempt, they see the quiz as an evaluation rather than a learning tool. If they are graded based on the most recent score, there may be a disincentive to continue to take the quiz (to practice) after an acceptable grade has been achieved. If they are graded based on an average grade, students are not likely to take the quiz repeatedly—if only because a bad score can dramatically reduce their chances of doing well.

Students should have the opportunity to see—immediately after completing each quiz—how many and which questions they answered correctly and incorrectly. Consistent with the importance of immediacy of reinforcement, this allows students to see how they did even as they remember why they answered questions the way they did. Ideally, for each question answered incorrectly, feedback should include information on where to turn to find the correct answer. It may be in the form of an indicator of the page to turn to or, better, a link to a Web-based image of the page(s) to review. The advantage of a Web-based link is that it makes the process of quizzing more interactive and less like a study tool.

Quizzes should be due frequently. In keeping with the idea that massed practice is less effective than spacing learning throughout the semester, quizzes should be due on a regular basis (once, twice, or three times a week) throughout the semester—not only before exams.

Q: How should quiz questions be organized?

A: Item selection should be randomized to make it harder for students to cheat. If every student sees the same quiz items in the same order, students will compare notes and prepare answers to the questions rather than understand the material. For the same reason, there should be several different versions of each quiz item.

The order of the questions (either in the same order as material is covered within the text or randomly arranged) is unrelated to the efficacy of quizzing. Instructors who prefer to make their quizzes more difficult by randomly arranging the order of questions should be encouraged to do so.

The number of questions that should appear on a quiz should be based on what the course instructors consider to be appropriate for the class. We have found that quizzes with 15 to 25 items work well. The 15 to 25 items should be drawn from a quiz pool of 100 to 200 questions per quiz assignment to ensure that students are taking different quizzes with each attempt.

For multiple-choice questions, when possible (i.e., the question does not have *all of the above* or *A* and *B* or other, similar answers as options), the order of the answers should be scrambled. This makes it harder for students to focus on the answer order and tends to focus them on the correct answer. Because spelling is important in answers to short-answer questions, students may understand the concept but answer incorrectly. We discourage the use of short-answer

questions in quizzing unless spelling is a part of the course learning objectives (e.g., foreign-language courses). Essay questions may be appropriate for quizzing but should be used sparingly—if only because of the time and effort required to grade them.

Q: Should you use test banks provided by commercial publishers?

A: Most publishing companies provide test banks in conjunction with their textbooks. Often, answers provide guided feedback linked to the textbook; for example, students can click and see a pdf of a page they need to study. Instructors need to screen questions from publisher test banks before including such questions in quizzes. Including all items provided by the publisher without reviewing them is not a good idea, if only because many of the items are not good questions. Some items are inconsistent with course goals, and others may not be important enough to be included.

Modularization

Many students get to the end of a course having mastered a large percentage of the material but not enough to pass the course. They are then forced to repeat the entire course. Others are required to take a developmental course because of low placement scores when actually they lack only a small part of the course content. Course modularization offers institutions a way to treat students as individuals and accommodate partial learning by having students study only what they don't know and thereby letting them make more-rapid progress.

Q: How can modularization be used to reduce the number of incompletes and/or failures?

A: Any course can be modularized by dividing it into distinct segments and assigning one credit for successful completion of one module, two modules, and so on. By requiring students to demonstrate a passing level of proficiency in one module before proceeding to the next, severe deficiencies can be identified and corrected early, resulting in a lower failure/withdrawal rate. In the traditional format, many students fall behind and feel compelled to withdraw. In a modularized format, students who complete, say, 60 percent of the material receive some credit rather than failing the course. And rather than having to reenroll for the entire course, students can take the remaining credits in the subsequent semester. That strategy has enabled redesign teams to eliminate one-fourth of course repetitions, thereby opening slots for additional students every year.

Q: How can modularization be used to combine multiple courses into one?

A: A computer programming redesign combined two introductory courses—one the primary entry point for computer science majors and the other a less technical version of the same course for non-majors—into one course organized in modules. The modules covered particular aspects of computer programming at five different levels of subject mastery and skill acquisition. Non-majors had to demonstrate mastery through level three; computer science majors, through level five. Course credit was variable depending on the number of modules successfully mastered and the level of skill mastery the student attained. Students who had difficulty with the higher levels could change majors and receive course credit without having to drop the course and repeat modules already mastered. And non-majors who developed an interest in becoming computer science majors could go further than originally planned to meet the more stringent requirements.

VII. How to Assess Student Learning

The basic assessment question to be answered is the degree to which improved learning has been achieved as a result of the course redesign. Answering this question requires comparisons between the student learning outcomes associated with a given course delivered in its traditional form and in its redesigned form. There are two steps to achieve this goal: (1) establish the method of obtaining data, and (2) choose the measurement method.

Q: How and when do you obtain the data?

A: There are various ways to acquire the data.

- During the Pilot Term

  This comparison can be accomplished in one of two ways:

  1. Parallel Sections (Traditional and Redesign)

  Run parallel sections of the course in traditional and redesigned formats and look at whether there are any differences in outcomes—a classic "quasi-experiment."

  2. Baseline Before (Traditional) and After (Redesign)

  Establish baseline information about student learning outcomes from an offering of the traditional format before the redesign begins and compare the outcomes achieved in a subsequent (after) offering of the course in its redesigned format.

  Note: The number of students assessed should include at least 100 from the traditional format and 100 from the redesigned format.

- During the First Term of Full Implementation

  Because there will not be an opportunity to run parallel sections once the redesign reaches full implementation, use baseline data from (a) an offering of the traditional format before the redesign began, or (b) the parallel sections of the course offered in the traditional format during the pilot phase.

The keys to validity in all cases are (a) to use the same measures and procedures to collect data in both kinds of sections and (b) to ensure as fully as possible that any differences in the student populations taking each section are minimized (or at least documented so that they can be taken into account).

Q: What measures should you use?

A: The degree to which students have actually mastered course content appropriately is, of course, the bottom line. Therefore, some kind of credible assessment of student learning is critical to the redesign project.

Following are descriptions of four measures that may be used.

- *Comparisons of Common Final Exams.* One approach is to use common final examinations to compare student learning outcomes across traditional and redesigned sections. This approach may include sub-scores or similar indicators of performance in particular content areas as well as simply an overall final score or grade. (*Note*: If a grade is used, there must be assurance that the basis on which it was awarded is the same under both conditions—e.g., not curved or otherwise adjusted.)

Examples

Parallel Sections. "During the pilot phase, students will register for either the traditional course or the redesigned course. Student learning will be assessed mostly through examination developed by departmental faculty. Four objectively scored exams will be developed and used commonly in both the traditional and redesigned sections of the course. The exams will assess both knowledge of content and critical-thinking skills to determine how well students meet the six general learning objectives of the course. Student performance on each learning outcome measure will be compared to determine whether students in the redesigned course are performing differently than students in the traditional course."

Before and After. "The specifics of the assessment plan are sound, resting largely on direct comparisons of student exam performance on common instruments in traditional and re-designed sections. Faculty have developed a set of common, objective questions that measure the understanding of key concepts. This examination has been administered across all sections of the course for the past five years. Results obtained from the traditional offering of the course will be compared with those from the redesigned version."

- *Comparisons of Common Content Items Selected from Exams.* If a common exam cannot be or has not been given, an equally good approach is to embed common questions or items in the examinations or assignments administered in the redesigned and traditional delivery formats. This design allows common baselines to be established. For multiple-choice examinations, a minimum of 20 such questions should be included. For other kinds of questions, at least two or three complex problems should be included.

Examples

Parallel Sections. "The primary technique to be used in assessing content is common-item testing for comparing learning outcomes in the redesigned and traditional formats. Direct comparisons of learning outcomes will be obtained from 15 common complex problems embedded into course assessments: 5 early in the semester, 5 at mid-semester and 5 in the final examination in both the traditional and redesigned courses."

Before and After. "The assessment plan will address the need to accommodate a total redesign. The plan calls for a before/after approach using 30 exam questions from the previously delivered traditionally-configured course and embedding them in exams in the redesigned course to provide benchmarks for comparison."

- *Comparisons of Pre- and Post-tests.* A third approach is to administer pre- and post-tests to assess student learning gains within the course in both the traditional and redesigned sections and to compare the results. By using this method, both post-test results and value-added analyses can be compared across sections.

Parallel Sections. "The most important student outcome, content knowledge, will be measured in both redesigned and traditional courses. To assess learning and retention, students will take: a pre-test during the first week of the term and a post-test at the end of the term. The faculty, working with the evaluation team, will design and validate content-specific examinations that are common across traditional and redesigned courses. The instruments will cover a range of behaviors from recall of knowledge to higher-order thinking skills. The examinations will be content-validated through the curriculum design and course objectives."

Before and After. "Student learning in the redesigned environment will be measured against learning in the traditional course through standard pre- and post-tests. The college has been collecting data from students taking this course, using pre- and post-tests to assess student learning gains within the course. Because the same tests are administered in all semesters, they can be used to compare students in the redesigned course with students who have taken the course for a number of years, forming a baseline about learning outcomes in the traditional course. Thus, the college can compare the learning gains of students in the newly redesigned learning environment with the baseline measures already collected from students taking the current version of the course."

- *Comparisons of Student Work Using Common Rubrics.* Naturally occurring samples of student work (e.g., papers, lab assignments, problems) can be collected and their outcomes compared—a valid and useful approach if the assignments producing the work to be examined really are quite similar. Faculty must have agreed in advance on how student performance is to be judged and on the standards for scoring or grading (a clear set of criteria or rubrics to grade assignments). Faculty members should practice applying the criteria in advance of the actual scoring process so as to familiarize themselves with them and to align their standards. Ideally, some form of assessment of interrater agreement should be undertaken.

Examples

Parallel Sections. "Students complete four in-class impromptu writing assignments. A standard set of topics will be established for the traditional and redesigned sections. A standardized method of evaluating the impromptu essays has already been established and will be used in grading each assignment. The essays are graded by using a six-point scale. The reliability measure for this grading scale has been established at 0.92. Additionally, each paper is read by at least two readers. The grading rubric will be applied to the four standard writing assignment prompts administered in parallel in simultaneously offered redesigned and traditional course sections."

Before and After. "The assessment plan is quite sophisticated, involving both before/after comparisons of student mastery of statistics concepts in the traditional course and the redesigned course. The design itself involves direct comparisons of performance on common assignments and problem sets using detailed scoring guides (many of which were piloted and tested previously and are thus of proven utility). Because the department has already established and benchmarked learning outcomes for statistics concepts in considerable detail, and uses common exercises to operationalize these concepts, the basis of comparison is clear."

Q: Should the assessments be different from those used in the course?

A: We strongly recommend that you avoid creating add-on assessments for regular course assignments such as specially constructed pre- and post-tests. These measures can raise significant problems with student motivation. It is easier to match and compare regular course assignments.

Q: How can we be sure that the students in parallel sections are equivalent if they have not been randomly assigned?

A: If parallel sections are formed based on student choice, it would be a good idea to consider whether differences in the characteristics of students taking the course in the two formats might be responsible for differences in results. Final learning outcomes could be regressed on the following: status (full-time versus part-time), high-school percentile rank, total SAT score, race, gender, whether the student was taught by a full-time or part-time faculty member, and whether the student was a beginning freshman.

Q: Are there other comparisons that would be useful to the redesign effort?

A: In addition to choosing one of the three measures described earlier, the redesign team may want to conduct other comparisons between the traditional and redesigned formats such as:

- Performance in follow-on courses
- Attitude toward subject matter
- Deep vs. superficial learning
- Increases in the number of majors in the discipline
- Student interest in pursuing further coursework in the discipline
- Differences in performance among student subpopulations
- Student satisfaction measures

VIII. How to Compare Completion Rates

Completion rates refers to the percentages of students who began the course and finished with grades of C or better. This measure—sometimes referred to as *pass rates*—is generally accepted in higher education to indicate student "success" in a course.

Completion rates are not the same as measures of student learning. *Assessment of learning* refers to direct and comparable measures of student learning outcomes; *completion rates* refers to final grades.

Q: How do we compare completion rates?

A: During both the pilot and full implementation terms (and in subsequent terms as well), the team should collect final grades for students in both the traditional and redesigned versions of the course utilizing NCAT's Completion Form (see Appendix B). *All* students who were enrolled in the course as of the official "census" date should be counted, including drops, withdrawals, incompletes and failures. Calculate the percentage of students earning a grade of C or better in both formats and compare the results.

Q: Why are grades not comparative measures of student learning?

A: Pass rates (grades of C or better) in traditional courses are not reliable indicators of student learning and almost universally suffer from inconsistencies in grading practices. Students in traditional courses are assessed in a variety of ways that lead to overall grading differences. Inconsistencies include (1) curving, (2) failing to establish common standards for topic coverage (in some sections, entire topics are not covered, yet students pass), (3) having no clear guidelines regarding the award of partial credit, (4) allowing students to fail a required final exam yet still pass the course, and (5) failing to provide training and oversight of instructors, especially part-time ones.

NCAT has frequently observed the phenomenon of improved student learning outcomes supported by clear assessment data coupled with decreased completion rates. This phenomenon is typically due to prior grade inflation.

Examples

- At Florida Gulf Coast University (FGCU), redesign students in fine arts succeeded at a much higher level than traditional students on module exam objective questions, which tested content knowledge (85 percent versus 72 percent), yet in a comparison of final grades, 22 percent of students in the traditional course received Ds or Fs or withdrew; in the redesigned course, 29 percent received Ds or Fs or withdrew. Upon further investigation, the FGCU team discovered that different standards for passing the course were being applied. The adjuncts who taught the traditional course curved their module exam grades—often by as much as 15 to 20 points.

- At the State University of New York at Potsdam, average scores on comparable questions graded by the same rubric improved from 2.22 in the traditional history course to 2.58 in the redesigned course, and correct responses to common multiple-choice questions increased from 55 percent to 76 percent; yet student success rates (grades of C or better) declined from 73 percent of traditional students to 61 percent of redesign students. Because generally less-demanding adjunct faculty have been eliminated from teaching the courses

and grading has become more uniform, the team believes past grades were higher because grading was easier.

- At Alcorn State University, the average of midterm exam scores and final exam scores in College Algebra from fall 2008 traditional sections were compared with those from fall 2009 redesigned sections. Students in the redesigned course performed significantly better: the average score of the fall 2008 traditional sections was 55.89, and that of the fall 2009 redesigned sections was 66.16. Even though students received better scores on the common exams, the drop-failure-withdrawal rate of fall 2009 was higher (47 percent) than that of fall 2008 (22 percent). The reason for the conflict between improved test scores and lower completion rates was most likely that the redesigned course used uniform grading methods across sections, whereas instructors in the past had had more grading flexibility, possibly leading to grade inflation.

Q: Why would one want to look at comparative completion rates as well as comparative measures of student learning?

A: It is important that students both master the content of the course and complete the course. It is possible to demonstrate increased student learning through redesign (e.g., final exam means that increase from 50 percent to 70 percent), but if only 20 percent of students take the final exam, there's a problem despite the demonstrated increase in student learning outcomes.

IX. How to Address Specific Faculty Concerns

Clearly, faculty members are crucial to the redesign and are involved at every stage. Certain issues, however, are particular to faculty members' situations—such as their changing roles, responsibilities, workloads, and training, all of which we address in this chapter. Some institutions are fortunate to have all instructors buy into and support the redesign, but most encounter some resistance along the way—resistance that ranges from mild to severe. Thus, we also provide some ideas about how others have dealt with faculty resistance to the new way of teaching.

The Faculty Role

Q: How does the instructor's role change?

A: In redesigned courses, the faculty role frequently changes from that of the sage on the stage to the guide on the side. Faculty members become facilitators of student learning, architects of meaningful learning activities, and managers of a diverse group of instructional personnel with distinct roles of their own. Faculty members spend decreased amounts of time preparing and presenting lectures, grading homework, or preparing and grading tests. Therefore, they can dedicate more time to helping students. Redesign represents a huge adjustment for many experienced instructors and for inexperienced instructors as well. At the same time, it is a very *rewarding* experience for instructors, as reported by experienced redesign teams.

Q: Doesn't course redesign reduce the interaction between students and instructors?

A: On the contrary, there is *more* interaction between students and instructors than ever before, and that interaction is more meaningful, more individualized, and more focused. The main reason students learn better under a redesign model is that they become less passive about and more actively involved with course content, and they receive help based on their individual needs.

Q: Who should be responsible for the course?

A: Someone must take overall responsibility for ensuring that the course works well, that all students have the same learning experiences and assessments, and that all course policies and procedures get implemented consistently. Make sure you have a course coordinator or project leader who can offer the necessary leadership. In smaller institutions, the department chair usually has overall responsibility for ensuring that the course works well, that all students have the same learning experiences and assessments, and that all course policies and procedures get implemented consistently. In larger institutions, a course coordinator might assume that responsibility. At the same time, it is important to emphasize teamwork and to involve others in the decision-making process. As in the traditional format, instructors themselves are responsible for their individual sections.

Q: Doesn't reducing costs suggest a negative impact on faculty such as loss of tenure track lines, deskilling the professoriate, or loss of funding to the department or program?

A: The goal of course redesign is not to threaten the faculty role in instruction but rather to re-envision it. The idea is to enable faculty to use higher-level skills and knowledge to design and

offer the course while assigning lower-level skill-based activities to other instructional personnel, as discussed in Chapter IV.

In the past, cost reduction in higher education has meant loss of jobs, but that's not the NCAT approach. In the vast majority of NCAT course redesign projects, the cost savings achieved through redesigned courses remained in the department that generated the savings; and the savings achieved were used for instructional purposes. NCAT thinks of cost savings as reallocations of resources that enable faculty and their institutions to achieve their wish lists of things they would like to do if they had additional resources.

Institutional participants have used cost savings in the following ways.

- To offer additional or new courses that previously could not be offered
- To satisfy unmet student demand by serving more students with the same resource base
- To break up academic bottlenecks—courses that delay students' progress within a subject area or program because the areas or programs are oversubscribed
- To increase faculty released time for research, renewal, or additional course development
- To fund undergraduate research programs
- To deal effectively with budget cuts without diminished quality
- To apply to combinations of these

Faculty Workload

Q: What redesigned teaching load is equivalent to a traditional three-credit-hour course?

A: There is no simple answer to that question because every institution and every department has a different set of rules (policies and procedures) in regard to faculty load. Redesign will require revisiting some of those rules because of the way that redesigned courses are structured. For instance, a teaching assignment that used to consist of a three-day-a-week hour-long lecture with paper assessments may now be very different because the software can provide most of the lecture and can automate most of the assessments, and other kinds of personnel can carry out different instructional tasks.

A common assumption in higher education is that instructors spend two hours outside class (preparing and grading) for every one hour spent in class. That means that a three-credit course typically requires the instructor to spend nine hours per week on the course. Because both the in-class time and the preparation and grading time are reduced in a course redesign, instructor time must be reallocated accordingly. You will need to make decisions based on your own institutional rules and the changes you made to achieve the redesigned course structure. In addition, many institutions ask instructors to schedule some of their office hours in a lab or help center so that they can provide assistance for all students in the lab when they don't have scheduled appointments with their own students.

Q: Are there tools that help instructors see how much time they are spending in the redesigned format versus in the traditional format?

A: NCAT developed the Scope of Effort Worksheet (see Appendix D) to help campuses document that the number of hours faculty devote to a redesigned course will be the same or fewer than those devoted to the traditional format of the course, even if class size increases or the number of sections that faculty carry increases. This is possible because the course

redesign off-loads to the technology certain tasks like lecturing, grading, and monitoring student progress. Explaining how this occurs and documenting the changes by using the Scope of Effort Worksheet enable redesign leaders to help others on campus understand the benefits of redesign for both students and faculty.

Faculty Training

Q: How much training is needed for instructors?

A: Many institutions experience problems because they underestimate the degree of training—both initial and ongoing—that is required in order to implement their redesigns successfully. The new format inevitably requires very different kinds of interactions with students from those in the traditional teaching format. Developing a formal plan for initial and ongoing training of all personnel—rather than assuming they will pick up the new methods on their own—will go a long way to ensuring a successful redesign.

Instructors working in a redesigned setting for the first time need enough training to understand the new philosophy of teaching that is required, because a change in basic mind-set must take place. Some people embrace that change immediately; others may have to be dragged along. Here are some tips:

- Plan to get instructors involved as early as possible.
- Involve instructors in curricular decision making.
- Offer workshops with discussions and presentations.
- Bring in guests from other schools that have successfully implemented a course redesign that is similar in model or discipline.
- As the semester progresses, meet frequently with all instructors to offer ongoing training. Some institutions meet weekly; others meet on a less-regular basis.

Q: What should instructor training include?

A: The most important aspect of instructor training involves how to "teach" in the redesign, because the redesigned format may be very different from the teaching format the instructors have used and/or experienced in the past. Instructors need to be coached in ways to facilitate—and engage students in—problem solving rather than instructors' resorting to lecturing or providing answers for students. Training should include:

- A full explanation of the redesign model, including its rationale and benefits
- Clear guidelines on instructors' responsibilities under the new model
- How to use the instructional software and other online resources
- The importance of maintaining consistency in implementing all elements of the redesign

Q: How often do we need to train instructors?

A: The desire to go back to old ways of doing things has to be overcome. Ongoing mandatory training of instructors is the only way to ensure that success will be achieved. All personnel need to be reminded of the policies and procedures and learn about changes in the software. We recommend holding a meeting with all experienced instructors at least once each semester to review old policies and point out any new ones.

As new faculty are brought into the course over time, it is important to help them go through the same steps of accepting a different learning model and to point out ways of creating the types of connections attributed to the traditional lecture format. We recommend conducting at the beginning of each semester a workshop for instructors new to redesign and then monitoring their work throughout their initial term of working under the redesigned model.

Q: How should we train adjunct faculty members?

A: In addition to involving adjuncts in instructor training sessions, full-time faculty need to mentor part-time faculty during the latter's initial term of working in the redesigned model. Although time-consuming, doing so will ensure greater consistency in the redesign. Mentoring is an investment that will ensure the continued success of the redesign.

Q: How do we ensure ongoing consistency among instructors?

A: Even when initial training is provided for all instructors, most institutions discover inconsistencies in application of the redesign, especially during the pilot period. For example, students may be required to complete guided-lecture notes before taking a quiz, but some instructors do not monitor guided-lecture-note completion. Despite policies against accessing external resources during class or lab, some instructors allow students to listen to music with headphones, check e-mail, or use non-course-related Web resources while in class. Despite policies to the contrary, some instructors permit use of notes on proctored exams.

The faculty need to formulate firm rules about such matters. Faculty need to adjust to the concept that they are not permitted to make decisions based on their individual interpretations; rather, all have to follow the same rules and guidelines. If an instructor has an idea for improving student learning and/or the process, the idea should be agreed upon and applied by all instructors. Because unforeseen issues arise regularly, weekly staff meetings are necessary—with results recorded, published, and distributed so that all faculty and staff can consistently implement the decisions. Although time-consuming, this investment ensures the continued success of redesign.

Faculty Resistance

Q: How can we overcome faculty resistance to the redesign?

A: There are a number of ways to overcome faculty resistance.

- *Persuade them.* Some faculty members are sincerely concerned that students cannot learn course content in the redesigned format. They have spent years lecturing, watching students do homework, and grading many, many papers. With greater exposure to situations in which the redesign is working, these sincere instructors will adapt to and embrace the more successful learning environment. The data demonstrating greater student success will persuade them, as will the assurances of their colleagues on campus and at other institutions who use the redesigned model.

- *Train them.* Instructors who want training are not confused. They recognize they are unfamiliar with software that will be used extensively in the redesign even if they have tried using it previously in one or two sections as homework assignments. They know they are accustomed to lecturing and that working with students in a different learning environment will require different approaches, and they seek assistance and training to learn the new

methods. Other instructors who are new to using software and the redesign model also need training. Both types of instructors know they need greater understanding and practice prior to full implementation of the new model. They also want to understand and adhere to the new policies but need training to do so.

- *Mentor them.* As new faculty join the redesign after the initial pilot, they will undoubtedly have questions as the term proceeds. Their confidence will grow with experience, but they will benefit from having a specific person available to help them in dealing with students. Mentors should check in frequently to be sure that new faculty are adapting to the new approaches. Mentoring can occur between full-time faculty, but it is especially important that full-time faculty mentor adjunct faculty. At most institutions, adjuncts have been permitted to teach in whatever ways they wanted. The new and consistent redesigned course represents a significant change for part-time faculty. An adjunct who is supervising tutors will need guidance in this role because it is a new one for most. Adjuncts are frequently not on campus when most full-time faculty are. They may not be able to observe the redesign when it is being managed by full-time faculty. Having a full-time faculty mentor or an experienced adjunct mentor will be valuable for all, but particularly for those part-timers who teach in the evening or on weekends. Mentoring will assist adjuncts as they join the new model, and it will help overcome objections related to change.

- *Reassign them.* Some faculty may never see the benefits of the redesign for both students and faculty. They will refuse to change or they will cause major difficulties for the team and for the administration. Even when the results demonstrate that the redesign is leading to greater student learning and higher completion rates, some faculty will not agree to even try the new approach. Such faculty should be reassigned to other responsibilities in the institution if they are full-time, tenure-track employees. The preferences of individual faculty to continue teaching as they always have—even when students are not succeeding—cannot be tolerated by an institution that truly wants student learning and completion to improve.

- *Fire them.* Sad as it may sound, some faculty care more about getting to do whatever they want than about seeing students succeed. Adjunct faculty hired from term to term and others who are not tenured may need to seek employment elsewhere. Again, institutions seeking to provide learning environments in which students succeed must have faculty who share that goal and who demonstrate their shared agreement through their participation in the redesign model.

It is important to remind all faculty why the redesign was undertaken. Some may argue that the institution should return to the traditional, old way of offering the course, but they should be reminded that that would not improve the situation for students, because fixing the old way was the reason the redesign began. Faculty should be reminded of the successes other institutions have achieved and the benefits to faculty, such as working more closely with students who need their assistance and reducing the tedious task of grading.

X. How to Deal with Technological Issues

Integrating software and other technologies into a course redesign involves a lot of details and a lot of decisions. The following questions are frequently asked by teams working on new redesigns; the answers have been collected from those who have successfully implemented and sustained course redesigns.

Q: How do we choose the right instructional software package?

A: Some teams initially believe they will choose the software that accompanies the textbook they're currently using. Although that's certainly a possibility, it is useful for teams to consider the range of software options now on the market. Prior to making a software selection, a team should invite various vendors to demonstrate products and discuss particular institutional needs in order to determine how well the software could meet those needs.

The following list was developed by Phoebe Rouse at Louisiana State University. It provides a structure for teams to use as they consider which software package would work best with their students at their institutions.

Must Haves (without these, nothing else matters!)

- *Reliability.* Students and faculty need to know that the software will operate consistently—and without major or frequent downtimes.
- *High-quality content.* Faculty must feel confident that the content included is comprehensive, current, and well explained.
- *User-friendliness.* The software must be easy to use. Explanations to faculty for setting up the software with the appropriate learning resources, homework, and assessments should be clear. Software should be easy for students to use so that they can focus on learning the course content, not learning the software.

Other Features to Consider

- Ease of installation
- Cost to student
- Cost to institution
- Quality and accessibility of technical support
- Vendor willingness to provide training
- Browser restrictions
- Platform restrictions
- Capability for faculty to communicate with students
- Algorithmic exercises available
- Tutorial features
- Textbook included
- Videos
- Partial credit for multi-part questions
- Pooling for tests
- Sophistication of testing mechanism
- Coordinator/master course capability
- Grade book features

- Ease of ability to export grades
- Feedback after submission
- Ability to print student work
- Multiple attempts allowed on assignments
- Settings for individual students
- Software compatibility with Americans with Disabilities Act
- IP address restriction capability

Q: What about using free (open-source) software?

A: Some teams have considered using free software or resources available in repositories at the state or national level, but most of the successful course redesigns have based their redesigns around commercial software or well-established websites. Free resources should be evaluated using the earlier list. A key consideration is the decision about who will maintain and update the free resources over time. Companies are committed to doing so; free resources are often produced as one-offs as part of a particular project or grant program.

Q: What should we do if students cannot purchase software access codes at the beginning of the term for financial aid reasons?

A: Some of the commercial software providers have an option that gives students temporary access codes for several weeks while students wait for their financial aid. Students who buy the access code retain the work done, as if the students had bought the code at the beginning of the term. If students do not purchase the access code by the end of the grace period, the students' work cannot be accessed. When interviewing software companies, you should ask whether they provide such a grace period for students.

Q: Do students also need a textbook?

A: Institutions have made different decisions regarding whether or not students need a textbook. Some believe it is important for students to see the course content in a hard-copy format; others believe that software accompanied by an online text is sufficient and view the hard-copy textbook as an unnecessary but temporary crutch. Still others make the hard-copy textbook optional depending on student preference. Making the decision about whether to require a textbook should occur *after* the software has been selected so that the kinds of resources included in the software are known.

Q: What kinds of problems can we anticipate regarding student computer literacy?

A: Assuming that students' ability to access Facebook or use a smartphone ensures their ability to use software is a common mistake. Many students like using computer software, especially because they have the chance to work with the software at home. Others, however, find computer work very stressful, saying they would rather be in a traditional classroom. Plus, many nontraditional students lack computer skills.

One solution is to develop brief training materials that help students get started using the software. Such materials could include resources that have already been developed by the software company. Some students can get started quickly by using the software and are willing to try different options; others prefer a set of instructions as to how to get started. Some institutions have also developed an online, orientation quiz on the software's features that

students complete during the first week of the term. In finding answers to the quiz questions, students become familiar with the features of the software they will be using. Other institutions offer workshops at the beginning of each term for students who need to learn basic computer skills. Instructors and tutors should pay particular attention to technophobes to help the latter overcome computer anxiety, and they should work with them more frequently if needed.

Q: What kinds of technological problems can we anticipate?

A: Most technological problems occur during the early stages of implementation and involve, for example, periodic Internet outages (sporadic interruptions in access to the course software or campus network interruptions), late-arriving equipment, and software server glitches. Course management systems and delivery servers may need to be upgraded to more-robust enterprise versions. When the Internet is not available, it is important to have an alternative plan to engage students.

Q: Should students bring their own computers to the lab/classroom, or should they use those already in the lab/classroom?

A: Different institutions have made different decisions. Institutions with a laptop requirement create labs with tables and chairs, and students use their own laptops. In essence, every classroom can be a lab. The downside to that approach is that students may be more likely to visit other websites and neglect their course work. Thus, other institutions believe that students should use only computers that are in the lab/classroom, where access locations can be limited to those related to the modules. For testing, using lab computers with restricted Web access is important so that it is clear that students are doing their own work. Walk-around proctoring can address both problems.

Q: How can we stop students from doing things other than course work in the lab or computer classroom?

A: Internet browsing (such as on Facebook) during class time can be a distraction and interfere with students' time on task. Problem-solving websites create academic-integrity issues. You need strict rules and you need to enforce them. Students caught violating the policy must receive a severe penalty such as losing participation credit for the week. Be sure to state that policy in the course syllabus. Lab computers can be set to allow access to only certain Internet Protocol sites, and/or software can be installed that locks down Internet surfing. Also, insist that cell phones and other devices be disallowed. Instructors and tutors walking around the lab/classroom can observe what students are doing. In large classes where instructors are busy conducting in-class activities, undergraduate learning assistants can be particularly useful in this regard, providing other sets of eyes, ears, and hands in the classroom to manage the active-learning environment.

Q: Who should be responsible for providing technological support in the course?

A: There is no one-size-fits-all answer to that question because every course redesign differs in the kinds of online resources used, in the role of the campus technology organization that supports the redesign, in the capabilities of lead faculty, in the availability of other personnel like undergraduate learning assistants to provide support, and so on. But someone needs to be designated the specific responsibility of providing or coordinating technological support. Often, what look like faculty members' philosophical objections to using more online work or other technologies are often only representative of concerns about the work and skills involved.

Knowing that someone will be in charge of making the technology "work" tends to melt objections away. Having the course coordinator be responsible for setting up and troubleshooting online work is important to ensuring that the online components stay consistent—and emphasized parts of the course. And there are the obvious efficiencies in instructors' not duplicating the work of creating and maintaining course shells that should be identical across all sections.

XI. How to Ensure Student Participation

The most important way to achieve student success in course redesign is to make sure students are doing the work. In this chapter we address how to introduce the course redesign to students, how to get them to do the work, what to do if they are not doing the work, and what to do if they say they "don't like" the redesign. This chapter is a compendium of ideas about how others have dealt with student acceptance of and resistance to the new way of learning.

Introducing the Course Redesign

Q: For students, what is the most difficult period in the redesign process?

A: Making the change from traditional classroom instruction to new ways of learning involves far more than learning to use a computer. Many students are set in their ways after a lifetime (albeit a brief one) of passive instruction. They need preparation before making the transition to a more-active learning environment. The adjustment period is often difficult, but persistence will win out. The pilot semester can be a difficult transition period as the redesign methodology gets introduced. Most common here are negative student reactions to the perception that the class will be impersonal because it uses technology or that it "has no teacher" (i.e., will lack opportunities for student-student and faculty-student interaction.)

Those challenges can be met by up-front engagement with advisers to explain what the course will be like and by the development of written materials and orientation sessions that explain the new format. Giving careful thought to how students will learn about the redesigned course will help avoid a number of problems that can arise.

Q: How should we orient new students to the course redesign?

A: Most institutions have found it useful to discuss the new approach to learning during new-student orientation. You need to develop—and communicate to students and family members—a coherent and compelling description of the course redesign that addresses common misconceptions and concerns. Both students and parents should be able to see a demonstration of the course and learn more about why the course redesign works so well. Some institutions have also established a website that includes a demonstration version of the course for students and parents so that they can gain a better understanding of the course redesign, the results it has produced and the benefits that students accrue.

As the institutional memory of how a particular course was taught in the traditional format begins to fade and as more and more students become successful, fewer and fewer students and their parents will question why the course is taught in the redesigned format. However, there will always be returning students who remember the "old way" and parents who say, "That's not how I learned X." For that reason—and because course redesign can be so different from the traditional format of other college classes—many institutions continue to include in their student orientations an explanation of the course redesign even well after the model has become fully established.

Q: Are there specific things we should be sure to avoid when we introduce the course redesign to students and others?

A: The most frequent problem that institutions have encountered lies in emphasizing the technology over the educational purpose of the redesign. Here's an example: "Initial stories in

the campus and local presses emphasized the technology of the course. The radical change in instructional style produced what the team dubbed the *no-teacher syndrome*. The stories frightened many students, angered faculty, and confused administrators as parents phoned administrators to ask for details about a so-called instructorless course that was still in the design stage. In hindsight, a better approach would have been to emphasize that technology was already being used in hundreds of other campus courses and that there would be more in-person help available than ever before. It would have been better from the outset to insist that the press stress educational ends rather than technological means. Although improved student learning will always seem less newsworthy than stories about, say, streaming video, it's nevertheless crucial to keep a clear focus on why the technology has been called into play in the first place."

Attendance/Participation

Q: Should lab/classroom/online hours be required?

A: Don't even bother to redesign if you are not going to require all course activities.

Q: How do we get students to go to class/lab and/or participate online?

A: You will never get all students to attend all class meetings or put in all of the required hours in the lab or online, but you can get most students to attend regularly by making classroom, laboratory, and/or online participation at least 10 percent of the final grade. (Some advocate a higher percentage for participation.) This is extremely important. Without course points for participation, success rates may not improve.

Q: Should all students be required to spend the same amount of time on course activities?

A: There are mixed opinions about whether or not students' required hours should be reduced throughout the semester if they earn a certain minimum grade on each test. Some institutions do not change the required amount of time for any student. Others allow the number of hours to decrease if a particular student is maintaining a certain minimum level of mastery on all assignments, quizzes, and tests. No institutions permit students to reduce the required hours to zero.

What to Do When Students Won't Do the Work

Q: What do we do if students do not start working immediately—at the beginning of the term—and they fall behind?

A: It is important to contact students at the end of the first week if they have not attended a lab session/class meeting or have not begun working. Students who start late usually have a difficult time completing the course. The software's tracking feature makes it easy to determine who should be contacted early. Sending an e-mail or making a telephone call demonstrates that the instructor has noticed the student's absence and cares that the student has not begun the course. Some students will respond to the e-mail or phone call by coming to class because someone noticed they are absent and followed up. Those students will continue to need support and encouragement but may become self-sufficient once they experience some success with the course content and see themselves making good progress.

Others will need more-assertive intervention. Those institutions that have early intervention specialists may be able to learn more about students' concerns or life issues and address them if possible. It may be that the course redesign is not the problem. Several institutions have tracked students who did not come to their redesigned classes—yet did not officially withdraw— and discovered that those students had stopped attending *all* classes. In those cases, the institutions administratively withdrew the students and encouraged them to return once they were ready and willing to attend classes.

Q: What do we do if students are not coming to the lab/class for the required number of hours or to the class meetings or are not doing the work?

A: It is essential to monitor student progress and intervene as needed. Faculty (or others working in the course) should track student progress and contact students by e-mail or telephone to set up a time to talk to those who are not engaged. Ideally, the contact should be personal during lab or class meetings. The instructor (or other personnel as described in Chapter IV) should be certain to talk with students who are behind at least once a week. The conversations should determine the problems students may be having with the content, the technology, or the course in general and help students overcome whatever the barrier may be. A student who has taken a test and done poorly should be asked to meet with the instructor (or others working in the course) in class or in the lab to discuss the errors.

Q: Should we communicate with students about problems only?

A: Absolutely not. It's easy to send out a weekly email to all students in the course with study tips or other encouraging thoughts. At some institutions, when a student has taken a major test and done well, the software sends an automatic congratulatory email to the student.

Q: What do we do if students say they don't like the redesign format?

A: When students arrive in college, they expect a particular way of learning: in the form of the traditional lecture format, which requires them to listen, take notes, and take tests. Course redesign, however, requires different behaviors, such as requiring that students engage with the content in an active learning environment before moving on. Thus, when students declare they don't like the redesign, many of them are actually objecting to having to do more work in order to pass the course.

Faculty must be prepared to explain clearly why the new model is better and how it improved prior students' success rates. Merely explaining how the redesign works is not enough. Faculty need to help students arrive at an understanding that additional work will lead to additional learning and to success in college and that they will be supported with personalized assistance in the process. Although students might initially complain that they believe they're working harder than they expected to or harder than their friends did in the traditional courses, their satisfaction with the new format will increase once they acquire the ability to learn the course content and experience success. Student complaints will also diminish once students accept that the new model is here to stay.

XII. Planning and Implementing the Redesign: A Timeline and Checklist

Implementing a course redesign involves four phases: (1) planning and development, (2) conducting a pilot term, (3) making revisions to the redesign plan as needed based on the pilot experience, and (4) fully implementing the redesign in all sections of the course, including assessing and evaluating the full implementation.

Based on the nearly 200 redesigns that NCAT has conducted, a reasonable timeline for completing these four phases is as follows:

- *Six Months Prior to the Pilot Term.* Take six months to plan and develop, during which teams engage in concrete preparation for a pilot term.

  Once the decision has been made to redesign a course, the team should develop a concrete plan that addresses the topics discussed in Chapters I to XI. (Chapter XIII describes what a plan should include.) Once a solid, well-articulated plan with the appropriate approvals and any needed funding is in place, concrete action to prepare for the plan is needed. The checklist found later summarizes the items that need to be addressed in the planning and development phase.

- *Spring Term.* Pilot the redesign with a subset of students and include all or almost all aspects of the redesign.

  NCAT recommends that every large-scale redesign conduct a pilot before moving to full implementation. What do we mean by a *pilot*? A pilot involves testing the redesign idea— including most if not all of the important quality improvement and cost-savings characteristics of the planned redesign—with a subset of students enrolled in the course. Enrollment in the pilot section(s) needs to be large enough so the redesign team can learn what problems students are likely to face and how to resolve them prior to scaling up to full implementation in all sections of the course. The pilot period provides an opportunity for the redesign team to uncover technology issues or any problems that might emerge involving the newly designed assignments or activities. For some institutions, the pilot term also provides a time to collect consistent data on student learning from both traditional and redesign sections that can be compared when consistent historical data are not available. For many institutions, the pilot has provided a time to make sure (1) that important audiences both on and off campus have been informed of changes in the course and (2) that all potential bumps in the road have been smoothed. Overall, a pilot provides the redesign team with a dress rehearsal of the redesigned course and an opportunity to resolve any issues that may arise. Teams have learned that it is much easier to solve problems with 150 to 200 students rather than with 1,000 students.

- *Summer Term.* Continue implementing the redesign with all students in the summer term while resolving issues that arose in the pilot.

  Conducting the pilot in the spring term gives the team time during the summer to address issues that may have arisen in the pilot. Inevitably, you will need to tweak the redesign so that any problems encountered can be resolved. The team may need to modify and/or add policies and procedures to address issues that emerged during the pilot. Training plans may need additional refinement to include any new policies or procedures that were adopted during the pilot. The team should also check with other offices on campus to resolve any

difficulties other offices may have encountered. Some institutions have conducted focus groups with students to uncover problems that can be corrected during this period.

- *Fall Term.* Fully implement the redesign with all students enrolled in the course and include all aspects of the redesign.

  A goal of course redesign is to include under the redesign model all of the institution's students who are enrolled in the course. NCAT calls the first term when this occurs *full implementation* of the redesign. All students benefit from the new learning environment, and both students and the institution benefit from reduced costs. Course policies and procedures are consistently applied to all students, and all students have an increased opportunity to succeed. There may be some modifications of the policies and procedures, but they will likely be minimal if the team has carefully thought through its plan and made corrections after the pilot.

Planning and Implementation Checklist

The following set of questions, organized according to the Essential Elements of Course Redesign, serves as a checklist to ensure that all aspects of a good redesign have been addressed prior to the pilot term. If you are able to answer each of these questions thoughtfully and concretely, your plan has an excellent chance of achieving its academic and financial goals and its benefits for students, faculty, and your institution. Some institutions have assumed that once they've addressed each of the questions, the redesign activity is over. However, that assumption is mistaken: these questions need to be (1) actively addressed in the planning phase, (2) implemented in the pilot, (3) reviewed and modified during the revision stage, and (4) carefully monitored and updated in future terms. Ongoing attention to these ideas will sustain the redesign and help ensure its effective continuation.

Element #1: Redesign the whole course and establish greater course consistency.
- Do you intend to redesign the whole course?
- How will you establish greater course consistency?
- Which redesign model do you intend to use? Why have you selected it?
- Has the importance of consistency for all students been clearly established among all faculty—both full-time and adjuncts? How will that consistency be ensured?
- How will you build and maintain consensus among the multiple redesign stakeholders?
- How will you prepare students and their parents for transition from the traditional format to the redesigned format?
- Has a course coordinator been identified? Have the coordinator's responsibilities been specified?
- Have a training plan and a schedule been established for full-time and adjunct faculty?
- How do you plan to move beyond the initial course design team and enlist other faculty in teaching the redesigned course?

Element #2: Require active learning.
- How will students be actively engaged with course content?
- How many lab/classroom hours will be required each week?
- Do faculty members understand how their roles will change under an active-learning model?

Element #3: Increase interaction among students.
- How will you increase interaction among students?
- Have you thought about incorporating small-group activities that can take place in the lecture hall? in the classroom? in the lab? online?
- Who is going to lead and monitor small-group activities? Have you thought about alternative staffing strategies?

Element #4: Build in ongoing assessment and prompt (automated) feedback.
- How do you plan to incorporate ongoing assessment and prompt feedback for students?
- Do you have a plan to automate grading when possible, such as grading of low-stakes quizzes and homework exercises?

Element #5: Provide students with one-on-one, personalized, on-demand assistance from highly trained personnel.
- How will you provide students with more-individualized assistance? Who will do this and how?
- Have you considered the use of various kinds of personnel who can provide needed student assistance and complete administrative tasks, such as undergraduate peer tutors, graduate teaching assistants, course assistants, and tutors? Who will do what?
- How will you select, orient, and train personnel both initially and on an ongoing basis?

Element #6: Ensure sufficient time on task.
- How will you ensure that students spend sufficient time on task?
- Do you plan to develop materials in addition to the software (notebooks, directions, task lists) to help keep students on task? Have the materials been reviewed for completeness and clarity?
- Do you have a clear timeline and weekly schedules for students that will enable students to finish on time?

Element #7: Monitor student progress and intervene when necessary.
- How will you monitor student progress? How will you deal with students who are falling behind?
- Have you investigated how the software can monitor and track student performance and support course administration?

Element #8: Measure learning, completion, and cost.
- Have you selected a method for obtaining data that will compare student learning outcomes during the pilot and full-implementation phases?
- Will you be able to use existing traditional data, or will you collect parallel data from the traditional and redesigned sections during the pilot term?
- Which of the four measurement methods will you use in each phase?
- Have you decided how you will implement your assessment plan, including working with others who may need to collect or analyze data?
- Have you investigated whether the traditional format contained grade inflation?
- Have you selected a cost reduction strategy to be used in the redesign?
- Have you completed the assessment-planning forms, the completion forms, and the Cost Planning Tool to document your plans?

Building Consensus among All Stakeholders

From its involvement in more than 200 course redesigns, NCAT has found that the most-important implementation issues revolve around building and maintaining a consensus about the redesign among all stakeholders: students, parents, faculty, professional staff, and senior administrators. The need to develop shared understanding of the redesign begins with developing a redesign plan; it continues through the pilot as the redesign plan becomes "real"; it becomes even more necessary during full implementation as more students, more faculty, and more staff become involved; and, equally important, it continues to be maintained on an ongoing basis.

Chapter XIII discusses in detail the issues of consensus and shared understanding and emphasizes sustaining consensus, but it is important for you to consider during the planning period. Having a great plan is not enough; there must be consensus among key stakeholders about that plan. You need to think about building initial consensus by focusing on answering the following questions.

- How will you prepare students and their parents for transition from the traditional format to the redesigned format?
- How do you plan to achieve faculty consensus about the redesign?
- How do you plan to achieve departmental commitment to the redesign?
- How do you plan to achieve commitment and cooperation from campus offices that will be affected by the redesign, such as the registrar, financial aid, information technology, facilities, and advising?
- How do you plan to achieve commitment and support from administrators?
- What strategies do you have in place to orient new personnel in college offices and at senior administrative levels?

XIII. Developing a Written Redesign Plan: Why It's Important

It would be hard to overstate the importance of having a written, specific course redesign plan. Writing things down ensures that you have addressed each issue. Writing things down ensures that everyone involved in the redesign knows what has been agreed to. A written plan can be referenced and revised when necessary throughout the process, serving as a roadmap to keep everyone on track.

In a written redesign plan, you should address the following:

- Select a redesign model and explain why you chose it and how you intend to embody the Eight Essential Elements of Course Redesign within it.

  We describe the Eight Essential Elements of Course Redesign in Chapter I. You need to describe specifically how you will embody those elements within your redesign implementation.

  WHY: As we said in Chapter I, if <u>any</u> of these elements are absent, it is unlikely that student success will improve at a reduced instructional cost. If <u>all</u> of these elements are present and you select an appropriate cost reduction strategy, we guarantee that student success will improve and costs will be reduced. We call these elements *essential* because they are. You need to be sure you have addressed each one of them in your plan.

- Describe specifically the changes to the traditional course structure that will result from the redesign (i.e., number and kinds of class meetings, number and kinds of sections including size(s), staffing plans, student requirements, testing, attendance management and other relevant logistics).

  Course redesign involves a lot of change and a lot of moving parts (and people). You need to think through and make decisions about all of the specific changes you intend to make and be able to describe them for multiple audiences.

  WHY: Being specific about your course redesign prior to its initiation will ensure that the number of issues and problems you'll need to deal with during the start-up phase will be minimized.

- Name and describe the learning materials/software you intend to use.

  You need to make a decision about what software you will use. That decision should be made prior to beginning your redesign implementation.

  WHY: Redesign is not a software-centered process. It focuses on pedagogy and course structure and organization. Choosing a software package upfront will allow you to focus on the more important and more difficult elements of redesign. In addition, you cannot begin to implement your redesign without having made a software choice. This should be done early in the planning process.

- Describe the assessment method you will use. Complete the two Assessment Forms for the pilot and full implementation of your redesign project.

  We discuss the choices of assessment methods in Chapter VII. You need to capture your plan for assessing student learning in the traditional and redesigned formats on the Assessment Forms, which are included in Appendix A.

WHY*:* Because you will face skepticism about implementing your course redesign (because it represents change, and lots of people do not like change), you will want to be able to "prove" that it works. Having valid and reliable student learning outcomes data that demonstrate improvement will address that skepticism and assure you that you are on the right track. Data trump subjective judgment.

- Complete the two Course Completion Forms for the pilot and full implementation of your redesign project.

  As we discuss in Chapter VIII, comparing course completion rates between the traditional and redesigned formats can be a complex issue due to prior grade inflation. You need to investigate your particular situation. Capture your plan for measuring comparative course completion on the Completion Forms, which are included in Appendix B.

  WHY*:* If all students who take the final exam score more than 90, but only 50 percent of students take the final exam, you have a problem. An important goal of course redesign is to improve completion rates. You need to measure completion rates for the same reasons that you need to measure student learning outcomes: data trump subjective judgment.

- Describe the cost reduction strategy you intend to use. Complete the Cost Planning Tool.

  We discuss cost reduction strategies in Chapter V. You need to capture your plan for reducing instructional costs on the Cost Planning Tool (CPT), which is included in Appendix C. You need to provide a brief narrative that explains the entries in the CPT when necessary. You also need to explain why you chose a particular strategy and what you intend to do with the savings.

  WHY*:* Course redesign has two goals: improving learning and reducing costs. Our purpose here is not to convince you of the value of reducing costs; it is to help you understand how to accomplish it and how to document it.

- Describe how you will build and maintain ongoing consensus about the redesign.

  We discuss the need to build and maintain ongoing consensus among all stakeholders about the redesign in Chapter XIV. You need to describe specifically how you will address each of the relevant stakeholders in the pilot, during the first term of full implementation and on an ongoing basis.

  WHY*:* The best-laid plans of mice and men often go astray. Even though it is impossible to anticipate all of the problems you may encounter in your redesign implementation, you should at minimum prepare for those that hundreds of others have faced.

- Include a brief timeline for your redesign project.

  We describe the four phases of planning and implementing your redesign in Chapter XII.

  WHY*:* Thorough planning is essential to ensuring a successful redesign implementation, but moving to implementation of your redesign as quickly as possible is equally important. Practice makes perfect!

- Develop a project budget that describes the support needed for your redesign effort and a budget narrative that explains each expenditure category.

WHY*:* As described in Chapter II, the budget may include funding for (1) building, rehabbing, or repurposing computer labs/classrooms; (2) equipment purchases; and (3) released time for faculty team leaders. The total dollar amount will vary from institution to institution depending on what is already in place and what will need to be purchased.

XIV. Building and Maintaining Consensus

From working with more than 200 course redesigns, NCAT has found that the most serious implementation issues encountered had to do with building and maintaining consensus about the redesign among all stakeholders: students, parents, faculty, professional staff, and senior administrators. The need for shared campuswide understanding of the redesign plan begins when it is developed; it continues through the pilot period as the plan becomes real; it becomes even more necessary during full implementation as more students, more faculty, and more staff get involved; and, equally important, it must continue on an ongoing basis.

Redesigning a course is not simply a faculty project but, rather, a solution to a recognized, institutional problem. The sustainability of that solution is based on continuing institutional agreement at all levels. Ongoing communication with all stakeholders about the redesign's effectiveness keeps the goals of the redesign and its outcomes clearly visible. The team needs to keep everyone updated on student success rates, student satisfaction, and cost reduction and to remind everyone of the situation prior to the redesign. Even though the *team* may be familiar with those facts, others in the institution may be new or may not know the history or be aware of the reasons the change was made.

Some institutions have not encountered those implementation issues because they foresaw them and dealt with them in advance. Others did not anticipate them and had to deal with them in mid-redesign. Some worked on resolving the issues constructively and ended up with successful redesigns; others backslid and abandoned key aspects of their redesign plans as consensus among various stakeholders waned.

We encourage you to pay special attention to how you will achieve initial and ongoing consensus among:

- Faculty
- Campus offices
- Senior administrators

Achieve initial and ongoing faculty consensus about the redesign.

The biggest implementation issue faced by most redesigns is achievement of consensus on a variety of issues among all faculty teaching the course. Because course development in the traditional format is usually done by a single faculty member working independently on a single section of a course, the redesign of an entire course (all sections) by multiple faculty can present a number of challenges such as reaching agreement on core course outcomes, instructional formats, topic sequences, and a common website. And because instructors are usually not used to talking about such issues, they need time to work through them. As several institutions have commented, however, this can be a good problem to have. Collective decision making and departmental buy-in are key factors that lead to successful redesigns.

About two-thirds of institutions have reported challenges about the redesign when it comes to achieving faculty consensus within a department. Some of this was attributed to leadership issues—for example, interim department chairs who were reluctant to press resisting faculty. All institutions stress the need for strong leadership and administrative support to overcome those challenges. Some team leaders thought they had solved the problem of faculty buy-in at the outset but were surprised to find they had not communicated as effectively as they thought they had. Team leaders thought they had their colleagues' support, but when the redesign got under

way, they discovered that the opposition was stronger than anticipated. This underlines the importance of constant communication to check signals and maintain momentum.

Examples

"Even though the departmental faculty agreed to the redesign initially, once it was accomplished there was some opposition from several faculty members. In retrospect, the team needed to do a better job of communication and inclusion and actively involve the other 16 full-time faculty in improving redesign components and course evolution. This has been largely overcome and is not an issue with adjunct faculty."

"Due to some instability in leadership in the department during the transition period, there was a large disparity among full-time faculty in the amount each was involved in the process. This led to some not being aware enough of processes and procedures when the semester started. It was expected and understandable that faculty used to lecturing had reservations about adopting the redesign model, but many quickly saw the value to students and embraced their new roles. Some were unable or unwilling to adapt to their new roles."

"The department has consistently supported redesign. Although there were initial skepticism and inertia to overcome, the result has been a very collegial process and one that has strengthened the department. The adjunct faculty are now fully involved with the implementation, having received extensive training and mentoring."

Achieve initial and ongoing consensus among campus offices.

Institutions frequently encounter challenges associated with preparing others on campus for the redesigned format. Most such challenges involve advising, wherein advisers do not provide correct information for students or simply misunderstand what the course is about. Team leaders need to constantly and consciously market the redesign to key campus constituencies that know little about the new format and how it differs from more-traditional offerings. Taking a proactive approach by offering sessions about the redesign model for various campus offices, explaining the benefits of the redesign to student government officers and organizations, using the summer to visit advisers and coaches to describe the benefits of the new approach, and addressing colleagues' concerns immediately can help during the transition period.

As full implementation continues, the team cannot assume that those who were informed about the development of the plan at the onset of the pilot still support the redesign. Some campus offices may have thought the redesign was merely an experiment rather than a permanent change. In addition to keeping departmental colleagues informed, the team needs to be sure that advisers and others who work with students know that their ongoing support is needed.

Examples

"Although the department worked closely with administrators while planning the redesign, more effort needed to be given to preparing the entire college community for the changes. Even though a thorough explanation of the redesigned rationale, benefits, and structure was presented to academic advisers and student service personnel, some were not as supportive as needed to encourage students to accept the change."

"Regular meetings were held with the professional advising staff to share information about the redesign curriculum and course policies. Frequent communication between the department chair and the assistant registrar was also necessary."

"The team made a campuswide presentation at an in-service training and conducted sessions for adviser training in order to educate the college faculty and staff. Some instructors and advisers still do not understand the redesign model well enough to register students."

Achieve initial and ongoing consensus among senior administrators.

Institutional commitment to a course redesign includes building and sustaining that commitment throughout the life of the redesign. In the course of implementing a redesign, things happen: lead faculty members leave or retire; departments get reorganized; presidents and provosts get new jobs. Faculty members—on their own—can show and have shown spectacular success in creating highly effective new learning environments, but for those successes to be sustained or for them to have real impact on the institution as a whole, both departmental leadership and institutional administrative leadership need to play active and continuing roles.

You will inevitably encounter problems in implementing your redesign as you make a transition to a new form of instruction. Without a full commitment to preserving the key elements of the redesign while addressing the problems you encounter, the institution may simply abandon the redesign, thus forgoing either the learning gains or the cost-savings benefits or both.

About half of all institutions cite the need to build institutional commitment to redesign outside their home department, especially among senior administrators. Participants frequently cite leadership and administrative support as factors in sustaining and expanding interest in redesign. In some cases, redesign is encouraged by system-level leadership; another team notes support by trustees as a factor. Like the building of acceptance within the department, however, the broadening of institutional commitment requires continuing attention and support even under favorable circumstances.

Examples

"Our greatest challenge involved institutional support. Some administrators viewed this redesign as a grand experiment or a test case. The redesign has exposed a number of issues that need to be addressed regardless of its success. The university needs to develop—and communicate to parents and students—a coherent and compelling description of our e-learning initiatives that addresses common misconceptions and concerns (e.g., that the university is becoming a distance-learning campus). Far from being an insulated and isolated initiative, this redesign was simply the first of many such efforts. The more the university can do now to learn from and address the larger support and public relations issues raised by this effort, the easier it will be for future redesign teams."

"In the middle of the redesign, the department of mathematics and computer science became split into independent departments in different colleges. The importance of having strong support from departmental (and university) leadership became increasingly clear after the department was split. Team members ended up in both departments, which created conflicting priorities that affected the pace of redesign. Unlike the joint department head, the new computer science department head was not a member of the redesign team, which resulted in a change in scope because of a decision about how the target courses would be

used. The fragility of creating and sustaining major pedagogic change under changes in leadership, which could bring changed priorities, was evident. Existing redesign features at the time of the split have been sustained and more fully developed, but aspects of the redesign that were not yet in place have been problematic to initiate due to changing interests and changing personnel. The team is still working to achieve all of the redesign goals; however, the pace of implementation has been slowed."

"All three of our campuses successfully implemented the full redesign with all 3,600 students, demonstrating increased student learning gains and decreased costs. Nevertheless, some faculty preferred the old model. In response to that faculty preference, a number of changes occurred on the three campuses. In the term immediately following the successful redesign, the college began offering a choice of either the redesigned or the traditional lecture format at two of the campuses. Altogether, 11 redesigned sections and 10 traditional sections were offered. The third campus developed a model that uses the redesign model but also incorporates pencil-and-paper homework requirements. Topics and term schedules are still coordinated between two of the campuses because some students use labs on both campuses; however, tests are developed independently. Although the workshops on study skills and time management were successful, they are no longer part of the redesigned course. These techniques have been combined into a credit course not applicable to a degree; the course is offered occasionally."

Ensuring Sustainability: The Fundamentals

Once a successful pilot has been conducted, once the bumps in the road have been smoothed out, and once full implementation is in place, most institutions expect that sustainability would be a given. After all, the redesign has both improved student success and reduced instructional costs. Why wouldn't the redesign be sustained? Making the assumption that redesign will automatically be sustained without continuing attention will turn out to be a big mistake. Because course redesign is so different from the traditional way of teaching in higher education, it must be continually sold and resold to all campus constituents. As the players change, continued focus on building and maintaining consensus cannot be underestimated.

Executive Leadership. The important role of senior administrators does not end when full implementation occurs. Senior administrators need to be prepared to support the redesign and to guard against the desire of some to backslide to the traditional format. The provost or president will need to remind those wanting to go back to the old way of the reasons the redesign occurred in the first place and what the evidence is that proves its ongoing success.

Faculty Leadership. Strong and continuing faculty leadership of the redesign is crucial to sustainability. Even though the individual providing the leadership may change, the importance of the role does not. The designated leader must continue to ensure the consistency of the course among sections as well as adherence to policies and procedures established initially. The leader also serves as liaison with other departments and divisions whose support is needed to maintain the redesign.

Ongoing Data Collection. Some institutions believe that demonstrating the initial success of the redesign through data comparisons is sufficient to generate campuswide consensus. They assume that similar results will continue, but they neglect to continue collecting and analyzing the data that support that continuation. Many institutions have initially seen a small increase in student success after the first term of implementation, but as they continued to tweak the redesign and become more familiar with how to implement it, the number of students

successfully completing the course continued to grow. Through ongoing measurement, institutions can see continuing improvement that will help sustain consensus.

Ongoing Communication. It is important to continue communicating with campus offices and other departments on an ongoing basis to keep them updated on student success rates, student satisfaction levels, and cost-effectiveness and to remind them of the situation prior to the redesign. While the *team* may be familiar with those facts, others in the institution may be new and may not know the history or the reasons the change was made. Letting them know about the successes other institutions have achieved using course redesign will make them feel they are not outliers but, rather, part of an important new trend.

Some institutions have developed a handout that explains the new way the redesigned course is being offered. Advisers can use such a handout to assist them as they explain the redesign to students. Students can take the handout with them to review later. Some institutions have worked with the college newspaper to publish an article that explains the redesign and includes data to demonstrate the successes students are experiencing.

Orientation of New Personnel. Changes in personnel are common at most institutions, particularly among part-time instructors. New full-time instructors are also hired from time to time. Turnover at the department chair, dean, and executive levels occurs nowadays more frequently on most campuses than in the past. New faculty and new administrators need a good understanding of why the redesign model is used, how it works, and what benefits it offers. New faculty, staff, and administrators should learn about the redesign from more than just an e-mail or a data report. They should be invited to visit the classroom or lab and talk with students, with tutors, and with faculty. They need to see firsthand how the redesign works and how all constituencies are benefiting.

Financial Plan. To ensure long-term sustainability, a financial plan that keeps the necessary technological infrastructure current and functional will be needed. Such things as upgrading or replacing computers, hiring lab tutors, and buying new versions of the commercial software require ongoing investment. Some administrators mistakenly believe that the creation of labs/computer classrooms is a onetime investment. Others may not remember that the original course redesign actually saved resources for the institution while improving student success. Unless administrators are reminded annually how cost-effective the redesign is and what its important components are, they will forget. Some institutions annually calculate how many instructors would have been needed to teach the same number of students in the traditional format, and they compare those costs with the costs of the redesign. Such data provide evidence to remind administrators why providing needed resources is important.

Sustainability Checklist

NCAT recommends that all institutions develop an *annual plan* to sustain the course redesign. Do you have an ongoing plan to:

- Collect data on learning outcomes, completion, and cost?
- Disseminate recent learning-outcome, completion, and instructional cost data to all stakeholders to document the redesign's continued success?
- Refurbish labs/computer classrooms as needed?
- Orient new students and their parents to the new model?
- Orient and train new department faculty to work in the redesign model?

- Recruit and train tutors and other support personnel?
- Orient new administrators to the redesign and invite them to visit the classroom or lab?
- Visit campus offices such as the registrar, advisers, and information technology staff to ensure their continued support of the redesign?
- Invite representatives of campus offices to visit and observe the redesign in action?
- Review course policies and procedures and make changes if needed?