IMPROVING LEARNING AND REDUCING COSTS
New Models for Online Learning
Established in 1999 as a university Center at RPI funded by the Pew Charitable Trusts

Became an independent non-profit organization in 2003

Mission: help colleges and universities learn how to use technology to improve student learning outcomes and reduce their instructional costs
Effective use of information technology can improve student learning, reduce instructional costs, and meet critical workforce needs.

We urge states and institutions to establish course redesign programs using technology-based, learner-centered principles drawing upon the innovative work already being done by the National Center for Academic Transformation.
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 a lower cost by taking advantage of the capabilities of information technology.
PROGRAM IN COURSE REDESIGN

Challenge colleges and universities to redesign their approaches to instruction using technology to achieve quality enhancements as well as cost savings.

Focus: Introductory Courses

50,000 students
30 projects
TRADITIONAL INSTRUCTION

Seminars

Lectures
“BOLT-ON” INSTRUCTION
QUANTITATIVE (13)

- **Mathematics**
  - Iowa State University
  - Northern Arizona University
  - Rio Salado College
  - Riverside CC
  - University of Alabama
  - University of Idaho
  - Virginia Tech

- **Statistics**
  - Carnegie Mellon University
  - Ohio State University
  - Penn State
  - U of Illinois-Urbana Champaign

- **Computer Programming**
  - Drexel University
  - University at Buffalo
SCIENCE (5)  
SOCIAL SCIENCE (6)

- Biology
  - Fairfield University
  - University of Massachusetts

- Chemistry
  - University of Iowa
  - U of Wisconsin-Madison

- Astronomy
  - U of Colorado-Boulder

- Psychology
  - Cal Poly Pomona
  - University of Dayton
  - University of New Mexico
  - U of Southern Maine

- Sociology
  - IUPUI

- American Government
  - U of Central Florida
HUMANITIES (6)

- English Composition
  - Brigham Young University
  - Tallahassee CC

- Spanish
  - Portland State University
  - University of Tennessee

- Fine Arts
  - Florida Gulf Coast University

- World Literature
  - University of Southern Mississippi
IMPROVED LEARNING OUTCOMES

- Penn State - 68% on a content-knowledge test vs. 60%
- UB - 56% earned A- or higher vs. 37%
- CMU - scores on skill/concept tests increased by 22.8%
- Fairfield – 88% on concept retention vs. 79%
- U of Idaho – 30% earned A’s vs. 20%
- UMass – 73% on tougher exams vs. 61%
- FGCU - 85% on exams vs. 72%; 75% A’s and B’s vs. 31%
- USM - scored a full point higher on writing assessments
- IUPUI, RCC, UCF, U of S Maine, Drexel and U of Ala - significant improvements in understanding content

25 of 30 showed improvement; 5 showed equal learning.
REDUCTION IN DFW RATES

- U of Alabama – 60% to 40%
- Drexel – 51% to 38%
- Tallahassee CC – 46% to 25%
- Rio CC – 41% to 32%
- IUPUI – 39% to 25%
- UNM – 39% to 23%
- U of S Maine – 28% to 19%
- U of Iowa – 25% to 13%
- Penn State – 12% to 9.8%

24 measured; 18 showed improvement.
COST SAVINGS RESULTS

- Redesigned courses reduce costs by 37% on average, with a range of 15% to 77%.
- Collectively, the 30 courses saved about $3 million annually.
TAKING COURSE REDESIGN TO SCALE

- The Roadmap to Redesign (R2R)
  2003 – 2006 (20 institutions)
- Colleagues Committed to Redesign (C2R)
  2006 - 2009 (60 institutions)
- Programs with Systems and States
  2006 – present (~80 institutions)
- The Redesign Alliance
  2006 – present (70+ institutions)
STATE AND SYSTEM-BASED PROGRAMS

- **Pilots**
  - South Dakota
  - Hawaii
  - Ohio
  - Minnesota

- **Full-Scale**
  - Maryland
  - Tennessee
  - Arizona
  - New York
  - Texas
  - Mississippi
- **Mathematics**
  - Beginning Algebra
  - College Algebra
  - Developmental Math
  - Discrete Math
  - Elementary Algebra
  - Intermediate Algebra
  - Introductory Algebra
  - Linear Algebra
  - Pre-calculus Math

- **Statistics**
  - Business Statistics
  - Economic Statistics
  - Elementary Statistics
  - Introductory Statistics

- **Computing**
  - Computer Literacy
  - Computer Programming
  - Information Literacy
  - Information Technology Concepts
  - Tools for the Info Age
- SCIENCE
  - Anatomy and Physiology
  - Astronomy
  - Biology
  - Chemistry
  - Ethnobotany
  - Geology
  - Physics

- SOCIAL SCIENCE
  - American Government
  - Macro and Microeconomics
  - Psychology
  - Sociology
  - Urban Affairs
• HUMANITIES
  - British Literature
  - Communication Studies
  - Developmental Reading
  - Developmental Writing
  - English Composition
  - European History
  - Great Ideas in Western Music
  - History of Western Civilization
  - Public Speaking
  - Spanish
  - Understanding the Visual and Performing Arts
  - U.S. History
  - World Literature
  - Women & Gender Studies

• PROFESSIONAL
  - Accounting
  - Education: The Curriculum
  - Elementary Education
  - Engineering Technology
  - Nursing
  - Organizational Behavior
REDESIGN CHARACTERISTICS

- Redesign the whole course—not just a single class
- Emphasize active learning—greater student engagement with the material and with one another
- Rely heavily on readily available interactive software—used independently and in teams
- Increase on-demand, individualized assistance
- Automate only those course components that can benefit from automation—e.g., homework, quizzes, exams
- Replace single mode instruction with differentiated personnel strategies

Technology enables good pedagogy with large #s of students.
GENERAL BIOLOGY
at Fairfield University

- Enhance quality by individualizing instruction
- Focus on higher-level cognitive skills
- Create both team-based and independent investigations
- Use interactive learning environments in lectures and labs
  - to illustrate difficult concepts
  - to allow students to practice certain skills or test certain hypotheses
  - to work with other students to enhance the learning and discussion of complex topics

Memorization vs. Application of Scientific Concepts
<table>
<thead>
<tr>
<th>Traditional</th>
<th>Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 sections (~35)</td>
<td>2 sections (~140)</td>
</tr>
<tr>
<td>7 faculty</td>
<td>4 faculty</td>
</tr>
<tr>
<td>100% wet labs</td>
<td>50% wet, 50% virtual</td>
</tr>
<tr>
<td>$131,610</td>
<td>$98,033</td>
</tr>
<tr>
<td>$506 cost-per-student</td>
<td>$350 cost-per-student</td>
</tr>
</tbody>
</table>

- Content mastery: significantly better performance
- Content retention: significantly better (88% vs. 79%)
- Course drops declined from 8% to 3%
- Next course enrollment increased from 75% to 85%
- Declared majors increased by 4%
FIVE REDESIGN MODELS

- **Supplemental**: Add to the current structure and/or change the content
- **Replacement**: Blend face-to-face with online activities
- **Emporium**: Move all classes to a lab setting
- **Fully Online**: Conduct all (most) learning activities online
- **Buffet**: Mix and match according to student preferences
FIRST-YEAR SPANISH
(Replacement Model)

- Increase active speaking via in-class interaction
- Use technology to support skill practice
- Provide immediate feedback online
- Increase student and instructor computer literacy
- Encourage collaborative learning, both online and in class
<table>
<thead>
<tr>
<th>Traditional</th>
<th>Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 57 sections (~27)</td>
<td>• 38 sections (~54)</td>
</tr>
<tr>
<td>• Adjuncts + 6 TAs</td>
<td>• Instructor-TA pairs</td>
</tr>
<tr>
<td>• 100% in class</td>
<td>• 50% in class, 50% online</td>
</tr>
<tr>
<td>• $167,074 ($2931/section)</td>
<td>• $56,838 ($1496/section)</td>
</tr>
<tr>
<td>• 1529 students @ $109</td>
<td>• 2052 students @ $28</td>
</tr>
</tbody>
</table>

✓ Oral skills: significantly better performance
✓ Language proficiency & language achievement: no significant difference

✓ A second Spanish project: final exam scores in speaking, reading and listening were higher
THE MATH EMPORIUM at Virginia Tech

Traditional
- 38 sections (~40)
- 10 tenured faculty, 13 instructors, 15 GTAs
- 2 hours per week
- $91 cost-per-student

Redesign
- 1 section (~1520)
- 1 instructor, grad & undergrad TAs + 2 tech support staff
- 24*7 in open lab
- $21 cost-per-student

Replicated at U of Alabama, U of Idaho, LSU, Wayne State, U Missouri-St. Louis, Seton Hall
THE EMPORIUM MODEL
77% Cost Reduction (V1)
30% Cost Reduction (V2)
UNIVERSITY OF ALABAMA
<table>
<thead>
<tr>
<th>Year</th>
<th>Success Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 1998</td>
<td>47.1%</td>
</tr>
<tr>
<td>Fall 1999</td>
<td>40.6%</td>
</tr>
<tr>
<td>Fall 2000</td>
<td>50.2%</td>
</tr>
<tr>
<td>Fall 2001</td>
<td>60.5%</td>
</tr>
<tr>
<td>Fall 2002</td>
<td>63.0%</td>
</tr>
<tr>
<td>Fall 2003</td>
<td>78.9%</td>
</tr>
<tr>
<td>Fall 2004</td>
<td>76.2%</td>
</tr>
</tbody>
</table>
FULLY ONLINE MODEL

**Traditional**
- Redesign one class
- Emphasize instructor-to-student interaction
- Instructor does all grading and provides all student feedback
- Use a single personnel strategy

**Redesign**
- Redesign whole course
- Emphasize student-to-student interaction and teaming
- Automate grading and student feedback
- Use a differentiated personnel strategy
COMPUTER LITERACY
Arizona State University

Traditional
- 2 lectures per week
- Focus: Word, Excel and FileMaker Pro
- 12 assignments submitted in hard copy & 4 paper-based, multiple-choice exams
- Open labs staffed by TAs and graders
- Course based on content too introductory for today’s tech-savvy students

Redesign
- All course content online
  1 optional lecture per week
- Focus: problem-solving & applications of computing concepts
- 7 self-guided assignments, 9 online quizzes & 4 major projects submitted online
- Discussion board & labs staffed by ULAs
- Course requires substantial independent inquiry and understanding of modern computing concepts
<table>
<thead>
<tr>
<th>Traditional</th>
<th>Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 sections (~270)</td>
<td>2 sections (~300) &amp; 1 section (~500)</td>
</tr>
<tr>
<td>2 instructors (2 each)</td>
<td>1 faculty coordinator</td>
</tr>
<tr>
<td>2 GTAs &amp; 6 graders do most grading (1120 hours)</td>
<td>80% automated grading + 1 GTA &amp; 3 ULAs (480 hours)</td>
</tr>
</tbody>
</table>

- Percentage of students earning 70 or better went from 26% to 65% in a much more difficult course.
- Cost-per-student decreased from $50 to $28, a 44% savings.
THE BUFFET MODEL

- Assess each student’s knowledge/skill level and preferred learning style
- Provide an array of high-quality, interactive learning materials and activities
- Develop individualized study plans
- Build in continuous assessment to provide practice and feedback
- Offer appropriate, varied human interaction when needed
WHAT DO THE FACULTY SAY?

- “It’s the best experience I’ve ever had in a classroom.”
- “The quality of my worklife has changed immeasurably for the better.”
- “It’s a lot of work during the transition--but it’s worth it.”
HOW CAN YOU LEARN MORE?

- Take advantage of the NCAT web site
- Subscribe to *The Learning MarketSpace*
- Join The Redesign Alliance
- Participate in our Annual Conference, March 28 – 30, 2010, in Orlando, FL
- Bring a Redesign Scholar to campus
- Initiate a state or system project
- Apply to NCAT’s national programs