

# **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**

# **SPELLINGS COMMISSION**

## **on the Future of Higher Education**

- **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.

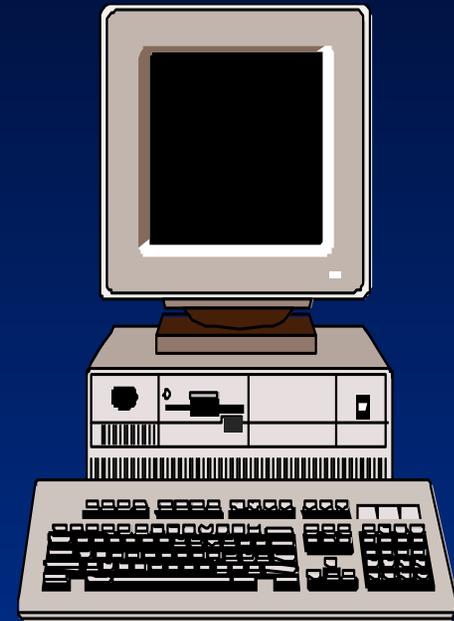


The **National Center** for  
**Academic Transformation**

## 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

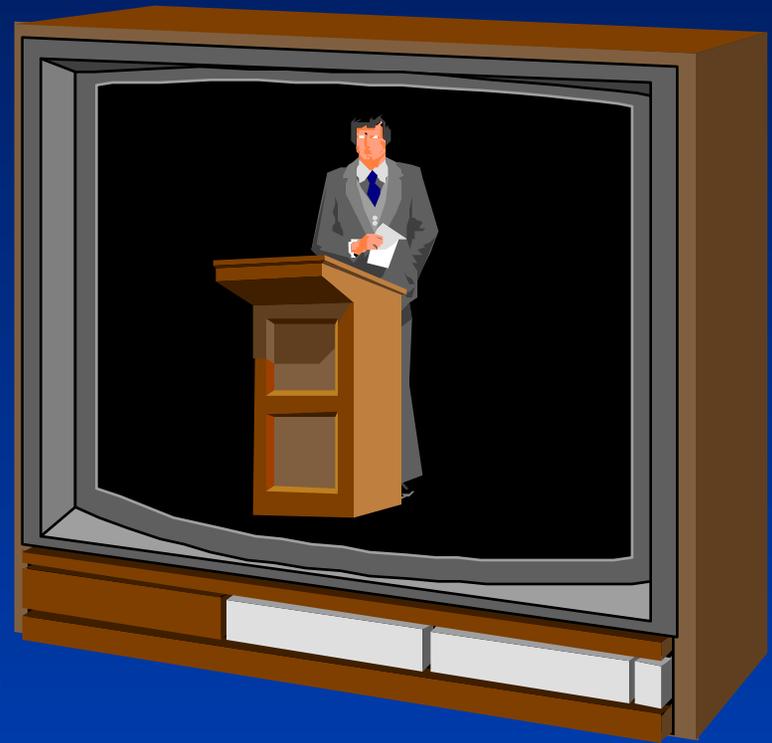
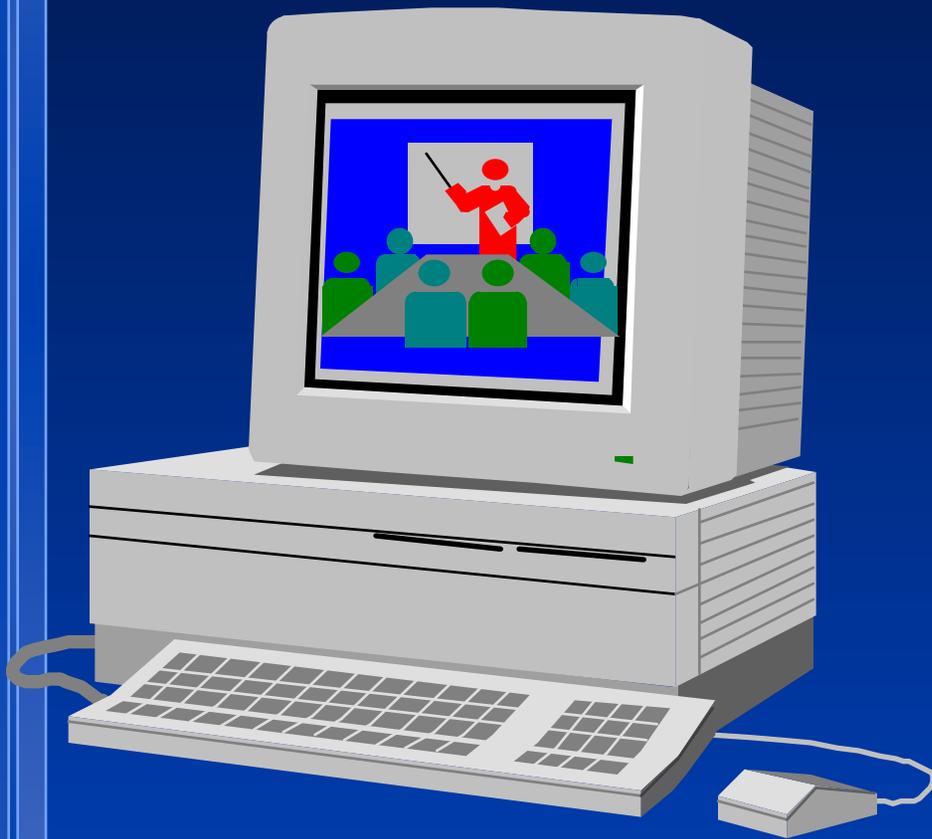


**Seminars**



**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**

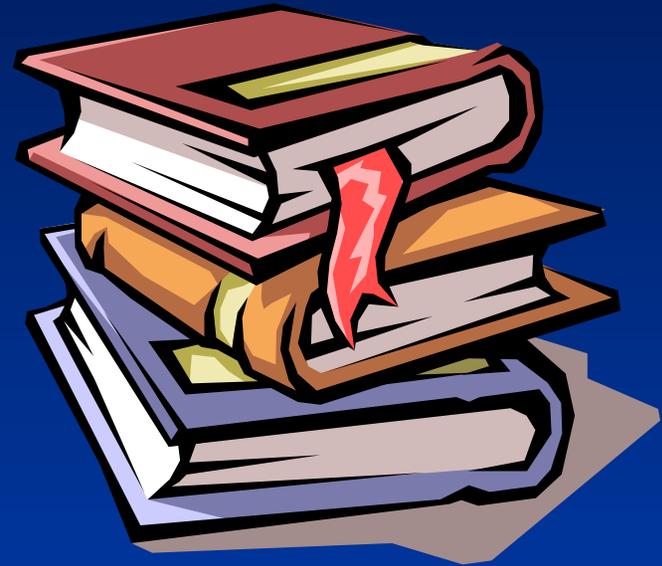
- IUPUI

- **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

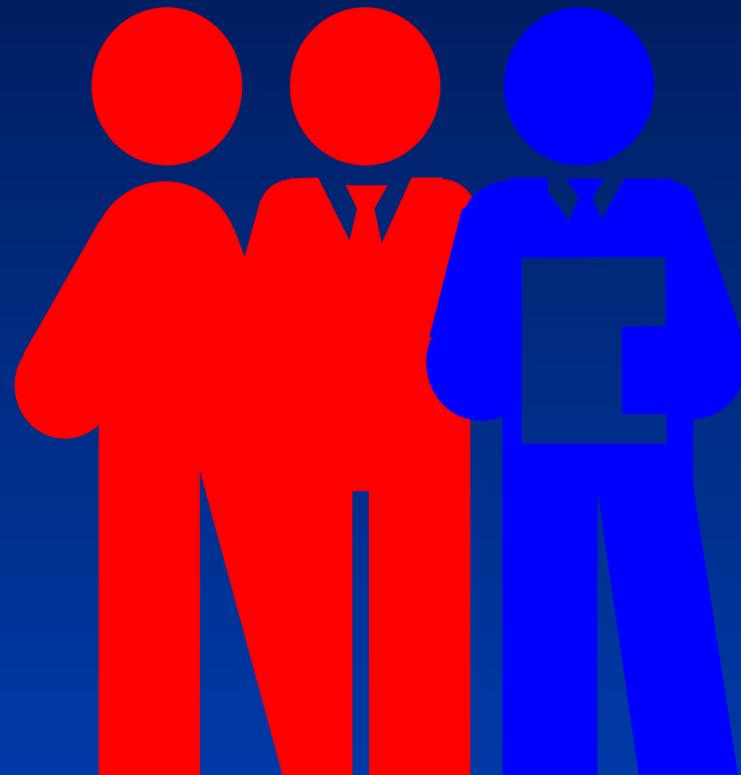
- U of Alabama – 60% to 40%
- Drexel – 51% to 38%
- Tallahassee CC – 46% to 25%
- Rio CC – 41% to 32%
- IUPUI – 39% to 25%
- UNM – 39% to 23%
- U of S Maine – 28% to 19%
- U of Iowa – 25% to 13%
- Penn State – 12% to 9.8%



**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**

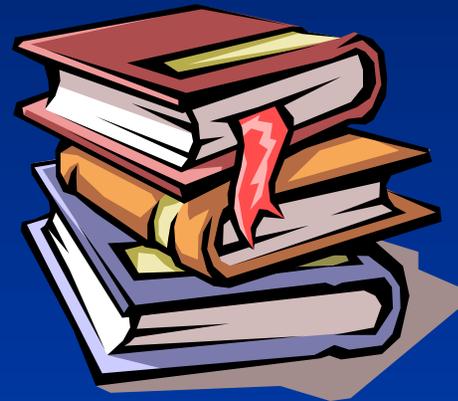
- American Government
- Macro and Microeconomics
- Psychology
- Sociology
- Urban Affairs

- **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**

## Traditional

- 7 sections (~35)
- 7 faculty
- 100% wet labs
- \$131,610
- \$506 cost-per-student

## Redesign

- 2 sections (~140)
- 4 faculty
- 50% wet, 50% virtual
- \$98,033
- \$350 cost-per-student

- ✓ **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



## Traditional

- 57 sections (~27)
- Adjuncts + 6 TAs
- 100% in class
- \$167,074 (\$2931/section)
- 1529 students @ \$109

## Redesign

- 38 sections (~54)
- Instructor-TA pairs
- 50% in class, 50% online
- \$56,838 (\$1496/section)
- 2052 students @ \$28

- ✓ **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 IDAHO



# UNIVERSITY OF ALABAMA



# UNIVERSITY OF ALABAMA SUCCESS RATES

- **Fall 1998**      • **47.1%**
- **Fall 1999**      • **40.6%**
  
- **Fall 2000**      • **50.2%**
- **Fall 2001**      • **60.5%**
- **Fall 2002**      • **63.0%**
- **Fall 2003**      • **78.9%**
- **Fall 2004**      • **76.2%**

# 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

## Traditional

- 4 sections (~270)
- 2 instructors (2 each)
- 2 GTAs & 6 graders do most grading (1120 hours)

## Redesign

- 2 sections (~300) & 1 section (~500)
- 1 faculty coordinator
- 80% automated grading + 1 GTA & 3 ULAs (480 hours)

✓ **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