

# IMPROVING LEARNING AND REDUCING COSTS: Taking Course Redesign to Scale



# HIGHER EDUCATION'S CHALLENGES

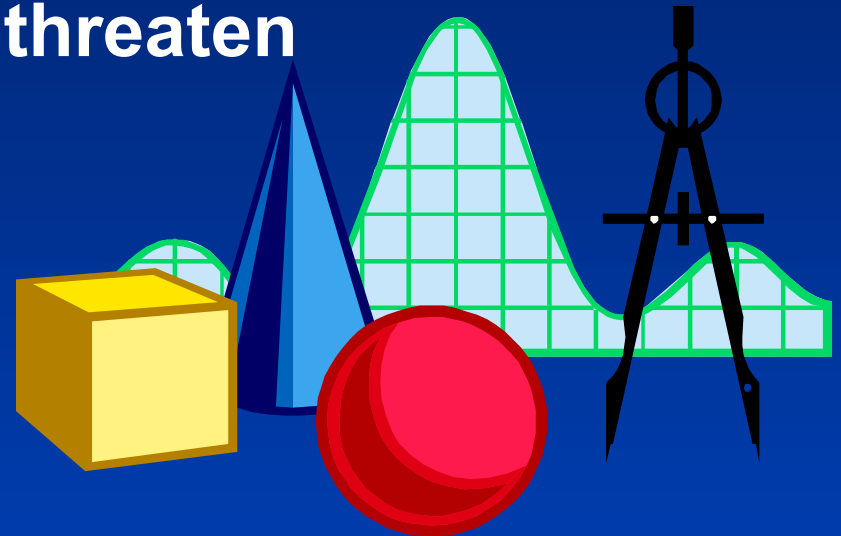
- Access
- Quality
- Cost



How can information technology help?

# ASSUMPTIONS THAT GET IN THE WAY

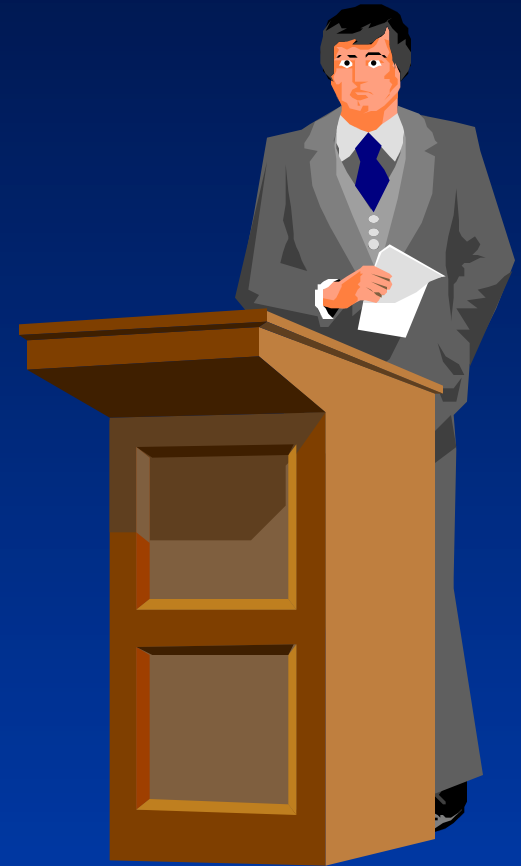
- Improving quality means increasing cost
- Adding IT increases cost
- Using IT may even threaten quality



# TRADITIONAL INSTRUCTION

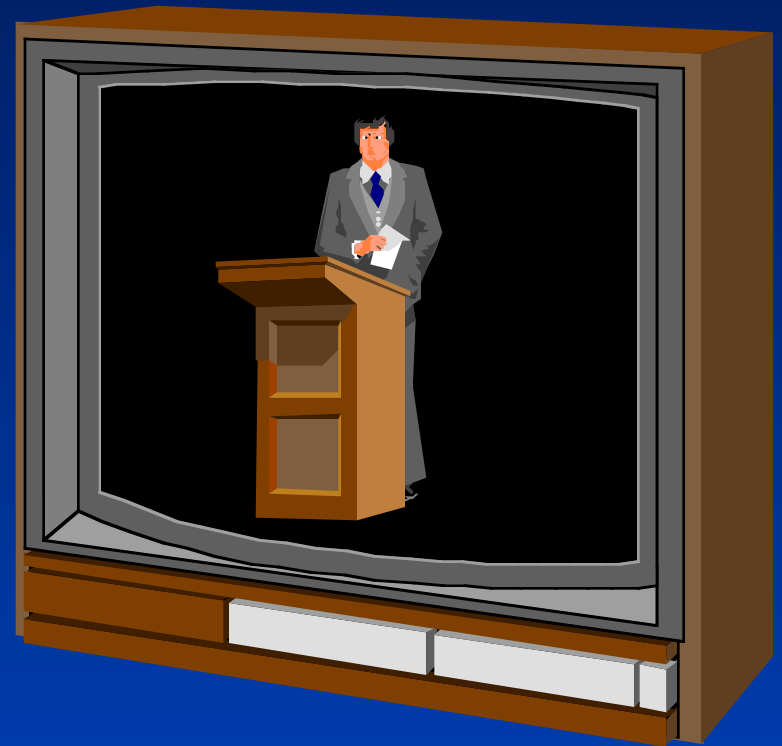


**Seminars**



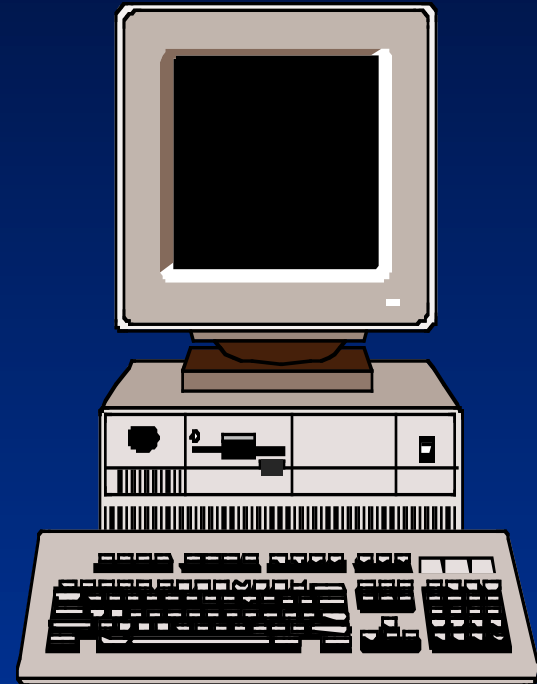
**Lectures**

# “BOLT-ON” INSTRUCTION



## 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.



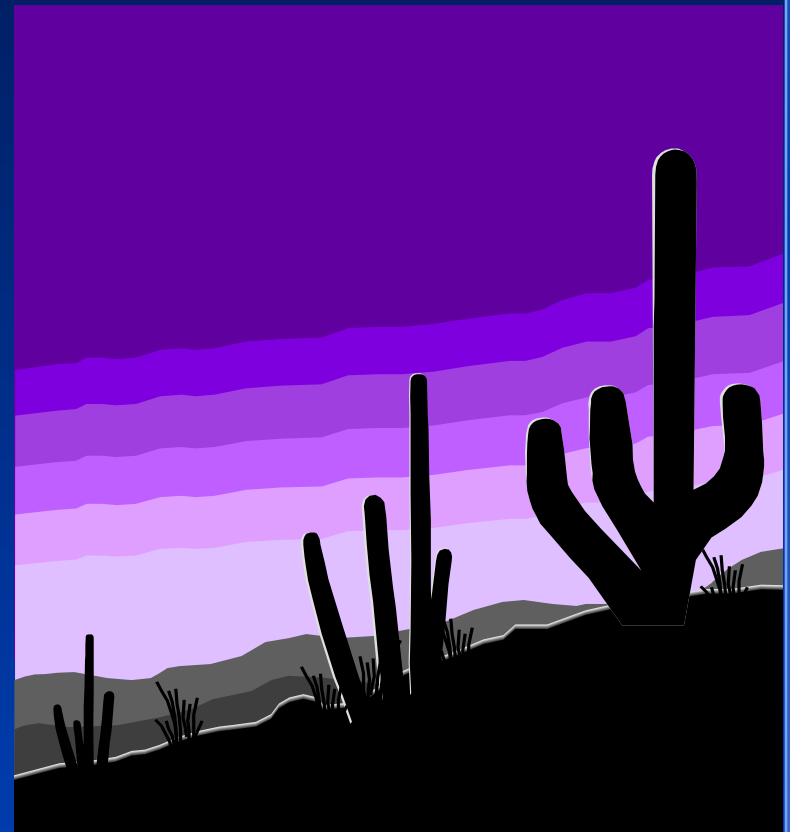
**\$6 million**  
**30 projects**

# THE ONE PERCENT SOLUTION

- Maricopa Community College District
- 200,000 students
- 2,000 course titles
- 25 courses =  
44% enrollment

**All CCs = 51%**

**All four-year = 35%**



# THE ONE PERCENT SOLUTION

- English (7)
- Psychology (1)
- Mathematics (5)
- Fitness (1)
- Sociology (1)
- Computing (1)
- Philosophy (1)
- Economics (2)
- Biology (2)
- Accounting (1)
- EMT (1)
- Spanish (1)
- Chemistry (1)





# 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 have shown improvement;  
5 have shown equal learning.**

# REDUCTION IN DFW RATES

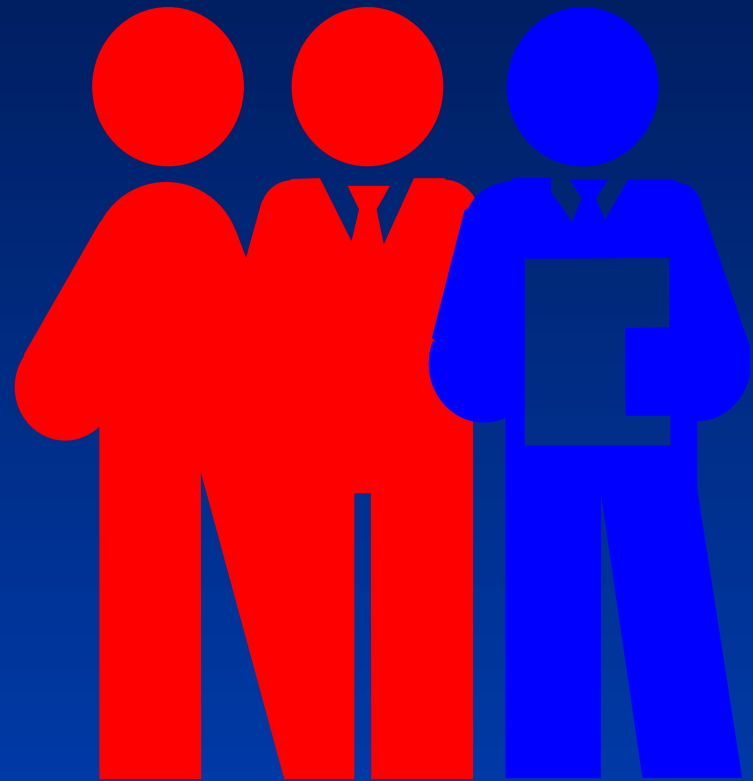
- U of Alabama – 60% to 40%
- Drexel – 51% to 38%
- Tallahassee CC – 46% to 25%
- Rio CC – 41% to 32%
- IUPUI – 39% to 25%
- UNM – 39% to 23%
- U of S Maine – 28% to 19%
- U of Iowa – 25% to 13%
- Penn State – 12% to 9.8%



**24 measured; 18 showed improvement.**

# COST SAVINGS RESULTS

- Redesigned courses reduce costs by 37% on average, with a range of 20% to 77%.
- Collectively, the 30 courses saved about \$3 million annually.



# WHAT HAPPENS TO THE SAVINGS? (\$3 million annually)

- Accommodate more students
- Offer more options at the second-year or upper-division level
- Develop distance learning courses and programs
- Decrease time to graduation for students by eliminating academic bottlenecks
- Redesign similar courses
- Free up expensive campus space



# 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



- Inconsistent student academic preparation
  - Inadequate student interaction with learning materials and complex topics
  - Inadequate use of modern technology
  - Inability of students to retain what they have learned (amnesia)
  - Inability of students to apply biological principles to other disciplines (inertia)
- **Memorization vs. Application of Scientific Concepts**

# ACADEMIC GOALS



- 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

## Traditional

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

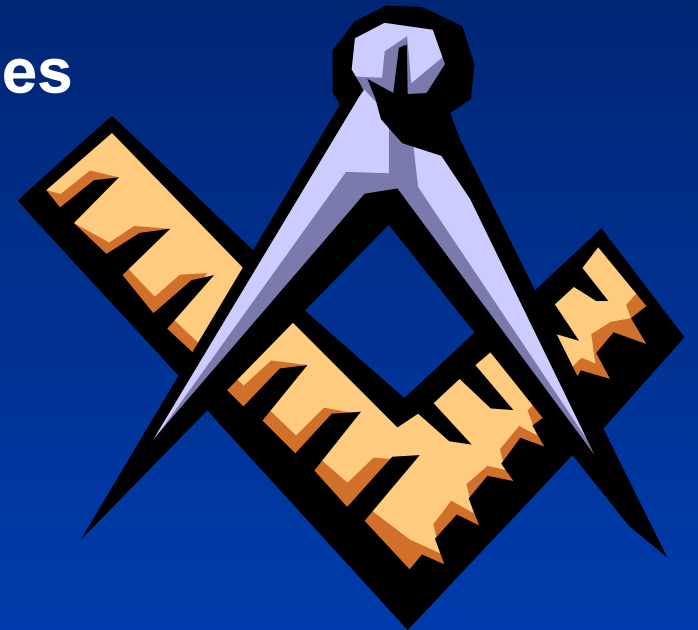
## Redesign

- 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 EMPORIUM MODEL

71% Cost Reduction (V1)  
30% Cost Reduction (V2)



# U. OF S. MISSISSIPPI

## World Literature



### Traditional

- 16 – 20 sections (~65)
- Taught by 8 faculty and 8 adjuncts
- Faculty do all grading
- \$70 cost-per-student

### Redesign

- Single online section
- Team-taught by 4 faculty and 4 TAs
- 50% automated grading via WebCT; 50% TAs
- \$31 cost-per-student

✓ Redesign triples course capacity.



# 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**

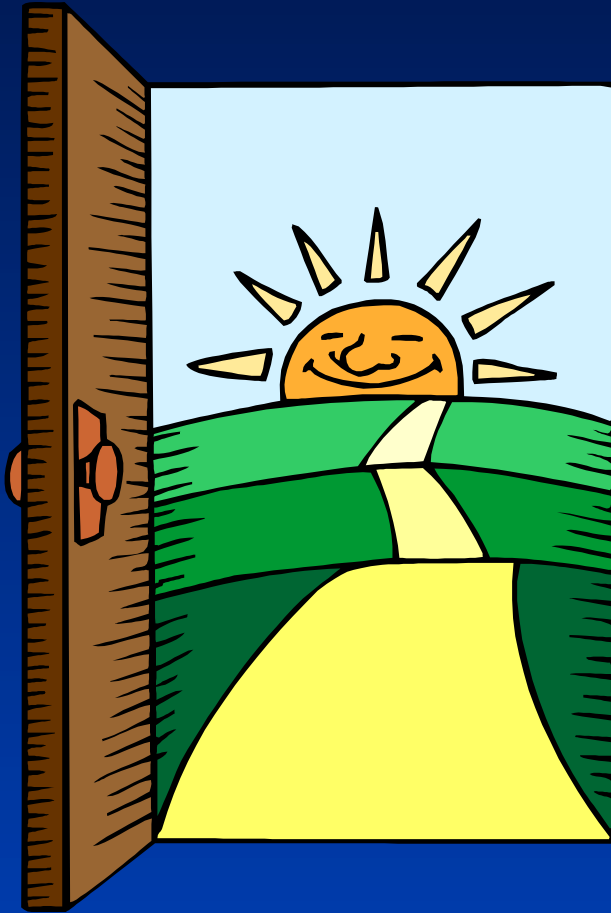


# WHAT DO THE FACULTY SAY?

- “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.”



# WHAT'S NEXT?



- The Roadmap to Redesign (R2R)
- Joint Proposal with the League
- Redesign Programs with Districts, Systems and States

# **PROGRAM GOALS**

- 1. Improve student learning and reduce instructional costs by implementing a research-based, systematic approach to redesigning large-enrollment courses.**
- 2. Assist states in solving critical issues such as enrollment growth, quality assurance and funding limitations.**
- 3. Leverage existing investments in information technology to better serve higher education's core mission - education.**
- 4. Build capacity within states and individual institutions to undertake subsequent course redesign programs.**

# FOR MORE INFORMATION

## WWW.CENTER.RPI.EDU

- Full project plans
- Monograph
- Progress reports
- Completed course planning tools
- Project contacts



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