IMPROVING LEARNING AND REDUCING COSTS
New Models for Online Learning
HIGHER EDUCATION’S CHALLENGES

- Access
- Quality
- Cost

How can information technology help?
“The biggest obstacle to innovation is thinking it can be done the old way.”
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.

50,000 students
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%
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 15% to 77%.
- Collectively, the 30 courses saved about $3 million annually.
WHAT HAPPENS TO THE SAVINGS?

- 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
- 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

- 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 vs. Redesign

<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
FIRST-YEAR SPANISH at the University of Tennessee

- Primary goal: Increase speaking skills
- Reduce in-class time by 50%
- Provide immediate feedback and support collaborative learning online
- 1529 students @ $109 vs. 2052 students @ $28
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
# THE MATH EMPORIUM at Virginia Tech

<table>
<thead>
<tr>
<th>Traditional</th>
<th>Redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 38 sections (~40)</td>
<td>- 1 section (~1520)</td>
</tr>
<tr>
<td>- 10 tenured faculty, 13 instructors, 15 GTAs</td>
<td>- 1 instructor, grad &amp; undergrad TAs + 2 tech support staff</td>
</tr>
<tr>
<td>- 2 hours per week</td>
<td>- 24*7 in open lab</td>
</tr>
<tr>
<td>- $91 cost-per-student</td>
<td>- $21 cost-per-student</td>
</tr>
</tbody>
</table>

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 SUCCESS RATES

<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>
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
FULLY ONLINE MODEL
Fine Arts, Literature, Math, Psychology

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

**Redesign**
- Redesign whole course
- Emphasize student-to-student interaction and teaming
- Automate grading and student feedback
- Differentiated personnel strategy
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
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.”
TAKING COURSE REDESIGN TO SCALE

- The Roadmap to Redesign (R2R)
- Lumina Study: Underserved Students
- Colleagues Committed to Redesign (C2R)
- Programs with Systems and States
FOR MORE INFORMATION
www.theNCAT.org

- Full project plans
- Monographs
- Progress reports
- Planning resources
- Lessons Learned
- Project contacts
HIGHER EDUCATION’S CHALLENGES

- Access
- Quality
- Cost

Can information technology help?
Yes – if we redesign!