TRANSFORMING LEARNING ENVIRONMENTS THROUGH COURSE REDESIGN
TODAY’S DISCUSSION

- Overview of the Methodology and Findings of the Successful Redesign Projects
- Examples from Successful Institutions
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
TRADITIONAL INSTRUCTION

Seminars

Lectures
“BOLT-ON” INSTRUCTION
WHAT’S WRONG WITH THE LECTURE?

- Treats all students as if they are the same
- Ineffective in engaging students
- Inadequate individual assistance
- Poor attendance and success rates
- Students fail to retain learning
WHAT’S WRONG WITH MULTIPLE SECTIONS?

- In theory: greater interaction
- In practice: large class size
- In practice: dominated by the same presentation techniques
- Lack of coordination
- Inconsistent outcomes
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

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

50,000 students
30 projects
SUMMARY OF RESULTS

- 25 of the original 30 showed improvement; 5 showed equal learning
- 24 measured retention; 18 showed improvement
- All 30 showed cost reduction
- Results in subsequent national and state and system programs have continued to show comparable results
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)
- Changing the Equation
  2009 – 2012 (38 institutions)
QUANTITATIVE

• Mathematics
  - Developmental Math
  - Pre-calculus Math
  - College Algebra
  - Discrete Math
  - Introductory Algebra
  - Elementary Algebra
  - Beginning Algebra
  - Intermediate Algebra
  - Linear Algebra

• Statistics
  - Business Statistics
  - Introductory Statistics
  - Elementary Statistics
  - Economic Statistics

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

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

• PROFESSIONAL
  - Elementary Education
  - Education: The Curriculum
  - Engineering
  - Organizational Behavior
  - Public Speaking
  - Accounting
  - Nursing
  - Nutrition
NCAT METHODOLOGY: Relevance and Utility

- **Discipline**: math & literature
- **Age**: traditional & working adults
- **Institution**: small & large
- **Location**: on-campus & at a distance
- **Redesign**: current & new courses
- **Level**: introductory & advanced
WHY REDESIGN?
Have a high impact!

Consider

• High drop-failure-withdrawal rates
• Student performance in subsequent courses
• Students on waiting lists
• Student complaints
• Other departmental complaints
• Lack of consistency in multiple sections
• Difficulty finding qualified adjuncts
WHY INSTITUTIONAL TEAMS?

• Faculty experts
• Administrators
• Technology professionals
• Assessment experts
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.”
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
- **Linked Workshop** – JIT workshops linked to a college level course
**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
- Mastery learning—**not** self-paced
- 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.**
SUPPLEMENTAL MODEL

- Maintain the basic current structure
- Change the content so that more is available on line
- Change interaction so that students are interacting more with the material
- Change the use of the time to reduce or eliminate lecturing and increase student interaction
BIOLOGY
University of Massachusetts

CHALLENGES

• Inconsistent student preparation
• Poor class attendance
• Lectures that repeated the contents of the textbook
• High dissatisfaction with course by both faculty and students
BIOLOGY
University of Massachusetts

- Continue to have large class meetings
- Require short pre-tests before the start of the first class each week and these are available for the entire term as review
- Receive small number of points for taking the online quiz
- Provide 24/7 online study materials
- Include small group interactions during class focused on applied biology problems
- Class periods are now used to discuss biology problems, rather than lecture
BIOLOGY
University of Massachusetts

Student Outcomes

• In spite of more difficult questions, scores on exams in the redesigned course averaged 73% vs. 61% in the traditional course.
• 23% of the exam questions in the traditional model required reasoning or problem solving skills vs. 67% in the redesigned course.
• Attendance averaged 89.9% in the redesigned course vs. 67% in the traditional course.
REPLACEMENT MODEL

- Blend face-to-face with online activities
- Determine exactly what activities required face-to-face and reduce the amount of time to focus only on those activities in class
- Provide 24/7 online interactive learning materials and resources
- Include online self-assessment activities with immediate feedback
INTRODUCTORY SPANISH
University of Alabama

Traditional Courses
- 3 5-credit-hour courses
- All face-to-face class meetings with instructor
- Taught primarily by GTAs
- Paper textbook
- Increasing demand with no way to accommodate more students

Redesigned Courses
- 3 5-credit-hour courses
- Reduce 1 face-to-face class meeting with instructor
- Online: quizzes, vocabulary & grammar exercises – automatically graded
- 33% enrollment increase
- GTAs teach 4 sections instead of 3 per year for same time commitment
OUTCOMES

• Traditional sections had an average final exam score of 65.5% in Spanish I.
• Immediately after the initial redesign in 2005, there was no difference, although costs were reduced by 25%.
• In spring 2009, the final exam score average in the fully redesigned course was 80%, demonstrating both sustainability and continued improvement.
• Cost reduction of $245 to $183 per student
GENERAL PSYCHOLOGY
Frostburg State University

CHANGES
- Reduced meetings from 2 to 1
- Required computer lab time
- Increased section size from 50 to 150
- Use active learning, online materials such as mastery quizzes, discussions, group assignments, self-assessments

DWF rate
- Previous average: 13%
  - 18% prior to pilot
- Pilot Semester
  - Traditional sections: 4%
  - Redesign sections: 22%
- Full Implementation
  - 13%

Cost Reduction: $90 to $25 per student
# ENGINEERING PHYSICS

**Auburn University**

## Traditional
- 750 students annually
- Lecture, lab, recitation structure
- High DFW rates
- Passively unengaged students

## Redesign
- Online activities completed before class
- Physics activity session (combined lab and recitation)
- Online: pretests, posttests, problem-solving, conceptual inventories
- Fewer GTAs needed
EMPORIUM MODEL

• Move all classes to a lab setting
• Permit the use of multiple kinds of personnel
• Allow students to work as long as they need to master the content
• Can be adapted for the kinds of students at a particular institution
• Allow multiple courses the same time
• Include multiple examples in math
EMPORIUM MODEL
University of Alabama
COLLEGE ALGEBRA
University of Missouri – St. Louis

CHALLENGES

- Inconsistent student academic preparation
- Success rates sometimes as low as 50%
- Inadequate student retention
- Inconsistent student outcomes, since taught in multiple sections
COLLEGE ALGEBRA
University of Missouri – St. Louis

• Traditional course – 3 50-minute lectures to 35-40 students in each section weekly
• Redesigned course
• 1 75-minute session with 75 students weekly to provide overview, assignment review, troubleshoot, and keep students on track
• 2 75-minute required labs in Math Technology Learning Center weekly
• Interactive software with videos, examples, exercises, homework and low stakes quizzing
• Individual assistance when needed
OUTCOMES

- Increase in number of students earning A or B, from 32% in traditional to 56% in redesign
- Decrease in DFW rate from 36% in 2002-03 to 21.6% in 2005-06.
- Fall 2008 – 80% students earned C or better
- Cost savings of 30%
- Now piloting redesign of Calculus and Statistics using the redesign model in the same Math Lab
STATICS
Mississippi State University

- Improved student performance
- Improved performance in subsequent mechanics courses (e.g., Dynamics, Mechanics of Materials)
- Greater engagement with the course content
- Improved retention in Engineering
- Reduced time to degree in Engineering
STATICS
Mississippi State University

Traditional
• 3 hours of lecture
• Students do homework and problem-solving outside of class on their own (and this is the toughest part!)
• 5 full-time faculty and 5 adjuncts teach 11 sections (~35 each)

Redesign
• 3-hour laptop lab with hands-on experiments
• Peer-to-peer and GTA assistance
• Lectures streamed for students to watch and review on their own
• 1 instructor teaches all sections supported by GTAs and ULAs

Reverse content presentation and practice
STATICS
Mississippi State University

- Redesign students performed significantly better on assignments (average 90 vs. 73) and in-class tests (average 79 vs. 66)
- Overall completion rates about the same as historical rates
- Cost-per-student dropped from $323 to $242 (25% reduction)
EMPORIUM MODEL

Also being used at:

- LSU
- Oklahoma State University
- University of Alabama
- University of Central Florida
- University of Idaho
- University of North Carolina – Chapel Hill
  to name a few….
FULLY ONLINE MODEL

- Moves all or most of the learning environment online
- Provides access to anyone, anywhere, anytime – on demand
- Allows international groups of students to interact easily and learn from each other
FINE ARTS
Florida Gulf Coast University

CHALLENGES

• Significant inconsistency among multiple sections
• Difficulty finding either faculty or adjuncts with the breadth of knowledge in all of the humanities
• Poor performance in this course that is required by all freshmen
• Growth in students and no money for new faculty
FINE ARTS
Florida Gulf Coast University

- Each module covers one aspect of the Humanities
- Each module is designed and monitored by a faculty expert in that academic area
- One course coordinator manages the course of 400+ students each term
- Undergraduate peer tutors and adjuncts guide discussion groups and evaluate longer papers
- 24/7 interactive learning resources are available anytime, any place
FINE ARTS
Florida Gulf Coast University

**Traditional**
- 25 sections (~30); 6 sections (~15) = 800
- Taught mainly by adjuncts
- “Course drift”
- $132 cost-per-student

**Redesign**
- Single section (~950)
- Taught by 1 faculty, 1 course coordinator, 20 preceptors
- Consistent & coherent
- $81 cost-per-student

- Average exam scores increased from 70% to 85%
- Number of A’s/B’s increased from 31% to 75%
- DFW rate decreased from 45% to 11%
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.
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
• Built in continuous assessment to provide instantaneous feedback
• Offer appropriate, varied human interaction when needed
Ohio State University

- Redesign students outscored traditional students on common exams (mean = 78.3 vs. 70)
- Percentage of students needing to retake the course reduced from 33% to 12%.
- Cost-per-student reduced from $191 to $132
LINKED WORKSHOP MODEL

- Retain basic structure of the college-level course, particularly the number of class meetings
- Replace remedial/developmental course with just-in-time (JIT) workshops
- Design workshops to remove deficiencies in core course competencies
- Workshops consist of computer-based instruction, small-group activities and test reviews to provide additional instruction on key concepts
- Students individually assigned software modules based on results of diagnostic assessments
- Workshops facilitated by students who have previously excelled in core course; students trained and supervised by core course faculty
- JIT workshop activities designed so students use concepts during next core course class session, which in turn helps them see the value of the workshops and motivates them to do workshop activities
**DEVELOPMENTAL MATH**  
Austin Peay State University

### Student Success Rates

<table>
<thead>
<tr>
<th>College Course</th>
<th>Before</th>
<th>SLA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fund of Math</td>
<td>32.4%</td>
<td>69.9%</td>
</tr>
<tr>
<td>Elem Statistics</td>
<td>22.4%</td>
<td>52.5%*</td>
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</tbody>
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*Higher than the success rate for students with 19-22 ACT subscores*
FACULTY BENEFITS

• Increased opportunity to work directly with students who need help
• Reduced grading
• Technology does the tracking and monitoring
• More practice and interaction for students without faculty effort
• Ability to try different approaches to meet different student needs
• Opportunity for continuous improvement of materials and approaches
A STREAMLINED REDESIGN METHODOLOGY
“A Menu of Redesign Options”

- Six Models for Course Redesign
- Five Principles of Successful Course Redesign
- Cost Reduction Strategies
- Course Planning Tool
- Course Structure Form
- Four Models for Assessing Student Learning
- Five Critical Implementation Issues
- Planning Checklist