IMPROVING LEARNING AND REDUCING COSTS
The Case for Course Redesign

The National Center for Academic Transformation

- 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.

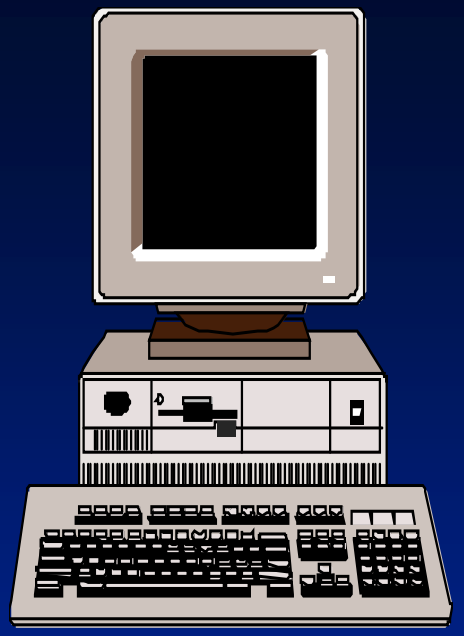
WHAT DOES NCAT MEAN BY COURSE REDESIGN?

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.

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



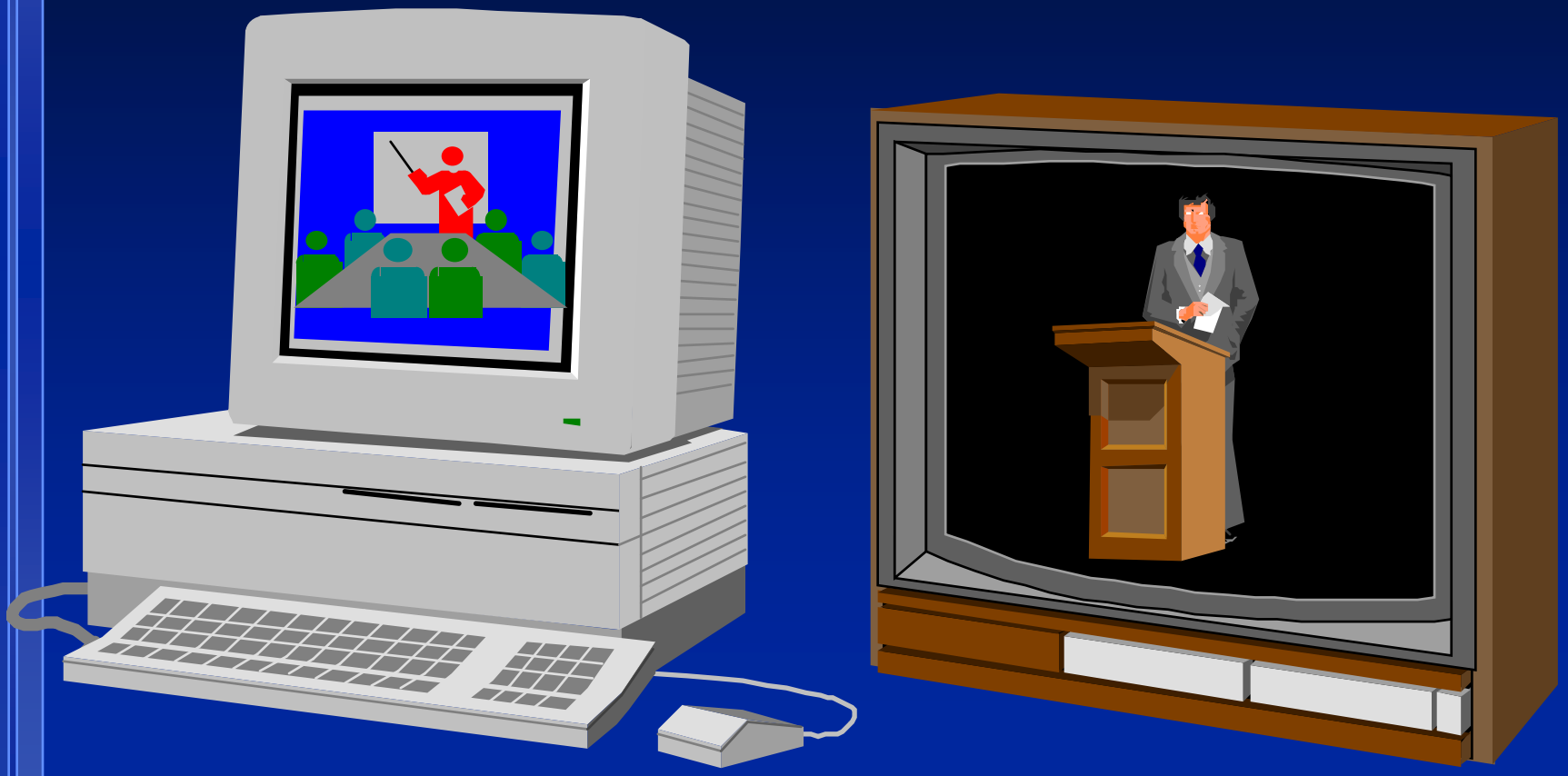
50,000 students
30 projects

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.

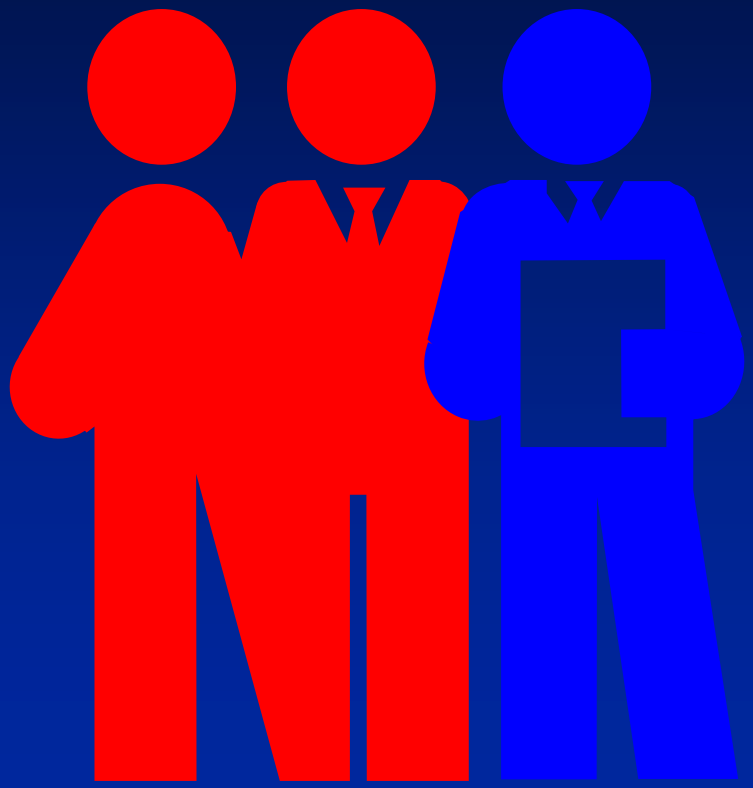
REDUCTION IN DFW RATES

- 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%

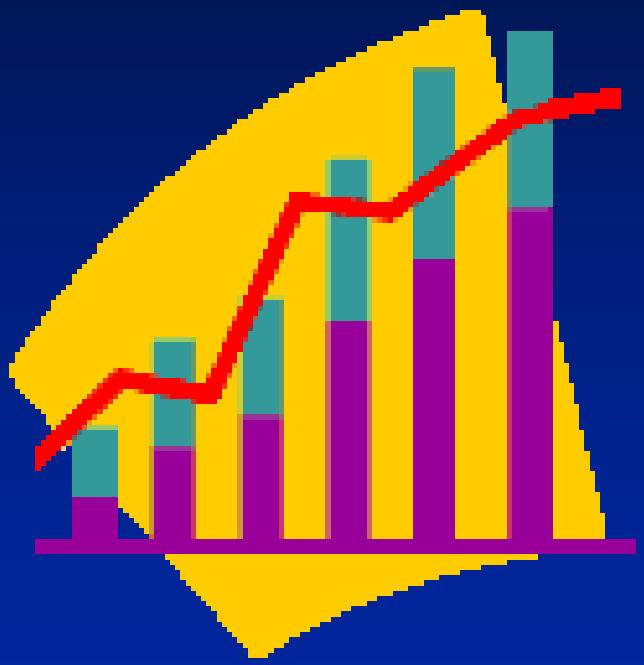
24 measured; 18 showed improvement.

COST SAVINGS RESULTS

- Redesigned courses reduced 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)
- Changing the Equation
  2009 – 2012 (38 institutions)

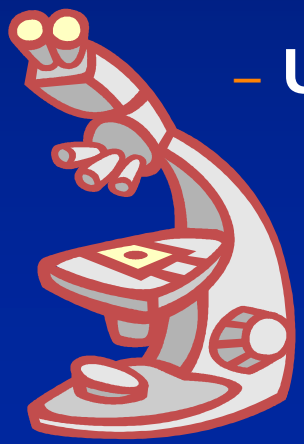
STATE AND SYSTEM-BASED PROGRAMS

- **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



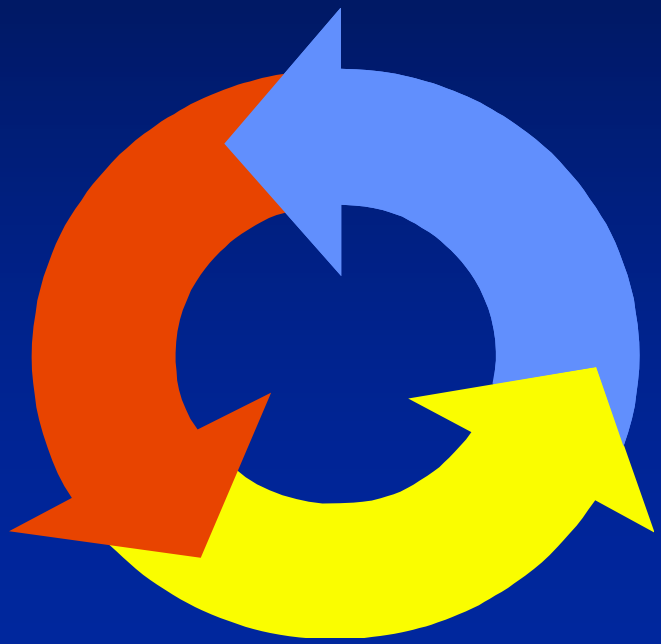
- **SOCIAL SCIENCE**
  - American Government
  - Macro and Microeconomics
  - Psychology
  - Sociology
  - Urban Affairs

- **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

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



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	Redesign
• 7 sections (~35)	• 2 sections (~140)
• 7 faculty	• 4 faculty
• 100% wet labs	• 50% wet, 50% virtual
• $131,610	• $98,033
• $506 cost-per-student	• $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%

SIX 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	Replace developmental courses with just-in-time workshops

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	Redesign
• 57 sections (~27)	• 38 sections (~54)
• Adjuncts + 6 TAs	• Instructor-TA pairs
• 100% in class	• 50% in class, 50% online
• $167,074 ($2931/section)	• $56,838 ($1496/section)
• 1529 students @ $109	• 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%

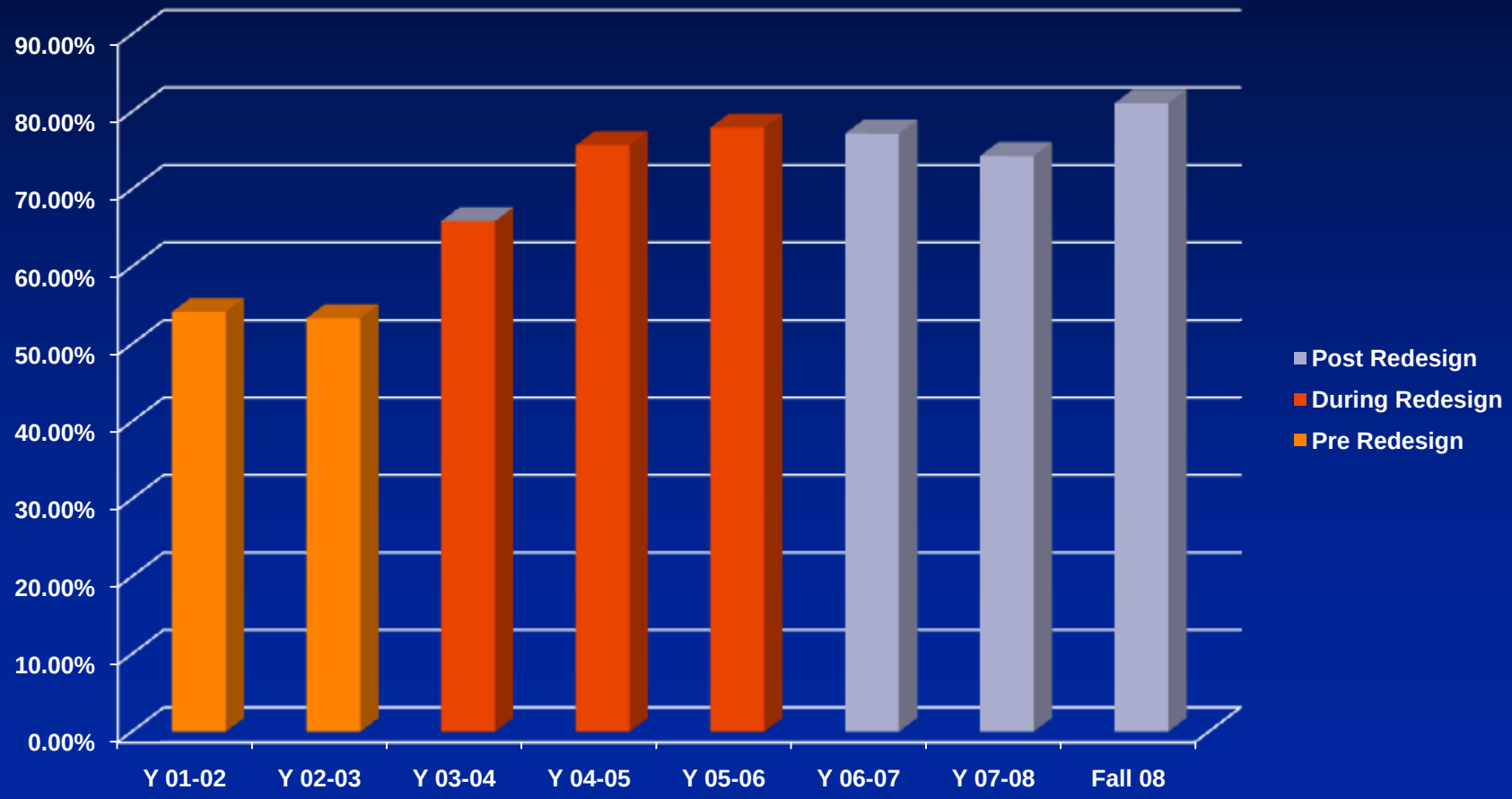
- Fall 2000 — 50.2%
- Fall 2001 — 60.5%
- Fall 2002 — 63.0%
- Fall 2003 — 78.9%
- Fall 2004 — 76.2%

MATH TECHNOLOGY LEARNING CENTER

University of Missouri St. Louis

Class size increased from 35 to 70, reducing costs by ~30%.

COLLEGE ALGEBRA
U of Missouri-Saint Louis



- “Over a third of America's college students and over half of our minority students don't earn a degree, even after six years. So we don't just need to open the doors of college to more Americans; we need to make sure they stick with it through graduation.

- And that means looking for some of the best models out there. There are community colleges like Tennessee's Cleveland State that are redesigning remedial math courses and boosting not only student achievement but also graduation rates.”

President Obama
August 9, 2010

DEVELOPMENTAL MATH
Cleveland State Community College

	Before	After
• Basic Algebra		
– Completion % (ABC)	52%	65%
– Course GPA	1.92	2.53
– Common test items	73.3%	86.2%
• Elementary Algebra		
– Completion % (ABC)	52%	70%
– Course GPA	1.95	2.88
– Common test items	70.3%	86.2%
• Intermediate Algebra		
– Completion % (ABC)	56%	79%
– Course GPA	2.02	3.20
– Common test items	77.3%	90.1%

DEVELOPMENTAL MATH PROGRAM COMPLETION

Before

- An average of 182 of 327 students (56%) success-fully exited the program.

After

- 268 of 340 students (79%) successfully exited the program.

This represents a **47% increase** in moving students through developmental studies to college-level math courses.

PERFORMANCE IN COLLEGE-LEVEL MATH COURSES

Before

- Completion rate of developmental students = 71%
- Completion rate of other students = 70%

After

- Completion rate of developmental students = 81%
- Completion rate of other students = 70%

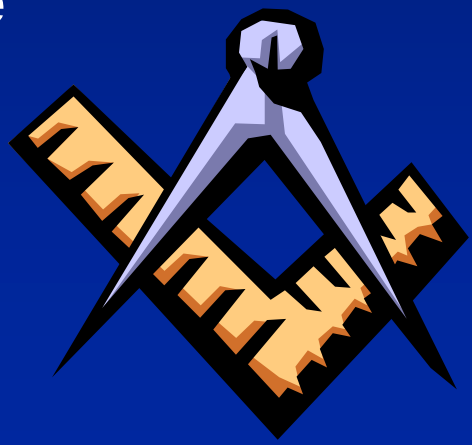
Redesign students also had higher average course grades (3.15 compared to 2.94)

COLLEGE-LEVEL MATH
Cleveland State Community College

	Before	After
• College Algebra		
– Completion % (ABC)	65%	74%
– Course GPA	2.26	2.89
– Common test items	76%	86%
• Finite Math		
– Completion % (ABC)	75%	91%
– Course GPA	2.53	3.63
– Common test items	82%	88%

ALL THIS AT REDUCED COST $50,000+ Annually

- Faculty productivity rose by 23%.
- Average student load per instructor went from 106 to 130.
- Adjunct faculty (N = 10) were eliminated.
- Low-enrollment sections: multiple courses are offered in the same classroom simultaneously.



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."

FOR MORE INFORMATION

www.theNCAT.org

- Project descriptions
- Progress reports
- Project contacts
- Program descriptions
- Monographs
- Planning resources

The National Center for Academic Transformation