Scaling Innovation in Developmental Math: Lessons from Research and Practice

Nikki Edgecombe, Community College Research Center
Barbara Lontz, Montgomery County Community College
Susan Bickerstaff, Community College Research Center

March 5, 2012
League for Innovation in the Community College
Philadelphia, PA
We conduct quantitative and qualitative research on:

- Teaching and learning in higher education
- Access to and success in postsecondary education
- High school to college transition
- Missions, governance, and accountability
- Workforce education
Our Challenge

• Over 60 percent of entering community college students are referred to developmental education

• Outcomes for students are discouraging
  – Vast majority of students do not complete the sequences to which they are referred
  – Developmental education is not effective for students near the cut-off point
  – Completion rates of those who skip the sequence are similar to compliers
Innovation in Developmental Education

• CCRC scan of reforms in developmental education suggests that innovation is widespread
• However, most reforms affect relatively few students and remain small in scale and largely unknown outside their institutions
• In rigorous evaluations, impacts are modest and short-term
Instructional Reform Approaches

- **Structural** reforms focus on reorganization of instructional time and delivery (e.g., compressed courses, mainstreaming, and modularization).
- **Curricular** reforms focus on rationalizing and refining content (e.g., alternative pathways, contextualization, and course elimination).
- **Pedagogical** reforms focus on changes to teaching (e.g., student-centered activities, conceptual learning, and metacognition).

Approaches are NOT mutually exclusive
• CCRC and partner colleges work to scale promising reforms at new institutions.
  – Faculty-driven effort, with intentional focus on classroom practice

• CCRC researchers document the implementation process and evaluate the impact of reforms on student success.
  – How can promising innovations in developmental education be introduced, sustained and scaled to enhance student learning, persistence and academic progression?

• Funded by the William and Flora Hewlett Foundation
• Our partners:
  – Concepts of Numbers from Montgomery County Community College
  – Accelerated Learning Program from Community College of Baltimore County
  – California Acceleration Project, led by faculty from Chabot College and Los Medanos College

• For more information, read *Inside Out* or visit www.scalinginnovation.org
 Concepts of Numbers

• All learning outcomes of a traditional arithmetic course are covered but in a different order

• Lessons proceed through concepts, (addition, subtraction, multiplication, division & combinations) using a discovery approach

• Students are assessed on the same skills as the traditional arithmetic course

Montgomery County Community College

CCRC Community College Research Center
Concepts of Numbers Outline

• Unit 1: History of Numbers
• Unit 2: The Real Number System
• Unit 3: Comparisons
• Unit 4: Addition
• Unit 5: Subtraction
• Unit 6: Multiplication
• Unit 7: Division
• Unit 8: Combinations
Unit 1: History of Numbers

• In understanding the evolution of numbers, students will better understand/appreciate our present system.

• The following civilizations are covered:
  
  Babylonian  
  Greek  
  Egyptian  
  Roman  
  African  
  Mayan

• The concepts of place value and place holders are explored.
Unit 6: Multiplication

- Multiplications (repeated combinations) of the following quantities
  - whole numbers
  - fractions
  - decimals
  - integers
  - algebraic expressions (distributive prop)

- Exponents

- Application of multiplication (e.g., area, circumference, percents)

- Properties (e.g., commutative, associative, identity & inverse)
Outcome Data: Success Rates

Success is a grade of C or better; Withdraws count as non-success

<table>
<thead>
<tr>
<th>MAT010 Concepts of Numbers versus MAT010 Traditional Course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Concepts of Numbers</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>Traditional Arithmetic</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>N</td>
</tr>
</tbody>
</table>

* the top 13% of Arithmetic Accuplacer scorers were accelerated into a 4 credit beginning algebra class

** an additional top 12% of Arithmetic Accuplacer scorers were accelerated into a 4 credit beginning algebra class
Scaling a Promising Practice

• Institution buy-in
  – financial
  – time for development

• Department approval
  – bringing to a larger scale
  – faculty willingness to try something new
  – training

• Monitoring/Assessment
Deeper Learning

• Implementation Team
• Universal Portal
• CoN-NECT
  – Course improvements
  – Journaling
  – Video segments
  – Class observations
  – Best practices
Preliminary Findings from Scaling Innovation Research

1. Structural and curricular concerns dominate during early implementation, but can serve as pathways to examining classroom practice

2. Infrastructure for collaboration and refinement is important, but challenging to implement and sustain
Structure and Curriculum: Questions about the What

• Course format and scheduling
  – Registration, scheduling, space, instructional supports, staffing, credit hours, financial aid

• Curricular questions
  – Textbook, course materials, assessments, assignments
  – Content-specific questions (i.e., How do you teach ____?)
Moving from What to How

• Embedding “design principles” into curriculum and structure
  – Small class size invites pedagogy that is responsive to student needs
  – Fewer practice problems enables more conceptual and less procedural instruction
  – Project-based assignments invite teaching for application

• Examining artifacts of practice
  – Curricular materials, video, classroom observations, assignments, student work
Collaborative Infrastructure

• Diverse coalitions build buy-in and ensure sustainability
  – Full-time and adjunct faculty
  – Administrators
  – Counselors and advisors
  – Instructional support staff
  – Institutional researchers
  – Students

• By reviewing data, the coalition can create processes for ongoing refinement
  – Course grades, student persistence to subsequent courses, student success in subsequent courses
  – Artifacts of practice
Challenges to Collaborative Work

• Antithetical to professional culture and structure of higher education

• Skills required are different from those typically associated with faculty role
  – Leadership, management, coaching
  – Faculty have varied needs

• Structures are contextually specific and challenging to sustain (e.g., curriculum writing team)
Doing Developmental Education Differently

It’s really hard to get faculty to look at teaching differently or changing curriculum in drastic ways when they’ve invested their identity in that way of teaching. ‘You’re not challenging a certain curriculum; you’re challenging me or the essence of who I am.’ - Faculty Leader

It has been one of the most positive and rewarding experiences of my professional career in higher education. I’m having opportunities to do things I didn’t know were possible in this way. Doing research, publications, presentations; those were all things I’ve dreamed of, and now I’m living that dream. - Faculty Leader
For more information:

Please visit us on the web at http://ccrc.tc.columbia.edu, where you can download presentations, reports, CCRC Briefs, and sign-up for news announcements.

Community College Research Center
Institute on Education and the Economy, Teachers College, Columbia University
525 West 120th Street, Box 174, New York, NY 10027
E-mail: ccrc@columbia.edu
Telephone: 212.678.3091