CAPR | CENTER FOR THE ANALYSIS OF POSTSECONDARY READINESS

AERA \ TORONTO,CA \ 04.06.2019

Paving the Way to Better Higher Education Outcomes: Findings From the Center for the Analysis of Postsecondary Readiness (CAPR)

Presenters: Elizabeth Zachry Rutschow, MDRC;
Elisabeth Barnett, Teachers College, Columbia University, CCRC;
Angela Boatman, Vanderbilt University

Chair: Patricia M. McDonough, University of California-Los Angeles

Commentators: James T. Minor, California State University & Shirley M. Malcom, American Association for the Advancement of Science

Acknowledgements

- The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through the grants mentioned below. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.
- R305C140007 to Teachers College, Columbia University

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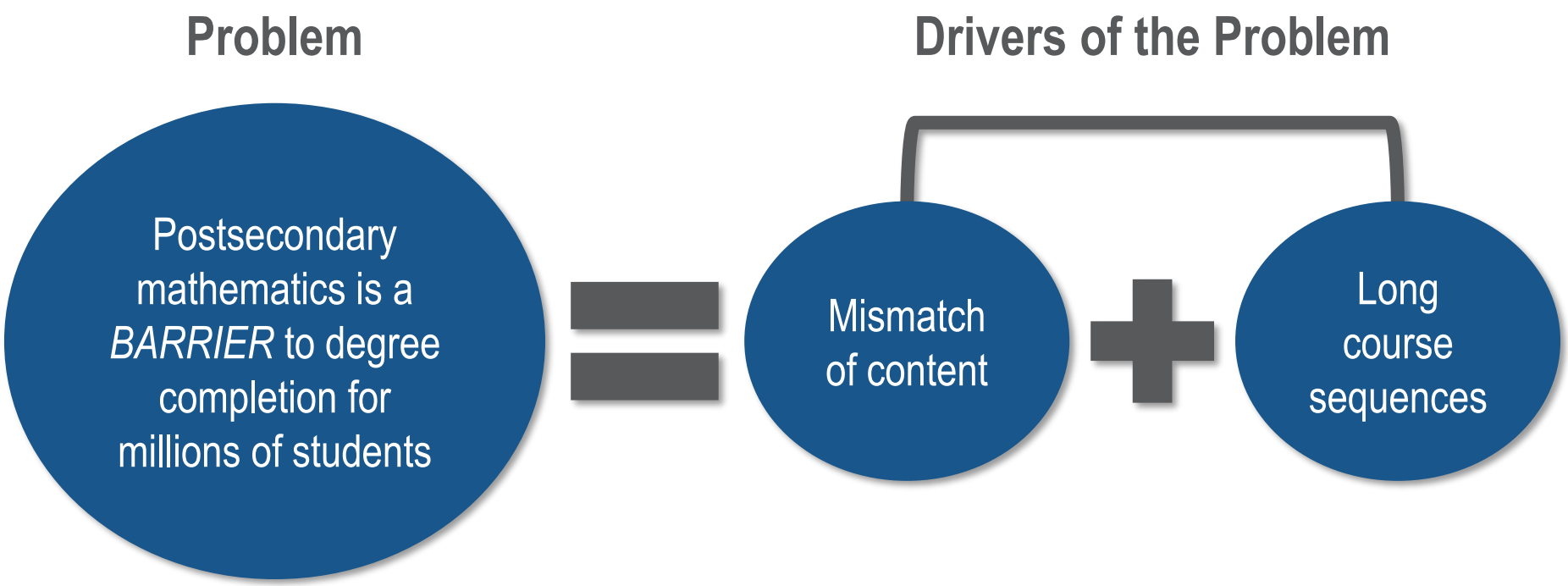
Evaluation of the Dana Center Math Pathways

Elizabeth Zachry Rutschow

MDRC

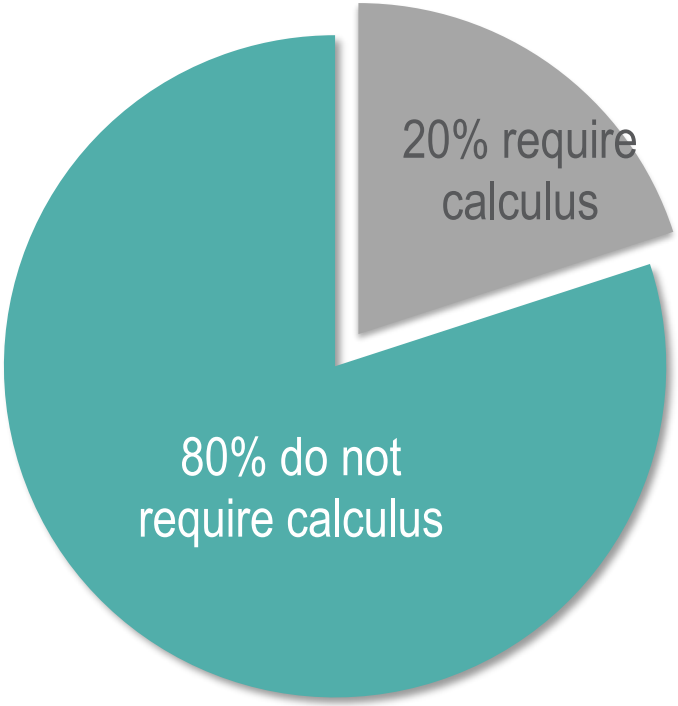
Drivers that Create Barriers for Students



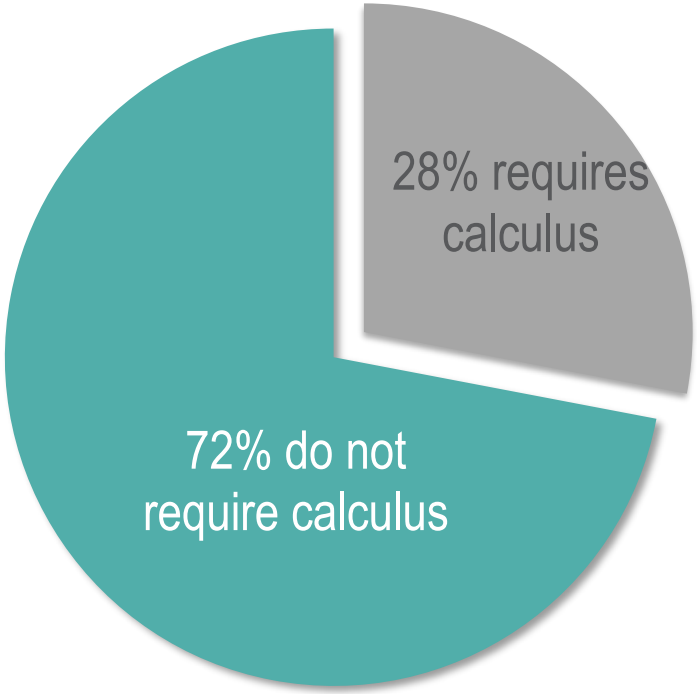
From *The Case for Mathematics Pathways* (Dana Center, 2016)

What Math Do Students Need?

Two-Year College Student Enrollment Into Programs of Study

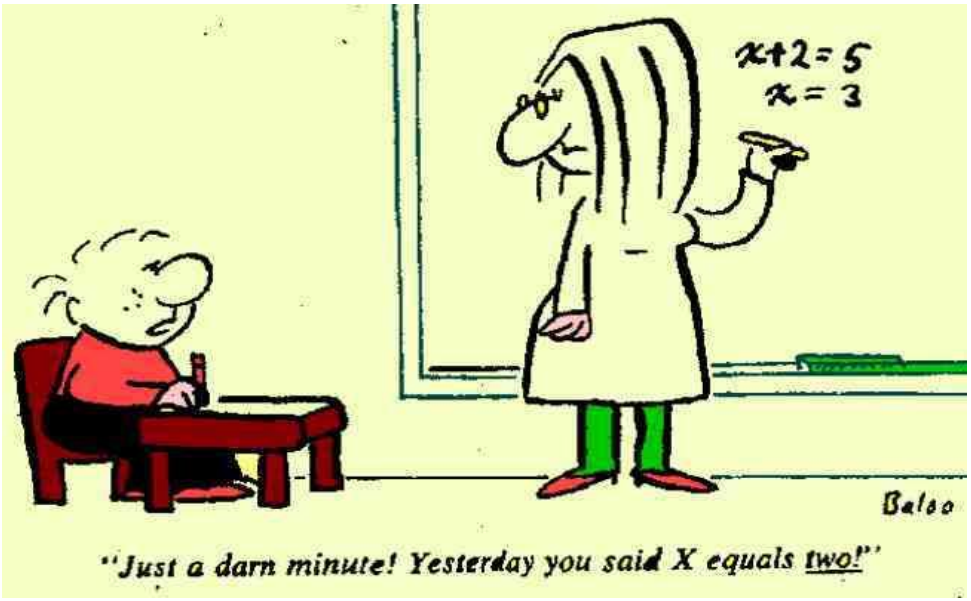


Four-Year College Student Enrollment Into Programs of Study



Burdman, P. (2015). Degrees of freedom: Diversifying math requirements for college readiness and graduation. Oakland, CA: Learning Works and Policy Analysis for California Education.

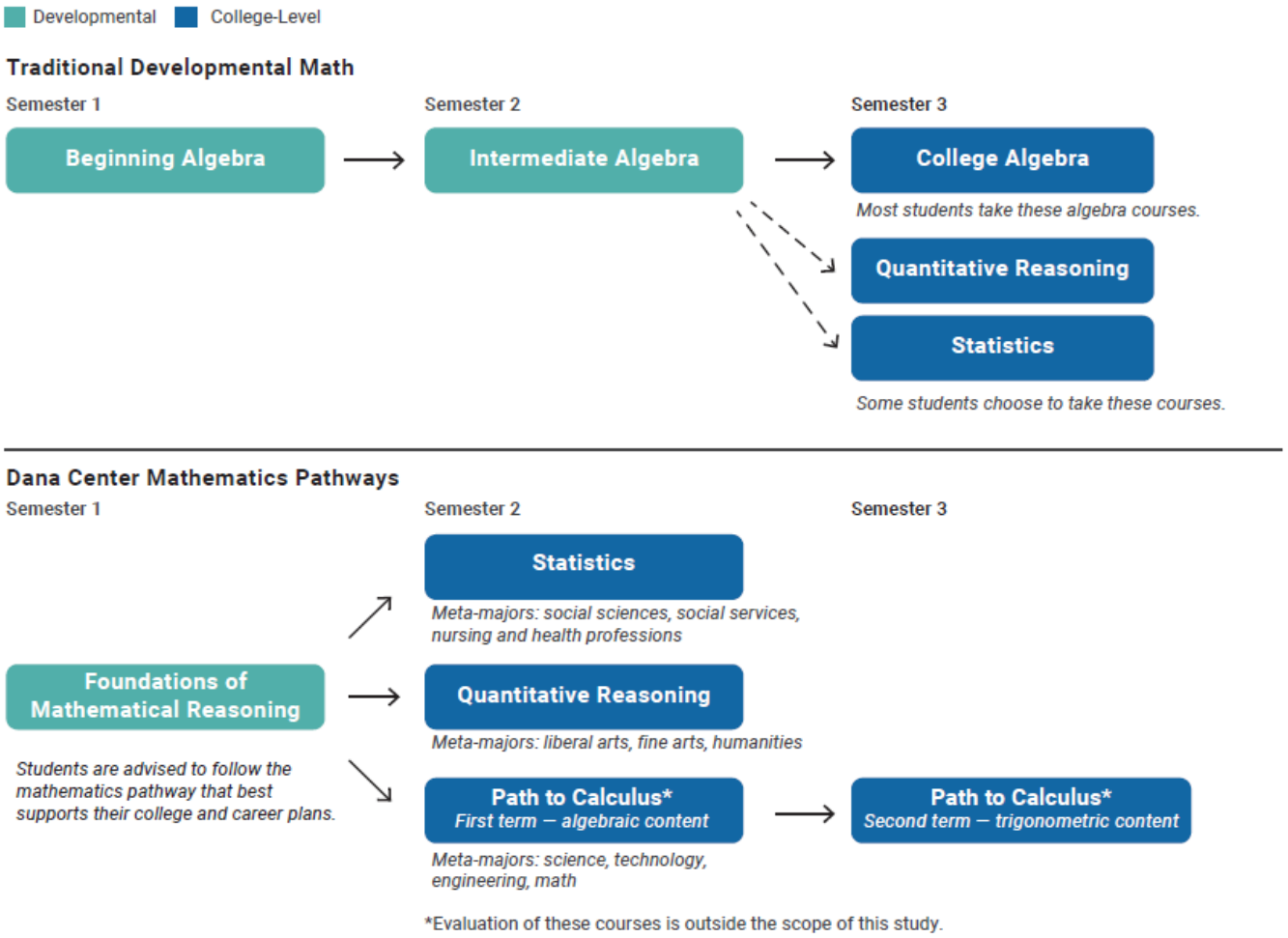
Traditional Math Instruction Tends to Focus on…



- Teacher-directed lecture
- Formulas and equations
- Rote memorization
- Few real-world applications

The Dana Center Mathematics Pathways (DCMP)

The DCMP Model: Revisions to Math Content



Teacher-directed lecture

Formulas and equations

Rote memorization

Few real-world applications

Active Learning

Small group work, student interaction, presenting solution methods

Reading and Writing

Problem Solving

Multistep problems building on previously learned content or answers;
Multiple solution methods

Constructive Perseverance

Understanding the role struggle plays in learning

Contextualization

Problems contextualized in real-life situations

Sample DCMP Problem

Question: A research report estimates that individuals who smoke are 15 to 30 times more likely to develop lung cancer than individuals who never smoke. If the lifetime risk of developing lung cancer for nonsmokers is about 1.9 percent, what is the lower limit of the estimated risk for smokers according to the report?

Answer: The lower limit of the estimated risk for smokers according to this report is _____ percent.

The CAPR Evaluation of the DCMP

A Mixed-Methods Evaluation: Impact, Implementation, & Cost Study

Impact study

- RCT at four Texas colleges
  - 1,422 students
  - 4 cohorts (Fall 2015 - Spring 2017)
  - Outcomes tracked for 3+ semesters
- Key outcomes
  - Completion of Developmental Math
  - Completion College-Level Math Course
  - Overall Academic Progress

Implementation study

- Fidelity and treatment contrast
- Differences in content and pedagogy

Cost study

- Is DCMP cost effective relative to traditional services?

Early Implementation: Challenges & Changes

Which pathway should students take?

- Revise requirements for majors
- Revise advising
- But not all eligible students reached

Will four-year transfer colleges accept a non-algebra math course?

- Good progress made with alignment four-year colleges

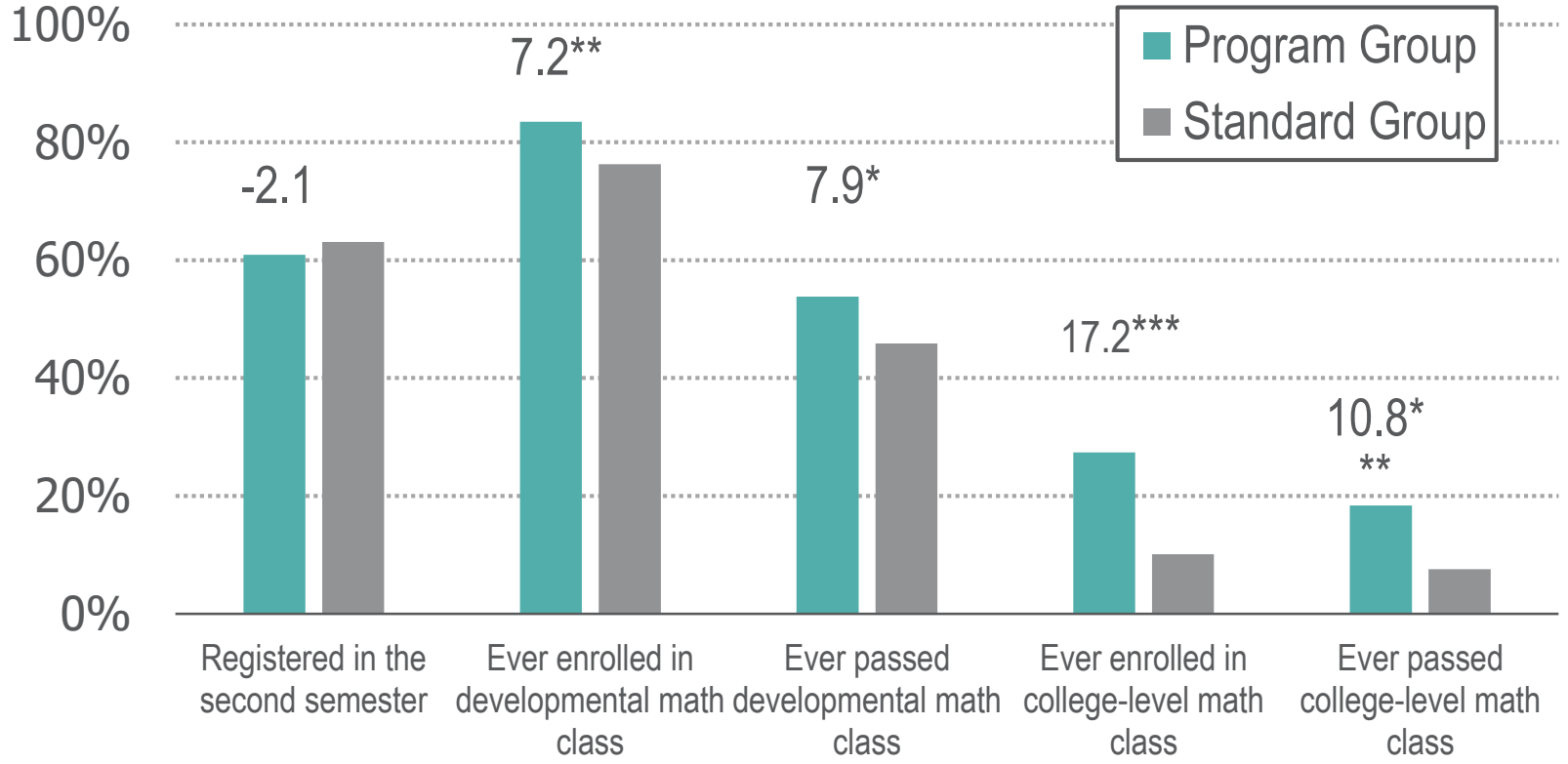
Can math faculty move away from algebra?

- Strong implementation
- Very different course content

Can faculty change pedagogy?

- Relatively strong implementation
- Contextualization & student centered approaches
- Qualitatively different classroom experience for students

Early Impacts on Student Success (Fall 2015 and Spring 2016 Cohorts, through 2 Semesters)



Statistical significance levels are indicated as follows: * = 10 percent; ** = 5 percent; *** = 1 percent.

The Final Report will include…

- Impact analysis, following all cohorts for at least three semesters
- Analysis of the institutional-level and classroom-level implementation of the DCMP
- Cost-effectiveness analysis of the DCMP

To be published in fall 2019

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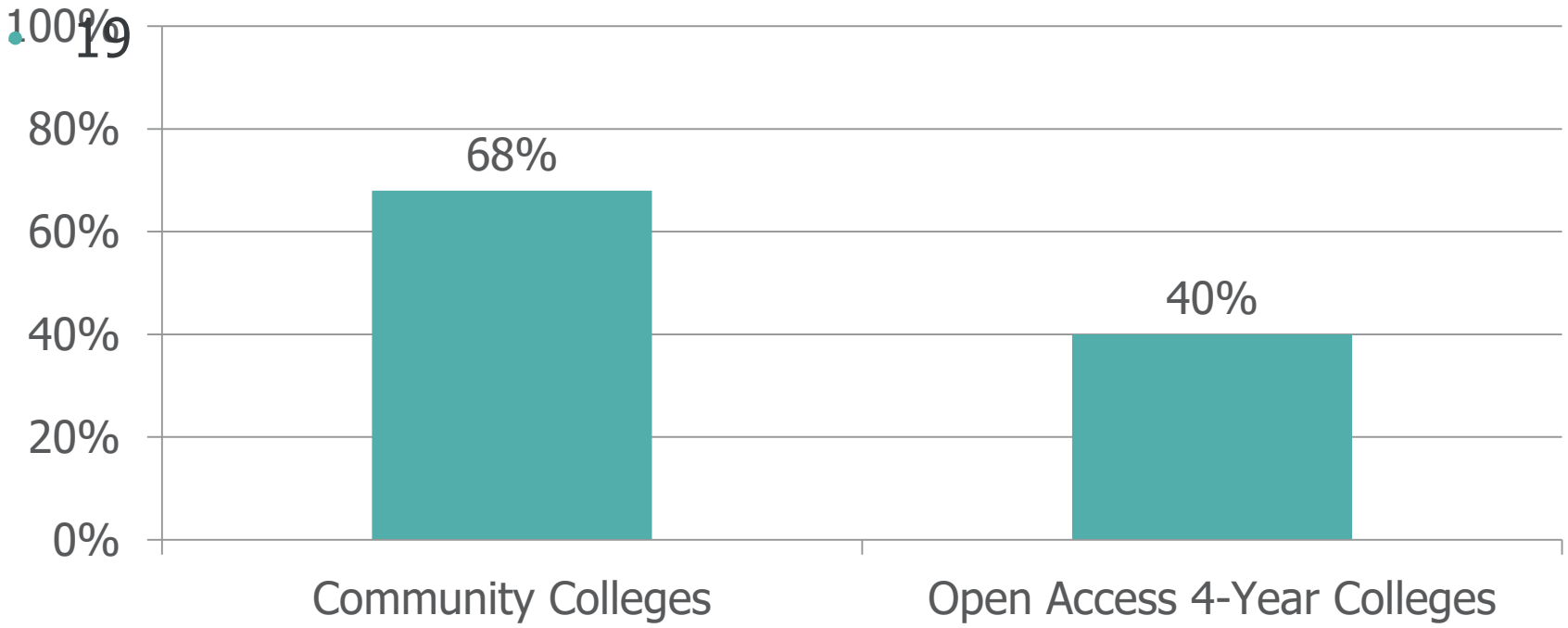
Evaluation of a Multiple Measures Placement System Using Data Analytics: Early Impact Findings

Elisabeth Barnett, Senior Research Scholar

Community College Research Center, Teachers College

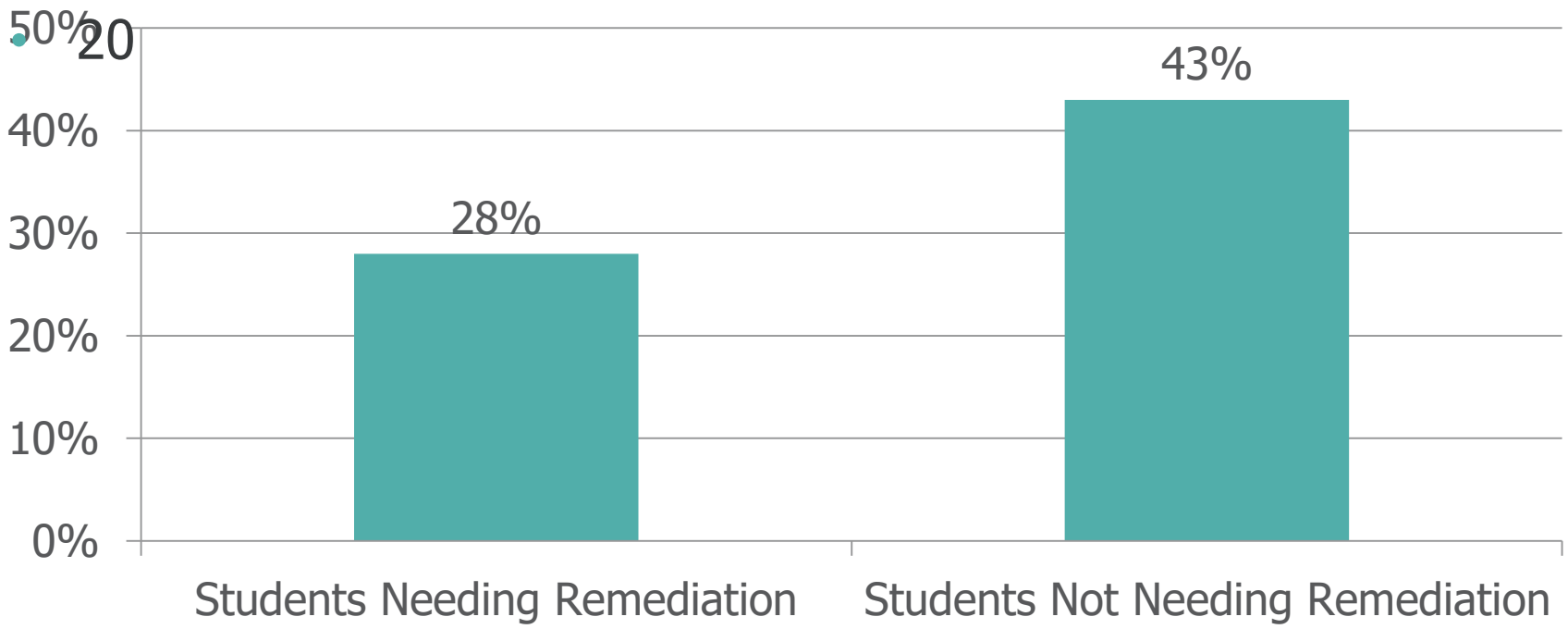
Multiple Measures Assessment

Students needing 1+ developmental education course (NCES, 2013)



Community college 8-year graduation rates

(Attewell, Lavin, Domina, and Levey, 2006)



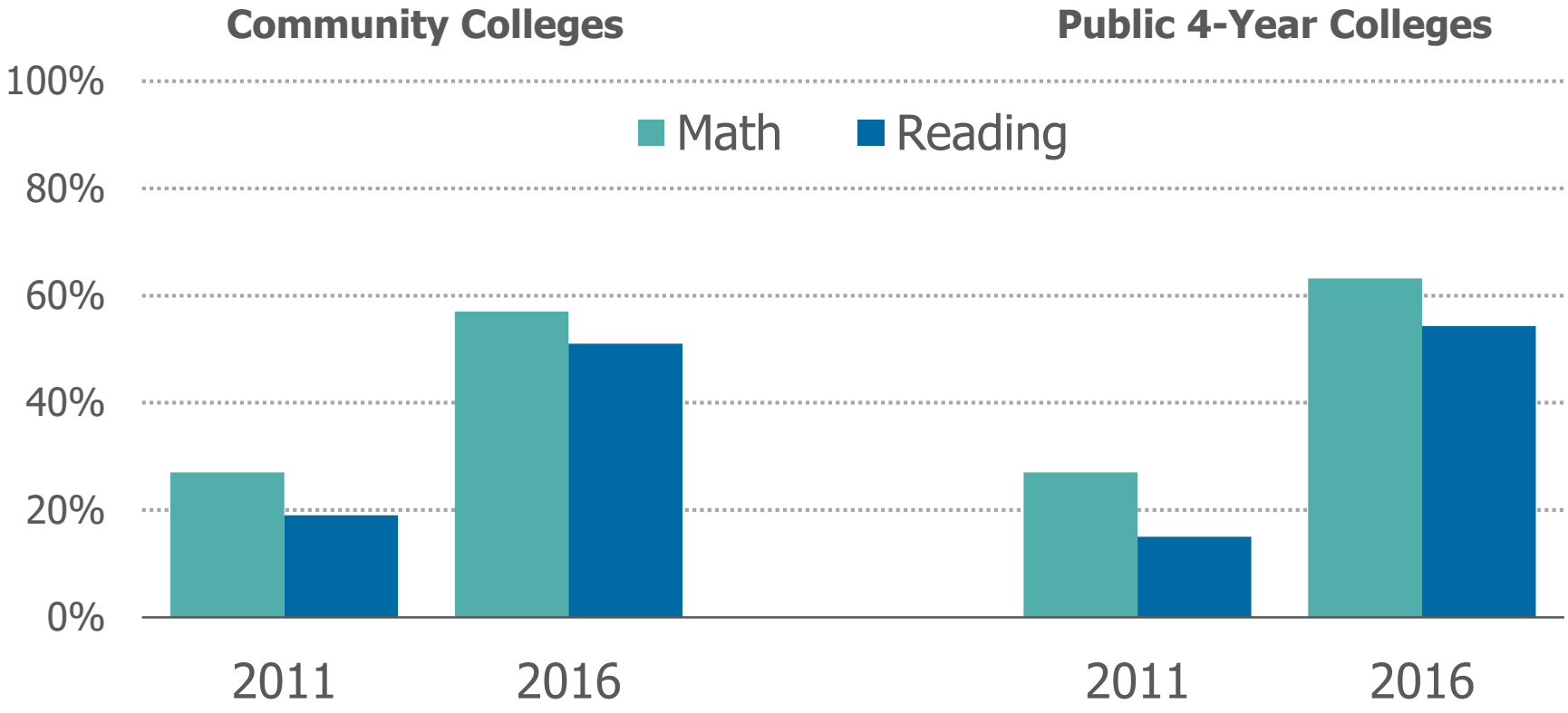
Under-placement and Over-placement

		Placement According to Exam	
		Developmental	College Level
Student Ability	Developmental	✓	***Over-placed*** *(English – 5%)* *(Math – 6%)*
	College Level	***Under-placed*** *(English – 29%)* *(Math – 18%)*	✓

Why Use Multiple Measures

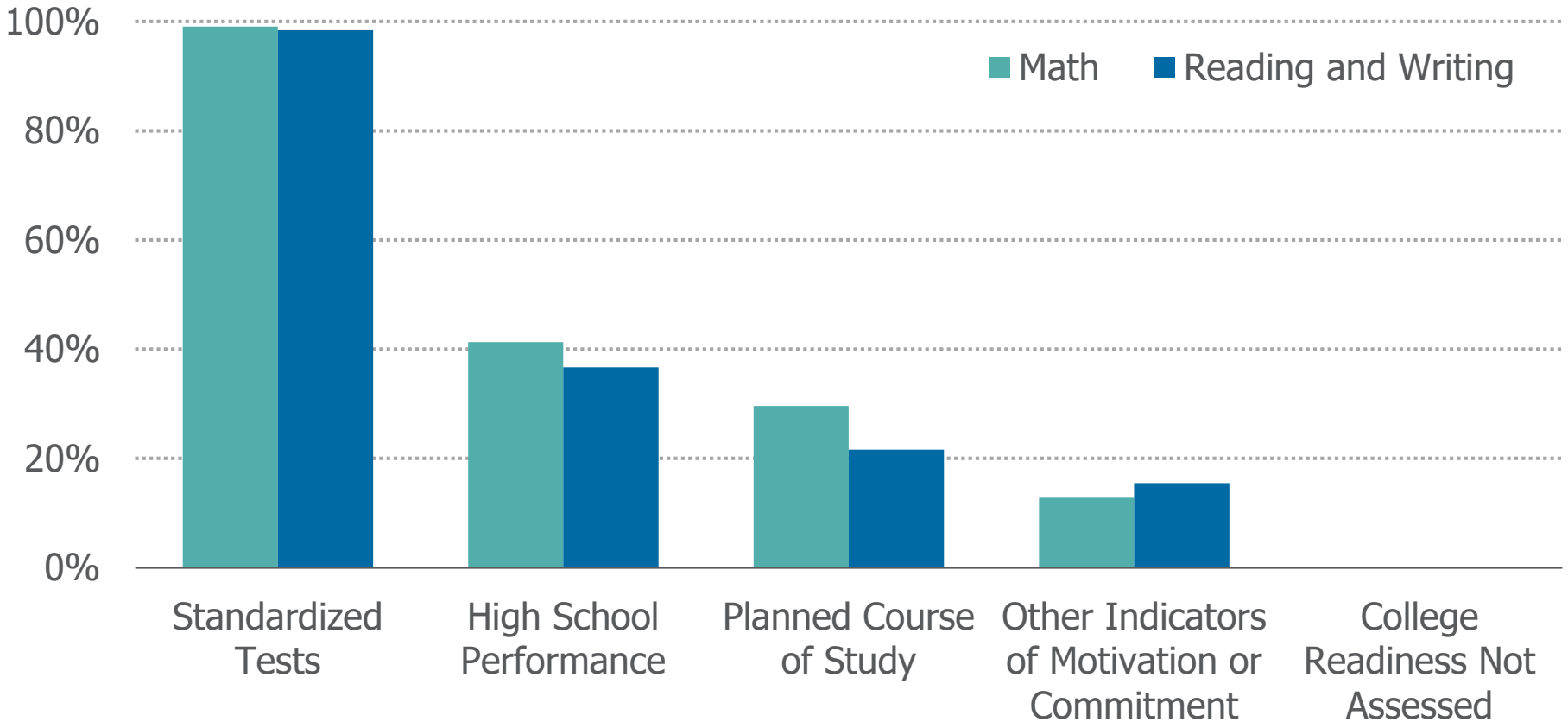
- Existing placement tests are not good predictors of success in college courses. High School Grade Point Average (GPA) does a better job.
- More information improves most predictions.
- Different measures may be needed to best place specific student groups.

Percent of Colleges Using Measures Other than Standardized Tests for Assessment



SOURCES: 2011 data from Fields and Parsad (2012); 2016 data from the CAPR's institutional survey.
NOTE: The Fields and Parsad (2012) reading statistics are for reading placement only, whereas the CAPR survey data are for both reading and writing.

Processes Used to Determine College Readiness in Community Colleges



SOURCE: Data from CAPR's institutional survey.
NOTE: Categories are not mutually exclusive.

The Center for the Analysis of Postsecondary Readiness (CAPR) Assessment Study

Research on Alternative Placement Systems

- 5-6 year project
- 7 State University of New York community colleges
- Evaluation of the use of predictive analytics in student placement decisions
- Research includes Randomized Control Trial (RCT), implementation study, and cost study
- Current status: completed preliminary report

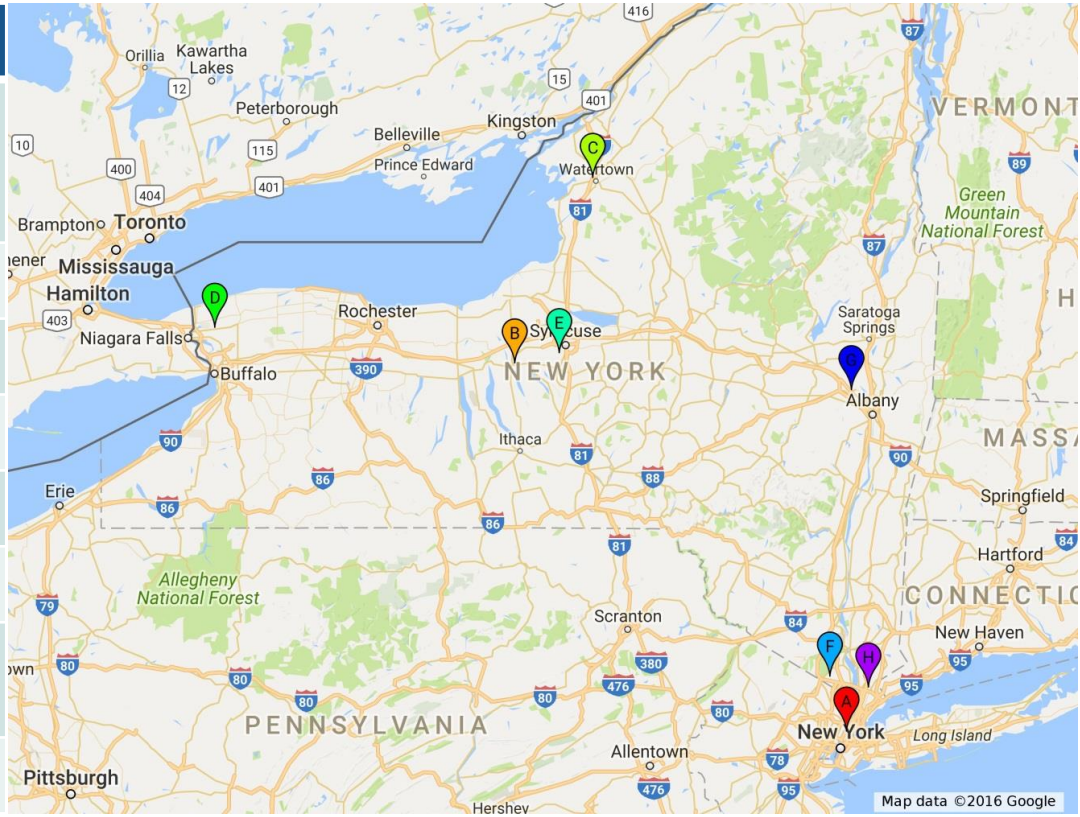
Research Questions (Summary)

1. Do students' outcomes improve when they are placed using predictive analytics?

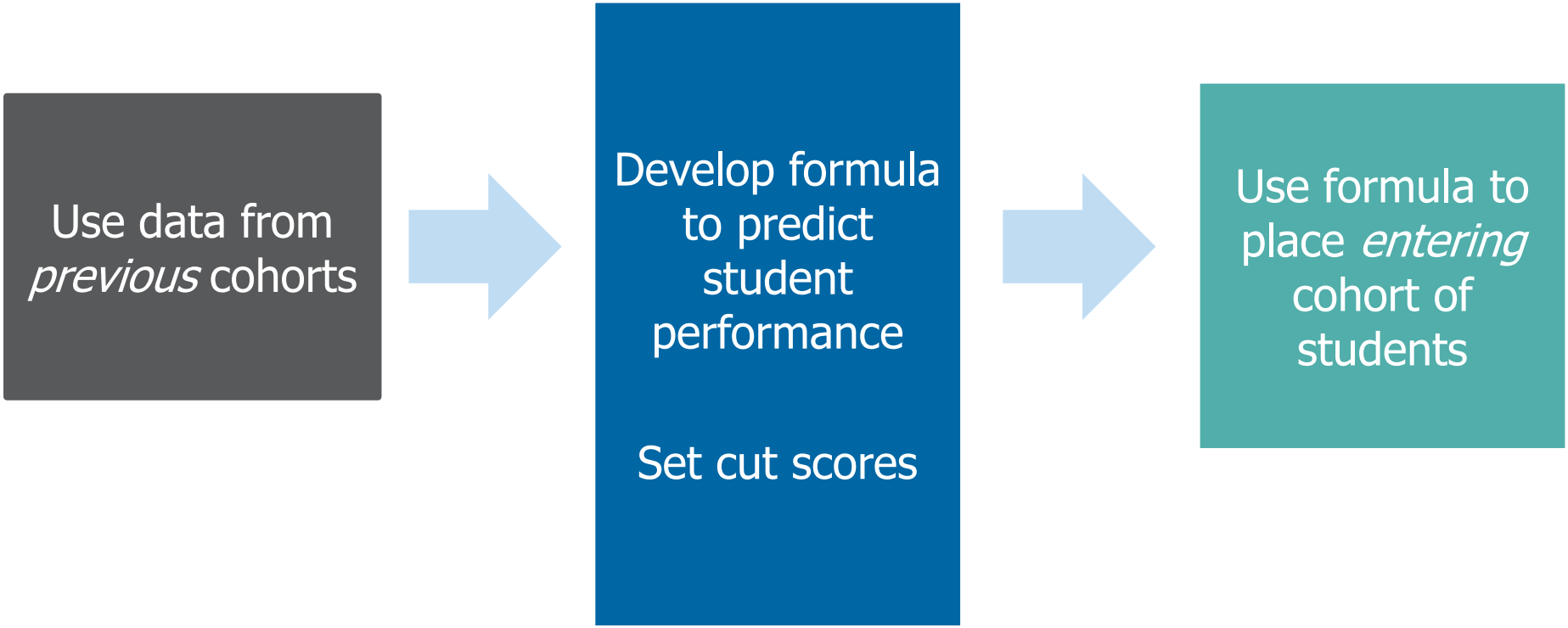
2. How does each college adopt/adapt and implement such a system?

The State University of New York Sites

LOCATION
A – The Center for the Analysis of Postsecondary Readiness, Community College Research Center, MDRC
B – Cayuga Community College
C – Jefferson Community College
D – Niagara County Community College
E – Onondaga Community College
F – Rockland Community College
G – Schenectady County Community College
H – Westchester Community College



How Does the Predictive Analytics Placement Work?



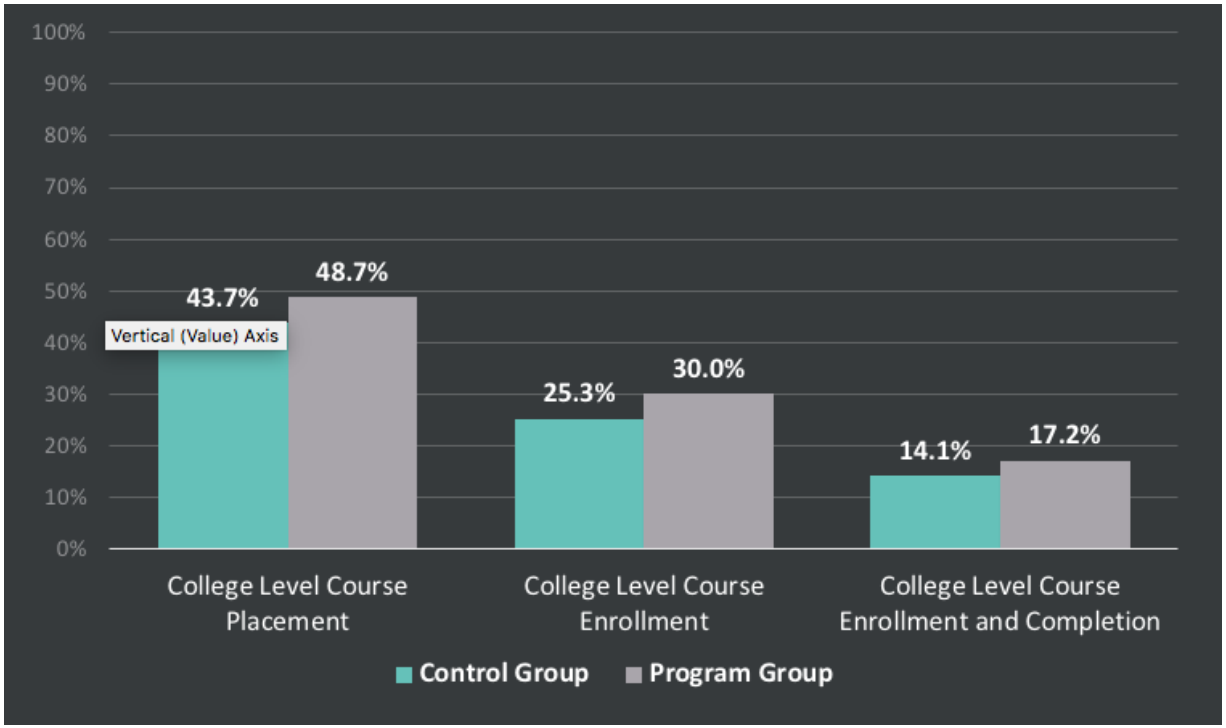
First Cohort - First Semester (Fall 2016)

Sample = 4,729 first year students across 5 colleges

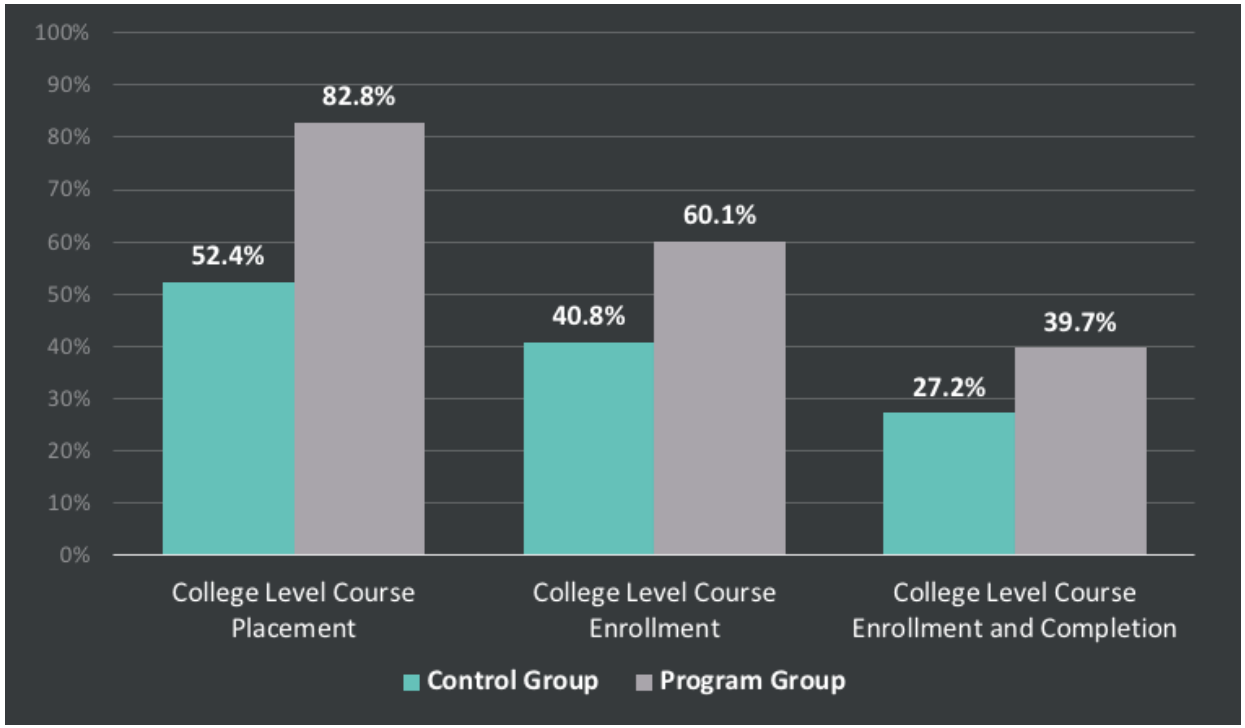
- 48% students assigned to business-as-usual (n=2,274)
- 52% students assigned to treatment group (n=2,455)
- 82% enrolled into at least one course in 2016 (n=3,865)

All of the findings shown here are statistically significant ($p<.05$)

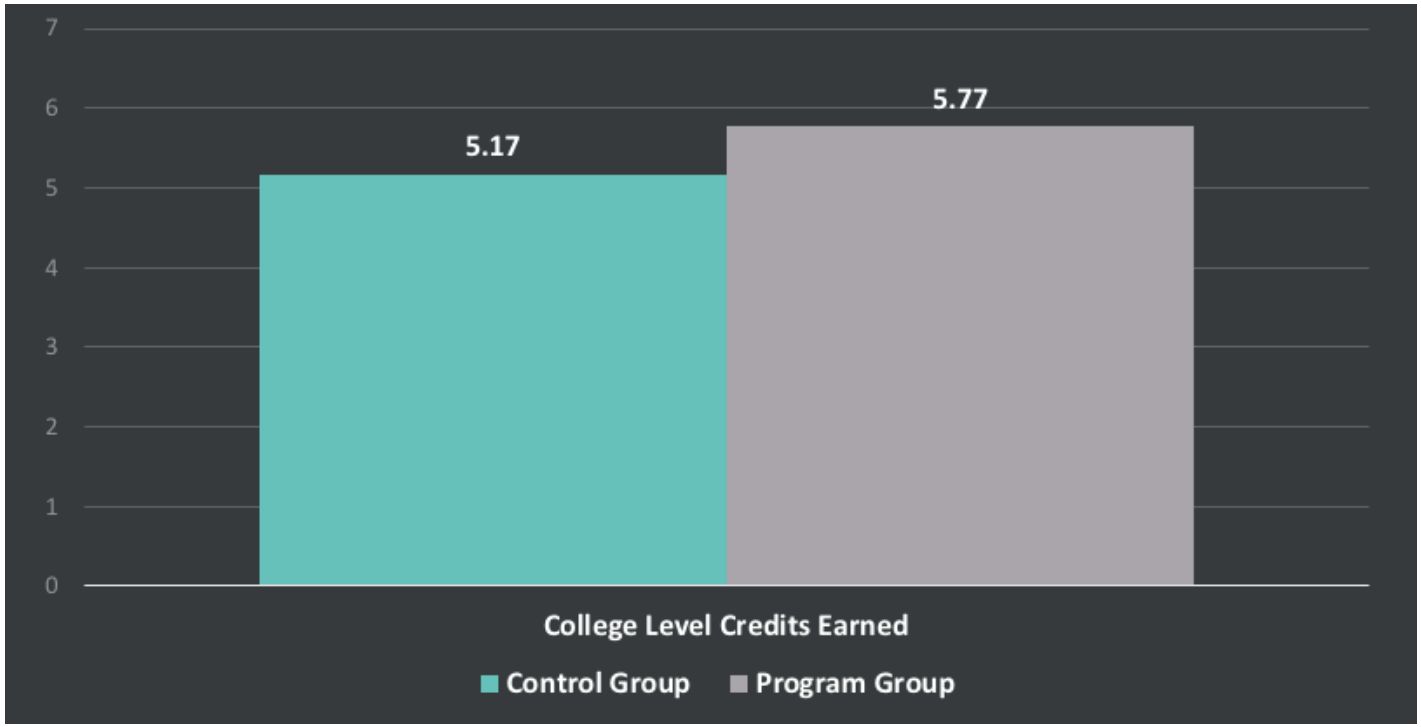
Treatment Effects: Math



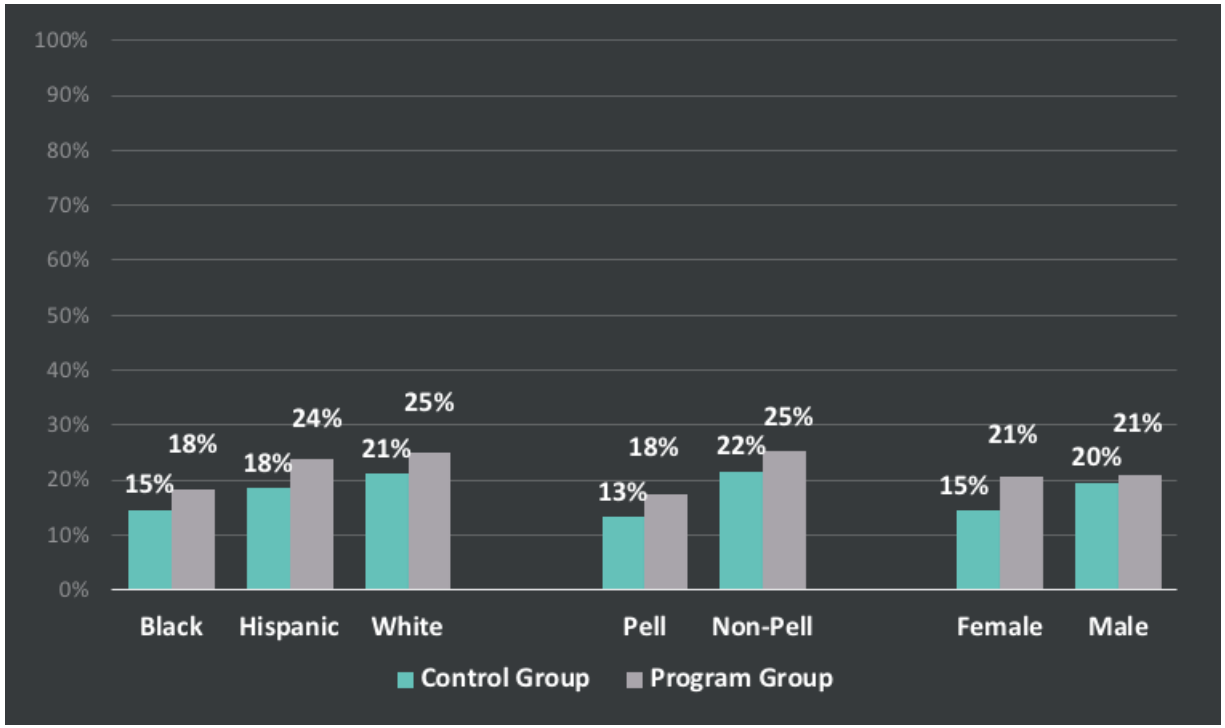
Treatment Effects: English



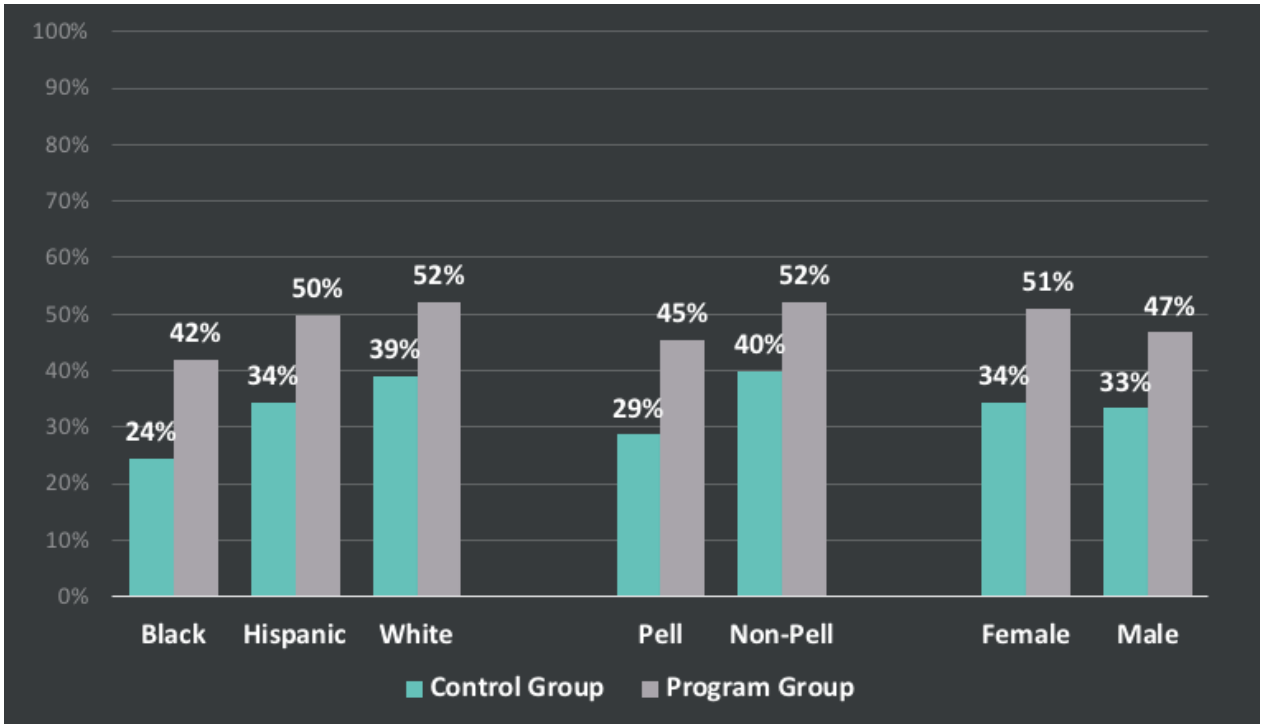
Treatment Effects: Total College Level Credits Earned



Treatment Effects: College Level Math Completion



Treatment Effects: College Level English Completion



Implementation Challenges

- The range of departments affected by the change
- Lack of historical data for analysis due to multiple reforms
- Concerns about the use of the high school GPA
- Access to the high school GPA
- Communications within colleges

Costs

- First fall-term costs were roughly $110 per student above status quo (Range: $70-$320)

- Subsequent fall-term costs were roughly $40 per student above status quo (Range: $10-$170)

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Implementation and Outcomes Findings From the Adoption of the Emporium Model in Developmental Math

Angela Boatman
Assistant Professor of Public Policy and Higher Education
Vanderbilt University

Emporium Model

- Replaces traditional lectures with interactive, instructional software
- Self-paced
- Faculty serve more as tutors who deliver individualized instruction as opposed to lecturers
- Content divided into modules taught using tutorials, practice exercises, and online quizzes and tests.
- Offered by third-party providers such as Pearson or McGraw Hill

Computer-Aided Instruction, K-12

- Experiments using computer-aided instruction find null effects on student test scores in math classes in high school (Cavalluzzo, Lowther, Mokher, & Fan, 2012; Pane, Griffin, McCaffrey & Karam, 2013)
- Test scores in treatment classrooms (with math technology) did not differ from test scores in control classrooms (Dynarski et al., 2007).

Strong positive effects:
- Pre-algebra and Algebra (Barrow, Markman, & Rouse, 2009)

Strong negative effects:
- Pane, J. F., McCaffrey, Slaughter, Steele, & Ikemoto, 2010

Heterogeneous effects:
- Test-score gains larger for students far behind their peers academically, and students with poor school attendance (Barrow, Markman, & Rouse, 2009)

Emporium Model in TN

- 13 community colleges, 6 public universities
- 2008-09: Early adopters
- 2011: Increase the adoption of this model to all public institutions (developmental math, reading, and writing)
- 2013: Full implementation
  - Colleges varied in the degree to which they "fully" implemented the model
  - Stricter in their compliance in math

- (2012: Eliminated developmental education from 4-year institutions)

Research Questions

1. How do students, faculty, and administrators experience the implementation of the emporium model?
2. Does the use of technology-centered instruction in developmental math courses result in higher course pass rates and persistence rates for students than the traditional version of these courses?
   - Do these results differ by institutional type and student sub-group?

Qualitative data collection

- **Two phases: Survey, Site Visits**
  - Site Visits: Purposive sampling (maximum variation)
  - Classroom observations, faculty/admin and student focus groups at four 2-year institutions and two 4-year institutions
    - Areas of focus: classroom instructional, logistical, and social experience; perceived benefits and challenges of various aspects of instruction and assessment
- **Analysis**
  - Transcription
  - Two stage, line-by-line coding to identify emergent categories and themes

Faculty Interviews

- Attitudes, perceptions, and behaviors
  - Initial resistance
  - Lack of direct instruction, loss of academic freedom, and the ability of students to "mimic" their understanding to move forward.
  - Staffing and scheduling changes required hiring math lab coordinators and reassigning existing faculty.

Student Focus Groups

- Cognitive accessibility
  - Increasing access to material
  - Affording abundant opportunities for practice
  - Providing immediate feedback
- Social accessibility
  - Multiple avenues for relationships with instructors
  - Deeping relationships with instructors

Students overwhelmingly express a preference for experience of technology-driven instruction in developmental math.

Impact Analysis

2005-06 to 2010-11 cohorts followed through 2015-16 at 19 public colleges

Difference-in-Differences

- Diff #1: Students assigned to dev math at the early-adopter institutions before and after adoption
- Diff #2: Students assigned to dev math from later-adopter institutions
  - Controls: gender, age, act math score, hs gpa, lottery status
  - Year and college-by-course fixed effects
  - Sensitivity Analyses: Event study, covariate balancing, falsification tests

	2-Year Colleges		4-Year Colleges	
	DD	Comparison Mean	DD	Comparison Mean
Passed First Dev Math	-0.011 (0.028)	0.64	0.054** (0.026)	0.78
Passed Dev Math in First Term	-0.010 (0.028)	0.64	0.055** (0.026)	0.78
# of Terms in Dev Math	-0.145 (0.110)	2.13	-0.291** (0.124)	2.00
Passed First College Math, overall	-0.028* (0.015)	0.29	-0.001 (0.019)	0.56
Passed College Math, if took	-0.068*** (0.021)	0.61	-0.052*** (0.014)	0.68

	2-Year Colleges		4-Year Colleges	
	DD	Comparison Mean	DD	Comparison Mean
Cum. Credits within 3 terms	-0.700* (0.376)	16.3	0.820 (0.541)	22.9
Cum. Credits within 6 terms	-1.636*** (0.601)	23.5	-0.757 (0.978)	40.5
Persist to 2nd semester	-0.042*** (0.013)	0.72	0.004 (0.020)	0.91
Persist to 2nd year	-0.069*** (0.014)	0.65	-0.051 (0.046)	0.88
Earned AA within 3 years	-0.014 (0.011)	0.06	0.004 (0.002)	0.01
Earned any degree within 6 years	-0.040** (0.016)	0.21	0.061** (0.027)	0.46

Heterogeneous Effects

By sector

- 2yrs: Less likely to pass college-level math, earn fewer credits, and earn a degree within 6 years
- 4yrs: More likely to pass dev math and spend fewer terms in dev math

By student characteristics

- Negative effects on passing college math larger for females, higher ACT math scores (2yrs) and lower ACT math scores (4yrs)

Discussion

- Positive student experience, but outcomes suggests unaddressed barriers at 2-year colleges
  - Are negative mid- and long-term relationships between the emporium model and student outcomes due to differences in the quality of instruction, supports, and relationships in subsequent (math) classes?
- Assumptions made about students' ability to self-pace
- Implications for technology-based instruction more widely

Reimagining Developmental Education

How can we do better for our students?

SAVE THE DATE
November 21–22, 2019
New York City, NY

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Questions?

Thank you for attending our session.