



Investigating Learning & Success: Innovating in College Remediation

Mickey Davis
Christopher Quarles

NCTM Research Conference
April 2016



Remediation

- Many are designated not college-ready
- Few make it to college-level
- It costs a lot of money

Background

Shall we fall back, and abandon the ground which, for thirty years past, we have been striving so hard to gain? Are those who are seeking only a partial education to be admitted into the college, merely for the purpose of associating its *name* with theirs? of carrying away with them a collegiate *diploma*, without incurring the fearful hazard of being over-educated? Why is a degree from a college more highly prized, than a certificate from an academy, if the former is not a voucher of a superior education?

Problems

- Repeat of high school curriculum
- Inaccurate placement
- It's a long slog (many exit points)
- Lack of alignment with k-12 and post-secondary
- Content (perceived to be) irrelevant
- Teaching quality inadequate
- Improvement focus is success rates

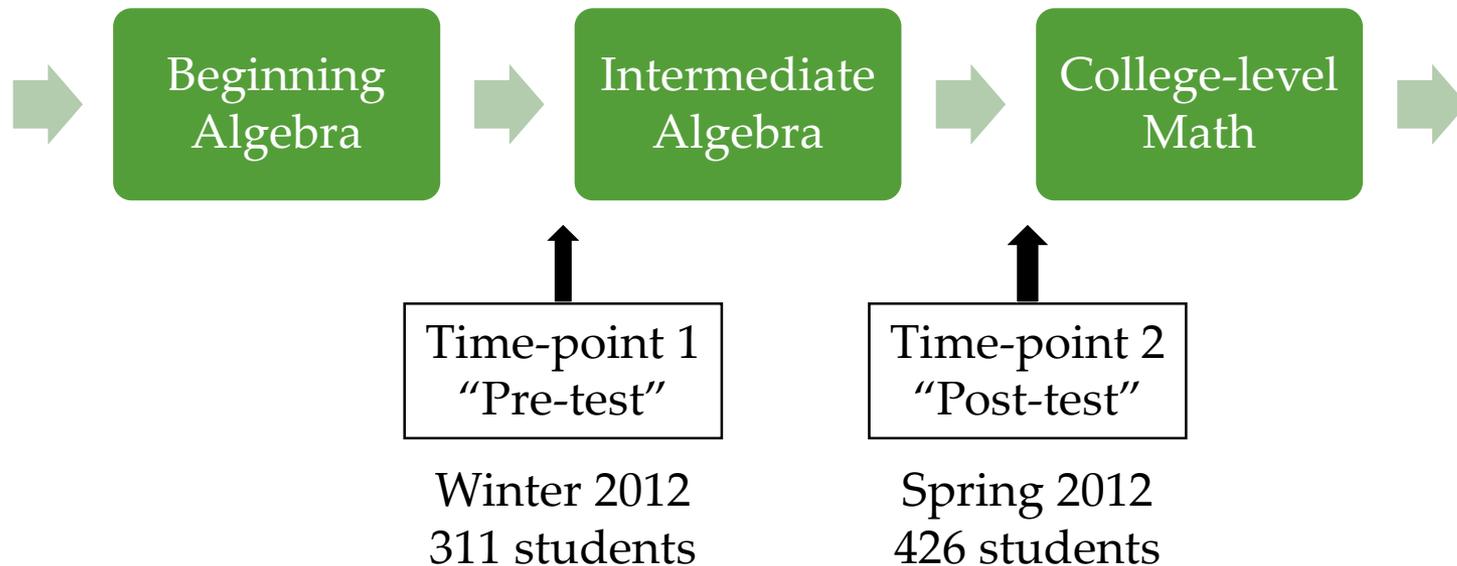
Research Goal:

Examine the relationship between:

- Learning in developmental math
- Progress toward a degree
 - Pass rates
 - Grades
 - Completion

The Students:

- Large, urban community college
 - ~ 12,000 students
 - ~ 6,500 Full-time equivalent students

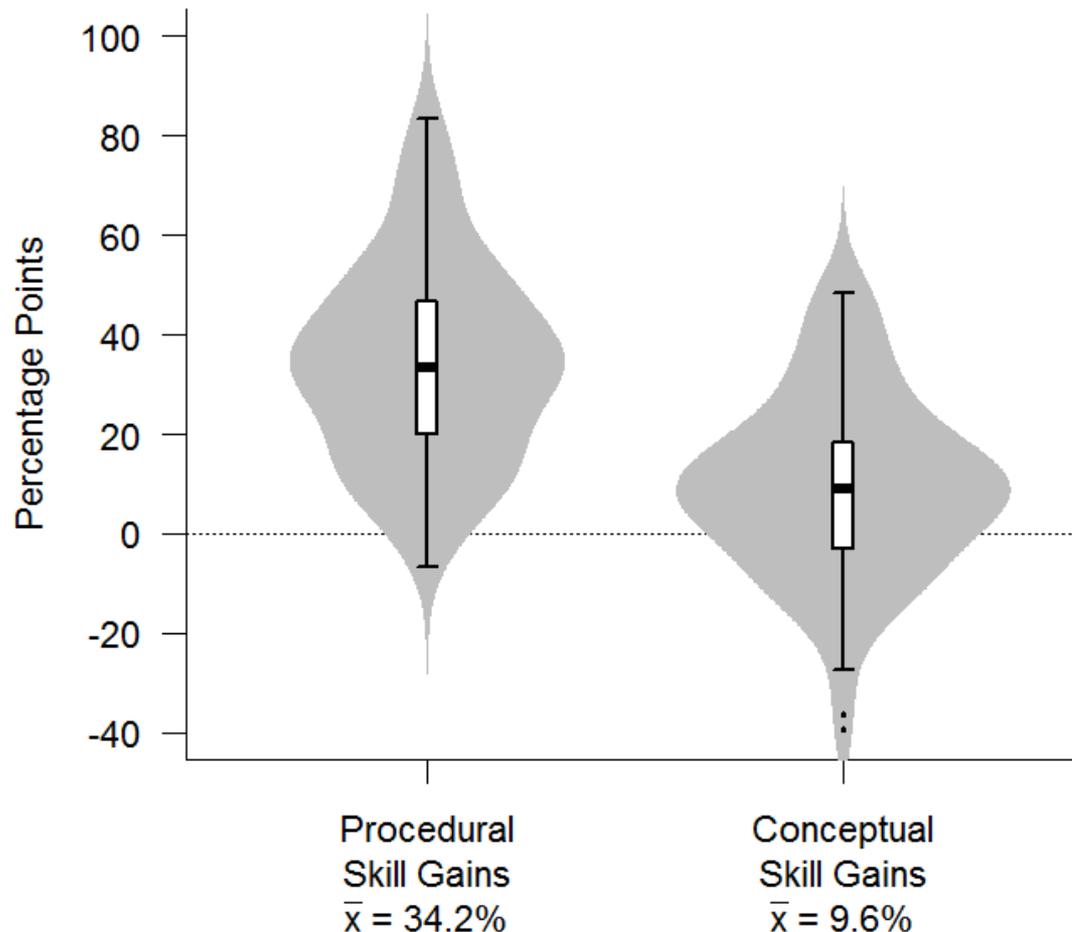


The Algebra Assessment:

- Scales
 - Procedural: “solve” or “simplify”
 - Conceptual: algebra + writing + graphs + data

What do students learn in Intermediate Algebra?

- Learning gains for students who took pre & post-test. (n = 107)



Do stronger algebra skills help students get better grades in college-level math?

Stepwise Linear Regression

- Data set:
 - College-level math Students
- Predict grades in college-level math by:
 - Block 1: “Post-test” scores
 - Block 2: Previous math grades
 - Block 3: Demographic variables

Assessment Scores Only (Block 1)	Precalculus n = 158		Statistics & Liberal Arts Math n = 172	
Procedural				
Conceptual				
All Variable Blocks	Precalculus		Statistics & Liberal Arts Math	
	B	SE	B	SE
Procedural	0.71	.45	0.19	.50
Conceptual	0.78	.48	1.26**	.46
Prev Math Gr	0.51***	.14	0.49***	.14
Age	-.03*	.02	0.01	.01
White	-.50*	.21	0.11	.21
Adjusted R ²	.216		.142	

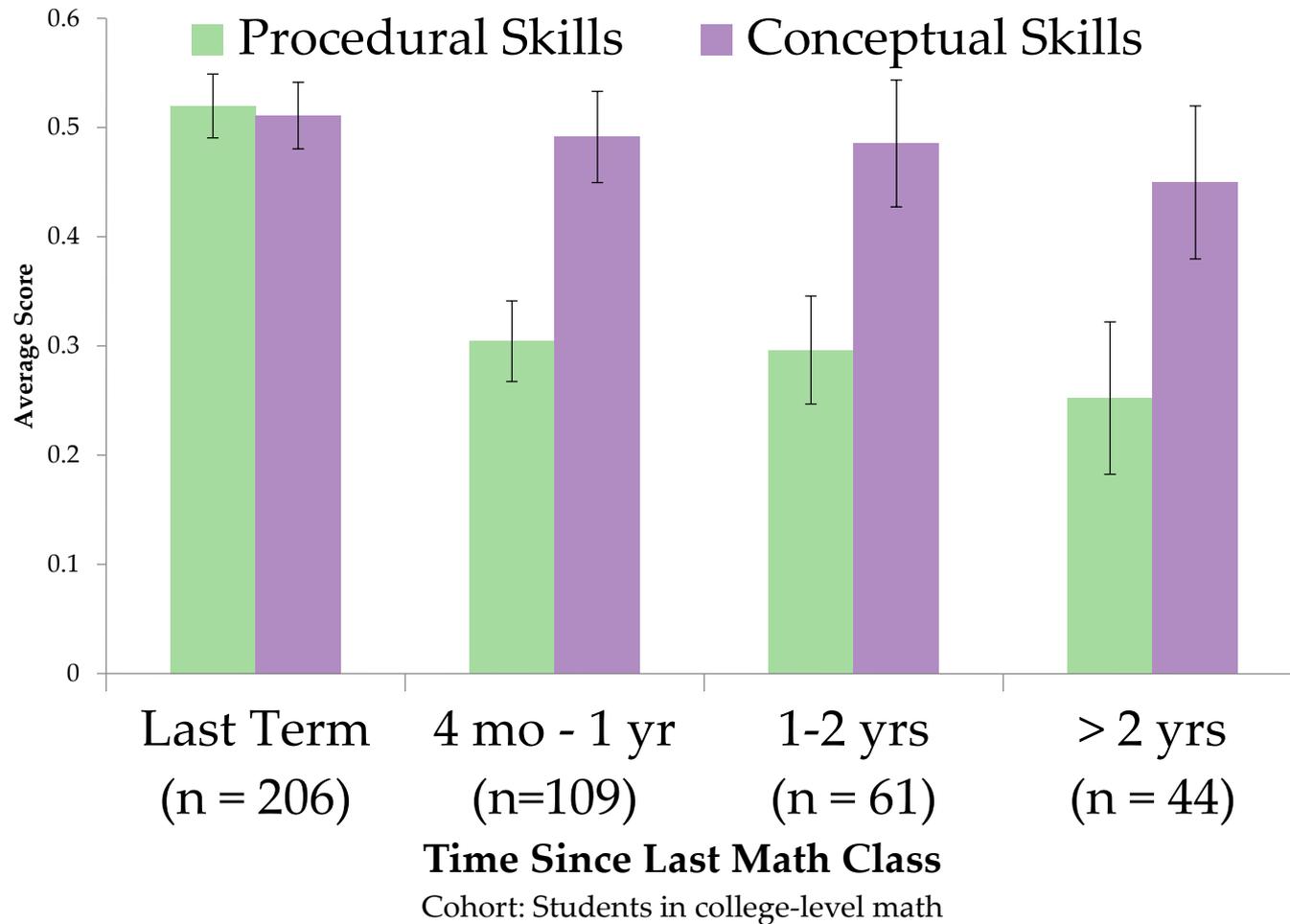
Are students with more algebra skills more likely to graduate?

- Compare logistic model vs “null” model

$$\begin{aligned} \text{logit}(\text{Complete}_i) = & \alpha + \beta_1 \cdot Ppost_i + \beta_2 \cdot Cpost_i + \beta_3 \cdot Male_i + \beta_4 \cdot PellElig_i \\ & + \beta_5 \cdot White_i + \beta_6 \cdot PrevGrades_i + \epsilon_i \end{aligned}$$

- Students with stronger algebra skills were not more likely to graduate.

Is conceptual understanding retained longer than procedural skills?



Our research suggests...

- Students are required to learn mostly procedural math
- Procedural math doesn't help students pass college-level math
- Conceptual skills are retained longer than procedural skills
- Students are denied access to degrees and certificates by mathematics courses that do not appear to provide much value



Changing the type of math taught may improve pass rates

- Less procedure
- Requirements targeted to student needs
- More conceptual understanding, interpretation, and explanation