



# ADVANCING EQUITY IN POSTSECONDARY MATH PATHWAYS

*The Mathematics of Opportunity: Designing for Equity*  
Berkeley, CA

October 22, 2019

# Presenters

## Facilitator

- Linda Collins - Executive Director, Career Ladders Project & LearningWorks

## Panelists

- Dr. Maxine Roberts, Principal, Education Commission of the States
- Dr. Rogéair Purnell, Principal, RDP Consulting
- Dr. Ben Duran, Executive Director, Central Valley Higher Education Consortium
- Myra Snell, Math Professor, Los Medanos College & Co-founder of the California Acceleration Project

# Goals

- Discuss potential opportunities and pitfalls of math pathway reforms with a focus on equity
- Consider supports to address students' lack of math confidence and anxiety
- Overview of intentional strategies to support equity math outcomes
- Share intersegmental efforts to address barriers to equitable math outcomes

# Broad Equity Context & Concerns

**Maxine Roberts**


- Why should equity be at the heart of postsecondary math reforms, and what are we learning from national research?

# What Are Math Pathways?

Designed to  
address  
“Algebra for All”

Different  
pathways based  
on course  
of study

# Key Elements of Math Pathways



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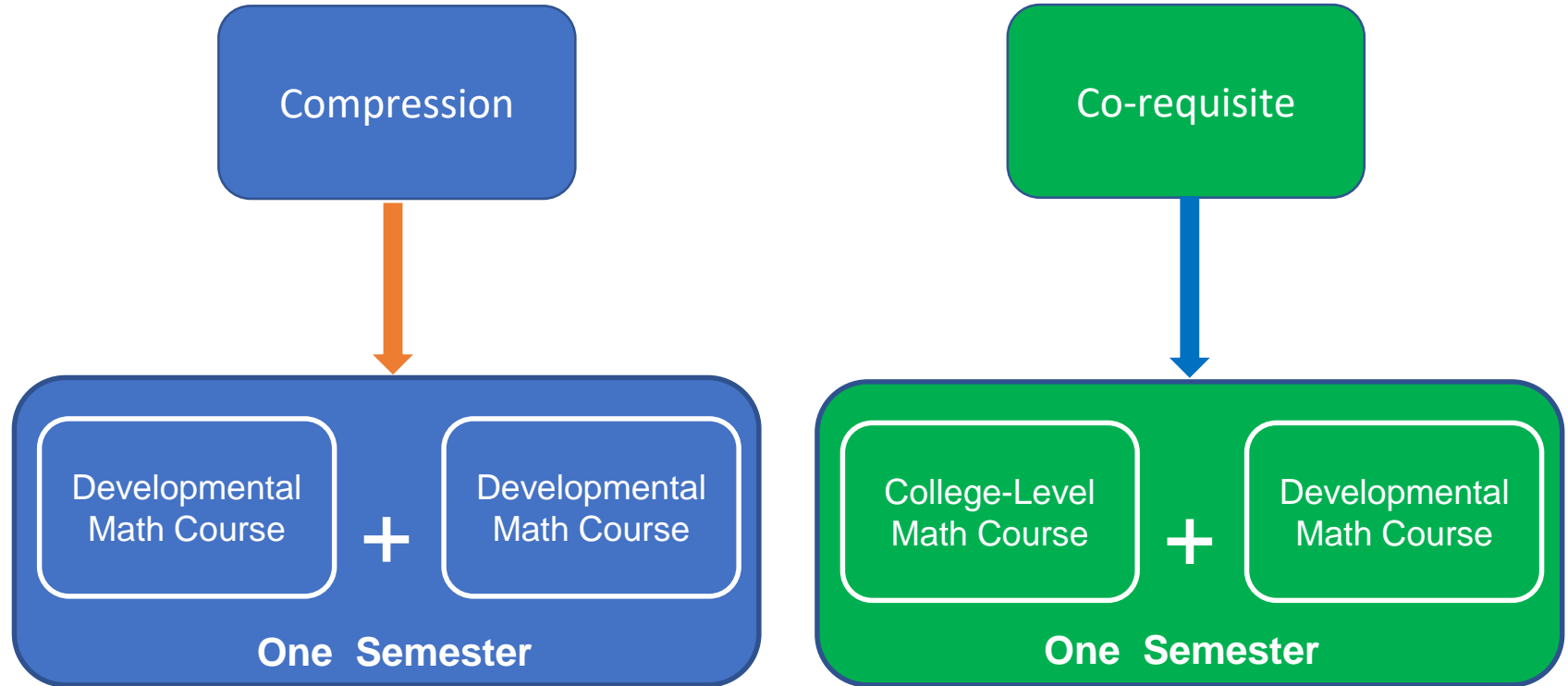
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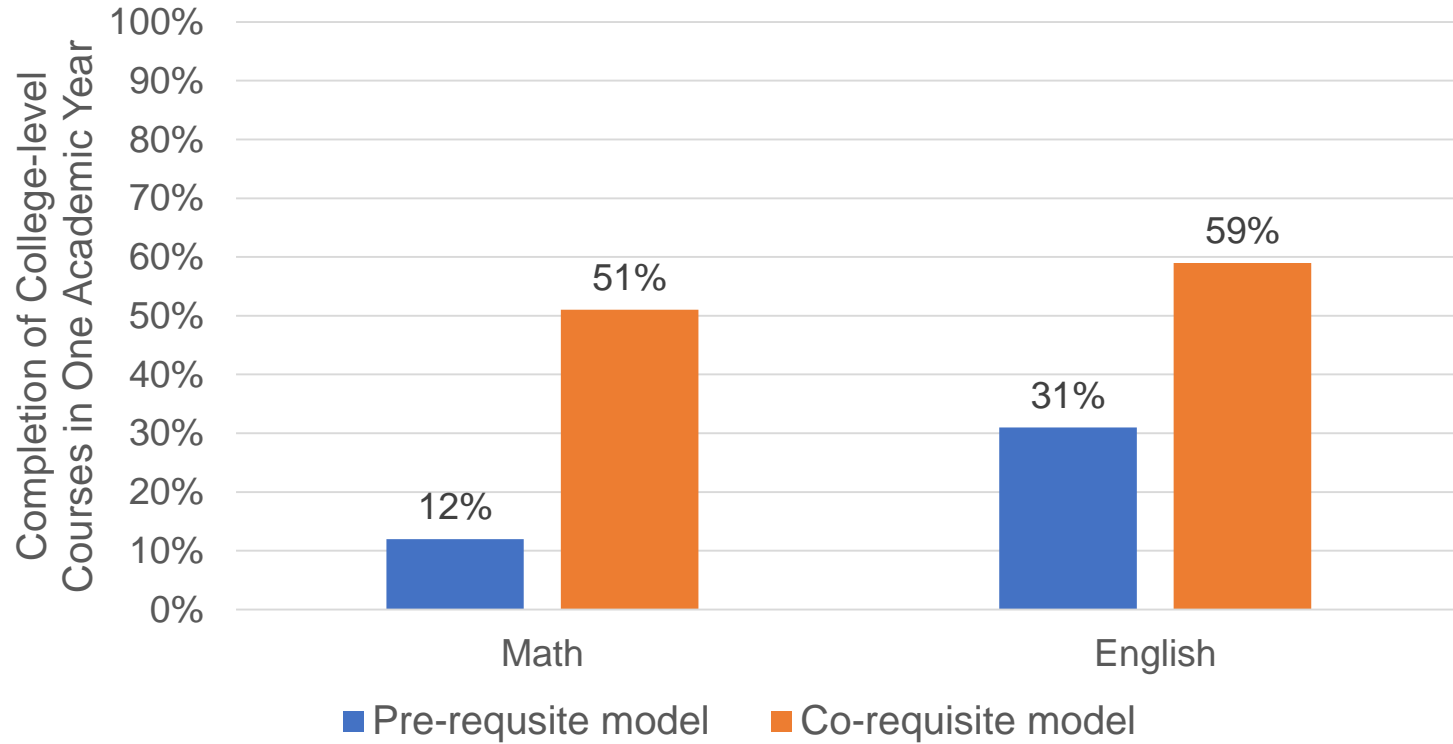
Contextualize  
course material

# Approaches for Teaching Math Pathways Courses



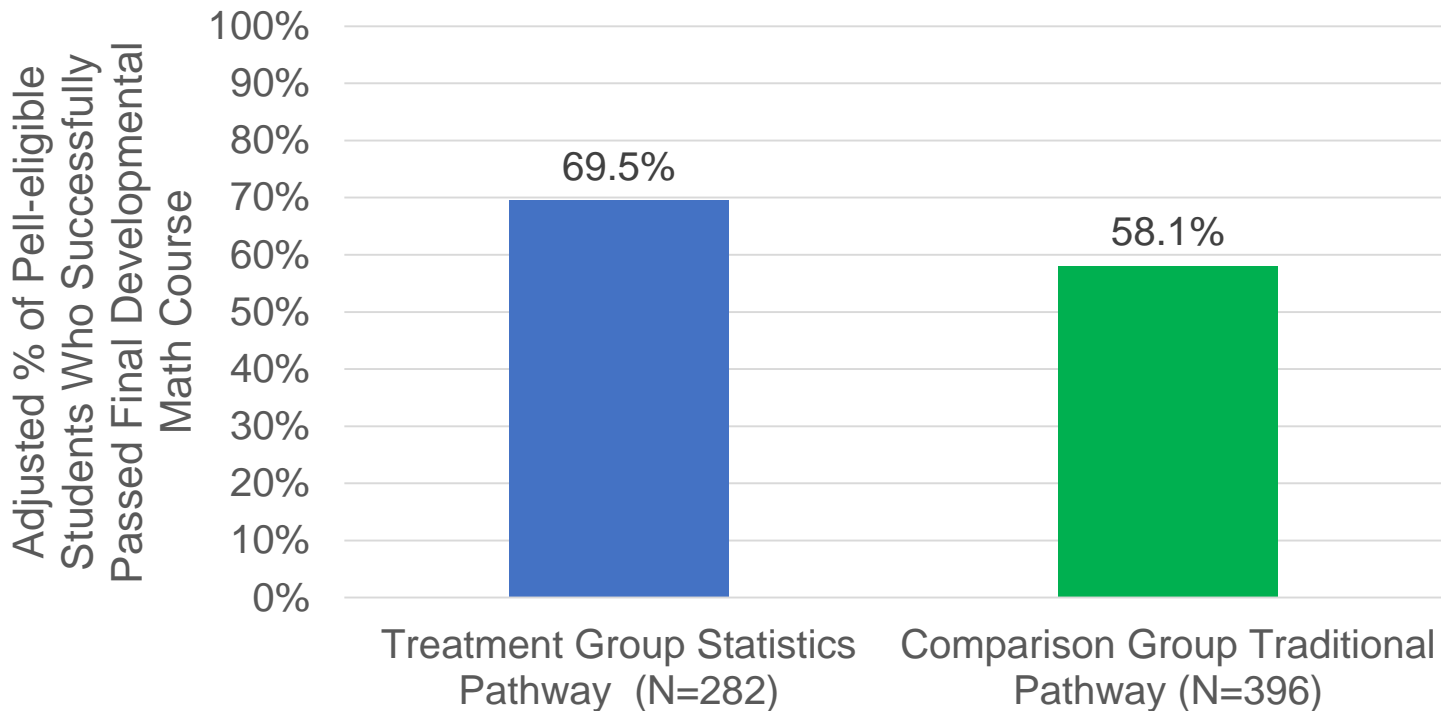
# Early Findings on Potential of Math Pathways

# Improved Academic Outcomes for All (TN)



Belfield, C., Jenkins, P. D., & Lahr, H. E. (2016). *Is corequisite remediation cost-effective? Early findings from Tennessee*. Community College Research Center.

# Improved Outcomes for Pell-Eligible Students in Final Developmental Math Course (DCMP)



Source: Marshall, A. & Shapiro, N. (2019). *Prioritizing success for all students: Maryland mathematics pathways*. Steps-to-Success. Denver, CO: Strong Start to Finish, Education Commission of the States.

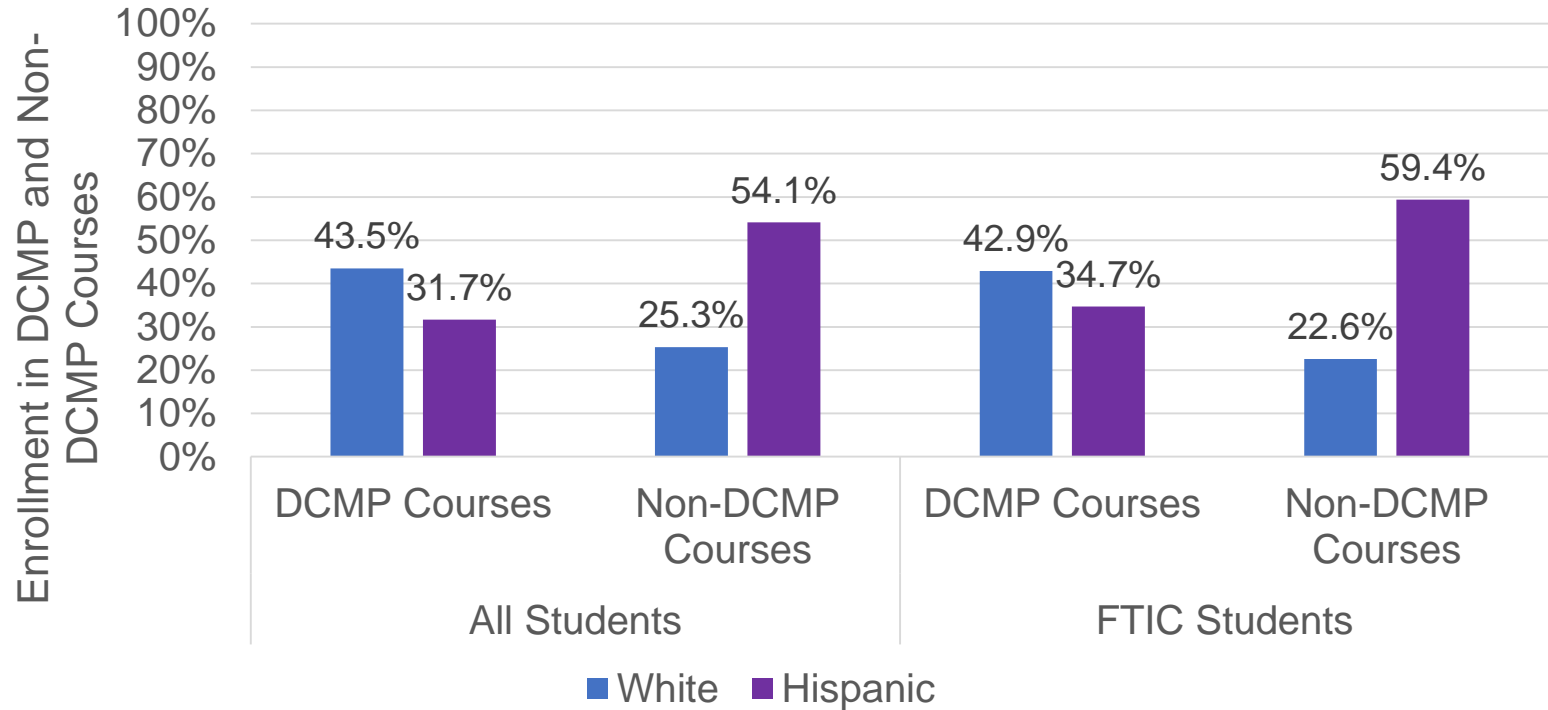
# Improved Student Experiences (DCMP)

Experiences	Sample Size	DCMP Students	Control Group
Students learned to struggle through problems	306	81.4%	63.8%
Problems used information from real life	315	68.0%	26.4%
Students discussed or shared strategies	316	76.2%	45.6%
Use math for daily activities	307	58.3%	26.8%
Students were asked to write out reasoning	313	71.2%	24.8%

Source: Rutschow, E. Z., Diamond, J., & Serna-Wallender, E. (2017). *Math in the Real World: Early Findings from a Study of the Dana Center Mathematics Pathways*. Research Brief. Center for the Analysis of Postsecondary Readiness.

# **Differentiated Outcomes in Math Pathways**

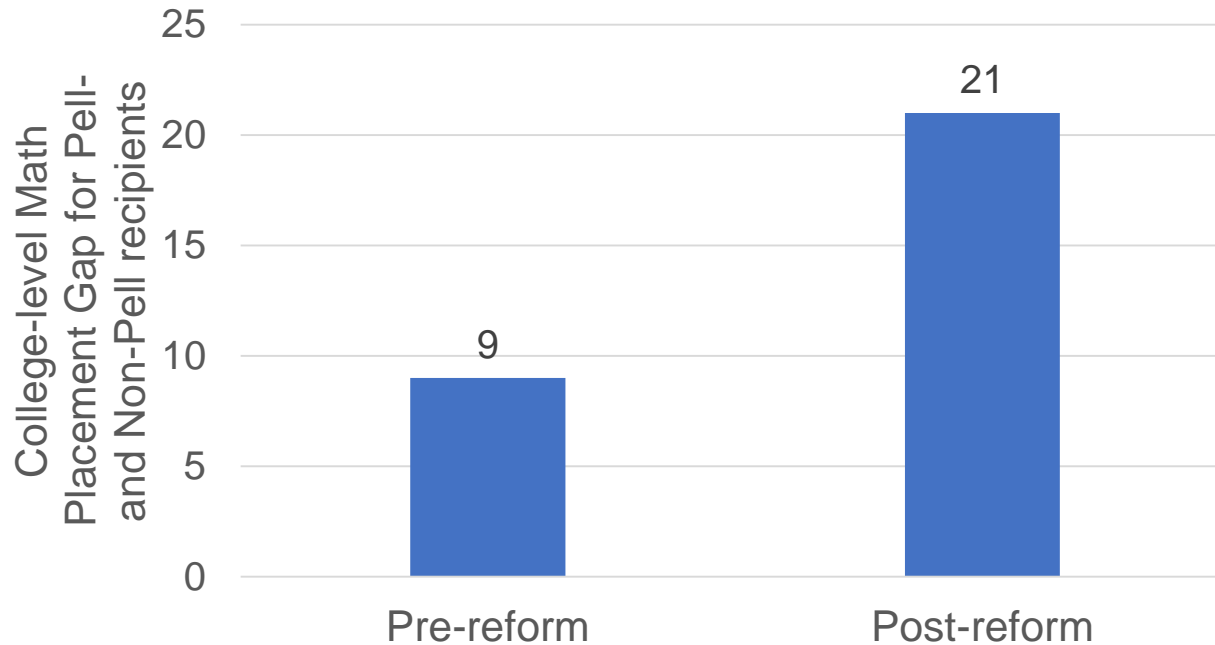
# Differences in Math Pathways Placement by Race/Ethnicity (DCMP)



Schudde, L. & Meiselman, A. (2019). *Early outcomes of Texas Community College Students Enrolled in Dana Center Mathematics Pathways Prerequisite Developmental Courses*. Research Brief. Center for the Analysis of Postsecondary Readiness.

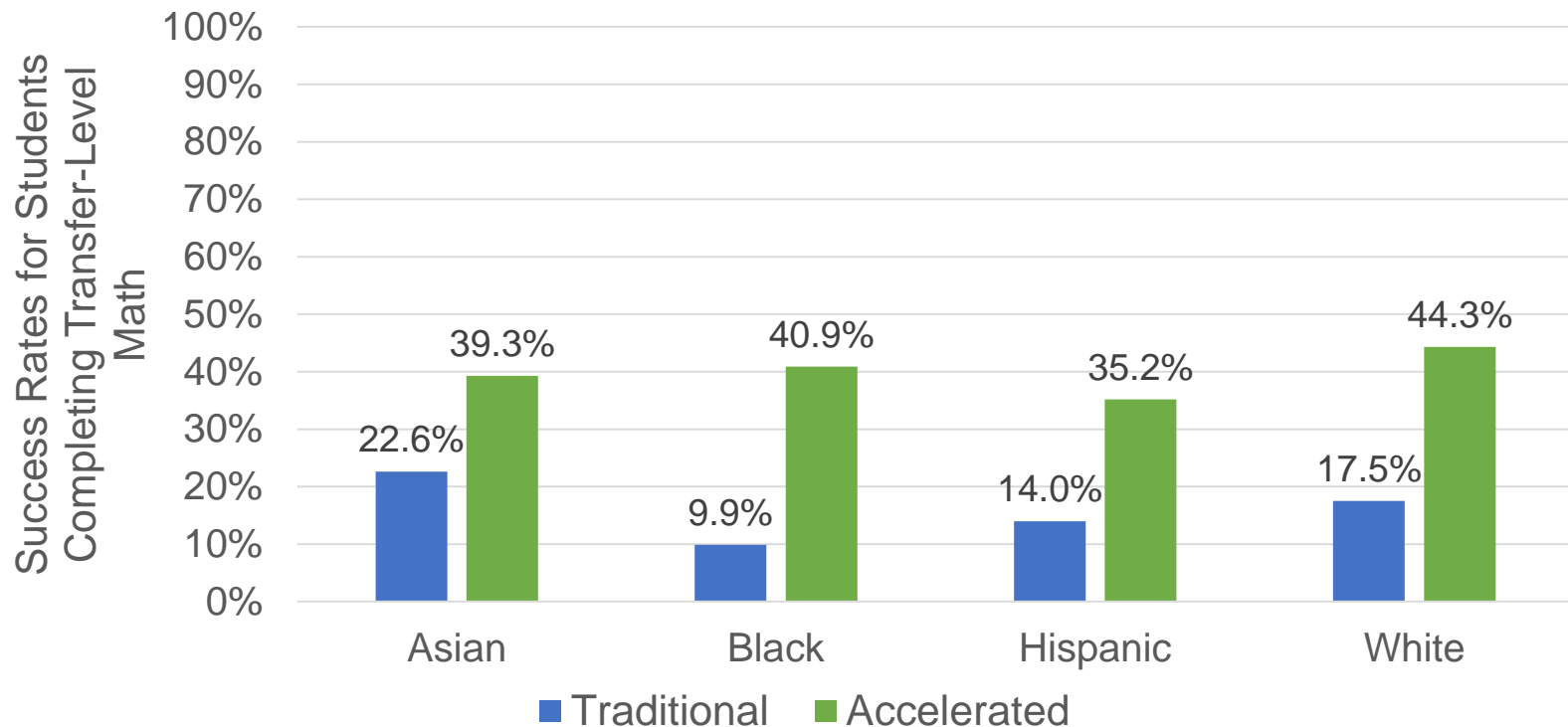


# Disparity in College-Level Math Course Placement Grows After Developmental Education Reform



Brathwaite, J., & Edgecombe, N. (2018). Developmental Education Reform Outcomes by Subpopulation. *New Directions for Community Colleges*, 182, 21-29.

# Difference in Transfer-Level Math Completion after Completing Mathematics Pathways



Hayward C., & Willet T. (2015). *Evaluating the California Acceleration Project: Equity implications of increasing throughput via curricular design*. Presentation prepared by the Research and Planning Group for California Community Colleges.

# Addressing Equity in (Mathematics) Education

## Math-related Literature

Auwarter & Aruguete (2008)  
Good, Rattan & Dweck (2012)  
Larnell (2016)  
Martin (2000, 2009)  
McGee & Martin (2011a, 2011b)  
Margolis et al (2010)

## Relevant Literature

Acevedo-Gil, Santos, & Solorzano (2015)  
Bensimon (2005, 2017)  
Harper (2010)  
Teranishi, Behringer, Grey, & Parker,  
(2009)  
Thayer (2000)

# DISCUSSION

What major equity challenges do you see in California (or your state) with implementing math pathways?

# Students' Experiences

## Rogéair Purnell

- What did students share about selecting a math pathway including the information they received, their sense of agency in the process, and the intentional strategies they encountered to support them?
- What are implications of students' experiences on equitable access to and success in their selected math pathway?

# Overarching Research Question

Do newly implemented math pathway policies and practices increase /support math success particularly for those who are historically underrepresented on college campuses and in Science, Technology, Engineering, Mathematics (STEM)-related majors/fields?

# Study Participants

Two community colleges (College of Alameda and Pierce College) *and* one CSU (Sacramento)

- Administrators and faculty interviews
  - 3 math chairs, 1 VP of Academic Affairs, 1 counselor, 1 academic success center director, 1 graduate student research assistant
- Student focus groups (2 CoA, 1 Pierce, 1 CSUS)
  - 37 mainly students of color (15 CoA, 15 CSUS, 7 Pierce)
  - Transfer, continuing, and first year students, BSTEM and non-STEM majors
  - Majority pursuing BSTEM areas of study

# Overarching Findings

Counseling is more effective, and information is better received if a student has selected a major or area of interest

Structured and proactive strategies have been strengthened and expanded—something that students recognize and appreciate—to ensure more students have needed math support.

Students understand what is true and valid may shift due to changes in requirements, so they triangulate information to decide which courses to take and with which instructors

A safe and empowering classroom environment that builds students' confidence as well as math mastery is critical



# Student Quote: Information

This counselor told me you need to take the prerequisite [math course] just to transfer. So I did ask... “You need to take the classes to transfer, not to like to have an associate degree, right?”... So I took it and then after I finished, I met with [a new] counselor ... and I told him this...[he said] your major is engineering so you need to take the pre calculus. So I was like, okay, but the first counselor did not tell me anything. He was just like take this and that [for the associate’s degree].

*So what math class did the first counselor tell you you should take? Statistics.*

# Student Quotes: Agency

It's always full [math classes with] good teachers meaning the ones that people recommend ...this [instructor is] highly recommended, but then [his/her courses] all get full and then I feel like I don't want to take [math] if I'm not going to take it with someone that will work well with me to learn something [so]I don't take it. And then I had a pile up... couple semesters of two math classes in one semester.

I'm a [science] major and I do have [a counselor]. She helps me a lot ... she actually told me I can enroll in Calculus, but I actually thought that I needed help more. So I placed myself in Pre-Calculus to help strengthen my Algebra a little bit. And, for the science part she's really been helpful with like my plan. I have like 46 units already in my first year. So I've been doing well and am on track to transfer.

# Student Quote: Intentional Strategies

I like this set up that we have in pre-calculus where you had to enroll in both [courses—the class and a support class]... some people had issues, they were [just enrolled] in the class and not the [support course]. [The instructor] helped everyone [enroll] because he uses... an extra long class to go over stuff and do different things. So how did you know to sign up for the extra course? [The counselor] helped me...she knew that [I asked if there was anything] I can do to help with the math ...stay I on top of it. And she said that [the support course] would work.

# THINK-PAIR-SHARE

What kind of support might help address students' lack of confidence and anxiety when selecting math course / pathways, especially given that some students come to college with a negative "aftermath" (i.e., having had previous math experiences that impacted their confidence)?

2 minutes for individual reflection

3 minutes to pair

5 minutes to share out

# Strategies Affecting Equitable Outcomes

**Myra Snell**

- What are the primary drivers of low and inequitable college math completion for community college students?
- What reforms have produced the largest gains in college math completion for low income students and students of color?

# Placement into long remedial sequences drives low college math completion rates and inequity

First math course	% of students completing college math in 3 years			
	At LMC	In California	In AtD study of 5 states	Model 70% success and persistence
Intermediate Algebra	37%	35%	27%	34%
Elementary Algebra	18%	15%	20%	17%
Pre-algebra or Arithmetic	10%	6%	10%	8%

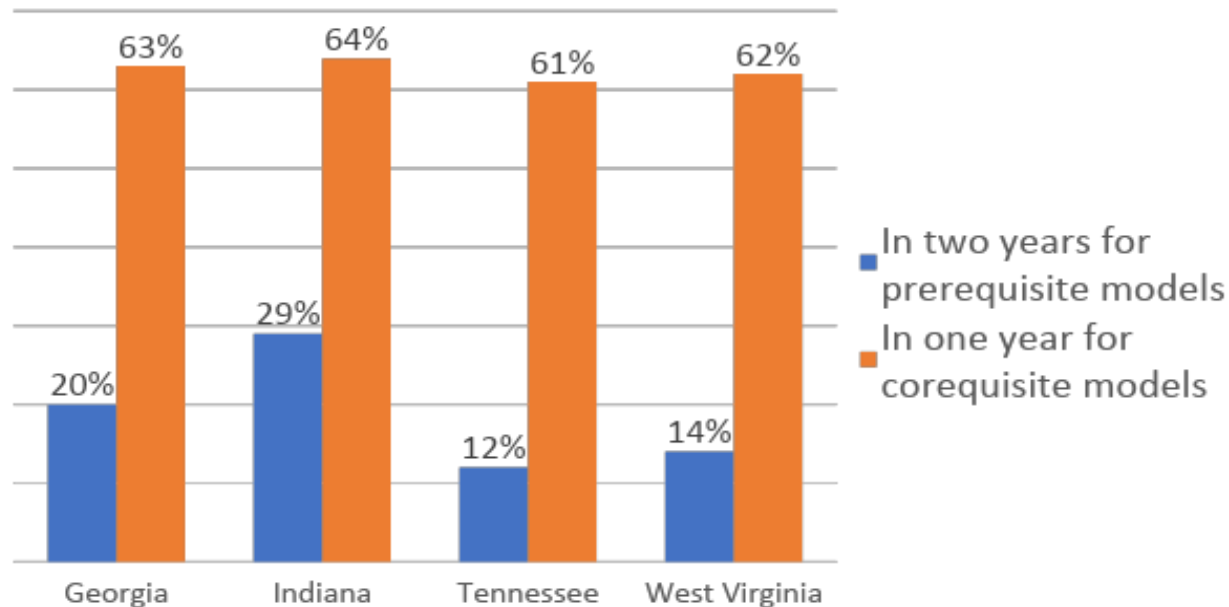
Across CA, more than half of Black and LatinX students in math remediation began here

## Beginning in remediation drives inequity in degree completion and transfer-readiness

A multiple regression study of the three community colleges in Contra Costa County estimates that **50-60%** of racial inequities in associate degree completion and transfer-readiness is explained by initial placement in math and English.

## College math with concurrent support better than traditional remediation for students deemed “not college ready”

### College Math Completion for Students “Not College Ready”



Source: Complete College America



## Direct access to college math with concurrent support, improves outcomes for low-income students and students of color at CA community colleges early to implement state-mandated reforms

Average one-year college math completion at “early implementer” colleges vs. statewide average:

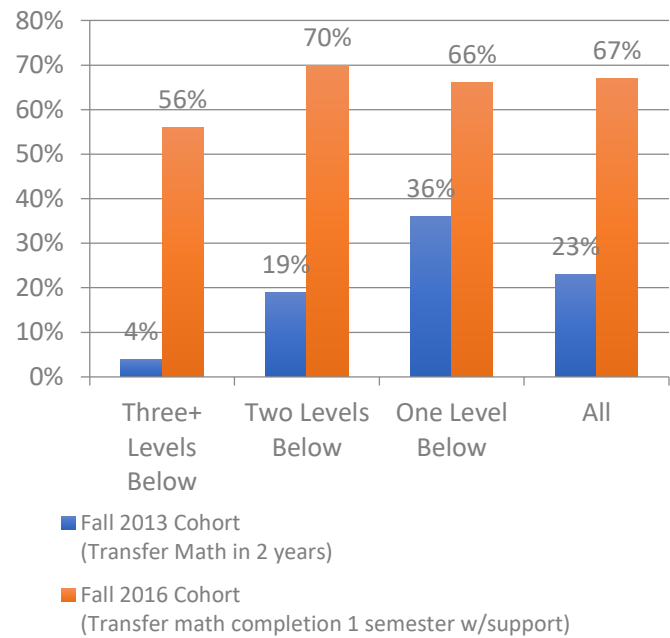
Overall statewide average in 2017: 28%

- Low-income: 49% vs. 23%
- LatinX: 48% vs. 19%
- African American: 46% vs. 13%

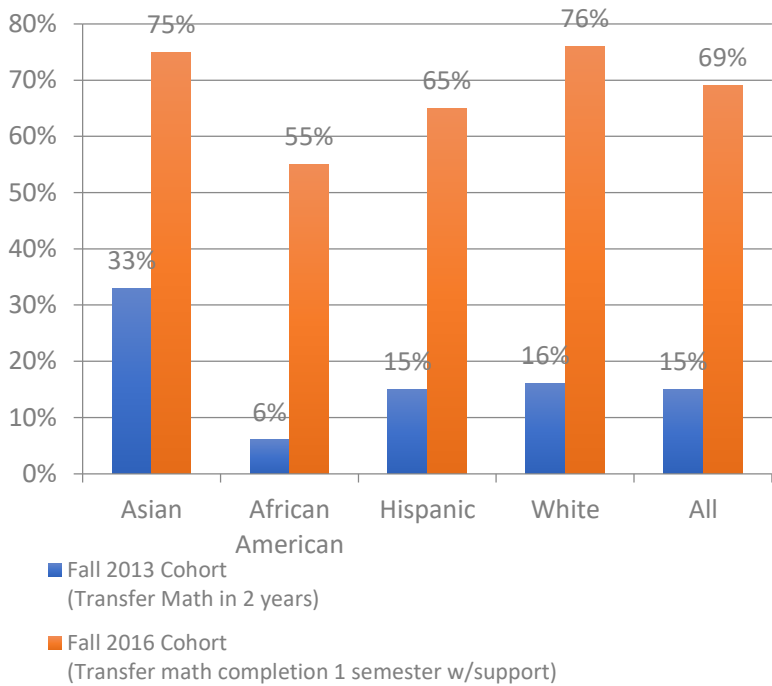
Source: PPIC *Remedial Education Reforms at California’s Community Colleges: Early Evidence on Placement and Curricular Reforms*, Oct 2018

# College Math Completion for Students Previously Placed into Remediation After Implementation of Placement Reform and Concurrent Support at Cuyamaca College

Completion of transfer-level math before and after change by assessment level



Completion of transfer-level math before and after change by ethnicity



# Teacher effect? Teacher expectations and equitable outcomes in STEM

Study of 150 STEM faculty with growth vs. fixed mindsets about intelligence.

“To be honest, students have a certain amount of intelligence and they really can’t do much to change it.”

When faculty who espoused a fixed-mindset view, students had lower course grades, and racial equity gaps were twice as large as in classes where faculty believe intelligence can be grown. Students also reported lower motivation in class.

Faculty mindset was a more powerful predictor of student performance than any other faculty characteristic (gender, race/ethnicity, age, teaching experience, tenure status).

[Canning, Muenks, Green, Murphy \(2019\)](#)



**What can we learn from students  
at CA community colleges that made  
early placement and remediation changes?**





## **Schelitha Tyler, Foothill**

Single mother of four, returned to college in her 30s with rusty math skills. “Math and I don’t get along.” Placed into pre-algebra but, after placement reforms, allowed to enroll in Statistics with support and passed. Now at San Jose State University majoring in Sociology.



## **Dawod Rakofa, Cuyamaca**

Recent immigrant to U.S., wants to be a computer engineer. Placed into pre-algebra and decided math wasn’t for him, changed his major to English. Took Statistics with support, made an A. “I realized I was pretty good at math.” Jumped into Precalculus with support and made an A. Passed Calculus I, II, and III, and Differential Equations and changed his major back to engineering.



## **Paris Hall, Citrus**

B student in high school but struggled with math, took and failed remedial algebra several times at Citrus. “I was really discouraged. I thought I’d never make it.” After placement reforms, allowed to take statistics with concurrent support and earned an A. The next semester transferred to San Bernardino State University to major in administration of justice.

## What Do Students Say Helped them Succeed?



Teachers were encouraging and required students to think. “He never made us feel stupid. He made us think about a question first, and then it was okay to ask questions.”



There was more time to process. “The professor didn’t have to rush through the material. There was more time to explain and answer questions. ”



Class time spent on collaborative group activities. “In a lot of classes, they don’t want students to talk to each other. But this class was very interactive. You really build a bond with classmates. We solved problems together.”

Teachers allowed students to learn from mistakes, redo assignments and make corrections. “He really did everything he could to help us succeed.”

Tutoring offered inside and outside of class. “I felt supported.”

# Advancing Intersegmental Pathways

**Ben Duran**

- Why are intersegmental strategies necessary and core to addressing inequitable student math success?
- What lessons have you learned that you would share with nascent regions and intersegmental partnerships working to address inequitable math outcomes?

# Challenges in Implementing Math Pathways

Benjamin T. Duran, Ed.D., CVHEC Executive Director



CVHEC covers a nine-county region and is a consortium of 27 higher education institutions consisting of:

- 14 Community Colleges
- 3 CSUs
- UC Merced
- 5 Independent Colleges and Universities



# Partnering for Student Equity and Student Success *(Partial List)*

- College Futures Foundation
- Lumina Foundation
  - Talent Hub designation – one of 17 in the nation
    - Talent Hub Advisory Committee
  - Partnership with Fresno Compact
- California Community College Chancellor's Office
- Charles A. Dana Center, University of Texas at Austin
- California Acceleration Project
- Complete College America
- California College Guidance Initiative (CCGI)

# Equity and Student Success Commitment



CVHEC  
Board's  
Region-wide  
Joint  
Commitment

A diagram consisting of two light blue circles connected by a right-pointing triangle. The left circle contains the text 'CVHEC Board's Region-wide Joint Commitment'. The right circle contains the text 'At its 2016 and 2017 Summits, CVHEC Board recommitted to scaling up co-requisite support in both Math and English as a commitment to equity and inclusion in the region – Pre AB 705 and EO 1110'.

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## *Challenges in Implementing Math Pathways*

### An Intersegmental Approach:

### CV Math Pathways Faculty Task Force

- Collaboration with the Charles A. Dana Center, University of Texas at Austin and the California Acceleration Project
- Professional Learning and Local, State and National Convenings
- Provide real-time data for colleges to use to appropriately implement AB705 and EO1110

## Challenges in Implementing Math Pathways

### Advising: Faculty driven efforts are key

- 2019 emphasis on Advising
- *CVHEC Regional Math Faculty Liaisons* serve as eyes and ears to inform needs in the region
- Work to impress upon the region:
  - The “myth” that students of color should take fewer units or enroll in remedial courses to ensure they are successful by not being over-taxed is hurtful to students, their completion rates, time to degree and an assault on equity and inclusion.

## Challenges in Implementing Math Pathways

Identify challenges and items that will need attention

- What about the 30% or so not passing the co-req course?
- Professional learning needed for faculty who are teaching different courses or populations they are not familiar with
- How do we provide training to Counselors/Advisors to ensure they place students in the correct pathway?
- Addressing the student mindset about “math and me”
- Other challenges that emerge organically from the field

**Q & A**





# THANK YOU!

Pamela Burdman, Director

Just Equations, a project of The Opportunity Institute

[pamela@theopportunityinstitute.org](mailto:pamela@theopportunityinstitute.org)