#### Dana Center Mathematics PATHWAYS

# Mathematics at the Transition from K-12 to Higher Education

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www.dcmathpathways.org

## **AP Calculus Exam-Taking is Increasing**



Source: Bressoud. (2017). The Role of Calculus in the Transition from High School to College Mathematics.

#### Most Calculus I Students Took Calculus in High School

Course taking in High School By students in Calculus I at PhD Universities			
	percentage	Mean grade (SD)	
Algebra II* $\leq 10^{\text{th}}$ grade	77%	3.8 (0.5)	
Precalculus* $\leq 11^{\text{th}}$ grade	67%	3.7 (0.6)	
Calculus $\leq 12^{\text{th}}$ grade	67%	3.8 (0.5)	
Statistics $\leq 12^{\text{th}}$ grade	9%	3.6 (0.6)	

\* Does not count students who took an integrated curriculum

Source: Bressoud. (2017). The Role of Calculus in the Transition from High School to College Mathematics.

## **Growth in Dual Credit**





## Percent of Students Completing One Dual Credit Course by Ethnicity



# Repeating and passing rates among students within the sample

	Percentage
Algebra 1 pass rate in grade 8 among students who first took algebra 1 in grade 8	62.69
Algebra 1 pass rate in grade 9 among students who first took algebra 1 in grade 9	37.60
Proportion of the sample who took algebra 1 in grades 8 and 9	22.72
Proportion of the sample who took algebra 1 in grades 9 and 10	13.49
Proportion of the sample who took algebra 1 in grades 8, 9, and 10	4.43
Proportion of the sample who ever repeated algebra 1	33.57
Proportion of the sample who ever repeated geometry	15.96
Proportion of the sample who ever repeated algebra 2	10.17
Proportion of the sample who ever repeated algebra 1, geometry, or algebra 2	49.70
Proportion of the sample who ever passed algebra 2	44.24
Proportion of the sample who did not take a math course in grade 12	30.18



Finkelstein, 2014.

## **The Need For Reform**



Source: "What We Know about Developmental Education Outcomes," CCRC, Teachers College, Columbia University, January 2014, 5, http://ccrc.tc.columbia.edu/media/k2/attachments/what-we-know-about-developmental-education-outcomes.pdf

#### **Quick structural change**

#### Mathematics pathways are structured so that:

- 1) All students, regardless of college readiness, enter directly into mathematics pathways aligned to their programs of study.
- 2) Students complete their first college-level math requirement in their first year of college.

#### **Continuous improvement**

## Students engage in a high-quality learning experience in math pathways designed so that:

- 3) Co-requisite strategies to support students as learners are integrated into courses and are aligned across the institution.
- 4) Instruction incorporates evidence-based curriculum and pedagogy.

## **Pathways aligned placement**

2-Year College Student Enrollment into **4-Year College Student Enrollment into Programs of Study Programs of Study** Require Require Calculus Calculus 20% 28% Do not Do not require require Calculus Calculus 72% 80%

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



#### **Emerging Texas Math Pathways**



## **States Implementing Co-Requisite Math at Scale**



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#### **Figure 2.** A Preponderance of Evidence More students succeed in less time with accelerated models



Consistent results across multiple sites using different models show that more students earn credit in less time with accelerated models.

**Sources:** Indiana (Complete College America, 2016); CUNY (Logue et al., 2016); Tennesse (Tennessee Board of Regents, 2016); Statway (Sowers & Yamada, 2015); CAP (California Acceleration Project, 2015); TX NMP (Rutschow & Diamond, 2015); and AtD (Bailey et al., 2010).

> DCMP (2019). The Case for Mathematics Pathways

## **Georgia Co-Requisite Model**



Source: Denley, T., CoRequisite Developmental Mathematics



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# Systemic dimensions of math pathway reforms

Student-centered

Faculty-driven

Administratorsupported

Policy-enabled

Culturallyreinforced

The University System of Georgia Mathematics Task Force

"...charged with determining how the System's colleges could dramatically improve success rates in gateway mathematics courses without compromising the disciplinary integrity of these courses."

-From University System of Georgia: Transforming College Mathematics

Ohio Board of Regents' Charge to the Mathematics Steering Committee

To develop expectations and processes that result in each campus offering pathways in mathematics that yield (1) increased success for students in the study of mathematics; (2) a higher percentage of students completing degree programs; and (3) effective transferability of credits for students moving from one institution to another.

## States using high school data for college placement

**Which States Allow Multiple Measures Placement?** 



Source: 50-State Comparison on Developmental Education Policies.



## A Common Vision for the Undergraduate Mathematics Program in 2025

The primary goal of this initiative is to develop a **shared vision in the mathematical sciences community** of the need to modernize the undergraduate mathematics program, especially the first two years.

• Common themes highlighted through initial examination of seven existing curriculum guides published by mathematical sciences professional associations.



www.maa.org/programs/faculty-and-departments/common-vision

## The Correlational Study: STEM

*r*(10)= -.64, *p* = .025



Leslie, Cimpian, & Meyer, in prep.

## **Supporting seamless transitions**



## **Tunnel of Eupalinus**

