Dana Center
Mathematics
PATHWAYS

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

Uri Treisman
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## AP Calculus Exam-Taking is Increasing



## Most Calculus I Students Took Calculus in High School

| Course taking in High School |  |  |
| :--- | :---: | :---: | :---: |
| By students in Calculus I at PhD Universities |  |  |
| Algebra II* $^{2} \leq 10^{\text {th }}$ grade | percentage | Mean grade (SD) |
| Precalculus* $\leq 11^{\text {th }}$ grade | $77 \%$ | $3.8(0.5)$ |
| Calculus $\leq 12^{\text {th }}$ grade | $67 \%$ | $3.7(0.6)$ |
| Statistics $\leq 12^{\text {th }}$ grade | $9 \%$ | $3.8(0.5)$ |

[^0]
## Growth in Dual Credit



Texas Education Agency

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

Percent of students completing one dual credit course


## Repeating and passing rates among students within the sample

| 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

## FIGURE 2. STUDENT PROGRESSION THROUGH THE DEVELOPMENTAL MATH SEQUENCES



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

## Dana Center Principles for Pathways

## 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 Programs of Study

4-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.

## Emerging Texas Math Pathways

## Meta-Major <br> Math Pathway



## States Implementing Co-Requisite Math at Scale

Figure 2. A Preponderance of Evidence
More students succeed 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



## Georgia Co-Requisite Model

USG System-wide Comparison of Success in Gateway Math Classes
African American Students


## 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.

Source: ECS, 2019

## 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.



## The Correlational Study: STEM

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



Field-specific Ability Beliefs
High score = need brilliance
Leslie, Cimpian, \& Meyer, in prep.

## Supporting seamless transitions



## Tunnel of Eupalinus




[^0]:    * Does not count students who took an integrated curriculum

