Deep Dive Policy Context for High School Math Pathways

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# The Panel



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# **High School Math Pathways**

Graduation requirements and student course-taking

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### Outline

- High school math graduation policy
- Student course completion
- Emerging pathways



# High School Math Graduation Requirements



### Most states require 3 years of math to graduate

- California is one of the 3 states that require only 2 years of math for high school graduation.
- Other states typically require three (29 states and DC) or four years (17 states).
- From 2001 to 2016, 25 states made their graduation requirements more rigorous.
  - Some incorporated college- and career-readiness components
- California has not updated its minimum policy since 1986.

Source: Gao 2017



### Most California districts require 3 years

% districts requiring 3 or more math for high school graduation, 2018-19

	Overall	High need	Urban	Rural	Low A-G	Low staffing
3 + math	59%	62%	54%	60%	63%***	64%
N districts	420	267	79	87	350	107
0						

Source: Gao 2019



### UC and CSU require 3 years of math

- Area C requirements: 3 years in...
  - Algebra I, Geometry, and Algebra II
  - Or series of integrated math including sufficient geometry
- 4 years recommended
  - 95% of UC freshman CA applicants (Fall 2019) completed four or more area C
  - <u>78% of CSU</u> first-year students completed four or more area C

Source: CSU Board of Trustees meeting agenda, July 23, 2019



### Slightly more districts chose the traditional pathway

% districts with traditional/integrated pathway, by school characteristics, 2017-18



Source: Gao 2019



# Introduction to Data Science

- UCOP-approved (Fall 2013)
- First Piloted in 2014-2015
- Meets area C requirement of A-G courses: Statistics
- Professional Development Required (offered through UCLA Center X)
- 15 Southern California districts, 45 schools, 3200 students (2019-20)



# Pathways



# IDS as a 4<sup>th</sup> year course:

Algebra I/ Geometry/ Algebra II/ IDS (Statistics) Math I Math II Math III

IDS as a 3<sup>rd</sup> year course : **AP Statistics** Algebra 1/ Geometry/ IDS or Math II Math 1 (Statistics) Prob & Stats

# **Course Options**

#### Quantitative Reasoning with Advanced Mathematical Topics (QRAT) (C-Approved)

#### Pre-requisites:

 Integrated Math III or Intermediate Algebra II with a passing grade

#### Intended for high school seniors who place into:

- Level 4 "Exceeds Standard" on SBAC/CAASPP
- Level 3 "Standard Met" on SBAC/CAASPP
- Level 2 "Standard Nearly Met" on SBAC/CAASPP (students who placed into Level 2 may participate in the course with a counselor/math teacher recommendation)

#### Students who typically enroll in this course:

- Are not ready to take an AP level math/QR course.
- May have originally been placed into pre-Calculus.
- "Just got by" IM III or Intermediate Algebra II but wish to further develop their readiness for college-level math.
- May not have planned on taking a senior year math course.

#### Transition to Quantitative Reasoning (TQR) (G-Approved)

#### CSU- and UC-Bound Pre-requisites:

· Completion of "c" subject area of the "a-g" requirements

#### Community College or Workforce-Bound Pre-requisites:

- Algebra I and Geometry or Integrated Math I and II
- May have also taken a third year of math (e.g. transition course, 2-year course, etc.)

#### Intended for high school seniors who place into:

- Level 3 "Standard Met" on SBAC/CAASPP
- Level 2 "Standard Nearly Met" on SBAC/CAASPP

#### Students who typically enroll in this course:

- May not have planned on taking a senior year math course.
- May have originally been placed into Algebra II or IM III.
- "Just got by" Algebra I and Geometry or IM I and II but wish to further develop their readiness for college-level math.

#### **STEM/MATH INTENSIVE MAJORS:**

Anthropology, Business, Biology, Chemistry, Computer Science, Economics, Environmental Science, Family and Consumer Sciences, Geology, Kinesiology, Liberal Studies, Math, Stats, Physics, and Engineering (Civil, Computer, Electrical, Mechanical)

# **Calculus in Admissions**

- Current UC admissions policies & practices regarding calculus
  - Statement on the Impact of Calculus on UC Admissions: <u>https://senate.universityofcalifornia.edu/\_files/committees/boars/document</u> <u>s/BOARS\_Statement-Impact-Calculus.pdf</u>
- The perception of the "Race to Calculus"

• Discussion: How do we address the perception that calculus is a requirement for admissions?

# **Student Course-taking**



### English and math are critical barriers to A-G completion

% students completing A-G courses, by subject area, 2007 -2014



Source: Gao and Johnson 2017

### Area C completion varies widely by student subgroups

% ... students completing area C, with a grade of C or better, 2007 -2014



Source: Gao and Johnson, 2017



### Fewer CA students completed higher math

% high school students completing higher math, class of 2013



Source: Gao 2019



### Fewer CA students completed higher math, continued

#### % students completing ... course, class of 2013



Source: Gao 2019



### **Disparities in 12<sup>th</sup> grade course-taking**

% high school seniors enrolled in higher math courses, 2017-18



Source: Asim, Kurlaender and Reed 2019



# Advanced course-taking by UC Applicants

- Proportion of Fall 2019 California freshman applicants who take advanced math courses
  - 30% with only one advanced math course
  - 65% with two (or more) advanced math courses
- Since 2016, ~95% of California freshman applicants take at least one advanced math course

# **Emerging Pathways**



### 30 % high schools offered probability and statistics

% high schools offering probability and statistics, 2017-18

	Overall	High need	Urban	Rural
unweighted				
prob and stats	34%	32%	37%	18%
A-G prob and stats	30%	29%	35%	12%
AP statistics	44%	38%	46%	22%
weighted				
prob and stats	46%	46%	46%	33%
A-G prob and stats	43%	43%	44%	24%
AP statistics	66%	59%	64%	44%
N high schools	1624	1013	598	193
Source: Gao 2019				



### Fewer students were enrolled in prob and stats

% public high school students enrolled in ..., 2017-18

	Overall	High need	Urban	Rural
prob and stats	4%	5%	4%	3%
A-G prob and stats	5%	5%	5%	4%
AP statistics	3%	3%	3%	3%

Source: Gao 2019



#### **Data Science**

 In 2018-19, about 80 public high schools offered data science (and related) A-G courses.



# Findings: A tale of 2 districts

#### LAUSD 2015-2016:

•~68% as 4<sup>th</sup> year & 32% as 3<sup>rd</sup>

• Demographics mirrored district: mostly Latino/a

and eligible for free/reduced lunch

• Levels Of Conceptual Understanding in Statistics

(LOCUS) Assessment:

• 10 % points on avg. ↑



# Findings: A tale of 2 districts

#### **CVUHSD 2017-2018**

•100% as a 4<sup>th</sup> year

• Demographics mirrored district: mostly Latino/a and

eligible for free/reduced lunch

• Levels Of Conceptual Understanding in Statistics (LOCUS)

Assessment:

• 8 % points on avg. ↑

• Math requirements: HS graduation, UC/CSU admissions:

• For approximately 25% of students, IDS allowed them to meet their requirements



# **Statistics and Calculus in Admissions**

- How does completed math coursework factor in to the admissions process?
- How is advanced math coursework viewed?
  - How is statistics vs. calculus viewed?

# CSUS Redesigned Courses (QRAT and TQR)

- What are the obstacles for these courses?
  - Placement into higher ed
  - 'G' versus 'C'
  - Data sharing
  - Training of teachers and new teachers
- How many students are in these courses?
  - 20 districts, 36 schools, and 1440 students (San Luis Obispo to Tahoe)
- Which students benefit from these courses?
  - 'QRAT' our 'C' course are for mid level 3 and Low 4 on CAASPP
  - $\circ~$  'TQR' our 'G' course for Level 2 and Low 3 on CAASPP
  - $\sim 10\%$  for our local feeder district

# **Focused Discussion**



If you had a magic wand, how would you change high-school course-taking?

- Take a few minutes to individually brainstorm your ideas
- Share with a partner or group of three:

What changes would you make to HS requirements and/or university admissions requirements to support equitable math learning as well as equitable preparation for college?

Please consider: What research, if any, is needed to better answer this question?

# **Focused Discussion**



If you had a magic wand, how would you change high-school course-taking?

- Take a few minutes to individually brainstorm your ideas
- Share with a partner or group of three
- Share out key ideas from your groups



# Concluding Thoughts

