Deep Dive
Policy Context for High School Math Pathways

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The Panel

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Monica Casillas: Associate Director of Introduction to Data Science at Center X, UCLA

Monica Lin: Director of Academic Preparation and Relations with Schools & Colleges at UC Office of the President

Ravin Pan: Associate Professor in the Teacher Credential Program for CSU, Sacramento
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

<table>
<thead>
<tr>
<th>% districts requiring 3 or more math for high school graduation, 2018-19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
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<tr>
<td>---------</td>
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<tr>
<td>3 + math</td>
</tr>
</tbody>
</table>

N districts 420 267 79 87 350 107

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
  - 78% of CSU 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\textsuperscript{th} year course:

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

IDS as a 3\textsuperscript{rd} year course:

Algebra 1/Math 1 \rightarrow Geometry/Math II \rightarrow IDS (Statistics) \rightarrow AP Statistics or 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 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
- 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 12th 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

<table>
<thead>
<tr>
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<th>Overall</th>
<th>High need</th>
<th>Urban</th>
<th>Rural</th>
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<tbody>
<tr>
<td><strong>unweighted</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>prob and stats</td>
<td>34%</td>
<td>32%</td>
<td>37%</td>
<td>18%</td>
</tr>
<tr>
<td>A-G prob and stats</td>
<td>30%</td>
<td>29%</td>
<td>35%</td>
<td>12%</td>
</tr>
<tr>
<td>AP statistics</td>
<td>44%</td>
<td>38%</td>
<td>46%</td>
<td>22%</td>
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<tr>
<td><strong>weighted</strong></td>
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<td>46%</td>
<td>46%</td>
<td>33%</td>
</tr>
<tr>
<td>A-G prob and stats</td>
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<td>43%</td>
<td>44%</td>
<td>24%</td>
</tr>
<tr>
<td>AP statistics</td>
<td>66%</td>
<td>59%</td>
<td>64%</td>
<td>44%</td>
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<tr>
<td>N high schools</td>
<td>1624</td>
<td>1013</td>
<td>598</td>
<td>193</td>
</tr>
</tbody>
</table>

Source: Gao 2019
Fewer students were enrolled in prob and stats

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

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Overall</th>
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<th>Urban</th>
<th>Rural</th>
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</thead>
<tbody>
<tr>
<td>prob and stats</td>
<td>4%</td>
<td>5%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>A-G prob and stats</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>AP statistics</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: Gao 2019
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 4th year & 32% as 3rd
- 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 4th 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
  - ‘TQR’ our ‘G’ course for Level 2 and Low 3 on CAASPP
  - 40% 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