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# Making Gains in Math through Dual Enrollment

## Technical Appendix

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## Appendix A. Research Methods

This study uses qualitative and quantitative research methods to explore how the expansion of dual enrollment (DE) improved equitable access to college math coursework. Our work was guided by the following research questions:

1. What does DE math course-taking look like overall? Does it vary by DE program type (CCAP/non-CCAP), course type (STEM/SLAM), course level (transfer-level, non-transferable<sup>1</sup>) and student subgroups (race/ethnicity, gender, first-gen, other)? Has access to DE math courses changed with the implementation of the equitable math placement policy (AB 705 in fall 2019) and the College and Career Access Pathways (CCAP in 2016)?
2. How do the changes in DE math course-taking relate to student success? Does it vary by DE program type (CCAP/non-CCAP), course type (STEM/SLAM), course level (transfer-level, non-transferable) and student subgroups (race/ethnicity, gender, first-gen, other)?
3. What are the challenges and opportunities in current efforts to implement equitable expansions of dual enrollment generally and in math specifically?

### Qualitative Methods

Interview site selection process involved using Chancellors Office Management Information System (MIS) student enrollment data for the Fall 2022 term, we identified the top community colleges for dual enrollment math in the seven regions of California. Selection criteria used to identify prospective interview sites were (1) number of dual enrollment BSTEM or SLAM math courses offered, (2) enrollment rates, (3) course success rates (defined as a grade of C or higher), and (4) number of underrepresented minority and first-generation college students enrolled. Ultimately, we contacted 15 campuses and seven responded, encompassing five regions: North/Far North, SF/Bay Area, Central Valley, Inland Empire/Desert, and LA/OC. From the initial seven points of contact, we employed snowball sampling (i.e. the interviewee refers additional interviewees) to connect to partnering regional, college, and high school leaders in a breadth of capacities. This method allowed us to highlight positive and collaborative within-site and between-site relationships. Depending on the response rate, each strand of region-college-high school interviews resulted in one to five interviews per initial community college site, resulting in 26 interviews with 28 interviewees. Table A1 describes the qualitative interview sample by key characteristics used to select the sites. Nine community colleges and five high schools are represented as indicated in the tables below. Ultimately, interviewees included community college administrators (dual enrollment administrators and department deans), dual enrollment course instructors (full-time community college faculty or adjunct high school teachers), high school district administrators, high school counselors, and partnering external organizations.

Each interview took place on Zoom and spanned 60 to 90 minutes and consisted of questions regarding (1) how dual enrollment is offered, (2) student recruitment and support, and (3) challenges in implementation. After transcription via Zoom recording or Otter.ai, the interview transcripts were imported into MAXQDA 2024 for deductive and inductive coding. The deductive codes were derived from the primary research questions, while inductive codes were employed as patterns emerged during the coding process.

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<sup>1</sup> For this study, we refer to any math courses that do not transfer to a four-year college or university as non-transferable courses. These non-transferable courses, which often include Algebra II, Algebra I, Geometry, and the like, are high school level courses and are often referred to in the field as developmental math or remedial when offered to students in college. However, given that the population we are studying are high school students, the terms remedial or developmental are not appropriate given that they are learning the math content for the first time.

The tables below indicate the characteristics of the interviewees, as well as the community colleges and high schools surveyed.

**TABLE A1**

Qualitative samples by key characteristics

**Interviewee Type Table**

Level	Regional	Community college leadership	Instructors	High school leadership
	External orgs (2) HS district (3)	College DE directors/deans/admin (6) College STEM deans (3)	Full-time college professors (3) High school teachers hired as adjunct professors (5)	HS DE directors/principals/admin (2) High school counselors (2)
n (= 26)	5	9	8	4

**Region-College Interview Table**

Region	North / Far North	SF / Bay Area		Inland Empire / Desert	Central Valley			LA / OC	
Colleges	A	B	C	D	E	F	G	H	I
Forms of DE math offered (at present)	<ul style="list-style-type: none"> <li>- online facilitated asynchronous courses, partnership with college faculty and high school teacher</li> <li>- CCAP and non-CCAP dual enrollment math on high school campuses in-person</li> </ul>	<ul style="list-style-type: none"> <li>- mostly concurrent enrollment and course taking in the summer</li> <li>- by special request</li> </ul>	<ul style="list-style-type: none"> <li>- mostly faculty onto high school campus during school hours for CCAP math</li> <li>- preference for college faculty over high school teachers</li> <li>- unlike other sampled colleges, experienced an increase in requests for algebra post-AB705</li> </ul>	<ul style="list-style-type: none"> <li>- all CCAP</li> <li>- previously more in-person at a high school</li> <li>- currently mostly online asynchronous and/or outside regular school hours</li> </ul>	<ul style="list-style-type: none"> <li>- early college program</li> <li>- mostly college early start students online asynchronous</li> <li>- CCAP: at the high school during school hours, statistics</li> </ul>	<ul style="list-style-type: none"> <li>- on-site middle college program via CCAP offering associate's degree pathways</li> <li>- mostly high school instructors approved to teach the CCAP courses at the high school during school hours</li> </ul>	<ul style="list-style-type: none"> <li>- online with multiple high schools from the same district in a single section</li> <li>-Math Bridge</li> </ul>	<ul style="list-style-type: none"> <li>- early college program offering associate's degree pathways</li> <li>- CCAP: at the high school during school hours</li> <li>- after school, online (depending on high school district policy)</li> <li>- historically remedial math, now statistics</li> <li>- preference for college faculty</li> </ul>	<ul style="list-style-type: none"> <li>- middle college and early college programs offering IGETC and degree pathways</li> <li>- CCAP: courses at high school campuses, but do not necessarily guarantee high school credit (e.g. some IGETC fulfilling course)</li> <li>- roughly half are high school instructors</li> </ul>

Region	CA Average	North / Far North	SF / Bay Area		Inland Empire	Central Valley			LA / OC	
Colleges	-	A	B	C	D	E	F	G	H	I
<b>Student Count (AY 2023-2024)</b>	20,547	~15,000	~10,000	~15,000	~20,000	~25,000	~15,000	~20,000	~20,000	~65,000
<b>Gender</b>										
% Female	52.73 %	~54 %	~54 %	~51 %	~55 %	~59 %	~55 %	~59 %	~50 %	~42 %
% Male	43.95 %	~44 %	~40 %	~43 %	~44 %	~40 %	~43 %	~40 %	~41 %	~44 %
% Non-binary	1.23 %	-	-	-	~1 %	-	~1 %	~1 %	-	~13 %
% Unknown	2.09 %	~2 %	~6 %	~6 %	~1 %	~2 %	~1 %	~1 %	~9 %	~1 %
<b>Race/Ethnicity</b>										
African-American	5.56 %	~2 %	~17 %	~20 %	~7 %	~7 %	~2 %	~4 %	~2 %	~2 %
American Indian/Alaskan Native	0.35 %	~2 %	~0 %	~0 %	~0 %	~0 %	~0 %	~0 %	~0 %	~0 %
Asian	11.04 %	~4 %	~18 %	~20 %	~10 %	~19 %	~6 %	~8 %	~38 %	~9 %
Filipino	2.05 %	~1 %	~2 %	~2 %	~2%	~1 %	~0 %	~0 %	~2 %	~1 %
Hispanic	48.35 %	~20 %	~30 %	~30 %	~59 %	~47 %	~73 %	~65 %	~19 %	~61 %
Multi-Ethnicity	4.08 %	~8 %	~7 %	~6 %	~4 %	~5 %	~2 %	~3 %	~5 %	~2 %
Pacific Islander	0.38 %	~0 %	~0 %	~0 %	~0 %	~1 %	~0 %	~0 %	~0 %	~0 %
Unknown	4.91 %	~3 %	~4 %	~5 %	~1 %	~7 %	~1 %	~2 %	~3 %	~13 %
White Non-Hispanic	23.29 %	~60 %	~21 %	~17 %	~16 %	~14 %	~15 %	~18 %	~30 %	~13 %

**Region-High School Interview Table**

Region	North / Far North	SF / Bay Area	Inland Empire / Desert	Central Valley	
High Schools	A	B	C	D	E
Main Partner College for DE Math	College A	College J	College D	College F	College K
Form of DE Math Offered (at present)	<p><b>Instructors:</b> Exclusively high school teachers hired as adjunct faculty by the partner community college</p> <ul style="list-style-type: none"> <li>- Prior to CCAP, the school had already been providing dual enrollment math courses during the school day at the high school through the help of the partner community college. CCAP allowed the school to provide additional benefits to the students such as covering the cost of course materials and closing off the course to only high school students</li> <li>- Enrollment prioritizes student interest. Must have at least a C in prior math courses to enroll in a dual enrollment math course.</li> <li>- Dual enrollment</li> </ul>	<p><b>Instructors:</b> Exclusively high school teachers hired as adjunct faculty by the partner community college</p> <ul style="list-style-type: none"> <li>- Offered a dual enrollment math class as an afterschool class onsite, but transitioned it to during the school day to allow all students to enroll</li> <li>- The course grants high school math credit, and the school intentionally selected the math course to fulfill the math prerequisite for most college majors</li> <li>- First semester is dual enrollment math, second semester is regular high school math</li> </ul>	<p><b>Instructors:</b> Mostly community college faculty coming onto the high school campus before high school hours</p> <ul style="list-style-type: none"> <li>- All dual enrollment (including math) courses can only count as high school elective credit and must be taken outside of regular high school hours. To meet these conditions, most dual enrollment courses in general are offered online.</li> <li>- A separate STEM pathway exists in the high school, for which a separate set of STEM dual enrollment courses (including math) exist but are only available to students on the pathway.</li> </ul>	<p><b>Instructors:</b> High preference for high school teachers as instructors (or present as collaborative support with college professor) because it guarantees high level of support for students</p> <ul style="list-style-type: none"> <li>- 4-year CTE pathways established via CCAP (can only enter at freshman year) that lead to certificates/Associates degrees. Courses are during the school day. For some pathways, the math courses are optional. These DE math courses are only available to the pathway students.</li> <li>- High school enrichment, in which students individually enroll in regular community college courses after high school hours or during the summer with the help of the high school and still</li> </ul>	<p><b>Instructors:</b> Exclusively high school teachers hired as adjunct faculty by the partner community college. Some already had master's degrees, but many received their master's degrees through a grant specifically for training high school teachers to be qualified for teaching dual enrollment</p> <ul style="list-style-type: none"> <li>- Offered like all other math courses, onsite during regular school hours.</li> </ul>

	<p>precalculus is taken as two courses as a one-year sequence</p> <ul style="list-style-type: none"> <li>- For Calculus, the first semester is a large prep class that all calculus students take together, while in the second semester, students have the choice to either be enrolled in AP Calculus or register for the dual enrollment calculus course (the two groups remain in the same classroom with the same instructor)</li> </ul>			<p>receive high school credit (non-CCAP)</p> <ul style="list-style-type: none"> <li>- Math Bridge</li> </ul>	
How the difference between AP and DE is communicated	<p>DE is more affordable and for public institutions, AP is for elite private institutions. DE is weighted more than AP for GPA boosts, so the courses can still be used to have an edge in college admissions, but may not save time and money at private institutions.</p>	N/A, no AP offerings	<p>DE is seen as for students who are pursuing public institutions, while AP would be a better fit for those who intend to go out-of-state or elite private institutions.</p>	<p>DE is more for fixed pathways and making progress towards a bachelors degree in high school, AP is more flexible but unpredictable because you must pass an exam for college credit. Having both DE and AP classes on a high school transcript is best, like "diversifying a portfolio."</p>	<p>DE is more affordable and for public institutions, AP is for UC or private university or STEM tracks.</p>
How the difference between AP and DE is practiced	<p><b>Courses offered:</b> Some courses are offered both as AP and dual enrollment, but the students will be in the same space with the</p>	<p><b>Courses offered:</b> N/A, no AP offerings</p> <p><b>Credit awarded:</b> high school math credit</p>	<p><b>Courses offered:</b> Largely determined by local union-driven MOUs. Pre-existing AP (and other non-DE) courses take priority. If there is</p>	<p><b>Courses offered:</b> DE math courses are only available to fixed pathway students. Both AP and DE courses employ strict prerequisite criteria (must</p>	<p><b>Courses offered:</b> The school chose to develop a one-year math sequence catered towards students who they determined were</p>

	<p>same teacher.</p> <p><b>Credit awarded:</b> AP grants 5 high school math credits per semester, while DE grants 10 per semester</p>		<p>something that is offered in this format, it cannot be offered as DE. (e.g. if there is an AP Statistics course, the school cannot offer a DE statistics course). Whatever is not offered as non-DE can be offered as DE.</p> <p><b>Credit awarded:</b> DE math courses can only grant high school elective credit, and not meet high school math requirements, but do award GPA boosts similar to AP</p>	<p>have As in the advanced math track)</p> <p><b>Credit awarded:</b> high school math credit, all A-G requirements, GPA boosts for AP and DE are the same</p>	<p>not presently served by the school's AP offerings: the fall semester is college algebra and the spring semester is elementary statistics, ensuring students will have completed their general education math requirement and a statistics requirement needed for most bachelor's degrees in non-STEM fields.</p> <p><b>Credit awarded:</b> high school math credit, GPA boosts for AP and DE are the same</p>
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## Quantitative Methods

Our analysis utilizes student-level longitudinal data from the California Community Colleges Chancellor’s Office Management Information System (MIS). The dataset includes records from students across the 116 community colleges within the California Community College system, capturing demographic details, academic transcripts (grades and credits earned), and course elements (such as levels below transfer-level, credit status, transfer status, and credit ranges). This data includes information up to Fall 2023.

Our analytical sample consists of 984,564 high school students who graduated between the 2015–16 and 2023-24 school years (excluding the Spring term of the senior year for the 2023-24 cohort due to lack of data) and enrolled in at least one dual enrollment course during high school. These students, identified as dual enrollment students using the “special admit” flag in the MIS data, are further categorized into College and Career Access Pathways (CCAP) participants and non-CCAP students, totaling 222,578 and 761,986 students, respectively. Note that our sample of “special admit” students also include private and home-schooled students; therefore, the number of students is higher than Kurlaender et al. (2021)—which includes only public high school students that were matched to MIS data. CCAP participants were identified using the SG13 variable in the MIS data, which was introduced in 2015-16 and indicates whether a student is participant in a CCAP agreement during the reporting term. Students flagged as CCAP at any point remain classified as such throughout our analysis.

However, discussions with researchers and technical experts at the Chancellor’s Office revealed challenges in community colleges’ early reporting of CCAP participation through the SG13 variable. These issues could have led to partial reporting or underreporting of student’s CCAP status. To address this, we supplemented the MIS data with a sample of 49,865 CCAP students who graduated from high school between the academic years 2015–16 and 2019–20 and that were included in two previous PPIC reports, *Dual Enrollment in California. Promoting Equitable Student Access and Success* and *Improving College Access and Success through Dual Enrollment*.<sup>2</sup> Approximately 74% of those 49,865 students were added to our analytical sample as additional CCAP participants given they are not flagged as CCAP in the MIS data, representing 16% of the total CCAP population in our analytical sample. Over time, the accuracy of the SG13 variable has significantly improved and it has become the sole indicator used by the Chancellors Office to determine CCAP participation. This improvement is

<sup>2</sup> The sample for those reports was constructed by using course information from the CCAP agreements drafted and signed between colleges and K–12 partners to establish participation in the program. This was complemented with information provided by dual enrollment program coordinators at different colleges and the annual reports colleges submit to the CCCCO every year as part of the reporting requirements associated with CCAP participation, which included more detailed information about courses students enrolled in and the number and demographics of students that enrolled.

likely driven by the fact that the Chancellor’s Office informed us that it now uses SG13 to determine CCAP funding allocations. In addition to the approach described above, we conducted a robustness check on dual enrollment math participation using an alternative method to flag CCAP students. A student is flagged as CCAP if they enrolled in a class where over 95% of the enrollees are flagged as CCAP students (95% threshold approach). Appendix Table B23 reaffirms our conclusion on math dual enrollment participation by dual enrollment program type (CCAP/non-CCAP).

In addition, the analytical sample includes 1,921,855 community college students who enrolled in a credit course at a community college as regular students and were part of the same graduating classes as the dual enrollees (e.g., 2015–16 to 2023-24).

Since the MIS lacks detailed information on students’ high school records, we inferred their high school graduating class using three approaches:

**SB11 Variable - EDUCATION:** This variable identifies the student's highest level of education and the year in which the degree or status was achieved. Through this variable we were able to determine the high school graduation year for 31.8% of dual enrollees and 85.5% of non-dual enrollees in our sample.

**SB03 Variable - BIRTHDATE:** For students without SB11 data, we estimated the high school cohort by assuming they enrolled in kindergarten once they were eligible to do so (i.e., be at least 5-years old by December 2 of the academic year when they start going to school)<sup>3</sup> and they graduated after 13 years of their kindergarten enrollment.

**STD1 Variable - STUDENT-AGE-AT-TERM:** For the remaining students without high school cohort information based on the SB11 and SB03 variables (less 1% of the non-dual and 1.47% of dual enrollment students, respectively), we used the age at which they took community college courses to estimate their high school graduation year, based on typical enrollment ages published by the California Department of Education. The California Department of Education publishes student enrollment based on grade and age, and we rely on this information to estimate their time of graduation (assuming graduating within four years), and high school grade levels.

After these estimations, we found that 10.5% of dual enrollees took a dual enrollment course after their estimated high school graduation year. This could happen for two reasons: students were incorrectly flagged in the MIS data as dual enrollees after graduating from high school and after being enrolled in community colleges as regular students; or the cohort assigned by us was not accurate. To address potential misclassifications or inaccuracies in our cohort assignments, we adjusted the high school cohort for these students by moving them to the next cohort year if the discrepancy was only one year. This reduced the discrepancy to 4.1% of the dual enrollment sample. Since we used the approach above as a proxy for a student’s high school cohort, we also conducted a robustness check by analyzing dual enrollment math participation trends by academic year, rather than by high school cohort as in our main analysis. Appendix Table B22 reaffirms our conclusion on time trends in math dual enrollment participation.

Finally, we identify students through the report in the following three categories:

**CCAP student:** a student is considered a CCAP student if the student ever participated in a CCAP course during high school years.

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<sup>3</sup> The birth date cutoff for kindergarten in California was only recently changed to September 1 through legislation in 2014. It had been December 2 before that going all the way back to 1891.

Non-CCAP student: a student is considered to be part of other dual enrollment modalities if the student never participated in the CCAP program but took part in an Early College High Schools (ECHS) and/or Middle College High Schools (MCHS) and/or other form of dual enrollment course during high school years.

Non-dual enrollment student: a student is considered a non-dual enrollment student if the student never participated in a dual enrollment program.

In our sample, 79% of dual enrollment students are classified under non-CCAP modalities, and 21% under CCAP. Among dual enrollment students, 48% enrolled at some point at a community college as regular students after high school graduation. Forty-seven percent of the students in the CCAP group and 48% of the students in other dual enrollment programs ended up enrolling as regular students at a community college.<sup>4</sup>

## Caveats and Limitations of this Study

- **Data Accuracy:** Our results depend on the accuracy of data reported by colleges to the Chancellor’s Office. Despite efforts to identify and correct inconsistencies, some data discrepancies may have gone undetected.
- **CCAP Course Data:** The MIS does not track specific CCAP courses, only whether a student participated in a CCAP agreement. This limits our ability to control for the number of credits or courses completed under the CCAP program.
- **High School Data:** We lack data on high school performance metrics (e.g., course history, grades, GPA), so our analysis focuses solely on course-taking behavior at community colleges. Also, we use proxies for the high school graduation cohort as detailed above as we lack data on actual high school graduation year.
- **Pandemic Impact:** Outcomes for recent cohorts are likely influenced by the COVID-19 pandemic, meaning progress in course completion, transfer rates, or degree attainment may reflect lower-bound estimates of the effects of CCAP programs and related legislation like AB 705.
- **Generalizability:** The selection of community college campuses for qualitative interviews was based on their significance across various measures of dual enrollment math offerings. Moreover, interviewees were identified through snowball sampling (i.e. the interviewee refers more interviewees), leveraging positive and collaborative within-site and between-site relationships. As a result, the sites included in the interviews are not intended to represent all dual enrollment programs in California equally. Instead, they likely reflect more successful implementations and positive relationships: prospective interviewees who were nonresponsive were not included in the study, and some people may not have been referred in the process due to negative experiences.

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<sup>4</sup> Enrollment rates exclude students from the high school cohort 2023-24.

## Appendix B. Tables and Figures

**TABLE B1**

Analytical sample size

Cohort	All DE	CCAP	Non-CCAP	Non-DE
2015-16	64,147	469	63,678	319,409
2016-17	75,372	4,757	70,615	298,488
2017-18	92,076	8,513	83,563	284,348
2018-19	107,223	17,492	89,731	256,587
2019-20	120,074	30,722	89,352	220,677
2020-21	119,129	26,404	92,725	204,790
2021-22	126,235	33,928	92,307	194,350
2022-23	130,388	44,076	86,312	138,375
2023-24	149,920	56,217	93,703	-

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one credit course at a CCC. The sample includes 222,578 CCAP students, 761,986 students in other dual enrollment modalities, and 1,921,855 non-dual enrollment students.

**TABLE B2**

Trends in Dual Enrollment Math Participation

Cohort	All DE Students		CCAP Students		Non-CCAP Students	
	Math (n)	Math (%)	Math (n)	Math (%)	Math (n)	Math (%)
2015-16	10,716	16.7	242	51.6	10,474	16.4
2016-17	12,220	16.2	1,142	24.0	11,078	15.7
2017-18	13,957	15.2	1,479	17.4	12,478	14.9
2018-19	16,195	15.1	2,282	13.0	13,913	15.5
2019-20	18,730	15.6	4,793	15.6	13,937	15.6
2020-21	19,754	16.6	4,042	15.3	15,712	16.9
2021-22	20,938	16.6	5,389	15.9	15,549	16.8
2022-23	19,994	15.3	5,999	13.6	13,995	16.2
2023-24	22,318	14.9	7,589	13.5	14,729	15.7

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

**TABLE B3**

## Trends in Dual Enrollment Math Participation by Program Type and Course Type

Cohort	All DE Math Students		CCAP Math Students		Non-CCAP Math Students	
	TL Math (%)	Dev. Math (%)	TL Math (%)	Dev. Math (%)	TL Math (%)	Dev. Math (%)
2015-16	65.4	44.3	52.9	69.4	65.7	43.7
2016-17	68.9	42.2	73.4	38.9	68.4	42.5
2017-18	71.9	40.1	73.8	39.4	71.6	40.2
2018-19	74.8	36.5	74.5	39.7	74.9	36.0
2019-20	79.5	29.0	82.6	26.5	78.4	29.9
2020-21	83.6	23.8	87.9	18.1	82.5	25.2
2021-22	87.0	19.7	90.4	15.7	85.9	21.1
2022-23	90.6	14.8	94.4	9.2	89.0	17.2
2023-24	92.8	11.3	94.9	7.7	91.7	13.1

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

**TABLE B4**

## Math dual enrollment students' demographic characteristics

Cohort	All DE Non-Math Students							
	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	53,431	55.5	42.8	14.6	4.3	46.4	26.3	31.1
2016-17	63,152	54.7	43.7	13.7	4.3	48.0	25.2	35.2
2017-18	78,119	55.1	43.3	13.9	4.1	48.9	24.0	37.1
2018-19	91,028	55.4	42.9	12.9	4.2	50.7	22.8	38.8
2019-20	101,344	55.9	42.3	12.9	3.7	51.5	21.9	39.2
2020-21	99,375	57.5	40.8	13.8	3.5	49.2	23.2	36.7
2021-22	105,297	56.8	41.2	14.7	3.6	49.3	22.8	36.0
2022-23	110,394	55.8	41.5	15.0	3.6	48.3	23.1	34.0
2023-24	127,602	55.5	41.3	14.7	3.6	49.9	21.9	32.9

Cohort	All DE Math Students							
	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	10,716	51	47	25	5	32	30	24

2016-17	12,220	52	47	24	4	33	30	28
2017-18	13,957	52	46	25	4	32	28	27
2018-19	16,195	52	46	24	4	35	27	28
2019-20	18,730	53	46	24	4	37	25	29
2020-21	19,754	54	44	26	3	33	27	26
2021-22	20,938	54	44	25	3	36	26	26
2022-23	19,994	54	44	27	3	35	25	25
2023-24	22,318	52	45	26	3	38	23	27

CCAP Math Students								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	242	52.5	46.7	13.2	4.1	55.8	19.0	32.6
2016-17	1,142	54.6	44.4	22.1	4.4	44.1	22.2	21.8
2017-18	1,479	54.6	44.2	19.4	4.1	45.6	22.2	33.1
2018-19	2,282	56.6	42.2	14.8	4.5	53.0	19.6	38.3
2019-20	4,793	56.1	42.4	16.3	3.9	48.3	23.5	33.8
2020-21	4,042	59.0	39.6	17.8	2.6	48.4	22.4	32.0
2021-22	5,389	57.9	40.2	17.7	3.5	48.6	21.7	32.4
2022-23	5,999	57.1	41.2	18.8	3.2	46.0	22.4	31.5
2023-24	7,589	55.5	42.3	20.5	2.5	44.9	22.4	30.3

Non-CCAP Math Students								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	10,474	50.7	47.3	25.2	4.7	31.0	30.0	23.6
2016-17	11,078	51.5	46.7	24.1	4.4	32.1	30.8	28.2
2017-18	12,478	51.9	46.2	25.9	4.5	30.7	29.2	26.7
2018-19	13,913	51.6	46.9	25.8	4.1	32.0	28.1	26.2
2019-20	13,937	51.7	46.7	26.9	4.0	32.8	26.1	27.5
2020-21	15,712	53.3	45.0	28.3	3.4	29.5	27.8	24.9
2021-22	15,549	52.6	45.2	28.2	3.1	31.0	26.8	23.8
2022-23	13,995	52.6	45.1	29.9	2.8	29.8	26.0	22.8
2023-24	14,729	50.1	46.3	28.8	2.9	33.7	23.6	24.9

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one dual enrollment credit course at a CCC.

**TABLE B5**

## Demographic Representation by Course Type among Math Dual Enrollees

All DE students - Dev math								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	4,747	54.3	43.9	15.0	6.9	41.9	26.9	31.4
2016-17	5,156	54.5	43.8	15.4	6.5	41.6	28.0	34.4
2017-18	5,595	54.2	43.7	16.4	6.6	40.9	27.4	33.9
2018-19	5,913	55.1	43.5	17.2	6.0	40.8	26.5	33.6
2019-20	5,433	54.2	44.4	20.2	5.8	38.5	26.0	32.7
2020-21	4,692	54.7	43.6	23.6	5.3	34.9	25.7	30.8
2021-22	4,128	54.2	43.6	24.8	4.7	34.7	24.7	30.1
2022-23	2,960	53.5	44.5	28.9	4.5	31.7	23.0	26.0
2023-24	2,520	51.9	45.0	28.1	4.7	32.4	22.7	25.0
All DE students - TL math								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	7,011	49.2	48.8	30.7	3.3	25.8	31.5	19.0
2016-17	8,419	51.0	47.3	28.0	3.2	29.0	31.3	24.0
2017-18	10,030	52.2	46.2	28.9	3.5	28.6	29.2	24.5
2018-19	12,121	51.5	47.0	27.2	3.4	32.6	27.3	25.7
2019-20	14,886	52.5	45.8	25.5	3.4	36.0	25.5	27.8
2020-21	16,516	54.5	43.9	26.8	2.9	32.8	27.1	25.2
2021-22	18,218	54.0	43.9	25.7	3.0	35.4	25.7	25.1
2022-23	18,121	54.0	43.9	26.4	2.7	34.9	25.1	25.2
2023-24	20,703	52.0	45.0	25.9	2.6	37.7	23.4	26.7
CCAP - Dev math students								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	168	53.6	45.8	9.5	4.2	66.1	13.7	35.7
2016-17	444	57.0	41.7	14.9	5.9	57.7	15.1	31.1
2017-18	582	54.6	44.2	13.7	5.0	53.8	19.1	41.9
2018-19	905	57.5	41.2	12.8	4.5	53.4	20.4	43.1
2019-20	1,268	54.9	43.4	14.0	4.9	50.9	21.8	38.6
2020-21	730	60.0	38.6	20.8	2.6	48.1	20.0	36.4

2021-22	848	56.0	42.1	18.4	5.4	44.6	22.5	36.8
2022-23	550	59.3	38.9	16.4	4.7	45.8	24.7	36.2
2023-24	587	55.5	41.2	24.0	4.4	38.2	21.5	27.6

**CCAP - TL math students**

Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	128	53.9	45.3	19.5	3.9	42.2	27.3	29.7
2016-17	838	53.5	45.5	25.5	4.1	37.8	24.8	17.8
2017-18	1,091	56.0	43.0	21.5	3.6	42.5	23.1	30.3
2018-19	1,700	57.4	41.4	16.5	4.7	51.7	19.2	36.2
2019-20	3,961	56.5	42.1	17.2	3.7	47.3	23.8	32.5
2020-21	3,554	59.0	39.8	17.4	2.6	48.4	22.7	31.4
2021-22	4,869	58.3	39.9	17.6	3.4	48.9	21.6	31.9
2022-23	5,665	57.0	41.2	18.9	3.1	45.9	22.3	31.1
2023-24	7,199	55.5	42.4	20.4	2.4	45.1	22.7	30.3

**Non-CCAP - Dev math students**

Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	4,579	54.4	43.9	15.2	7.0	41.1	27.4	31.2
2016-17	4,712	54.3	44.0	15.5	6.5	40.1	29.2	34.7
2017-18	5,013	54.2	43.7	16.7	6.7	39.4	28.4	33.0
2018-19	5,008	54.7	43.9	18.0	6.3	38.6	27.6	31.8
2019-20	4,165	53.9	44.7	22.1	6.0	34.7	27.3	30.9
2020-21	3,962	53.7	44.5	24.1	5.8	32.4	26.8	29.7
2021-22	3,280	53.8	44.0	26.5	4.6	32.2	25.2	28.4
2022-23	2,410	52.2	45.8	31.7	4.4	28.4	22.6	23.7
2023-24	1,933	50.8	46.1	29.4	4.8	30.6	23.1	24.2

**Non-CCAP - TL math students**

Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	6,883	49.1	48.9	30.9	3.3	25.5	31.6	18.8
2016-17	7,581	50.8	47.5	28.3	3.1	28.0	32.0	24.6
2017-18	8,939	51.7	46.5	29.8	3.4	26.9	29.9	23.8
2018-19	10,421	50.5	47.9	28.9	3.2	29.4	28.6	24.0
2019-20	10,925	51.1	47.2	28.5	3.3	31.9	26.1	26.1

2020-21	12,962	53.2	45.1	29.4	3.0	28.6	28.3	23.6
2021-22	13,349	52.5	45.4	28.6	2.8	30.5	27.2	22.7
2022-23	12,456	52.6	45.2	29.8	2.5	29.9	26.4	22.5
2023-24	13,504	50.1	46.3	28.9	2.7	33.7	23.8	24.8

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

**TABLE B6**

**Demographic Representation by Course Pathway among Transfer-level Math Dual Enrollees**

All DE students - BSTEM TL math								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	4,961	43.5	54.6	35.2	3.0	22.1	31.1	17.3
2016-17	5,724	45.9	52.3	32.1	3.0	25.6	30.8	21.1
2017-18	6,533	47.2	51.0	34.8	2.9	23.3	28.5	21.3
2018-19	7,840	45.3	53.1	32.6	3.0	26.2	28.2	21.4
2019-20	9,189	45.6	52.6	31.4	2.8	30.0	25.5	23.5
2020-21	10,103	48.0	50.3	32.4	2.6	26.9	26.9	21.5
2021-22	10,598	47.5	50.3	31.5	2.8	28.4	26.1	21.0
2022-23	10,037	46.4	51.3	33.4	2.2	26.8	25.7	19.3
2023-24	11,940	44.7	52.1	32.2	2.4	29.6	24.1	21.6
All DE students - SLAM TL math								
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	2,702	60.7	37.0	22.5	4.1	31.7	32.2	22.0
2016-17	3,583	60.3	38.0	22.7	3.7	34.3	31.3	28.1
2017-18	4,370	61.1	37.4	20.9	4.3	35.9	29.9	29.1
2018-19	5,436	61.7	36.9	20.6	4.1	40.9	25.6	31.0
2019-20	7,017	62.2	36.5	18.0	4.0	43.5	25.6	33.0
2020-21	7,905	63.1	35.4	20.7	3.3	39.2	27.5	29.3
2021-22	9,318	61.6	36.5	20.1	3.2	41.9	25.3	28.7
2022-23	9,753	61.7	36.5	20.2	3.2	41.9	24.8	30.5
2023-24	10,160	60.5	36.7	19.9	2.8	45.7	22.5	31.8

**CCAP - BSTEM TL students**

Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	63	42.9	57.1	25.4	3.2	38.1	31.7	27.0
2016-17	579	47.3	51.5	31.6	3.1	31.6	26.3	13.6
2017-18	630	47.8	50.8	26.3	3.5	33.3	27.0	26.5
2018-19	837	49.6	48.6	21.9	3.6	42.4	23.8	31.1
2019-20	1,990	50.8	47.4	21.4	3.2	40.6	25.7	27.1
2020-21	1,734	53.7	45.2	20.7	3.3	43.1	23.7	28.9
2021-22	2,301	52.3	46.1	21.9	3.3	41.6	23.5	28.1
2022-23	2,437	49.7	48.3	25.5	2.7	36.4	25.0	24.0
2023-24	3,742	47.7	49.7	25.7	2.3	36.7	25.3	25.3

#### CCAP - SLAM TL students

Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	85	58.8	40.0	17.6	4.7	43.5	23.5	31.8
2016-17	435	63.7	35.4	25.3	5.1	43.4	19.3	21.4
2017-18	560	65.5	33.9	16.8	3.4	52.3	19.1	35.2
2018-19	1,039	64.4	34.8	14.1	5.6	57.7	15.1	40.0
2019-20	2,346	62.1	36.8	14.0	4.0	53.1	21.7	37.3
2020-21	2,061	63.6	35.1	15.9	2.3	51.6	21.8	33.8
2021-22	3,013	61.9	36.1	15.4	3.2	52.4	21.2	33.6
2022-23	3,769	61.8	36.7	15.5	3.4	50.3	21.5	34.6
2023-24	3,971	62.4	35.8	16.9	2.5	51.4	19.9	34.2

#### Non-CCAP - BSTEM TL students

Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)
2015-16	4,898	43.5	54.5	35.3	3.0	21.9	31.1	17.2
2016-17	5,145	45.8	52.4	32.2	3.0	25.0	31.3	21.9
2017-18	5,903	47.2	51.0	35.7	2.9	22.3	28.7	20.8
2018-19	7,003	44.8	53.6	33.9	2.9	24.3	28.7	20.3
2019-20	7,199	44.1	54.0	34.2	2.7	27.1	25.5	22.5
2020-21	8,369	46.8	51.4	34.9	2.4	23.5	27.6	19.9
2021-22	8,297	46.2	51.5	34.2	2.7	24.8	26.9	19.1
2022-23	7,600	45.3	52.3	36.0	2.1	23.7	26.0	17.8
2023-24	8,198	43.3	53.2	35.1	2.5	26.4	23.6	19.9

Cohort	n	Non-CCAP - SLAM TL students						First gen (%)
		Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	
2015-16	2,617	60.8	36.9	22.7	4.1	31.3	32.5	21.7
2016-17	3,148	59.9	38.3	22.3	3.5	33.0	32.9	29.1
2017-18	3,810	60.4	37.9	21.5	4.4	33.5	31.4	28.2
2018-19	4,397	61.1	37.4	22.1	3.7	36.9	28.0	28.9
2019-20	4,671	62.2	36.4	20.0	4.1	38.6	27.5	30.9
2020-21	5,844	63.0	35.5	22.3	3.7	34.8	29.5	27.7
2021-22	6,305	61.5	36.7	22.4	3.2	36.9	27.3	26.4
2022-23	5,984	61.6	36.4	23.2	3.0	36.6	26.8	27.9
2023-24	6,189	59.3	37.2	21.8	2.9	42.0	24.1	30.2

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

## TABLE B7

### Trends in Transfer-level Math Completion Through Dual Enrollment

Cohort	CCAP TL Math Students			Non-CCAP TL Math Students		
	Enrollment	Success	%	Enrollment	Success	%
2015-16	128	104	81.3	6,883	5,893	85.6
2016-17	838	734	87.6	7,581	6,389	84.3
2017-18	1,091	905	83.0	8,939	7,539	84.3
2018-19	1,700	1,360	80.0	10,421	8,729	83.8
2019-20	3,961	3,375	85.2	10,925	9,125	83.5
2020-21	3,554	3,013	84.8	12,962	11,228	86.6
2021-22	4,869	4,028	82.7	13,349	11,188	83.8
2022-23	5,665	4,741	83.7	12,456	10,460	84.0
2023-24	7,199	6,126	85.1	13,504	11,128	82.4

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

**TABLE B8**

## Trends in Transfer-level Math Completion Through Dual Enrollment by Demographics

CCAP TL Math Students								
Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	79.7	82.8	89.6	79.1	80.0	87.0	79.6	77.1
2016-17	85.7	89.8	88.9	72.8	79.5	86.9	79.0	83.2
2017-18	81.2	85.3	89.3	74.1	76.8	86.4	78.1	86.6
2018-19	81.4	78.0	90.4	63.6	76.5	85.8	77.8	84.1
2019-20	86.0	84.2	91.6	72.6	77.6	87.0	79.6	87.7
2020-21	85.0	84.4	92.4	78.1	79.8	87.8	79.9	89.4
2021-22	82.6	83.2	91.7	73.7	75.9	86.2	76.5	87.5
2022-23	83.5	83.9	91.5	70.2	77.0	85.8	78.1	87.4
2023-24	83.9	86.9	91.8	71.1	75.2	87.2	74.6	89.7
Non-CCAP TL Math Students								
Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	86.6	84.6	89.7	79.5	80.0	87.0	79.7	86.2
2016-17	84.8	83.7	88.4	73.1	78.9	86.6	78.9	86.6
2017-18	84.7	83.9	89.4	73.1	77.3	85.9	78.5	86.7
2018-19	83.7	83.8	90.6	65.1	76.3	86.0	77.8	87.1
2019-20	83.6	83.5	91.5	70.6	75.3	86.3	78.1	87.7
2020-21	86.2	87.3	92.7	78.1	79.3	87.4	80.1	90.3
2021-22	83.5	84.4	91.9	73.9	74.7	85.8	75.5	87.7
2022-23	83.3	85.0	91.4	68.7	75.7	84.8	76.5	87.6
2023-24	82.0	83.4	91.4	67.5	72.2	86.0	71.4	88.1

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

**TABLE B9**

## College Enrollment Rates by Dual Enrollment Status and Type of Institutions

All DE Math Students					
cohort	n	% enrolled CC	% enrolled UC	% enrolled CSU	% enrolled other 4-year
2015-16	10,716	29.6	15.2	9.2	11.9

2016-17	12,220	30.8	15.2	11.6	12.7
2017-18	13,957	29.1	15.7	11.1	13.3
2018-19	16,195	29.8	14.9	12.1	13.1
2019-20	18,730	29.8	9.5	11.0	12.2
2020-21	19,754	26.1	16.0	10.5	14.2
2021-22	20,938	25.8	16.7	11.8	14.0
2022-23	19,994	24.6	15.7	10.5	11.6

CCAP Math Students					
cohort	n	% enrolled CC	% enrolled UC	% enrolled CSU	% enrolled other 4-year
2015-16	242	31.8	1.7	1.7	0.0
2016-17	1,142	32.8	14.6	15.0	8.1
2017-18	1,479	34.3	14.1	13.5	10.3
2018-19	2,282	37.6	12.0	11.3	8.5
2019-20	4,793	32.2	8.1	15.1	9.9
2020-21	4,042	30.0	12.6	12.2	11.8
2021-22	5,389	29.0	15.4	15.8	11.2
2022-23	5,999	23.9	15.1	12.9	8.7

Non-CCAP Math Students					
cohort	n	% enrolled CC	% enrolled UC	% enrolled CSU	% enrolled other 4-year
2015-16	10,474	29.6	15.5	9.3	12.2
2016-17	11,078	30.6	15.3	11.2	13.2
2017-18	12,478	28.5	15.9	10.8	13.6
2018-19	13,913	28.5	15.4	12.3	13.8
2019-20	13,937	29.0	10.0	9.5	13.0
2020-21	15,712	25.0	16.9	10.1	14.9
2021-22	15,549	24.6	17.2	10.4	15.0
2022-23	13,995	24.9	15.9	9.5	12.9

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

## TABLE B10

### College Enrollment Rates by Demographics for Math Dual Enrollees

#### CCAP Math Students - CCC

Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	37.0	25.7	34.4	20.0	35.6	26.1	29.1	32.1
2016-17	33.5	32.3	31.0	38.0	38.3	24.5	32.9	29.7
2017-18	33.9	35.5	30.0	26.2	39.6	29.9	39.9	36.2
2018-19	37.4	37.6	28.1	28.4	40.1	40.3	40.0	38.9
2019-20	32.2	32.5	27.9	24.5	34.1	32.6	33.9	34.0
2020-21	29.3	31.4	21.4	23.8	34.1	29.7	32.4	29.5
2021-22	27.7	30.7	23.5	13.1	32.3	29.0	33.5	26.3
2022-23	24.0	23.6	21.0	15.0	25.3	25.6	26.9	22.9
Non-CCAP Math Students - CCC								
Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	31.0	28.5	21.3	32.2	34.6	31.5	37.8	30.7
2016-17	30.9	30.8	20.6	27.5	36.0	33.8	37.4	31.6
2017-18	28.9	28.3	20.3	22.3	34.0	31.0	34.9	26.9
2018-19	28.9	28.5	20.9	23.4	33.1	29.9	33.9	28.1
2019-20	31.0	26.9	22.9	19.7	32.2	33.9	32.6	29.7
2020-21	25.3	24.9	19.0	19.5	28.5	29.0	29.6	23.8
2021-22	24.9	24.3	17.3	21.2	29.9	27.3	30.4	23.7
2022-23	24.5	25.0	16.9	23.5	31.8	28.0	32.2	22.6
CCAP Math Students - UC								
Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	1.6	1.8	6.3	0.0	0.0	2.2	0.0	3.8
2016-17	13.5	15.6	26.6	8.0	9.7	15.0	11.2	11.2
2017-18	11.8	16.7	30.0	11.5	8.0	15.2	10.8	12.5
2018-19	13.5	10.0	26.6	9.8	9.0	9.8	9.6	15.6
2019-20	9.0	6.9	15.3	5.3	7.5	5.7	8.3	7.6
2020-21	13.8	10.9	25.1	9.5	8.8	9.8	9.2	13.6
2021-22	17.0	13.2	28.6	11.0	12.3	12.4	13.9	18.0
2022-23	16.1	13.8	25.1	9.8	12.5	12.7	12.6	17.6
Non-CCAP Math Students - UC								
Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)

2015-16	15.1	16.0	26.0	8.7	12.1	12.7	12.4	16.8
2016-17	14.4	16.2	26.7	9.5	11.5	11.9	11.7	16.8
2017-18	16.0	15.9	29.0	9.9	10.7	10.8	11.8	18.2
2018-19	15.3	15.6	26.2	8.5	10.4	12.7	12.4	16.9
2019-20	9.5	10.4	16.5	7.8	7.2	8.0	8.6	11.1
2020-21	17.2	16.7	26.5	8.3	11.8	13.4	14.1	18.8
2021-22	17.8	16.7	27.9	12.7	12.3	12.3	14.3	18.9
2022-23	16.0	16.1	25.8	8.3	10.2	11.7	11.8	18.0

**CCAP Math Students - CSU**

Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	3.1	0.0	3.1	10.0	0.0	2.2	2.5	0.0
2016-17	14.4	15.8	19.8	14.0	12.5	15.8	12.4	19.3
2017-18	15.2	11.5	11.5	8.2	14.8	14.3	14.5	15.0
2018-19	12.2	10.1	13.6	17.6	11.9	7.8	12.0	9.8
2019-20	15.8	14.3	14.1	20.2	16.2	13.2	16.1	12.5
2020-21	12.5	11.6	9.7	7.6	14.2	11.5	12.8	11.4
2021-22	16.3	15.3	14.0	8.9	18.4	14.2	16.6	15.4
2022-23	13.0	12.9	9.4	10.4	16.3	10.4	14.7	11.8

**Non-CCAP Math Students - CSU**

Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	9.7	9.0	9.0	7.7	10.8	9.0	12.1	10.1
2016-17	12.2	10.2	10.7	10.6	12.9	10.2	12.3	11.1
2017-18	11.6	9.9	8.7	9.7	14.0	10.3	12.5	10.8
2018-19	13.4	11.1	10.4	14.4	15.1	10.8	14.3	11.5
2019-20	10.5	8.5	8.2	10.5	11.6	8.4	11.2	9.4
2020-21	10.6	9.6	9.2	9.5	12.2	9.3	12.2	9.6
2021-22	10.9	9.9	9.1	10.2	12.6	9.8	13.1	9.5
2022-23	10.2	8.9	7.5	13.7	11.7	9.5	11.2	9.1

**CCAP Math Students - Other 4-year**

Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016-17	9.3	6.3	4.4	8.0	5.6	14.6	4.8	8.0

2017-18	11.0	9.2	8.4	8.2	5.3	18.9	6.1	15.9
2018-19	9.7	6.8	8.6	13.7	5.2	14.5	4.2	13.8
2019-20	10.7	8.8	7.7	17.0	6.3	16.3	5.7	13.1
2020-21	12.4	10.6	10.4	14.3	6.8	22.8	6.3	17.2
2021-22	11.6	10.8	9.1	19.9	7.3	20.1	5.8	16.2
2022-23	9.4	7.7	8.2	11.4	5.1	14.6	4.9	12.2

Non-CCAP Math Students - Other 4-year								
Cohort	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	12.9	11.4	12.3	10.7	7.3	17.0	6.5	16.3
2016-17	14.0	12.2	13.8	13.7	8.1	16.9	6.4	17.0
2017-18	14.5	12.6	13.4	14.3	8.3	18.8	6.8	18.1
2018-19	14.6	12.9	14.6	15.9	8.6	19.0	7.5	18.9
2019-20	13.5	12.3	16.1	15.1	7.0	16.4	6.8	17.4
2020-21	15.7	14.1	15.3	17.8	9.2	19.6	7.2	19.7
2021-22	15.8	14.2	15.1	15.8	9.4	21.2	7.0	19.2
2022-23	12.6	13.4	14.6	13.4	6.7	17.6	6.3	16.4

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC.

**TABLE B11**

Share of Students Completing TL Math as Dual Enrollees or Within 1yr of Enrollment at CCC by Degree/Transfer-Intending CCC Enrollees

Cohort	CCAP math students								
	TL Math – 1yr (%)	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	36.8	30.9	43.8	72.2	0.0	23.5	65.0	33.3	50.0
2016-17	59.8	58.3	62.0	79.3	44.0	52.7	67.5	51.3	59.8
2017-18	58.8	59.1	58.8	69.5	47.6	54.5	65.8	52.4	64.9
2018-19	65.4	64.6	66.0	81.4	44.8	62.1	69.1	60.3	72.6
2019-20	77.2	77.5	76.6	85.1	69.4	75.5	80.9	74.9	78.2
2020-21	80.2	80.3	80.0	80.9	66.7	80.3	80.4	76.9	81.3
2021-22	78.6	77.1	80.8	82.2	50.0	79.3	78.4	76.6	81.0

Non-CCAP math students									
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Cohort	TL Math – 1yr (%)	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	58.6	56.1	61.7	78.5	39.0	47.8	64.6	50.5	67.2
2016-17	63.0	60.6	65.9	76.6	43.4	54.7	69.0	56.8	69.5
2017-18	65.6	65.1	66.3	80.0	48.6	56.4	70.2	58.0	71.3
2018-19	71.4	69.9	73.0	85.5	49.7	64.0	74.3	63.7	77.4
2019-20	74.2	73.0	75.7	87.9	48.2	67.3	76.6	68.8	79.5
2020-21	79.2	78.5	80.5	88.6	66.9	73.1	80.9	74.3	82.7
2021-22	80.8	78.5	83.7	90.0	72.3	73.0	84.6	74.5	84.8

Non-DE students									
Cohort	TL Math – 1yr (%)	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	18.3	17.6	19.0	37.2	8.4	12.5	23.0	13.8	24.6
2016-17	20.3	20.3	20.4	40.6	9.0	14.6	25.4	16.1	27.5
2017-18	24.0	24.4	23.6	45.4	11.9	17.9	29.3	19.0	30.9
2018-19	30.1	31.5	28.8	51.0	16.5	24.5	36.1	25.4	38.3
2019-20	31.4	32.1	30.7	53.3	17.1	25.4	37.3	26.2	39.3
2020-21	32.0	32.3	31.7	53.2	18.2	25.4	37.9	26.6	39.7
2021-22	33.5	34.3	32.8	56.3	20.2	26.7	41.9	28.2	43.0

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2021-22 who took at least one math dual enrollment credit course at a CCC (in the case of CCAP/non-CCAP) and enrolled in a CCC after high school graduation as a degree/transfer intending student.

**TABLE B12**

Average Unit Accumulation by 1st Year of College Enrollment by Degree/Transfer-Intending CCC Enrollees

CCAP Math students									
Cohort	Units	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	34.4	31.1	38.2	38.7	24.3	29.7	46.9	31.0	30.3
2016-17	32.8	33.4	32.1	35.5	28.7	32.0	34.4	35.2	39.6
2017-18	36.4	37.9	34.5	43.1	38.6	32.9	42.0	33.2	42.4
2018-19	37.6	37.9	36.7	40.6	35.5	36.3	39.9	35.0	38.6
2019-20	39.6	40.2	39.0	44.3	37.7	38.7	39.9	38.3	40.5
2020-21	39.4	39.8	38.8	41.1	40.5	39.9	38.3	37.6	40.0
2021-22	40.0	40.4	39.8	41.2	34.9	39.5	40.4	37.7	42.3

Non-CCAP Math students									
Cohort	Units	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	35.7	36.4	34.8	41.0	28.9	32.1	38.1	32.3	38.7
2016-17	36.5	37.0	35.8	39.3	28.4	33.5	39.5	33.1	39.5
2017-18	37.2	38.7	35.3	41.2	30.1	34.0	39.4	34.0	40.7
2018-19	38.6	39.6	37.3	43.2	30.8	35.2	41.5	35.8	41.2
2019-20	39.4	40.6	37.8	44.8	27.8	34.9	42.0	36.2	42.1
2020-21	40.8	40.7	40.9	43.9	36.2	37.6	41.7	38.3	42.5
2021-22	43.1	42.6	43.8	49.5	37.9	37.5	45.5	38.2	46.3

Non-DE students									
Cohort	Units	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	15.1	15.8	14.4	20.9	10.8	13.5	16.7	13.5	17.2
2016-17	15.1	15.9	14.4	20.9	10.8	13.5	17.0	13.7	17.4
2017-18	15.3	16.0	14.6	21.5	11.2	13.5	17.2	13.7	17.7
2018-19	15.5	16.4	14.6	21.9	11.5	13.6	17.6	13.9	18.3
2019-20	15.4	16.0	14.7	21.9	11.1	13.4	17.5	13.6	18.0
2020-21	15.4	15.8	15.0	21.5	11.4	13.3	17.7	13.6	18.0
2021-22	16.2	16.6	15.7	23.1	12.1	13.9	19.1	14.2	19.4

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2021-22 who took at least one math dual enrollment credit course at a CCC (in the case of CCAP/non-CCAP) and enrolled in a CCC after high school graduation as a degree/transfer intending student. For DE students, unit accumulation includes DE courses.

**TABLE B13**

**Degree Completion Rates Among Transfer/Degree-Intending CCC Students**

CCAP Math Students						
Cohort	Associate – 1yr (%)	Associate – 2yr (%)	Associate – 3yr (%)	Certificate – 1yr (%)	Certificate – 2yr (%)	Certificate – 3yr (%)
2015-16	12.0	20.3	25.8	3.8	7.5	9.8
2016-17	9.1	20.3	25.2	5.9	11.0	14.6
2017-18	11.6	21.6	29.7	6.4	12.9	18.1
2018-19	16.7	30.4	39.4	10.1	19.9	26.1
2019-20	19.0	33.3	40.7	12.9	24.1	29.3
2020-21	17.3	30.4	-	14.0	24.9	-

2021-22	12.9	-	-	13.2	-	-
Non-CCAP Math Students						
Cohort	Associate – 1yr (%)	Associate – 2yr (%)	Associate – 3yr (%)	Certificate – 1yr (%)	Certificate – 2yr (%)	Certificate – 3yr (%)
2015-16	9.6	21.7	30.1	5.5	12.1	17.5
2016-17	10.8	22.4	30.1	6.8	14.4	19.3
2017-18	12.6	26.1	34.3	8.4	17.0	22.4
2018-19	11.8	27.3	34.9	7.4	17.2	22.4
2019-20	14.0	27.3	34.2	9.7	18.8	23.1
2020-21	14.3	27.3	-	10.2	18.2	-
2021-22	9.8	-	-	6.8	-	-
Non-DE Math Students						
Cohort	Associate – 1yr (%)	Associate – 2yr (%)	Associate – 3yr (%)	Certificate – 1yr (%)	Certificate – 2yr (%)	Certificate – 3yr (%)
2015-16	1.5	7.7	15.2	1.5	5.6	10.2
2016-17	1.8	8.9	16.2	1.8	6.6	11.2
2017-18	2.2	10.2	17.6	2.0	7.2	12.0
2018-19	2.5	11.0	18.2	2.1	7.9	12.4
2019-20	2.3	11.5	17.5	2.1	8.2	12.0
2020-21	1.9	7.5	-	2.0	6.0	-
2021-22	0.2	-	-	0.5	-	-
DE TL-Math Students						
Cohort	Associate – 1yr (%)	Associate – 2yr (%)	Associate – 3yr (%)	Certificate – 1yr (%)	Certificate – 2yr (%)	Certificate – 3yr (%)
2015-16	16.7	31.5	39.7	9.4	16.9	22.8
2016-17	16.4	29.5	36.3	10.1	18.4	23.3
2017-18	18.3	33.5	42.3	11.7	21.6	27.0
2018-19	18.6	36.5	44.6	11.3	22.8	28.5
2019-20	21.0	36.2	43.2	13.8	24.9	29.0
2020-21	19.8	35.2	-	14.4	24.8	-
2021-22	14.2	-	-	11.1	-	-

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2021-22 who took at least one math dual enrollment credit course at a CCC (in the case of CCAP/non-CCAP) and enrolled in a CCC after high school graduation as a degree/transfer intending student..

**TABLE B14**

Degree/transfer intending math students

All DE Math students										
Cohort	n	Degree, transfer intending (%)	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	6,215	55.9	56.6	55.4	45.9	61.2	61.7	56.4	61.5	52.9
2016-17	7,130	57.5	57.9	57.5	47.2	59.7	63.2	59.1	64.0	55.3
2017-18	7,784	56.2	56.1	56.6	43.8	58.2	63.8	56.6	63.7	52.3
2018-19	8,489	57.2	57.4	57.2	46.1	58.7	63.6	58.6	66.3	56.0
2019-20	9,040	59.1	59.8	58.1	48.6	58.7	65.2	59.3	68.6	57.5
2020-21	8,622	59.2	58.7	59.7	47.1	66.5	66.1	61.4	67.6	58.6
2021-22	6,583	69.8	71.1	68.3	62.3	66.9	74.1	70.2	76.7	69.4
CCAP Math students										
Cohort	n	Degree, transfer intending (%)	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	190	70.0	65.4	75.3	69.2	85.7	70.4	69.0	75.0	68.4
2016-17	747	61.6	61.6	61.6	52.4	73.5	65.7	58.8	68.0	63.6
2017-18	938	61.5	63.7	59.5	54.6	58.3	66.3	56.6	69.6	58.2
2018-19	1,342	64.2	65.2	63.1	57.4	52.7	68.5	61.6	71.6	62.1
2019-20	2,421	59.4	60.1	58.6	49.7	57.6	64.4	56.2	70.2	60.1
2020-21	1,938	60.7	60.8	61.2	47.7	61.5	64.8	60.9	66.9	63.3
2021-22	1,919	70.0	72.1	67.3	65.2	62.5	71.6	69.6	74.3	72.0
Non-CCAP Math students										
Cohort	n	Degree, transfer intending (%)	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
2015-16	6,025	55.5	56.3	54.8	45.4	60.7	61.2	56.2	61.0	52.7
2016-17	6,383	57.1	57.5	57.0	46.6	58.0	62.8	59.1	63.7	54.8
2017-18	6,846	55.5	55.1	56.2	42.6	58.1	63.3	56.5	62.8	51.8
2018-19	7,147	55.9	55.9	56.2	45.0	59.9	62.1	58.2	64.9	55.1
2019-20	6,619	59.0	59.7	58.0	48.4	59.1	65.7	60.3	67.9	56.8
2020-21	6,684	58.7	58.1	59.3	47.0	67.6	66.7	61.6	67.8	57.7

2021-22	4,664	69.8	70.6	68.6	61.6	68.0	75.7	70.4	78.0	68.6
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SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2021-22 who took at least one math dual enrollment credit course at a CCC (in the case of CCAP/non-CCAP) and enrolled in a CCC after high school graduation as a degree/transfer intending student.

**TABLE B15**

DE math course intake

All DE Math students, cohort 2022-23									
Cohort	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
Upper math	3,156	36.5	61.7	50.6	0.8	10.1	24.2	8.0	76.7
Calculus	2,906	46.7	51.5	33.4	1.8	23.9	28.8	17.8	66.2
Algebra	1,955	54.4	43.3	11.9	4.1	43.4	30.3	26.6	49.1
Liberal math	568	60.2	37.7	6.2	3.0	55.3	26.8	38.2	35.0
Precalculus	3,381	49.6	47.8	32.6	2.1	29.9	23.9	24.1	59.7
Statistics	9,270	61.7	36.5	21.0	3.2	41.0	24.8	30.0	49.9
Trigonometry	1,552	49.5	48.4	19.3	3.5	40.9	26.1	28.9	52.1
Other math	316	53.2	46.2	22.2	1.3	24.7	41.1	12.3	65.5

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohort 2022-23 who enrolled in DE math courses.

**TABLE B16**

DE math course combo

All DE Math students, cohort 2022-23	
Combo	n
Upper math-Calculus	1,084
Calculus-Precalculus	656
Calculus-Statistics	604
Precalculus-Statistics	503
Algebra-Trigonometry	491
Precalculus-Trigonometry	460
Algebra-Statistics	451
Upper math-Statistics	444
Calculus-Trigonometry	426

Upper math-Precalculus	385
Statistics-Trigonometry	305
Calculus-Algebra	206
Upper math-Trigonometry	168
Algebra-Precalculus	115
Upper math-Algebra	96
Liberal math-Statistics	82
Other math course-Statistics	81
Upper math-Other math course	35
Algebra-Liberal math	26
Calculus-Other math course	20
Other math course-Precalculus	19
Algebra-Other math course	17
Liberal math-Trigonometry	10
Other math course-Trigonometry	10
Liberal math-Precalculus	9
Upper math-Liberal math	5
Liberal math-Other math course	5
Calculus-Liberal math	3

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohort 2022-23 who enrolled in more than one DE math courses.

### TABLE B17

Number and share of students taking corequisite math courses

All DE Math students		
Cohort	n	%
2015-16	10,716	0.4
2016-17	12,220	0.8
2017-18	13,957	1.7
2018-19	16,195	3.3
2019-20	18,730	4.7
2020-21	19,754	5.0
2021-22	20,938	4.7

2022-23	19,994	3.4
2023-24	22,318	4.6

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in DE math courses.

**TABLE B18**

DE math students demographics by region

All DE Math Students								
Cohort	n	Central Valley / Mother Lode	Inland Empire/ Desert	Los Angeles/ Orange County	North / Far North	San Diego / Imperial	San Francisco / Bay Area	South Central Coast
2016-17	12,220	8.9	6.0	16.2	10.2	11.1	37.4	10.3
2022-23	19,994	14.9	7.7	20.7	11.0	8.6	29.7	7.3
All DE Non-Math Students								
Cohort	n	Central Valley / Mother Lode	Inland Empire/ Desert	Los Angeles/ Orange County	North / Far North	San Diego / Imperial	San Francisco / Bay Area	South Central Coast
2016-17	63,152	10.2	4.0	35.6	8.3	7.6	23.8	10.4
2022-23	110,394	14.9	7.2	31.1	10.5	7.4	20.0	9.0
CCAP Math Students								
Cohort	n	Central Valley / Mother Lode	Inland Empire/ Desert	Los Angeles/ Orange County	North / Far North	San Diego / Imperial	San Francisco / Bay Area	South Central Coast
2016-17	1,142	16.5	4.4	14.7	1.2	51.0	11.7	0.4
2022-23	5,999	18.1	9.7	28.3	8.5	13.5	16.9	5.0
Non-CCAP Math Students								
Cohort	n	Central Valley / Mother Lode	Inland Empire/ Desert	Los Angeles/ Orange County	North / Far North	San Diego / Imperial	San Francisco / Bay Area	South Central Coast
2016-17	11,078	8.1	6.1	16.4	11.1	7.0	40.0	11.3
2022-23	13,995	13.5	6.9	17.4	12.1	6.6	35.2	8.3
All DE TL Math Students								
Cohort	n	Central Valley / Mother Lode	Inland Empire/ Desert	Los Angeles/ Orange County	North / Far North	San Diego / Imperial	San Francisco / Bay Area	South Central Coast

2016-17	8,419	9.1	4.6	15.6	9.7	11.9	37.2	11.8
2022-23	18,121	15.7	8.2	20.4	11.2	9.2	27.9	7.4
All DE Dev Math Students								
Cohort	n	Central Valley / Mother Lode	Inland Empire/ Desert	Los Angeles/ Orange County	North / Far North	San Diego / Imperial	San Francisco / Bay Area	South Central Coast
2016-17	5,156	7.8	10.1	16.8	11.4	8.4	37.5	8.0
2022-23	2,960	7.5	3.0	20.6	8.9	4.1	48.7	7.2

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2022-23 who enrolled in at least one dual enrollment credit course.

**TABLE B19**

First-year GPA for transfer intending students

Cohort	CCAP Math		Non-CCAP Math		Non-DE		Completed TL-math while DE students	
	n	First-year GPA	n	First-year GPA	n	First-year GPA	n	First-year GPA
2015-16	133	2.299	3,341	2.729	197,951	2.266	1,502	3.154
2016-17	460	2.594	3,643	2.791	187,350	2.270	1,919	3.147
2017-18	577	2.641	3,798	2.827	180,255	2.266	2,170	3.173
2018-19	862	2.745	3,997	2.901	165,720	2.328	2,603	3.233
2019-20	1,437	2.859	3,903	2.978	142,686	2.288	3,214	3.260
2020-21	1,177	2.903	3,923	3.084	125,133	2.259	3,385	3.300
2021-22	1,344	2.906	3,254	3.092	110,821	2.222	3,077	3.307
CCAP Math, first year GPA								
Cohort	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	2.317	2.308	2.993	1.974	2.013	2.835	2.088	2.219
2016-17	2.670	2.505	2.966	2.015	2.423	2.824	2.420	2.606
2017-18	2.675	2.589	2.933	2.387	2.458	2.978	2.484	2.851
2018-19	2.806	2.640	3.064	2.488	2.634	2.960	2.637	2.900
2019-20	2.918	2.785	3.117	2.596	2.742	3.042	2.740	2.991
2020-21	2.947	2.838	3.141	2.605	2.805	3.049	2.750	3.033
2021-22	2.907	2.904	3.084	2.432	2.808	3.044	2.773	3.078
Non-CCAP Math, first year GPA								

Cohort	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	2.774	2.679	3.046	2.281	2.478	2.928	2.518	2.912
2016-17	2.830	2.744	3.027	2.174	2.582	3.007	2.590	2.963
2017-18	2.887	2.751	3.114	2.362	2.597	2.992	2.640	3.011
2018-19	2.968	2.816	3.252	2.302	2.649	3.090	2.688	3.075
2019-20	3.026	2.917	3.346	2.330	2.680	3.149	2.716	3.181
2020-21	3.106	3.063	3.343	2.814	2.851	3.172	2.863	3.225
2021-22	3.080	3.108	3.356	2.803	2.837	3.235	2.869	3.240

Non-DE, first year GPA								
Cohort	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	2.357	2.176	2.751	1.843	2.067	2.515	2.113	2.492
2016-17	2.365	2.178	2.791	1.841	2.064	2.538	2.110	2.516
2017-18	2.353	2.179	2.808	1.868	2.046	2.548	2.085	2.534
2018-19	2.412	2.240	2.913	1.908	2.102	2.634	2.138	2.630
2019-20	2.345	2.226	2.873	1.851	2.055	2.601	2.074	2.590
2020-21	2.297	2.220	2.819	1.847	2.016	2.571	2.050	2.540
2021-22	2.262	2.180	2.792	1.828	1.980	2.604	2.008	2.552

Completed TL-math while DE students, first year GPA								
Cohort	Female	Male	Asian	Black	Latino	White	First gen	Non-first gen
2015-16	3.229	3.071	3.281	2.832	2.987	3.250	3.033	3.258
2016-17	3.220	3.063	3.311	2.776	2.952	3.278	2.998	3.271
2017-18	3.224	3.106	3.330	2.810	2.991	3.278	3.065	3.294
2018-19	3.307	3.136	3.415	2.939	3.058	3.342	3.104	3.334
2019-20	3.296	3.219	3.501	3.033	3.061	3.361	3.065	3.412
2020-21	3.321	3.275	3.479	3.058	3.130	3.378	3.133	3.400
2021-22	3.306	3.310	3.453	3.115	3.154	3.411	3.151	3.423

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2021-22 who took at least one math dual enrollment credit course at a CCC (in the case of CCAP/non-CCAP/TL-math completers) and enrolled in a CCC after high school graduation as a degree/transfer intending student.. For DE students, the GPA includes DE courses.

## TABLE B20

Share of student completing transfer-level math through dual enrollment

CCAP Math students, cohort 2022-23

Math type	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
BSTEM	2,437	83.8	86.9	92.1	73.1	78.4	90.7	82.4	89.2
SLAM	3,771	82.8	80.8	90.1	72.9	78.2	85.7	79.4	85.0
Non-CCAP Math students, cohort 2022-23									
Math type	n	Female (%)	Male (%)	Asian (%)	Black (%)	Latino (%)	White (%)	First gen (%)	Non-first gen (%)
BSTEM	7,600	83.7	85.1	91.7	68.8	72.3	84.0	74.1	87.8
SLAM	5,985	82.9	84.5	90.8	65.9	77.6	86.0	77.8	87.3

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohort 2022-23 who took a SLAM and/or BSTEM math course while participating in dual enrollment.

**TABLE B21**

Degree/transfer intending students that transfer to 4yr institutions

CCAP Math			
Cohort	Transfer within 1 year (%)	Transfer within 2 years (%)	Transfer within 3 years (%)
2015-16	3.8	12.8	24.2
2016-17	3.7	14.3	24.5
2017-18	3.3	15.9	24.7
2018-19	4.4	17.8	25.9
2019-20	6.1	18.7	28.6
2020-21	5.6	19.4	
2021-22	2.9		
Non-CCAP Math			
Cohort	Transfer within 1 year (%)	Transfer within 2 years (%)	Transfer within 3 years (%)
2015-16	5.1	17.5	29.5
2016-17	4.3	17.9	28.6
2017-18	4.4	20.8	31.8
2018-19	5.7	22.1	33.8
2019-20	7.8	25.3	37.6
2020-21	7.2	27.5	
2021-22	4.8		
Non-DE			
Cohort	Transfer within 1 year (%)	Transfer within 2 years (%)	Transfer within 3 years (%)

2015-16	0.6	5.3	12.7
2016-17	0.6	6.1	13.7
2017-18	0.7	7.3	14.5
2018-19	0.7	7.9	14.8
2019-20	0.8	8.4	14.5
2020-21	0.7	7.5	
2021-22	0.3		

Completed TL-math while DE students			
Cohort	Transfer within 1 year (%)	Transfer within 2 years (%)	Transfer within 3 years (%)
2015-16	8.3	25.7	38.7
2016-17	6.4	22.4	33.7
2017-18	6.8	26.4	38.5
2018-19	7.3	27.3	39.6
2019-20	10.3	28.7	40.7
2020-21	9.0	30.1	
2021-22	5.6		

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2021-22 who enrolled in a CCC after high school graduation and took at least one math course. Transfer is defined as the completion of at least 12 credits while being enrolled in the CCC one year prior to transferring.

## TABLE B22

### Dual enrollment math trends by academic years

Academic Year	Math dual enrollees	Non-math dual enrollees	CCAP Math	Non-CCAP Math
2015-16	12,009	85,327	378	11,631
2016-17	15,561	115,300	1,759	13,802
2017-18	18,104	133,952	2,064	16,040
2018-19	20,715	163,071	3,369	17,346
2019-20	23,469	178,693	5,475	17,994
2020-21	24,717	168,545	5,300	19,417
2021-22	24,904	170,229	6,664	18,240
2022-23	24,205	160,220	7,695	16,510
2023-24	18,824	98,390	6,271	12,553

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school students who enrolled in at least one dual enrollment credit course at a CCC between the academic year of 2015-16 to 2023-24.

**TABLE B23**

Number and share of math dual enrollees by program type using the 95% threshold approach for CCAP flagging

Cohort	Math dual enrollees	CCAP Math	CCAP Math Share (%)	Non-CCAP Math	Non-CCAP Math Share (%)
2015-16	10,716	364	3	10,352	97
2016-17	12,220	1,529	13	10,691	87
2017-18	13,957	2,229	16	11,728	84
2018-19	16,195	2,947	18	13,248	82
2019-20	18,730	5,378	29	13,352	71
2020-21	19,754	2,982	15	16,772	85
2021-22	20,938	3,006	14	17,932	86
2022-23	19,994	2,935	15	17,059	85
2023-24	22,318	3,385	15	18,933	85

SOURCE: Authors' calculation using COMIS data.

NOTE: Sample restricted to high school graduating cohorts between 2015-16 and 2023-24 who enrolled in at least one math dual enrollment credit course at a CCC. CCAP students are flagged if the student enrolled in a class where over 95% of the enrollees are CCAP students.

**TABLE B24**

Number and share of math dual enrollments by course type

Dual enrollment math enrollments	Course enrollments (N)	Share (%)
Non-transferable math	3,345	11
Liberal arts math	296	1
Statistics	9,759	33
College Algebra	2,069	7
Trigonometry	1,612	5
Precalculus	3,710	13
Calculus I	3,052	10
Upper division math	5,032	17

SOURCE: Authors' calculation using COMIS data.

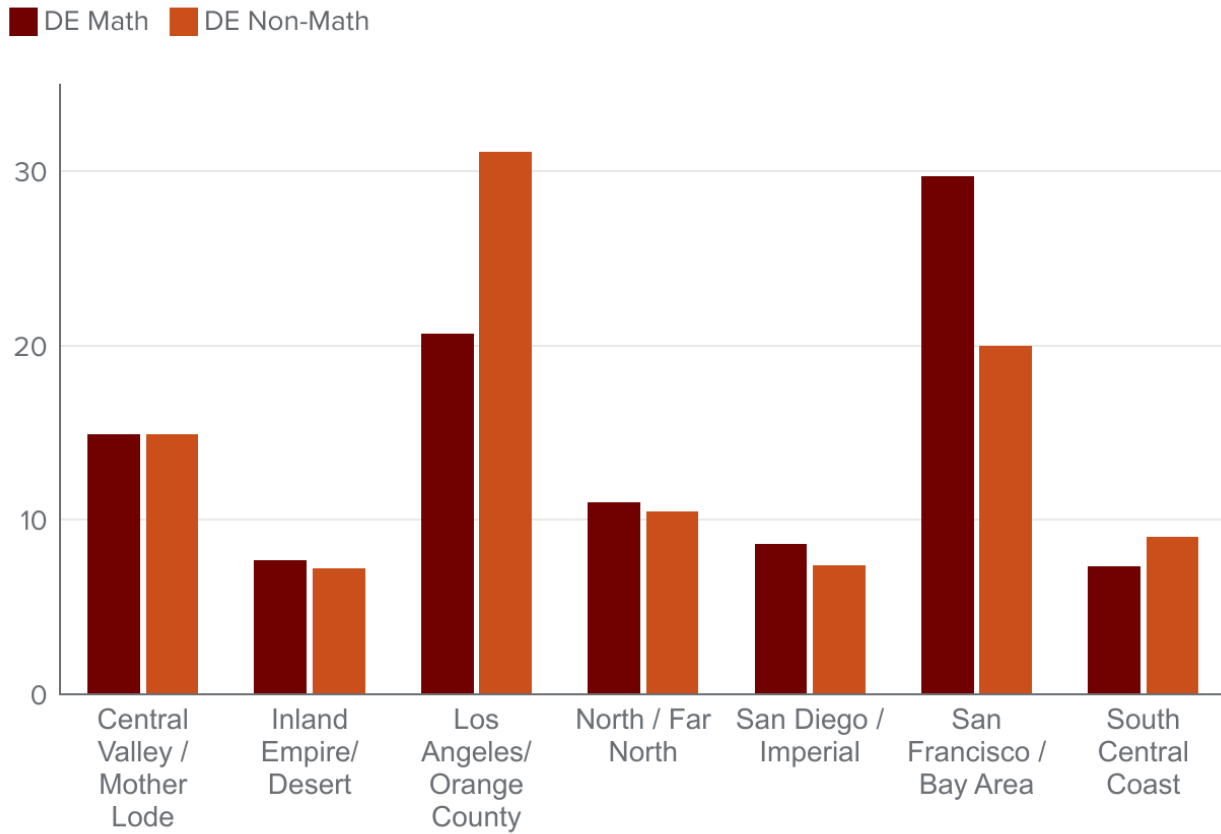
NOTE: Sample restricted to 29,574 math dual enrollments by 19,994 students in 2022-23 high school graduating class. Upper division math courses include Calculus II, Calculus III, differential equations, linear algebra, etc. Precalculus courses include Precalculus + Trigonometry combo. Statistics courses include statistics courses offered outside math departments. These courses represent 97% of math dual enrollments.



FIGURE B1

## Math dual enrollees are more concentrated in San Francisco/Bay Area while non-math dual enrollees are concentrated in Los Angeles/Orange County

% distribution



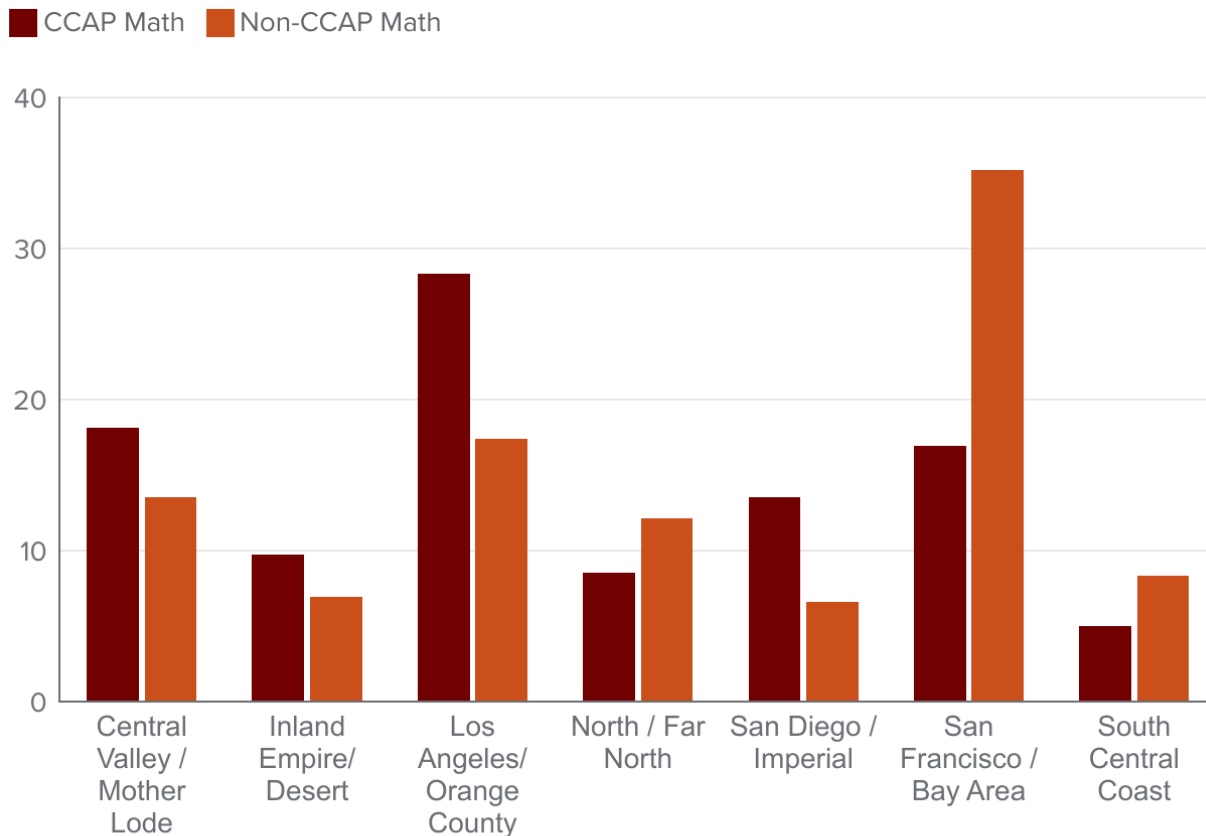
**SOURCE:** Authors' calculations using MIS data.

**NOTES:** Sample is restricted to high school graduating cohort of 2022-23 who enrolled in at least one dual enrollment credit course at a CCC. Figure is created using data from Technical Appendix Table B18.

FIGURE B2

### CCAP math dual enrollees are more represented in Los Angeles/Orange County and San Diego/Imperial regions than non-CCAP enrollees

% distribution



**SOURCE:** Authors' calculations using MIS data.

**NOTES:** Sample is restricted to high school graduating cohort of 2022-23 who enrolled in at least one math dual enrollment credit course at a CCC. Figure is created using data from Technical Appendix Table B18.

FIGURE B3

## The demographic composition of dual enrollees in transfer-level math courses now mirrors more closely the distribution in non-transferable math courses only

% distribution

### TL math

	Male	Female	First Gen	White	Black	Latino	Asian
2016-17	47	51	24	31	3	29	28
2022-23	44	54	25	25	3	35	26

### Non-TL math only

	Male	Female	First Gen	White	Black	Latino	Asian
2016-17	44	55	34	28	6	42	15
2022-23	44	54	26	23	4	32	29

**SOURCE:** Authors' calculations using MIS data.

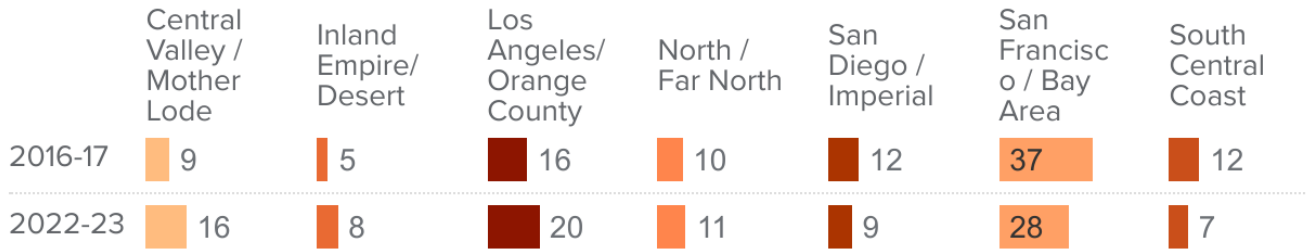
**NOTES:** Sample is restricted to high school graduating cohorts of 2016-17 and 2022-23 who enrolled in at least one math dual enrollment credit course at a CCC. Students who took both non-transferable math courses and transfer-level math courses through dual enrollment are counted under "TL math." Figure is created using data from Technical Appendix Table B5. For context, the racial composition of all 12th graders in 2022-23, according to the CDE DataQuest, is: 4.9% African American, 9.5% Asian, 55.7% Hispanic or Latino, 21.2% White, and the rest are American Indian and Alaska Native, Filipino, Pacific Islander, Two or More Races, and Not Reported.

FIGURE B4

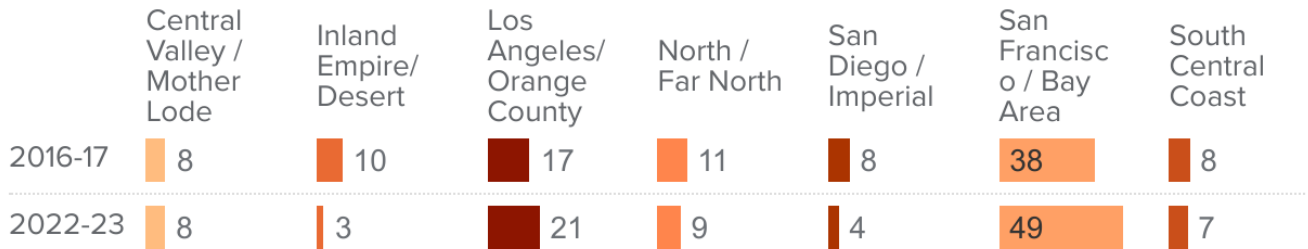
## Students from Central Valley/Mother Lode and Inland Empire/Desert regions are now more represented among dual enrollees taking transfer-level math courses

% distribution

### TL math



### Non-TL math only



**SOURCE:** Authors' calculations using MIS data.

**NOTES:** Sample is restricted to high school graduating cohorts of 2016-17 and 2022-23 who enrolled in at least one math dual enrollment credit course at a CCC. Students who took both non-transferable math courses and transfer-level math courses through dual enrollment are counted under "TL math." Figure is created using data from Technical Appendix Table B18.

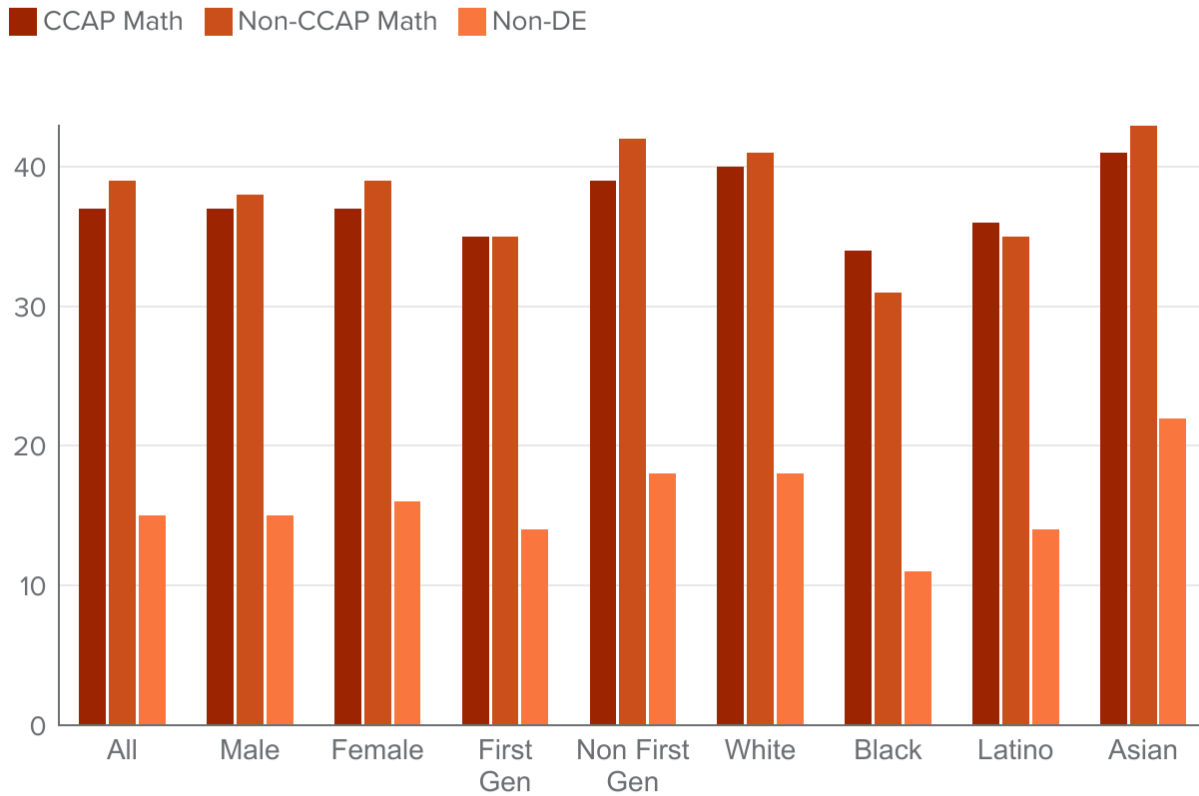
FIGURE B5

## Math dual enrollees accumulate more units by the end of first year of college enrollment

Number of units accumulated by the end of 1st college year

By demographics

By cohorts



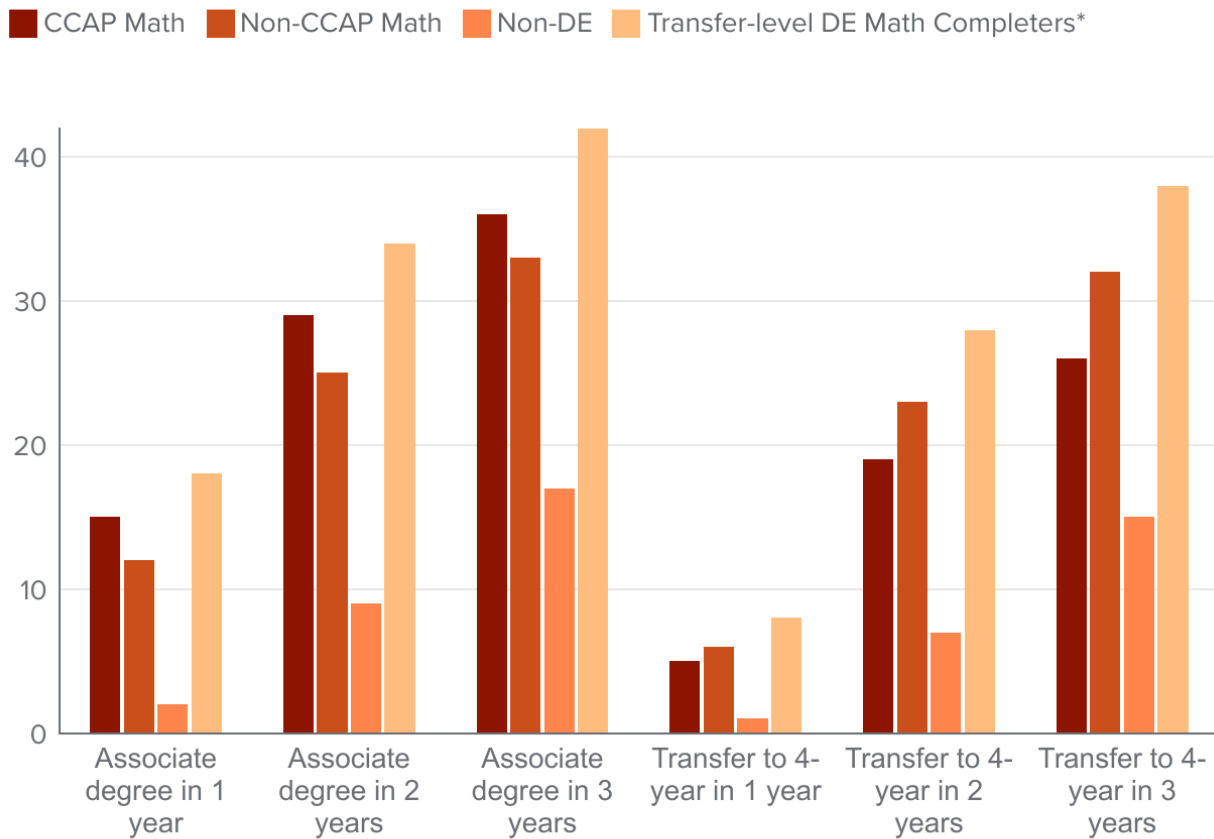
**SOURCE:** Authors' calculation using COMIS data.

**NOTES:** Sample is restricted to high school graduating cohorts between 2015-16 and 2021-22 who enrolled in a CCC after high school graduation as a degree/transfer-intending student. Figure is created using data from Technical Appendix Table B12.

FIGURE B6

## Math dual enrollees achieve better completion outcomes

Associate degree completion and transfer to 4-year institutions rates



**SOURCE:** Authors' calculation using COMIS data.

**NOTES:** Sample is restricted to and pooled together high school graduating cohorts between 2015-16 and 2021-22 who enrolled in a CCC after high school graduation as a degree/transfer-intending student and whose degree data are available. Associate degrees include credit awards only. Figure is created using data from Technical Appendix Table B13 & B21. \*Transfer-level DE math completers are students who completed transfer-level math courses during high school through dual enrollment, and are a subset of CCAP/Non-CCAP Math groups.

## Appendix C. Additional Insights from Interviews

### Recruitment into dual enrollment courses varies

According to interviewees, general recruitment into dual enrollment and traditional high school courses appears to be similar unless the dual enrollment courses are part of a larger structured pathway (such as CTE pathways) that is promoted to students and parents. In other words, enrollment into dual enrollment occurs through a self-selection process similar to that of other high school courses, unless individual counselors are intentional with encouraging students who otherwise would not see themselves as college-bound to consider enrolling in a dual enrollment course. However, some partnerships are intentional about recruiting underrepresented students or from cohorts of students. Interviewees reported that students are exposed and recruited into dual enrollment through their personal knowledge from family and friends, personal relationships with high school counselors, or blanket promotion of opportunities from the high school. Community colleges are typically not involved in student recruitment but may choose to do so for structured dual enrollment programs at high schools with which they have established relationships.

### Background Information on the Math Bridge Program

College Bridge has made tremendous efforts in expanding access to dual enrollment in California with the establishment and implementation of the Dual Enrollment Math Bridge program. In line with its mission to identify and eliminate barriers to accessing and succeeding in postsecondary education for underrepresented students from Black, Latino, low income and rural students, College Bridge has made significant progress in scaling dual enrollment partnerships in the Central Valley.

In December 2022, College Bridge, in partnership with the Central Valley Higher Education Consortium (CVHEC) — including Cerro Coso, Columbia, Madera, Reedley, Taft, and West Hills College Coalinga — launched the Math Bridge program with initial funding from the U.S. Department of Education. As a high school intervention program, the overall goal of the Math Bridge seeks to close equity and achievement gaps in college math and college completion at the 21 Central Valley rural high schools within the six colleges' service areas.

To expand the program's reach to more low-income, minority, and rural students, College Bridge secured additional grants from the California Regional K-16 Education Collaboratives Grant Program (through the Fresno-Madera K-16 Collaborative and the Tulare-King College and Career Collaborative) as well as the federal government in April and December 2023.

Math Bridge provides high school students specifically and/or those who are non-traditionally college bound access to transfer-level math coursework to help them transition seamlessly from high school to college. In highlighting the success of the program, an executive officer of the program noted, “...we've spent 11 years building a model that is closing successfully not just equity and achievement gaps but having kids who come in from behind leapfrogging their honors peers and coming out of high school ahead. We have seen kids who used to struggle in math graduate high school with their math done from college, and then flips to pursue STEM majors at very high rates, and they're successful. We can absolutely use this as a model to close equity and achievement gaps for sure.”

Beyond the access to college level math coursework, program participants will receive comprehensive support services, including academic advising, counselling, mentorship and financial aid assistance carefully curated by their college and/or high school instructors to facilitate a seamless transition to postsecondary options. In commenting on the access to support services for students enrolled in the program, the executive member

intimidated- “...the last thing we want is for them to simply take a dual enrollment math course without any of the support services, because the last thing that I want, everybody else wants, is 30% of the kids walking around with either an F or a withdrawal on a transcript. It can also be really devastating to some students if they're not given any assistance while they're taking dual enrollment courses, especially mathematics, which is a tough subject for many students.” According to Math Instructor in College A in the Central Valley, “in addition to tutoring, the math bridge team provides wraparound support for students. We sometimes help students with college exploration where counselors provide information on things they might encounter in their first year of college.”

Participation in the program is at no cost to students, occurs on their high school campus, and occurs during the regular bell schedule- (except for a few institutions that have night classes).

A key component of the program is the integration of the College Transition Bridge (CT Bridge) curriculum into the math courses to enhance student retention, completion and overall college success. At the end of Fall 2025 (first year of implementation), Math Bridge will enroll nearly 1,000 students from 13 Central Valley high schools in college-level math courses<sup>5</sup>.

## Background Information on Professional Development for Dual Enrollment Instructors

In highlighting the significance of continuous training, an adjunct faculty in College B with over 25 years of experience teaching high school students shared an encounter they had personally training a new dual enrollment instructor. They noted below,

*“...in teaching high school classes there needs to be a bit of adjustments and alignment. Ordinarily people assume a faculty member who teaches Algebra 2 and other college level math courses shouldn't have a problem teaching high school students. However, in handling [their] first dual enrollment class, [they were] a little nervous about Math 11, which is statistics. So, [we] met several times, and we looked over the lessons and tests. I helped [...] by giving some pointers and how to handle the class [and] giving some ideas of what to cover and what not to cover. [...]. When it's your first time teaching students at a level you are not used to, you must try and figure it how to go about it. [The instructor] had to learn Canvas and a whole new grading system and everything else. So, there's a lot to do. [...] At the end of the encounter, they said, “Hey, I'm just going to use the resources you gave me and then go from there and adjust, because yeah, it's going to be a learning curve.””*

This encounter underscores the need to have needed training to be able to handle the demands of a new classroom.

## Aligning high school and community college interests poses challenges

**The professional boundaries of teachers and faculty.** For example, multiple interviewees referred to instances in which the math teacher at a high school was hired by the partner community college to be an adjunct faculty. While the high school expected their teacher to be able to teach the forthcoming dual enrollment course at their high school, another faculty at the community college with seniority in teaching placements unexpectedly accepted the teaching appointment.

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<sup>5</sup> (MATH BRIDGE UPDATE- April 2024 – Central Valley Higher Education Consortium, n.d.)



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