

Transitions in Math from High School to Community College Before and After AB 705, Updated through Fall 2021

Terrence Willett

January 2023 | www.rpgroup.org

Introduction

The California Community Colleges (CCC) began implementation of AB 705 in fall 2018, ensuring that most students started in transfer-level math rather than a developmental education sequence (see sidebar). The RP Group's Multiple Measures Assessment Project (MMA) has found that for all student groups, dramatically increasing access to transfer-level math courses corresponds with significantly improved completion of these courses within one year (i.e., throughput-see Key Terms, p. 2). These outcomes exceed all rates exhibited in the past when students largely began in basic skills offerings. At the same time, course success has decreased at varying rates across colleges, resulting in a perceptual "paradox" of one key indicator increasing (throughput) as another decreases (course success rates).¹

Further, educators, advocates, and policy makers alike have hoped that increased access to transfer-level courses would lead to greater alignment between the state's high schools and community colleges in math pathways, with students taking the next step beyond their high school learning rather than repeating courses they already completed. However, with implementation varying across the state, it is unclear to what extent

Multiple Measures Assessment Project (MMA) Overview

The RP Group launched MMA in 2014 to contribute to the advancement of developmental education reform in the California Community Colleges. MMA now supports the California Community Colleges Chancellor's Office with the implementation of AB 705 and AB 1705 which seek to improve equitable placement and completion.

This legislation requires colleges to maximize students' completion of transfer-level English and math courses within one year (and three years for those placed into the English as a Second Language sequence). Colleges must use students' high school coursework, grades, and grade point average (GPA) for placement, and offer support to increase their enrollment and success in transfer-level classes. MMA conducts research and provides recommendations to help colleges – and ultimately our system's students – achieve these goals.

Learn more at www.rpgroup.org/mma.

¹ Find this and other research produced by MMA at www.rpgroup.org/mma.

colleges are intentionally placing students into math courses that build on and advance their high school learning rather than duplicating content and revisiting skills.

To better understand these issues and the impact of AB 705 on how students transition from high school to community college in math pathways, MMAP compared CCC students' math placement and initial course completion in fall 2016 (pre-AB 705 implementation)² to fall 2021 (post-implementation). This brief provides a summary of this comparison, updating research previously released by The RP Group showing data through fall 2019. Find below key findings followed by a high-level description of our methodology. Then discover details from our analysis, followed by a conclusion that includes ideas for future research.

Key Findings

Prior to AB 705 implementation (fall 2016):

- **Most students had to retake math courses they already successfully completed in high school;** about 78% of students repeated one or more math courses at the community college previously passed in high school with a C- or better.
- **Minoritized³ students were about 20% more likely than Asian and White students to take community college math courses that were lower** than those they had already successfully completed in high school.

After AB 705 implementation (fall 2021):

- **Far fewer students had to repeat math coursework already completed in high school once enrolled at a community college;** 47% of students repeated one or more math courses at the community college previously completed in high school with a C- or better.
- **Over 80% of minoritized students transitioned to transfer-level math at their community college.**

Continued challenges include:

- **Almost half of students are still repeating previously completed high school math coursework.**
- **Students are retaking advanced math courses at high rates post-AB 705.** The rate of students who completed an advanced high school math course (above Algebra 2) and repeated the same course at the community college was over twice as high in 2021 (21%) compared with 2016 (9%).
- **Now, more students are successfully completing transfer-level math in one term compared to the period before AB 705's implementation; this finding holds true even when giving those students who started in remediation pre-AB 705 one year or longer to complete. Since passage**

Key Terms

Throughput: percent of students who enrolled at a particular starting level then successfully completed the transfer-level English or math course in one year, OR who successfully completed either a transfer-level English or an ESL course equivalent to transfer-level English in three years.

Course success: completion of a transfer-level English or math course in one term, with a grade of A, B, C, CR, or P, regardless of starting level (i.e., at or below transfer level).

² AB 705 took effect in fall 2018.

³ Minoritized ethnicities include Black/African American, Filipina/o/x, Hispanic/Latina/o/x, Native American/Indigenous, and Pacific Islander students.

of the law we have seen a perceptual “paradox” of completion volumes increasing as success rates decreased.

Even though course success rates have been declining, they are far above throughput for students who started in remedial courses prior to AB 705 (e.g., ~20% throughput for students who started one level below transfer-level math prior to the law’s implementation compared with a 52% average course success rate for transfer-level math in fall 2021). The fourfold and higher increase in access to transfer-level coursework for some minoritized groups has resulted in a net increase of students completing these courses in spite of lower success rates. Notably, this period includes the height of the COVID-19 pandemic and its corresponding impacts that complicate evaluation efforts.

Methodology

The RP Group obtained data for this analysis from the Ed Results Partnership’s Cal-PASS (Partnership for Achieving Student Success) Plus data system using the MMAP data file methodology.⁴ We limited our analysis to students with four years of high school data however findings are not necessarily strictly limited to that group. To determine the highest level of high school math successfully completed by these students, the analysis included a student’s last high school math course completed with a grade of C- or better. Then, we looked at the first math course they enrolled in at their community college. See Table 1 for a list of math course abbreviations referred to in this analysis.

Table 1. Math Course Abbreviations

Abbreviation	Definition
Arith	Arithmetic
PreAlg	Prealgebra
Alg 1	Algebra 1 and equivalent (e.g., Integrated Math 1)
EIAlg	Elementary Algebra and equivalent (e.g., two levels below transfer)
Geom	Geometry and equivalent (e.g., Integrated Math 2)
Alg 2	Algebra 2 and equivalent (e.g., Integrated Math 3)
IntAlg	Intermediate Algebra and equivalent (e.g., one level below transfer)
PreCalc	Precalculus
Calc+	Calculus 1 or higher
AP Stats	Advanced Placement Statistics
TL	Transfer Level Course
BSTEM	Business, Science, Technology, Engineering, Math
SLAM	Statistics and Liberal Arts Math

Analysis

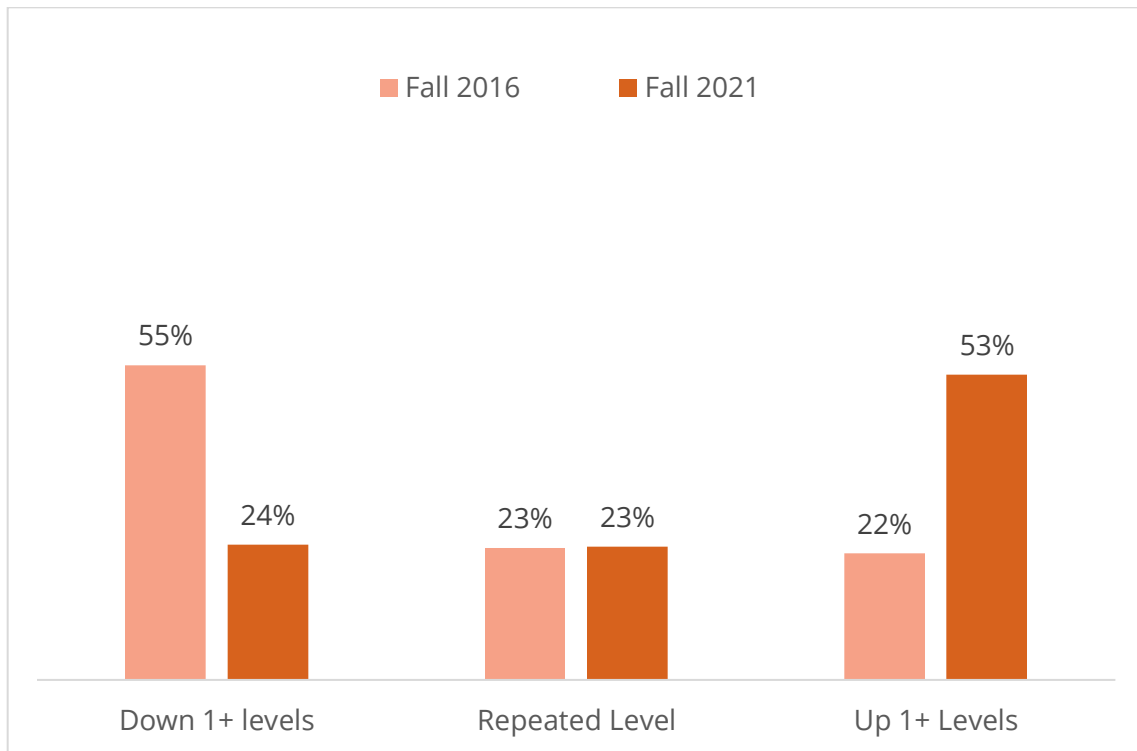
Figure 1 shows that after AB 705 implementation, students were much more likely to place at least one level above their high school math coursework once enrolled at a community college. Students’ placement in courses lower than the highest-level math they completed in high school dropped by more than half from 55% in 2016 to 24% in 2021. On the other hand, the rate at which students were placed in the next course or a

⁴https://rpgroup.org/Portals/0/Documents/Projects/MultipleMeasures/AB705_Workshops/AccessEnrollmentSuccess_RPGroup_Final2020-1.pdf?ver=2021-04-28-082835-143

higher-level offering than completed in high school more than doubled from 22% to 53%, respectively. The rate at which students repeated the same course remained the same (23%).

At the same time, these data indicate that nearly half (47%) of students continue to repeat or enroll in a lower-level course than they already successfully completed in high school, slowing their trajectory from high school to college along their math pathway.

Figure 1. Student Transitions from High School to Community College by Level of First Attempted Math Course, Fall 2016 Compared with Fall 2021



Further, the **rate at which all racial/ethnic groups transitioned to a course one or more levels above the highest course they completed in high school more than doubled for all groups** – a positive sign for AB 705’s impact on improving equitable outcomes (Figure 2). These rates were about 2.5 times greater for Black/African American and Latina/o/x students and almost 3 times higher for Pacific Islanders.

Notably, Asian students transitioned up one or more levels at the lowest rate in fall 2021. Historically, Asian students have been much more likely to complete advanced high school math. For example, Asian students were twice as likely as White students and almost 5 times as likely as Latina/o/x students to have completed calculus in high school in fall 2016. The apparently low upward transition rate for Asian students in fall 2021 appears to be caused by a “ceiling effect,” meaning these students are already much closer to the maximum level math course available at their community college.

Figure 2. Percentage of Students Transitioning up One or More Levels of Math from High School to Community College by Ethnicity, Fall 2016 Compared with Fall 2021

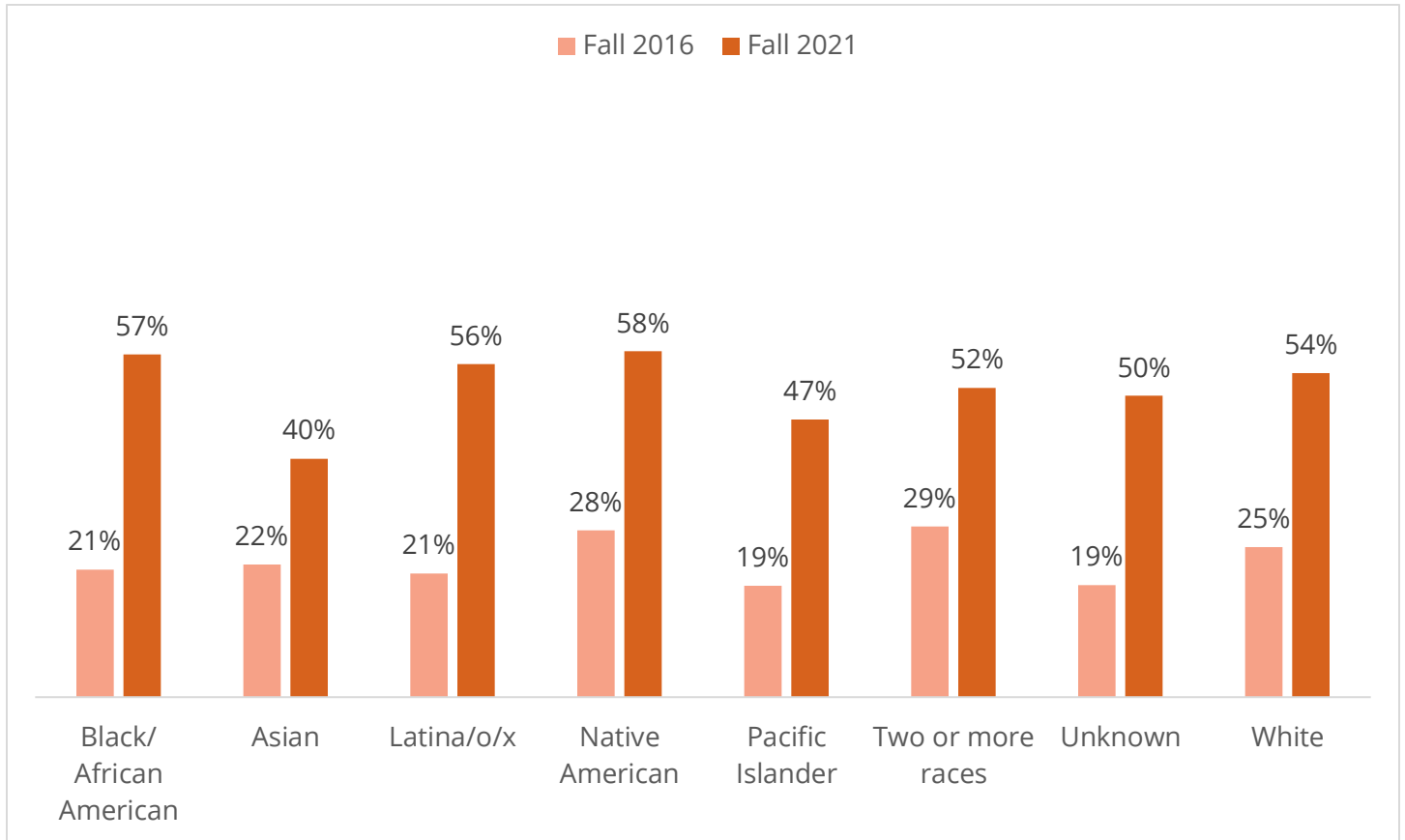


Figure 3 displays the percentage of students who enrolled in a transfer-level math course at the community college. The rates at which all student groups accessed transfer-level math increased substantially from 2016 to 2021: about twofold for Asian and White students, over fourfold for Latina/o/x students, over fivefold for Black/African American students, sixfold for Pacific Islander students, and sevenfold for Native American students. At the same time, Black/African American, Latina/o/x, Native American, and Pacific Islander students' transition to transfer-level courses remained lower than those of their Asian and White counterparts.

Figure 3. Percentage of Students Transitioning to Transfer-Level Community College Math by Ethnicity, Fall 2016 Compared with Fall 2021

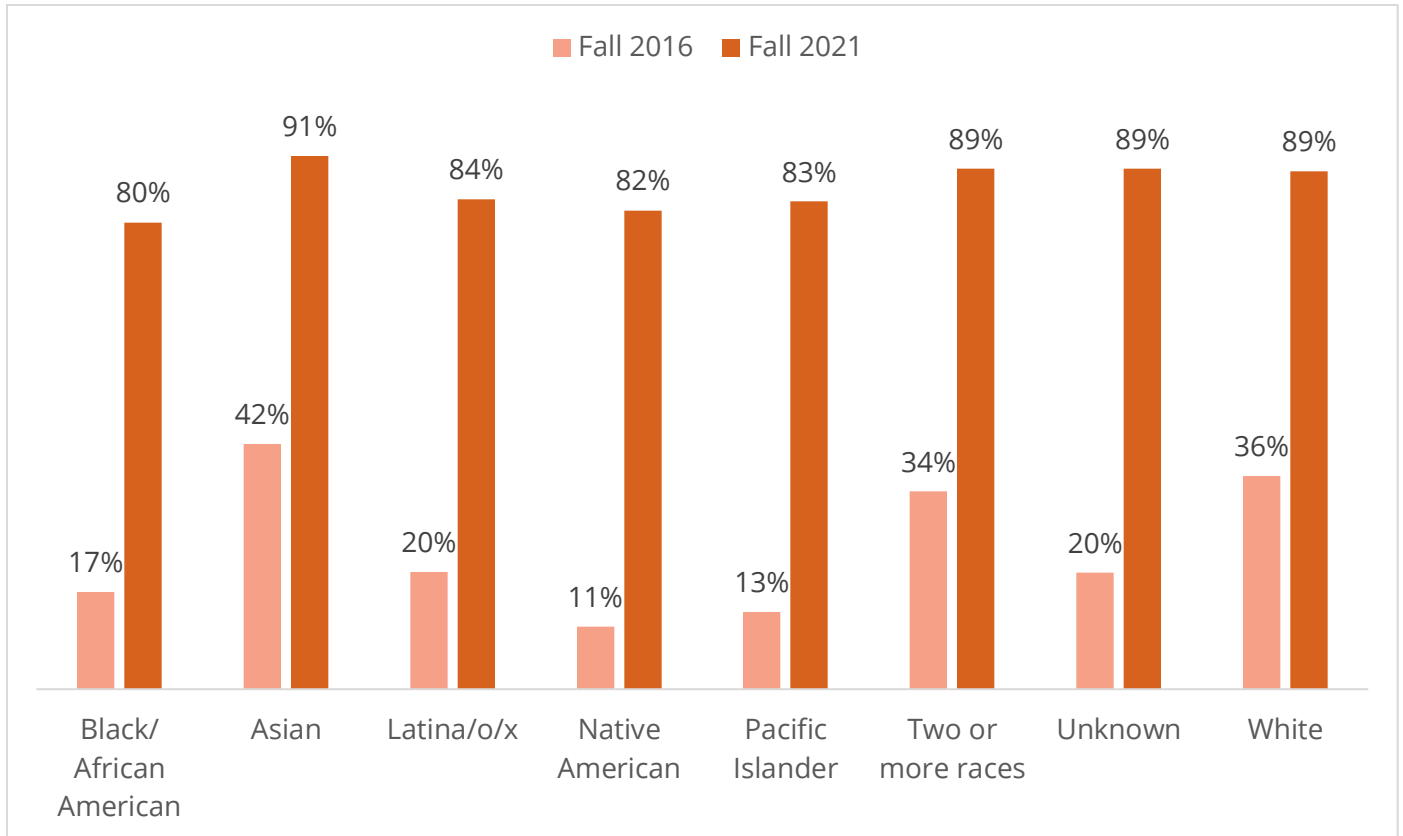


Table 2 groups students by the highest math course they completed in high school, then shows the row percentage of those who placed into different levels of math at the community college. For example, looking at the first row of data in Table 2, of those whose highest high school math was arithmetic (HS Arith), 12% attempted arithmetic (CC Arith) as their first math course at the community college in fall 2016.

Asterisks (*) indicate the cell had fewer than 10 students. Darker shaded cells represent higher values within each row for high school course level. Cells with an orange border indicate repeating already completed high school courses. "Total Row %" refers to the total percentage of students who placed at a given level once at the community college, regardless of highest math course completed in high school. For example, 5% of all students placed into CC Arith in fall 2016. See Table 1 (p. 3) for a list of course abbreviations.

We compared these data for fall 2016 and fall 2021. As displayed, **a student who completed high school arithmetic in fall 2016 was placed in community college elementary algebra at the highest rate (34%). However, these students were placed into transfer-level statistics and liberal arts math (SLAM) (51%) at the highest rate post-AB 705.** A plurality of students had completed Algebra 2 or the equivalent in high school in both years. In fall 2016, about one-third of those students repeated Algebra 2 at the community college, while almost another third retook lower-level courses. In contrast, a strong majority (84%) of these students transitioned to transfer-level classes in fall 2021.

Table 2. Students' Math Pathways from High School to Community College, Fall 2016 Compared with Fall 2021

	CC Arith	CC PreAlg	CC EI Alg	CC Geom	CC Int Alg	CC TL SLAM	CC PreCalc	CC Calc+	Total N
Fall 2016									
HS Arith	12%	29%	34%	*	21%	2%	1%	*	1,674
HS PreAlg	17%	40%	18%	*	23%	*	*	*	109
HS Alg 1	11%	32%	32%	*	22%	2%	1%	*	1,905
HS Geom	8%	23%	32%	*	31%	3%	2%	0%	4,296
HS Alg 2	4%	13%	24%	*	40%	11%	8%	1%	8,044
HS Stats	2%	10%	17%	*	34%	19%	13%	5%	3,697
HS PreCalc	2%	6%	12%	*	37%	18%	19%	6%	4,745
HS Calc+	1%	1%	3%	*	20%	16%	20%	39%	1,776
Fall 2016 Total Row %	5%	14%	22%	0.05%	33%	11%	10%	5%	100%
Fall 2016 Total Row N	1,261	3,800	5,749	13	8,661	2,937	2,563	1,262	26,246
Fall 2021									
HS Arith	*	1%	3%	*	25%	51%	18%	1%	2,401
HS PreAlg	*	*	*	*	38%	45%	8%	*	93
HS Alg 1	0.2%	1%	3%	*	23%	52%	19%	2%	2,605
HS Geom	0.4%	1%	3%	*	26%	52%	17%	1%	3,867
HS Alg 2	0.1%	0.5%	1%	*	13%	55%	27%	3%	12,042
HS Stats	*	0.3%	0.5%	*	7%	56%	26%	9%	8,379
HS PreCalc	*	0.1%	0.4%	*	6%	48%	28%	18%	8,014
HS Calc+	*	*	*	*	3%	32%	15%	50%	3,608
Fall 2021 Total Row %	0.1%	1%	1%	*	12%	51%	24%	11%	100%
Fal 2021 Total Row N	46	207	456	*	5,004	20,951	9,881	4,464	41,009

Notes: * indicates cell had fewer than 10 students. Darker shaded cells represent higher values within each row of high school course level. Cells with an orange border indicate repeating already completed HS courses. See p. 3 for list of course abbreviations.

As Table 3 shows, **students' overall success rates in their first community college math course after transitioning from high school declined from 57% in fall 2016 to 52% in fall 2021**, dropping to as low as 47% in fall 2019. Looking at high school Algebra 2 completers alone, those who repeated that class at a CCC had a 55% success rate in fall 2016, which was nearly identical to that of their peers who attempted statistics once at a community college (54%). However, in fall 2021, the success rate for those repeating Algebra 2 was 3 percentage points lower than for those progressing to statistics (45% and 48%, respectively). In both years, the highest success rates were generally seen among students (a) repeating a course more than one level below the highest math course completed in high school, and (b) those who completed high school math courses above Algebra 2.

Figure 5. Success (Grade of C or Better) in First Community College Math Course Attempted after High School Transition, Fall 2016 Compared with Fall 2021

	CC Arith	CC PreAlg	CC EI Alg	CC Geom	CC Int Alg	CC TL SLAM	CC PreCalc	CC Calc+	Total N
Fall 2016									
HS Arith	52%	46%	39%	*	37%	51%	43%	*	1,674
HS PreAlg	50%	41%	35%	*	36%	*	*	*	109
HS Alg 1	48%	43%	40%	*	29%	42%	40%	*	1,905
HS Geom	50%	55%	46%	*	41%	39%	34%	59%	4,296
HS Alg 2	64%	66%	58%	*	55%	54%	46%	39%	8,044
HS Stats	64%	65%	65%	*	65%	72%	69%	68%	3,697
HS PreCalc	66%	72%	69%	*	66%	68%	59%	58%	4,745
HS Calc+	50%	86%	79%	*	76%	81%	69%	74%	1,776
Fall 2016 Total Row %	55%	57%	53%	54%	55%	64%	57%	67%	57%
Fall 2016 Total Row N	1,261	3,800	5,749	13	8,661	2,937	2,563	1,262	26,246
Fall 2021									
HS Arith	*	43%	44%	*	34%	40%	36%	49%	2,401
HS PreAlg	*	*	*	*	26%	40%	0%	*	93
HS Alg 1	40%	45%	47%	*	37%	42%	39%	52%	2,605
HS Geom	43%	43%	50%	*	38%	36%	31%	30%	3,867
HS Alg 2	27%	66%	46%	*	45%	48%	39%	40%	12,042
HS Stats	*	50%	52%	*	55%	64%	55%	68%	8,379
HS PreCalc	*	33%	64%	*	63%	65%	54%	52%	8,014
HS Calc+	*	*	*	*	73%	78%	65%	72%	3,608
F2021 Total Row %	41%	50%	49%	*	44%	54%	47%	62%	52%
F2021 Total Row N	46	207	456	*	5,004	20,951	9,881	4,464	41,009

Notes: * indicates cell had fewer than 10 students. Darker shaded cells represent higher values within each row of high school course level. Cells with an orange border indicate repeating already completed HS courses. See p. 3 for list of course abbreviations.

Conclusion

This analysis compares students' math transitions from high school to community college in fall 2016 and fall 2021 to examine the impact of AB 705 implementation beginning in 2018. However, voluntary reform efforts were underway across California's community colleges prior to the passage of AB 705, including acceleration, enhanced multiple measures placement, supplemental instruction, embedded tutoring, and equity pedagogy. Multiple policy and practice changes combined with the impacts of a global pandemic (i.e., rapid movement to online instruction) make it challenging to separate the influence of the AB 705 law from these other factors.

At the same time, these reforms have clearly resulted in most students beginning in transfer-level math once at their community college. This increased access to transfer-level courses has more than made up for declines in transfer-level math success rates, resulting in a greater volume of students completing gateway math. This creates a perceptual "paradox" where instructors see lower success rates in their courses but policy makers see increases in the key performance indicator of completion of transfer-level math (as well as English).

In part, this may result from instructors encountering a higher percentage of students in their transfer-level courses who are first-time college math takers and proportionately more from minoritized populations. This context contrasts with the pre-AB 705 era when the majority of students in transfer-level math (and English) were "survivors" of remedial sequences; by definition, these students had more college experience as well as skills and strategies to succeed in higher education. Moreover, these students were disproportionately White and Asian. Still further, grading practices remain unstandardized regardless of AB 705 implementation, and definitions of "rigor" vary among faculty over time, making it difficult to determine causal factors between the impacts of the legislation and changes in success rates without examining data at the instructor level.

Although more students are completing gateway math than ever before, challenges remain, with many students repeating high school coursework – especially those at the advanced math level. AB 705 focused on maximizing the completion of transfer-level work of *any* level and did not address upward progression when transitioning to college. This analysis indicates that many advanced high school math students do not pick up their math sequence where they left off once at community college, with the volume of students in the "calculus to calculus" transition category more than doubling in the timeframe between fall 2016 to fall 2021 (from 684 to 1,801).

Articulation of high school and community college coursework is up to local districts to manage and focusing on such efforts could increase students' completion rates and reduce time and units to completion. The recent passage of AB 1705 now specifically prohibits colleges from making students repeat coursework already successfully completed in high school. In addition, that legislation limits colleges to having no more than two courses that are prerequisite to the calculus sequence. MMAP will continue to monitor students' math pathways to understand if and how AB 1705 is further strengthening transitions for advanced math students.

One consequence of AB 705 and the follow up legislation of AB 1705 is that the average community college student is deciding between the Statistics and Liberal Arts Math (SLAM) and the Business, Science, Technology, Engineering Math (BSTEM) pathways in their first math enrollment. Current MMAP research is examining the degree to which students continue along a BSTEM pathway or switch to SLAM (or vice versa), how these choices relate to students' selection of a college major, and their subsequent progression towards completion including students' progression through the community college BSTEM math sequence through calculus and differential equations and linear algebra. Results could inform high school to college articulation and implementation of guided pathways approaches, including student advising and support program development.