Research Brief

What Students Say About Their STEM Calculus 1 Preparation, Experiences, and Success

Statewide Survey Findings

November 2026

Introduction

In 2022, California passed AB 1705—legislation that built on developmental education reform catalyzed by AB 705 and further focused on improving equitable math placement and outcomes for community college students pursuing Science, Technology, Engineering, and Math (STEM) majors. AB 1705 specifically requires colleges to place these students directly in STEM Calculus 1 (California Community Colleges Chancellor's Office [CCCCO], 2024).[1]

As colleges work to respond to these requirements, understanding California community college students' STEM Calculus 1 experiences in this new context can help to strengthen implementation to best meet their needs and advance their success. In fall 2025, The RP Group's Multiple Measures Assessment Project conducted a statewide survey of students who had (1) enrolled in STEM Calculus 1, regardless of major, or (2) declared a STEM major that required it. Through this study, nearly 2,000 students from 57 colleges shared information on their prior math background, their sense of readiness for STEM Calculus 1, and—among those who had taken the course—their experiences in it.

This research finds that while high school background matters, how students perceive their preparedness and how confident they feel is also associated with their STEM Calculus 1 success.

STEM CALCULUS STUDENT SURVEY OVERVIEW

- Surveyed California community college students who either enrolled in STEM Calculus 1 or were a first-time student who declared a STEM major, fall 2019 through fall 2025
- Engaged nearly 2,000 participants from 57 colleges across the system
- Administered online in fall 2025
- Explored students' prior math preparation, route to STEM Calculus 1, course experiences, and course outcomes
- Captured students' perceptions of their readiness for and performance in STEM Calculus 1 and the factors impacting their success

IN THIS BRIEF

Of the students surveyed, some had taken STEM Calculus 1 while others had not attempted the course. This brief highlights results from the subset who took STEM Calculus 1, focusing on their preparation,

[1] California Community Colleges Chancellor's Office implementation guidance provides additional details on these requirements and related exceptions.

experiences, and course success. It includes additional analyses examining the relationships among students' reported high school math background, their psychological readiness (i.e., their Perceived Preparedness and Calculus Confidence), and their STEM Calculus 1 pass rates. (A companion brief examines the experiences of students who chose not to take STEM Calculus 1; see sidebar below.)

We begin with an overview of the study, followed by key findings. We conclude with practical implications for how California's community colleges can improve completion of this important STEM program milestone, ultimately strengthening both students' economic mobility and the state's workforce.

Study At a Glance

The MMAP team conducted a statewide survey in fall 2025 to obtain a broad view of student experiences across the California Community Colleges (CCC) system. We developed the survey with input from multiple stakeholders, including Student Senate for California Community Colleges members and the Chancellor's Office, to strengthen clarity and relevance. We contacted all 115 colleges offering transfer-level math courses in early September 2025, requesting their assistance with local administration and providing messaging for student outreach.

FOR MORE INFORMATION

Find details on data and methods in the technical appendices.

Find results from survey participants who did not take STEM Calculus 1 in *Research Highlight: Why Students Choose Not to Take STEM Calculus 1*.

The online survey was open from September to November 2025. We asked colleges to distribute it to first-time and first-enrolled STEM students and to any student who had attempted STEM Calculus 1, fall 2019 through fall 2025 (regardless of major). Participants completed a short series of questions about their experiences pursuing a STEM degree and/or taking STEM Calculus 1 at a California community college. In total, 1,979 students from 57 different colleges responded to the survey, providing a broad and diverse set of perspectives to inform ongoing implementation of AB 1705 and future efforts to strengthen STEM math placement and outcomes statewide.

Of the 1,979 respondents, 987 reported ever enrolling in STEM Calculus 1. This brief focuses on the responses of those students. Find full details about the study's data and methods and all results in the technical appendices (see sidebar on this page).

Key Findings

WHAT STUDENTS SAY ABOUT THEIR STEM CALCULUS PREPARATION, EXPERIENCES, AND SUCCESS

Students entered STEM Calculus 1 with a wide range of high school math backgrounds.

Of the nearly 1,000 students who reported having ever attempted STEM Calculus 1, 85% said that degree or transfer requirements influenced their decision to enroll in this course. Students came to this course with varying levels of high school math background. Participants most commonly reported Precalculus as their highest high school math course (26%, *n* = 254), yet notable numbers of students also entered having previously taken Calculus or higher (19%, *n* = 186), Intermediate Algebra (15%, *n* = 144), Trigonometry (6%, *n* = 56), or Statistics (5%, *n* = 54). About 23% of students (*n* = 225) did not provide their highest high school math course.

Transfer-level prerequisites were the primary path into the course.

The largest proportion of students indicated they gained access to STEM Calculus 1 by completing prerequisite courses at a California community college (42%), followed by a counselor or self-guided placement recommendation (31%), and high school coursework (27%). Petition-based access was rare, reported by only 2.5% of respondents.

Students who began in transfer-level prerequisites felt these courses prepared them to succeed in STEM Calculus 1.

Respondents who began their math journey in a transfer-level preparatory course at their community college reported high overall agreement that these courses helped them subsequently succeed in STEM Calculus 1 (Table 1, p. 4). When disaggregating by placement profile (see sidebar to the right), 85% of low-placement-profile students and 82% of high-placement-profile students agreed that their prerequisite coursework ultimately prepared them for success in the course (Table 2, p. 4).

While still a strong majority, fewer students overall agreed that their high school math coursework prepared them for success in STEM Calculus 1 (68%). Again, when disaggregating by placement profile, students with a high placement profile reported much higher rates of agreement. For example, among students in the high-placement-profile group, 72% who began in a prerequisite course and 83% who enrolled directly in STEM Calculus 1 agreed or strongly agreed that their high school math prepared them to succeed in STEM Calculus 1. These ratings compare with roughly 60% of low-placement-profile students.

STEM MATH PLACEMENT PROFILE DEFINED

Based on the statewide default placement rules for the STEM math pathway, placement profiles in this study include:

- **High placement profile:** Students who passed high school Trigonometry, Precalculus, or Calculus.
- **Low placement profile:** Students who did not pass high school Trigonometry, Precalculus, or Calculus.

Exam difficulty and outside pressures are the most common challenges.

Two primary challenges emerged in students' reflections on their first experience in STEM Calculus 1. Roughly half indicated that struggles outside of school affected their performance in the course (51%), and almost half reported having a hard time passing the exams (47%) (Table 1).

Table 1. Student Reflections on STEM Calculus 1 Experiences

Statement	Agreed/ Strongly Agreed
My previous math coursework in high school prepared me to succeed in Calculus 1.	68%
My previous math coursework in college prepared me to succeed in Calculus 1.	77%
I was able to turn in my assignments on time.	72%
My learning style fits with the instructor's teaching style.	66%
I experienced some struggles outside of school that affected my ability to do well in Calculus 1.	51%
I had a hard time passing the exams.	47%

Note: Statements in order of appearance on survey.

Table 2. Student Reflections on Preparation for STEM Calculus 1, Level of Agreement by Math Pathway[2]

Statement	Non-STEM Math Start	Low Placement Profile		High Placement Profile	
		Transfer-Level Prereq Start	Direct Entry STEM Calc 1	Transfer-Level Prereq Start	Direct Entry STEM Calc 1
College math prepared me to succeed	83% (*n* = 180)	85% (*n* = 211)	–	82% (*n* = 96)	–
High school math prepared me to succeed	58% (*n* = 180)	57% (*n* = 212)	64% (*n* = 124)	72% (*n* = 96)	83% (*n* = 279)

Online resources are the most widely used supports.

The survey asked participants to indicate the resources they found most helpful in their first attempt at STEM Calculus 1 (Table 3, p. 5). Online resources widely available to the public (e.g., YouTube, Khan Academy) emerged as the leading support, selected by nearly two-thirds of students who took the course (*n* = 638). Roughly one third identified tutors or academic support staff (36%, *n* = 356), classmates (33%, *n* = 330), and instructors (30%, *n* = 298) as a top resource. Just over 20% (*n* = 206) cited friends or family as most helpful.

Most respondents who attempted STEM Calculus 1 reported completing the course.

Students who attempted STEM Calculus 1 were asked to report their final grade, or if they were currently enrolled, the grade they expected to receive. We then calculated completion rates, defined as receiving a final grade of A, B, C, or Pass, for all respondents. Among students who attempted STEM Calculus 1 at the

[2] Non-STEM Math Start includes students whose first CCC math course was in Statistics or a below-transfer-level remedial course. Find more details on each math pathway group in the technical appendices.

time of the survey and answered the question about the grade they earned or anticipated receiving (n = 750), 84% indicated they had completed or were on track to pass the course.

Table 3. Resources STEM Calculus 1 Students Selected as Most Helpful

Resource	*n*	% of STEM Calculus 1 Students
Online resources (e.g., YouTube, Khan Academy)	638	65%
Tutors or academic support staff	356	36%
Classmates	330	33%
Instructor (e.g., office hours)	298	30%
Friends or family	206	21%
Did not use any of the above	100	10%
Other	21	2%

Note: Because students could select more than one option, the sum does not equal 100%.

A CLOSER LOOK: EXPLORING MATH BACKGROUND, PSYCHOLOGICAL READINESS, AND STEM CALCULUS 1 SUCCESS

In addition to asking students about their STEM Calculus 1 preparation, experiences, and success, the survey also included questions about how they felt before starting the course. Exploratory analyses of these items revealed two distinct constructs:[3] *Perceived Preparedness*, reflecting how students felt about their readiness for STEM Calculus 1 when entering the course based on their prior math experiences and background, and *Calculus Confidence*, reflecting their belief in their ability to perform and succeed in the required coursework once enrolled. The section that follows draws on these student responses, using statistical models to examine how high school math background, student demographics, and these two psychological readiness factors relate to students' self-reported STEM Calculus 1 outcomes.[4] The analyses addressed the following questions:

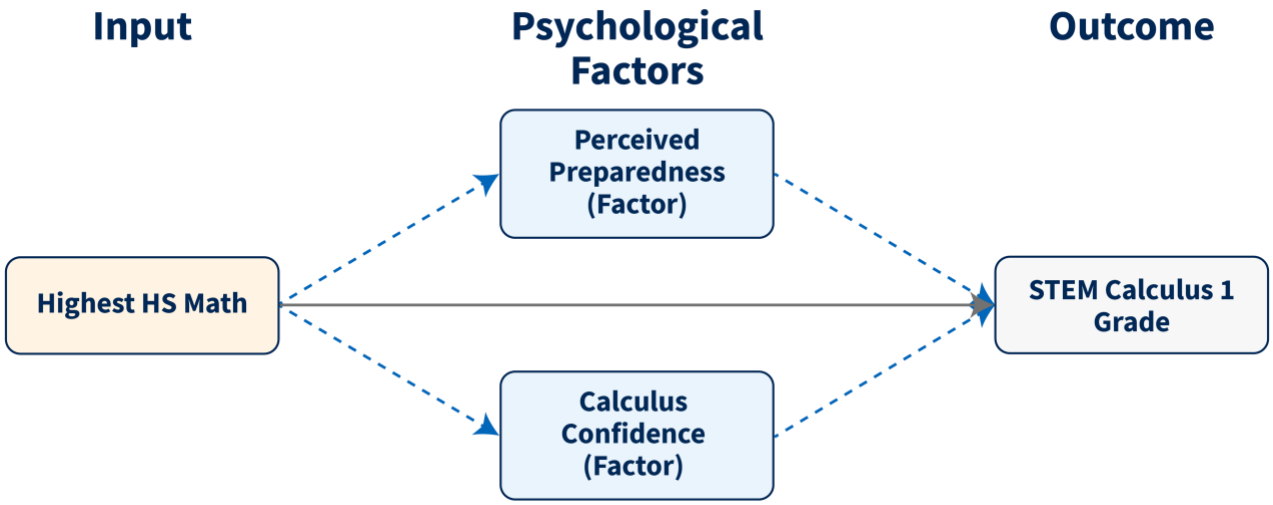
- How does self-reported high school math background relate to psychological factors such as Perceived Preparedness and Calculus Confidence?
- To what extent does self-reported high school math background directly predict STEM Calculus 1 grade, and does this relationship vary by starting course level, race/ethnicity, or gender?
- To what extent are Perceived Preparedness and Calculus Confidence associated with self-reported calculus grade?

We included gender and race/ethnicity in each model to examine whether there were any demographic differences or equity gaps. Figure 1 (p. 6) presents the conceptual framework guiding the analyses.

[3] Find details on the exploratory factor analysis, including the survey items used to construct these composite variables, in the technical appendices.

[4] Regression analyses used complete-case data. See the technical appendices for full regression tables.

Figure 1. Conceptual Framework: Exploring Relationships Between High School Math Background, Psychological Readiness, and STEM Calculus 1 Grade



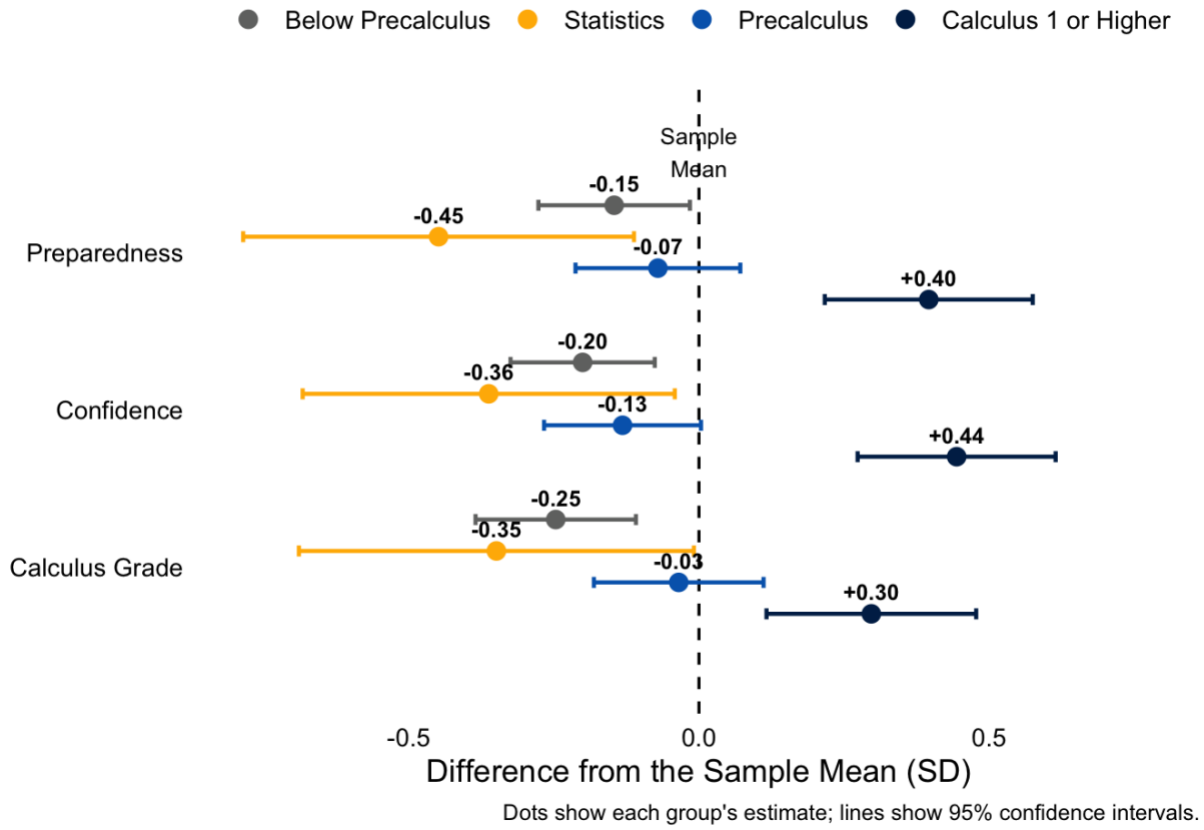
Students who completed Calculus in high school felt more prepared for and did better in STEM Calculus 1.

Across all models, students who completed Calculus or higher in high school reported feeling more prepared and confident and earning higher grades in STEM Calculus 1. This advantage persisted after controlling for where students began in community college math, their race/ethnicity, and their gender.

Figure 2 (p. 7) shows outcomes by the highest level of high school math.[5] The x-axis represents how far each group is from the overall sample average (in standard deviation units) on Perceived Preparedness, confidence, and self-reported STEM Calculus 1 grade. Students whose highest high school math course was Calculus or higher stood out clearly from the rest of the sample and were the only group with statistically significant ($p < 0.05$) results for self-reported preparedness, confidence, and STEM Calculus 1 grade.

[5] Below Precalculus group includes students who completed Algebra 1, Geometry, Algebra 2, or Trigonometry in high school but did not complete Precalculus or higher. These students were combined into one group due to low sample size.

Figure 2. Outcomes by Highest High School Math



Women reported lower preparedness, confidence, and STEM Calculus 1 grades than men.

Figure 3 (p. 8) shows men's and women's[6] average preparedness and confidence scores and STEM Calculus 1 grades compared to the overall sample average (in standard deviation units). The sample had roughly equal proportions of women and men, with slightly more women (49% women, 48% men, and 3% gender diverse students). Men's average scores were slightly above the mean, while women's average scores were below it across all three outcomes. Even after considering differences in high school math background, women reported significantly lower preparedness, confidence, and STEM Calculus 1 grades than men, indicating a gender gap.[7]

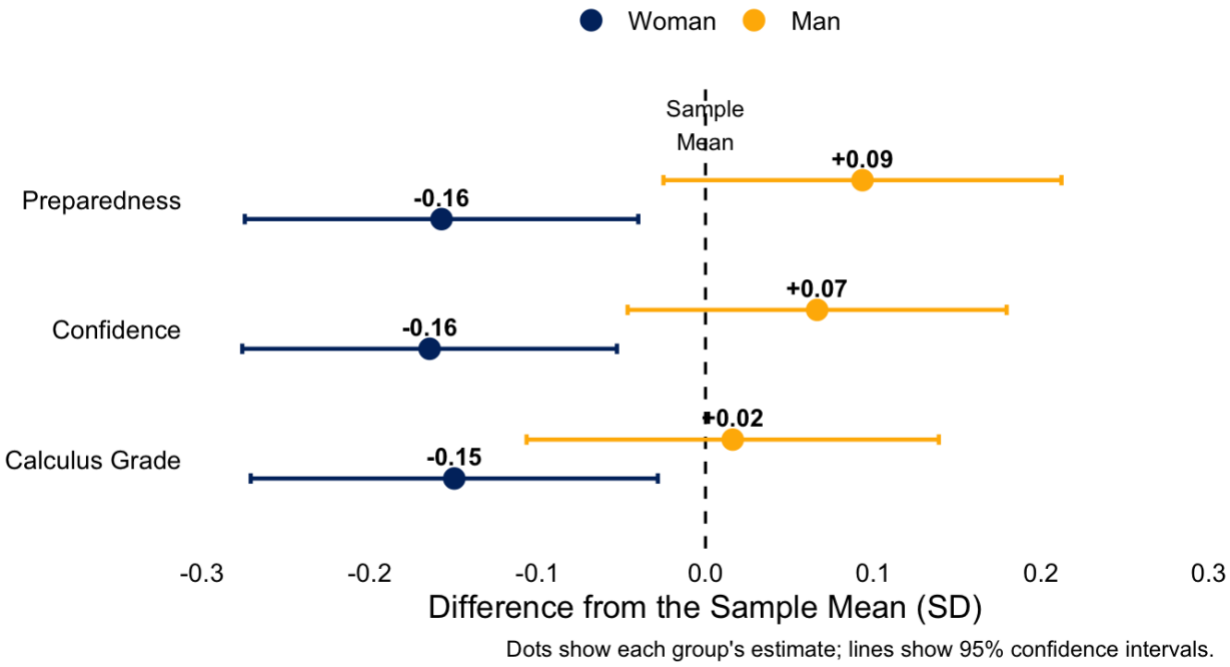
Further analysis showed that the gender gap in STEM Calculus 1 grades was no longer significant after accounting for psychological factors. Additional statistical modeling, adjusting for students' high school math background, starting CCC math level, and gender, and adding students' preparedness and confidence scores, found that the previously significant gender gap in reported STEM Calculus 1 grades went away. This result suggests that differences in perceived readiness for Calculus between women and men may be associated with the gender gap in course outcomes. This pattern is consistent with research

[6] Gender diverse students include students who selected "Non-binary," "I use a different term," or selected both "Man" and "Woman" when describing their gender. Gender diverse students were included in the analysis but are not shown here in the chart due to the small sample size. Full results for this group are available in the technical appendices.

[7] Adjusted regression results can be found in Table D1 in the technical appendices.

on the role of gender in mathematics self-efficacy, or students' beliefs about their ability to successfully complete mathematics tasks.[8]

Figure 3. Outcomes by Gender



Hispanic/Latine students reported lower preparedness, confidence, and STEM Calculus 1 Grades than other racial/ethnic groups.

Figure 4 (p. 9) shows average preparedness, confidence, and STEM Calculus 1 grade scores for Hispanic/Latine, African American/Black, Asian, and White students[9] compared to the overall sample average.[10] Asian students reported the highest average STEM Calculus 1 grades, slightly higher preparedness, and average confidence. African American/Black students showed a similar overall pattern; however, none of their outcomes were significantly different from the sample mean.

In further analysis, controlling for high school math background, Latine/Hispanic students served as the reference group. Compared to this group, Asian students reported significantly higher Perceived Preparedness and higher STEM Calculus 1 grades, while White students reported significantly higher confidence.[11] These results suggest that outcomes vary by racial/ethnic group.

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[8] Research (Pajares & Miller, 1994) linked mathematics self-efficacy to performance and found gender differences in these beliefs even after considering prior mathematics experience, and in a national study of college Calculus I students, women reported lower confidence in their math abilities, even among students with strong preparation (Ellis et al., 2016).

[9] Multi-ancestry and students who selected American Indian/Alaska Native; Middle Eastern/North African; or Native Hawaiian/Pacific Islander; Not Listed or Prefer Not to Share are not shown here due to small sample size. Full results for these groups are available in the technical appendices.

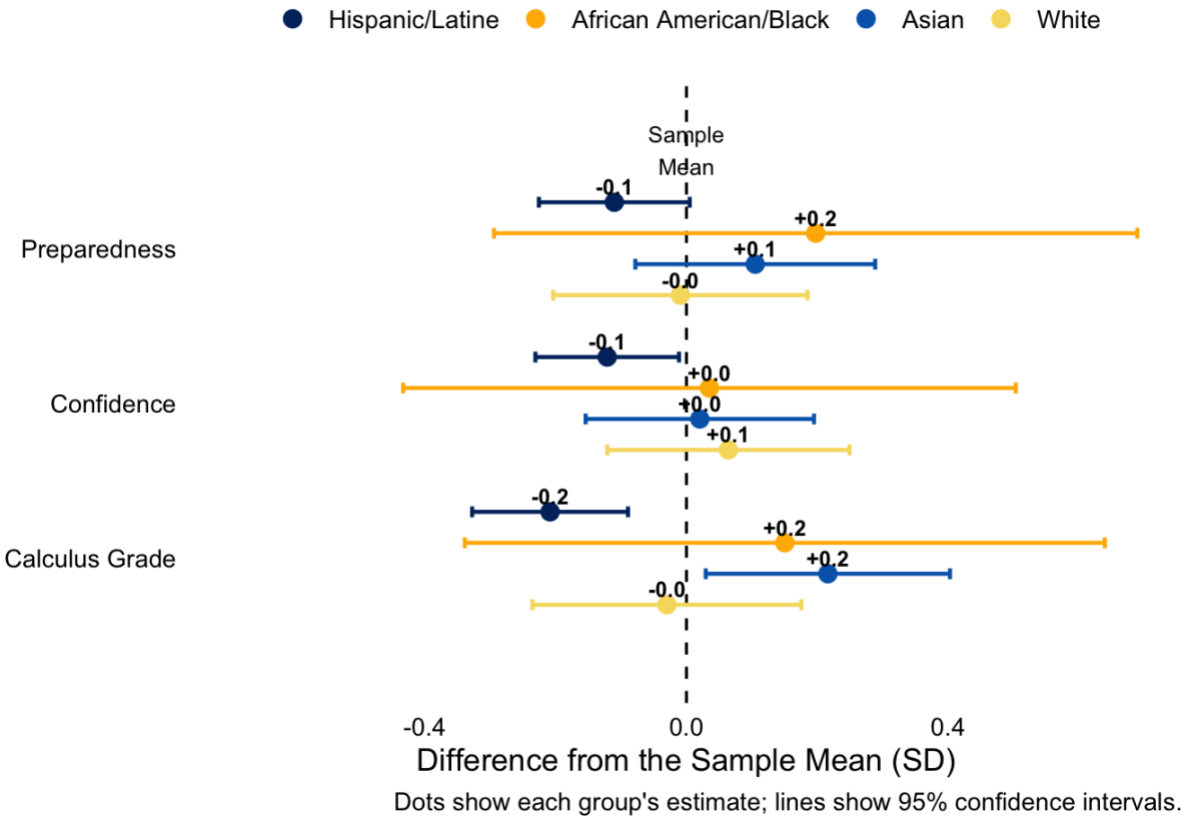
[10] Sample averages are shown in standard deviation units.

[11] Hispanic/Latine students were used as the reference group in the analysis because they were the largest race/ethnicity group (36%). More information about the reference groups and model results can be found in the technical appendices.

Further analysis found that racial equity gaps persisted even after accounting for psychological factors.

We were curious to see whether psychological factors mediated the racial/equity gap in STEM Calculus 1 grades after controlling for prior math preparation. Unlike with gender, adding confidence and preparedness scores to the model did not eliminate the racial/ethnic gap in reported course success. This finding suggests that the disparities in outcomes by race/ethnicity are not fully explained by differences in students' psychological readiness, and other unmeasured factors may be contributing to this gap.

Figure 4. Outcomes by Race/Ethnicity



Dots show each group's estimate; lines show 95% confidence intervals.

LIMITATIONS AND FUTURE RESEARCH

This study relies on self-reported data on students' high school math background, starting math at the community college, and STEM Calculus 1 grades. These data were not verified against transcript records and may be subject to recall or social desirability bias. While students from 57 of the state's 115 community colleges responded, the sample was self-selected, so findings may not represent all STEM Calculus 1 students statewide. Finally, the design is cross-sectional and correlational rather than causal: Students were not randomly assigned to high school math backgrounds or preparation levels, so the relationships identified among high school math background, psychological readiness factors, and grades should be interpreted as associations rather than causal effects. Additionally, this study did not measure other constructs, such as student motivation or study habits, that may also shape math outcomes.

Future research should consider linking survey responses to institutional transcript data to validate self-reported grades and coursework and to track longer-term outcomes. Qualitative research could help clarify how confidence and preparedness operate in practice for students, particularly why these factors account for the gender gap but not the racial/ethnic gap. Finally, examining instructional context, such as course design, classroom practices, and available supports, may help identify the structural factors driving persistent racial/ethnic equity gaps.

Conclusion and Recommendations

While faculty and departments are already engaged in reimagining support structures and curricular approaches to improve student success, students' perspectives on their journey to STEM Calculus 1 and their experiences in this pivotal course offer an additional layer of insight. Their input points to barriers, including passing exams and managing outside pressures, as well as underlying factors, such as their sense of preparedness and confidence, to consider alongside existing efforts.

Taken together, these findings suggest that improving STEM Calculus 1 outcomes requires attention not only to academic issues, but also to the practical challenges and lower perceived readiness some students bring to their course experiences. Colleges working to advance the intentions of AB 1705 and strengthen completion of this critical milestone may consider the following recommendations.

Recognizing students' complex lives outside of school may improve their success in the STEM math classroom. With many students citing struggles outside of school that affect their ability to do well in STEM Calculus 1, math departments may want to adopt strategies to proactively identify these learners and connect them with holistic supports. Exploring ways to create a classroom environment that maintains rigor while remaining responsive to students' needs may also strengthen course completion.

Existing support resources are valued but underutilized by some students. With nearly two-thirds relying on public online resources and just around one-third leveraging institutional resources like instructor office hours and tutoring, colleges may want to explore why students are less likely to utilize certain in-person supports, and whether targeted outreach could increase their use, especially for less-prepared students. For example, colleges could embed counseling touchpoints within math tutoring centers to destigmatize seeking on-campus help and build a sense of belonging. Given that nearly half of

students agreed they had a hard time passing the exams, explicitly linking these college supports to test preparation may facilitate students' engagement.

High school math background remains a strong leverage point. Given the consistent advantage for students who completed Calculus or higher in high school, strengthening high school-to-college math pathways (e.g., dual enrollment, articulation agreements, CCC outreach to high schools) could support more equitable readiness before students arrive at CCCs.

Perceived Preparedness and Calculus Confidence may serve as both an early signal and a potential intervention point. Since these factors predicted grades and accounted for the gender gap, brief surveys or check-ins early in the term could help identify students who may benefit from proactive outreach, while strategies that build math confidence and perceived readiness among women may help address gaps before they emerge. Toward that end, some colleges already offer courses specifically designed to address math anxiety and build math confidence; evaluating these courses and identifying effective practices across institutions may be a valuable next step.

Racial/ethnic equity gaps require structural, not just psychological, interventions. Since confidence and preparedness did not explain the racial/ethnic gap, colleges should look beyond individual-level psychological support to systemic factors, such as course access, instructional practices, a sense of belonging, and/or financial/logistical barriers, to address these disparities.

References

California Community Colleges Chancellor's Office. (2024, February 27). *Required action: AB 1705 validation of equitable placement, support, and completion practices for STEM programs* [ESLEI 24-15]. https://www.cccco.edu/wp-content/uploads/2024/03/ESLEI-24-15-AB-1705-Validation-of-Equitable-Placement-Support-and-Completion-Practices-for-STEM-Programs.pdf

Multiple Measures Assessment Project Overview

The RP Group launched MMAP in 2014 to support the advancement of developmental education reform in the California Community Colleges. MMAP now supports the California Community Colleges Chancellor's Office with the implementation of AB 705 and AB 1705, which seek to improve equitable placement into, and completion of transfer-level English and math courses required for a student's program of study.

Find more information at www.rpgroup.org/mmap.