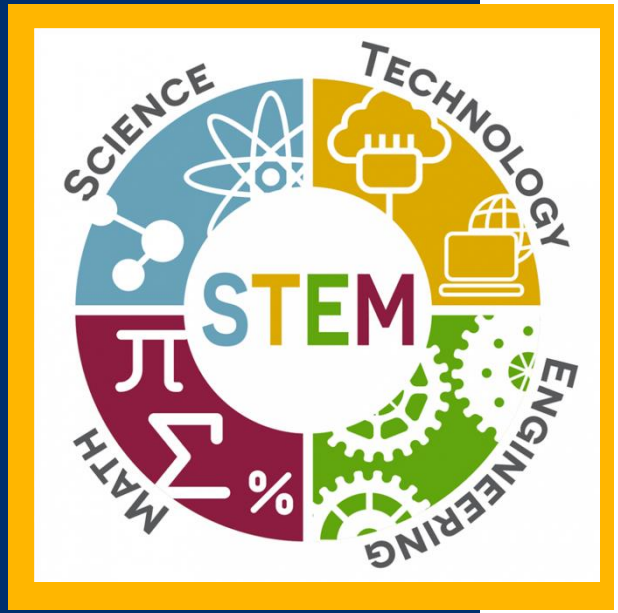
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STEM
Faculty Focus Group

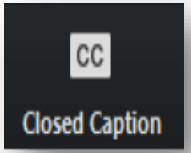
STEM (Science, Technology, Engineering, and Mathematics) Pathways and Academic Outcomes

Focus Group 1: December 6, 2023

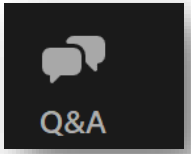
Focus Group 2: December 13, 2023

Sponsored by ASCCC in collaboration with the California Community Colleges Chancellor's Office

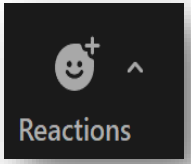
Webinar Logistics



Closed Captions (CC) are available



Click the *Q&A* tab to enter questions for the presenters and to read their responses

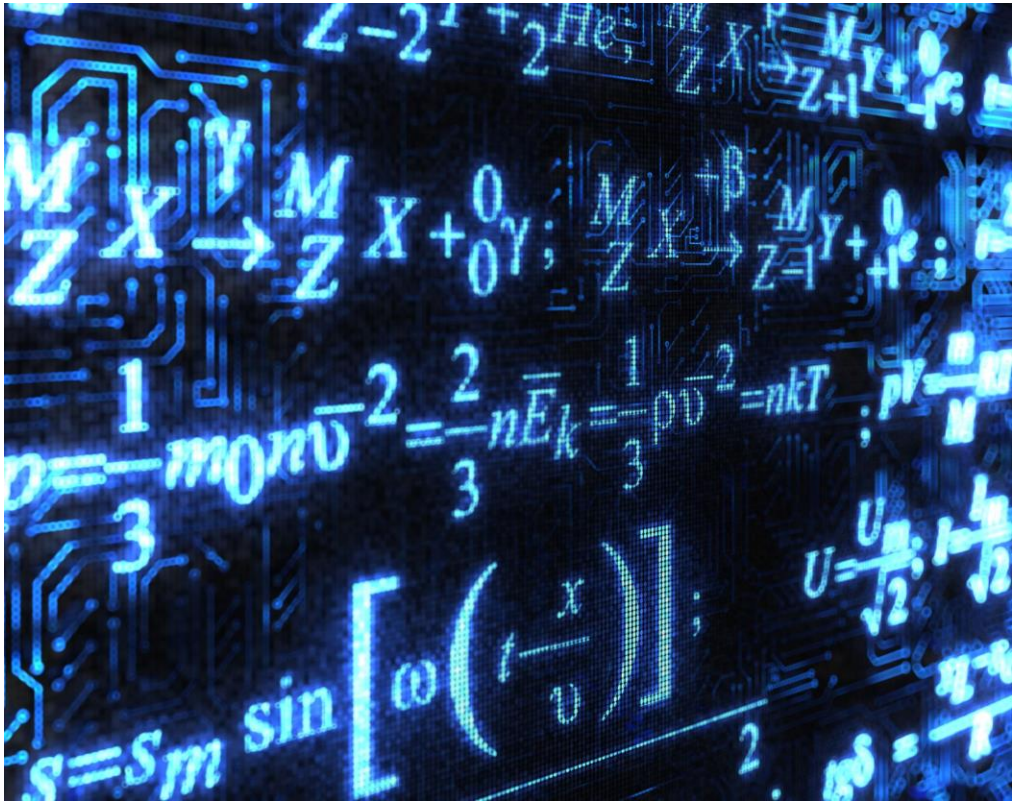


There will be opportunity for open discussion. However, during presentations use the *Raise Hand* feature for comments or questions

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Welcome

Dr. Aisha Lowe



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Introductions

Please share a little about yourself:

- Name
- Role (college and discipline)
- One thing you are most looking forward to this holiday season?

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Meeting purpose and objectives

Dr. Aisha Lowe and Cheryl Aschenbach

- Building the STEM pipeline
  - Simplifying and streamlining pathways to fuel STEM degrees
- Careful and thoughtful implementation
- Value of faculty input and expertise

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Preparatory Homework

- **Activity 1:** Please review this 16-minute presentation by Dr. Nathan Klingbeil, Professor of Engineering at Wright State University in Ohio. Started in 2004, the Wright State Model for Engineering Mathematics has more than doubled the average graduation rate in engineering across the entire range of ACT scores. https://www.youtube.com/watch?v=CWCWq155hyc
- **Activity 2:** Please review the overview of key research: https://drive.google.com/file/d/1JKq85Z7WMQxOlwJYgz77hKz-2ufRVDQY/view?usp=drive_link

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Questioning the Equation

What if?

Nathan Klingbeil's TEDx Talk

Discussion

Share your thoughts:

What is most striking to you from the Ted Talk and/or the research reviewed?

How do we remain competitive in awarding STEM degrees/transfers?

What is the modern curricular scope and sequence that can support all students regardless of their preparation to ensure their success to complete a STEM pathway?

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Innovating CCC Stem Pathways

ALL FOLLOWING SLIDES BY THE RP GROUP ARE PRELIMINARY RESULTS AS OF 12/6/23 AND MAY BE DIFFERENT FROM ANY FINAL PUBLISHED VERSIONS OF THIS STUDY.

Multiple Measures Assessment Project (MMAP)

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Data Under development



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The Role of AB 705/1705 in Innovating STEM Pathways

Mallory Newell, Director of Institutional Research, Planning and Accreditation, De Anza College

Terrence Willett, Dean of Research, Planning and Institutional Effectiveness, Cabrillo College

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Data Under development

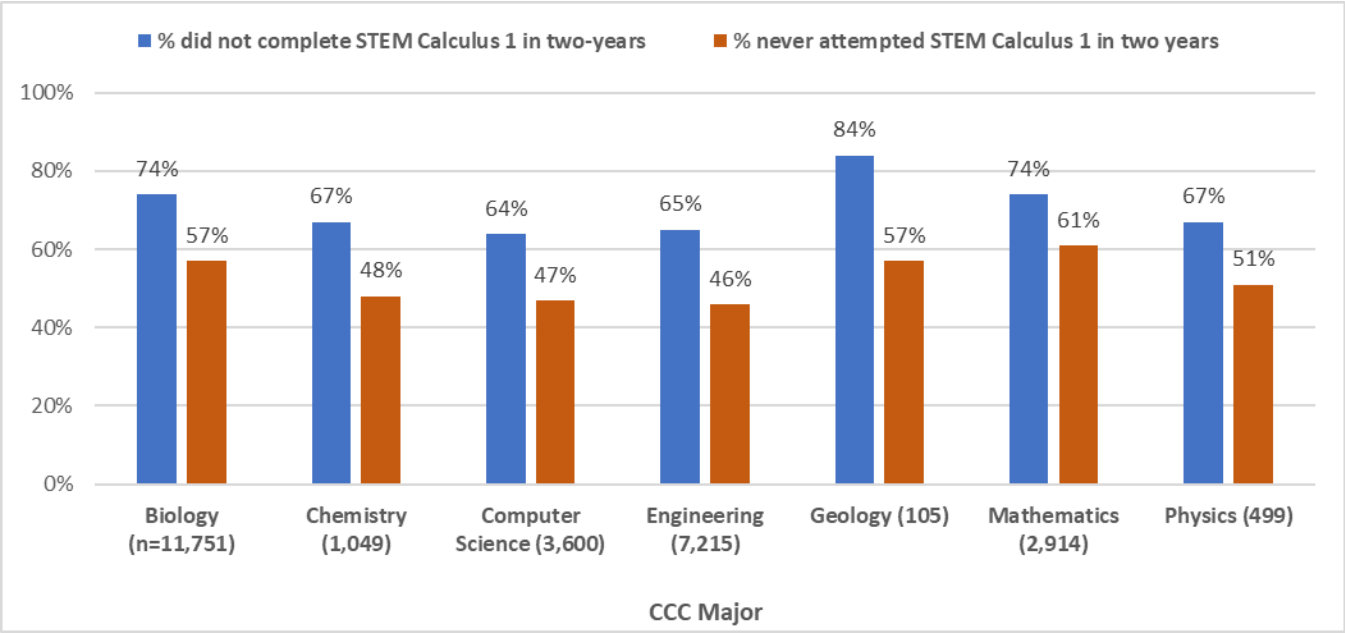
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What is the issue that AB 1705 attempts to address in STEM?

AB 1705 requires community colleges to examine the impact of their on-ramps to STEM Calculus 1 on STEM students' completion of this gateway course.

Why is this important?

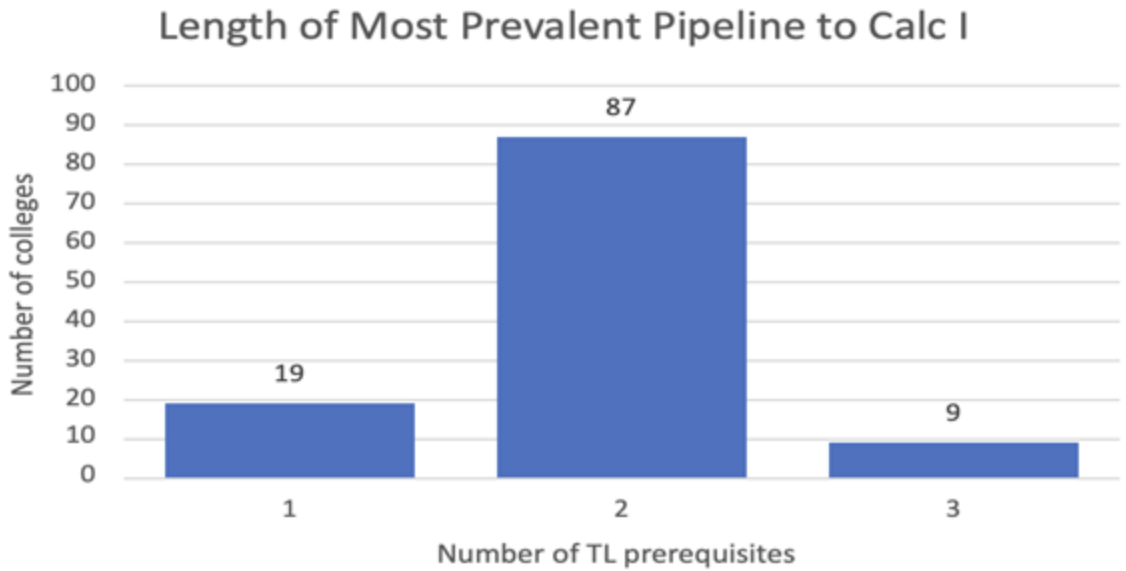
Many STEM students starting in the pipeline to STEM Calculus do not persist to or complete Calculus 1. As a result, STEM programs lose a substantial number of their potential students.



Note: **STEM students who started in a transfer-level prerequisite -- College Algebra, Trigonometry, or Precalculus** -- between 2012 and 2019 **tracked for two years** to completion of STEM Calculus 1 by summer 2022.

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The length of most California Community College transfer-level prerequisite pipelines to STEM Calculus 1 is a two-course sequence.

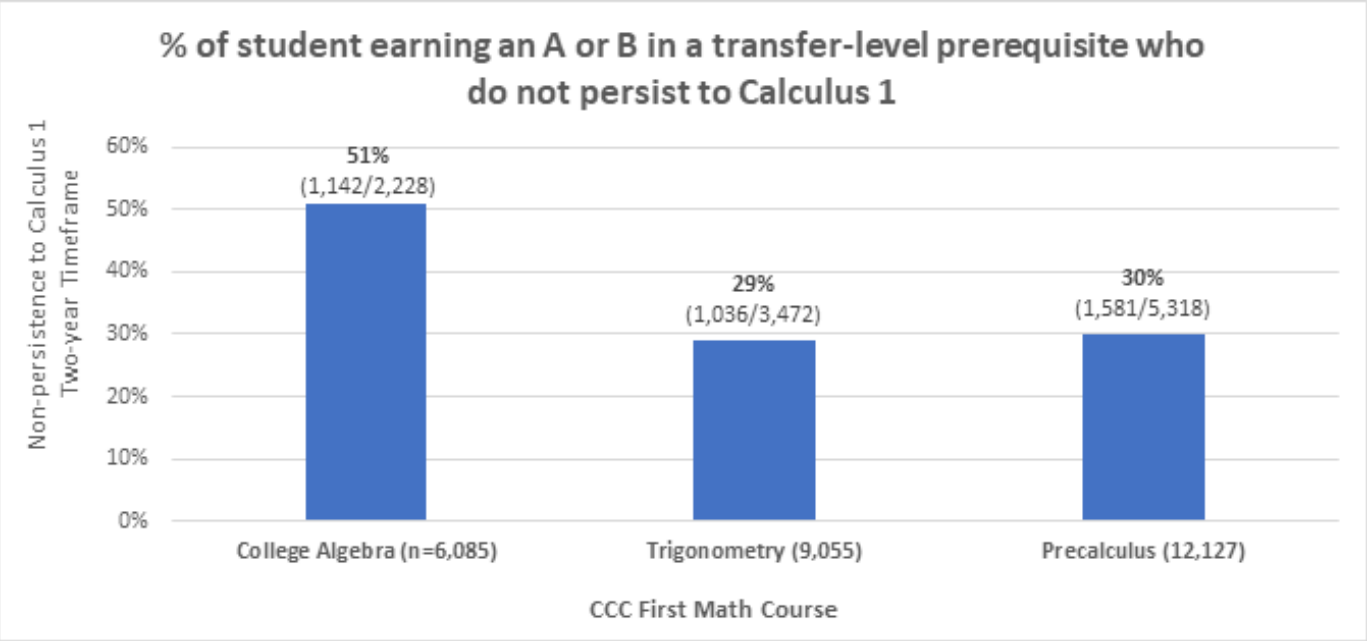


Note: Fall 2022 schedule review.

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We have a persistence problem in the pipeline to STEM Calculus 1. Students earning an A or B in a transfer-level prerequisite to STEM Calculus 1 are not persisting to Calculus.



Note: For 2012-2019, **STEM students who started in a transfer-level prerequisite** -- College Algebra, Trigonometry, or Precalculus -- and tracking **enrollment to STEM Calculus 1 within two years** (by summer 2022).

AB 1705 attempts to improve STEM Calculus 1 completion by setting standards that ensure STEM students begin in the course that gives them the highest probability of completing Calculus 1.

78213 Section (f) By **July 1, 2024**, for calculus-based associate degrees or transfer majors in science, technology, engineering, and mathematics (STEM), **community colleges shall examine the impact of placing and enrolling students into transfer-level course sequences**, composed of no more than two transfer-level courses, **that prepare students for the first STEM calculus course**, in order to **verify the benefit of the coursework** to students by showing **all** of the following:

(A) The student is **highly unlikely to succeed** in the first STEM calculus course without the additional transfer-level preparation.

(B) The enrollment will **improve the student's probability of completing** the first STEM calculus course.

(C) The enrollment will **improve the student's persistence to and completion of the second calculus** course in the STEM program, if a second calculus course is required.

Methodology

Comparative throughput rates in STEM Calculus I and Calculus II for groupings of students based on their high school preparation.

- Students with a STEM program of study with at least 1 STEM calculus course required for their major as defined by C-ID
    - STEM includes: Biology, Chemistry, Computer Science, Engineering, Geology, Math, Physics
    - Major as reported to MIS upon matriculation and completion of educational plan
- Students with at least 11th or 12th grade high school data
    - Self-reported (CCCApply) and Actual (CalPass)
    - Also looked at students with no high school data for comparison
- Disaggregated by high school preparation
    - STEM default placement rules for precalculus
    - Highest high school math course completed
- Two and three-year completion rates of STEM Calculus 1 and 2 (throughput rates)

Operationalizing standards of AB 1705 placement and first course enrollment for STEM Calculus 1

In the analysis presented today, we use an extension of the STEM default placement rules for precalculus to define four placement levels:

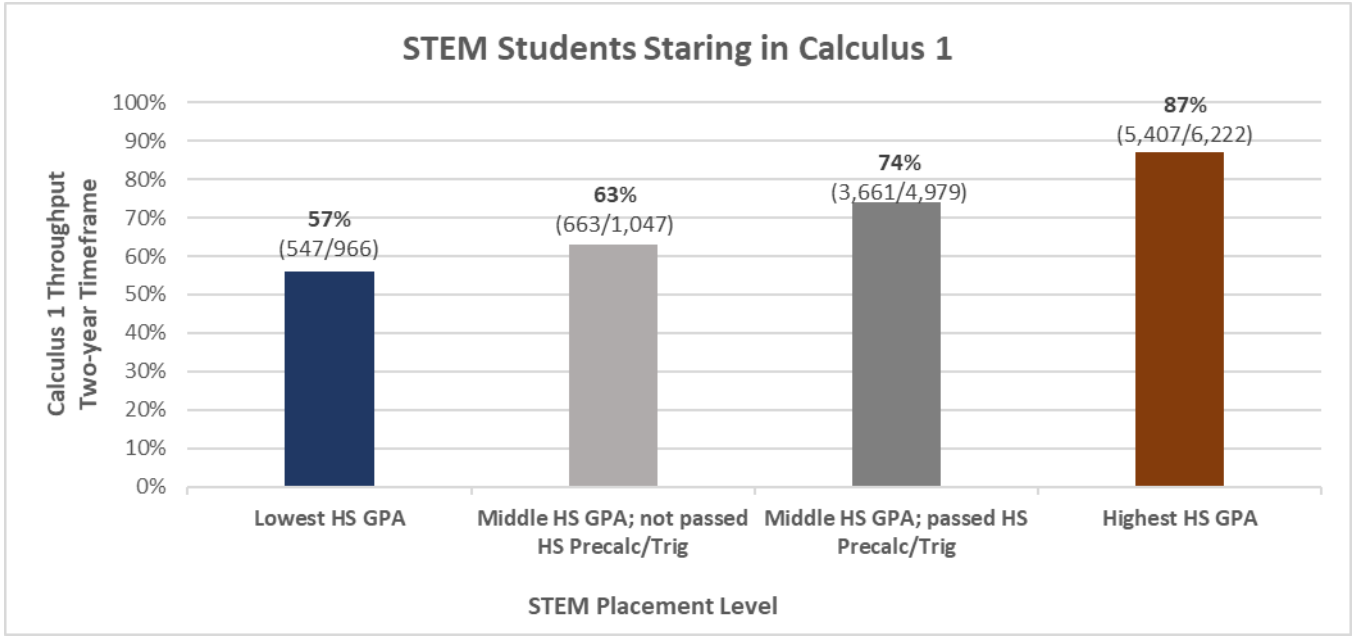
- **GPA >= 3.4** (highest predicted success rates)
- **3.4 > GPA > 2.6** AND **PASSED** Trigonometry, Precalculus, or Calculus in High School
- **3.4 > GPA > 2.6** AND **DID NOT PASS** Trigonometry, Precalculus, or Calculus in High School
- **GPA <= 2.6** (lowest predicted success rates)

AB 1705 standards part (a): Is the student "highly unlikely to succeed in the first STEM calculus course"?

If STEM students across all four placement levels started in STEM Calculus 1:

- Is there a group (or groups) who are "highly unlikely to succeed in STEM Calculus 1 without additional preparation"?

When STEM students across all four placement levels started in STEM Calculus 1, there was no group that was "highly unlikely" to succeed in Calculus, based on commonly used definitions of highly unlikely events.



Note: STEM students who started directly in STEM Calculus 1 between fall 2012 and summer 2019 who were given **two-years to successfully complete** STEM Calculus 1 between fall 2012 and summer 2022. **High school preparation based on STEM default placement rule categories**.

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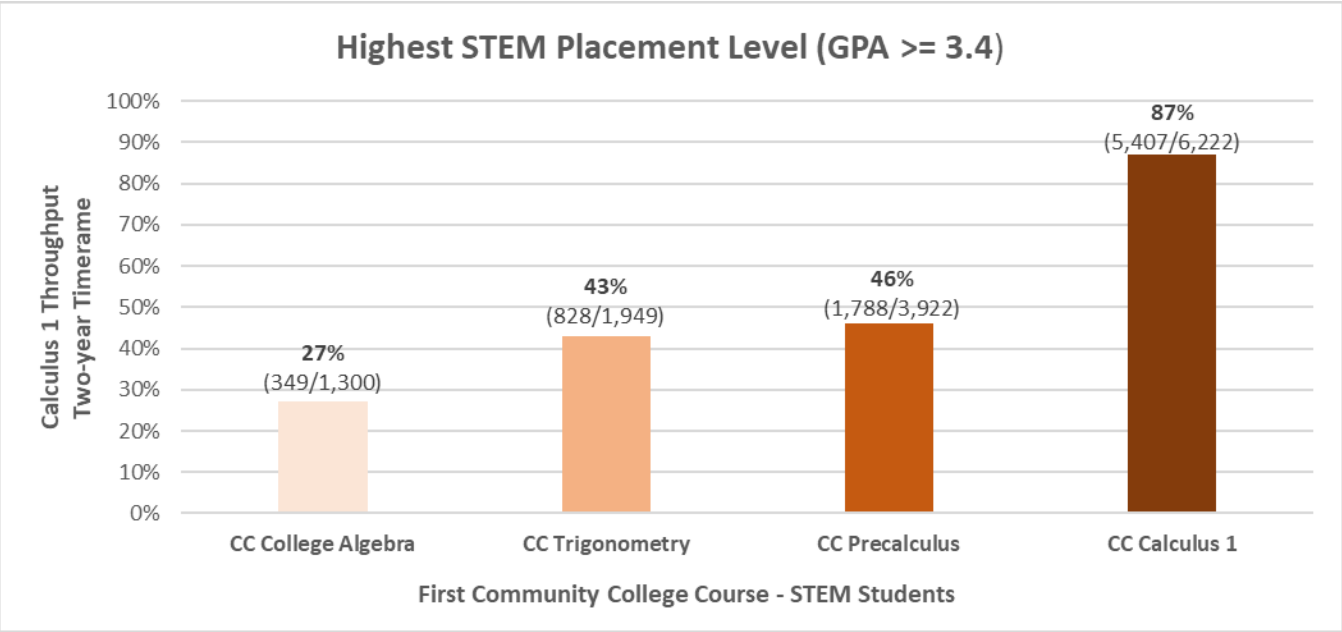
AB 1705 standards part (b): Does additional preparation "improve the probability of completing STEM Calculus 1"?

For STEM students at each placement level:

- Does starting in a transfer-level prerequisite improve the probability of completing STEM Calculus 1?

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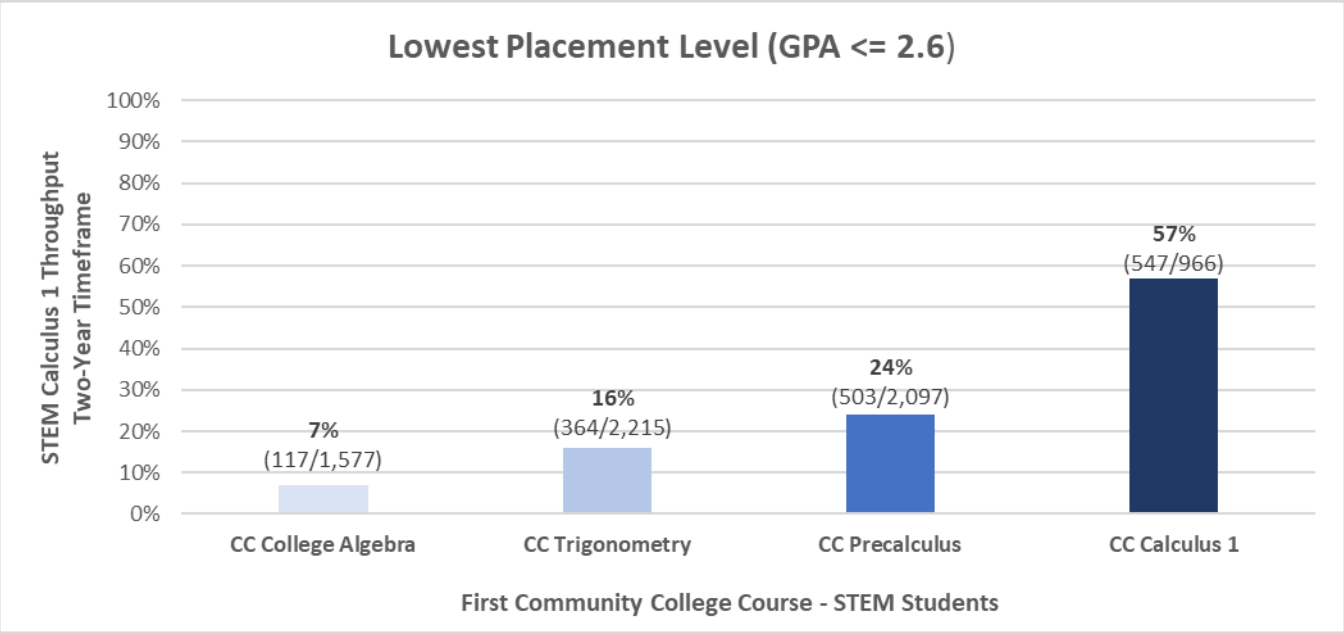
For students in the highest placement level (HSGPA>=3.4) starting in STEM Calculus 1 rather than a transfer-level prerequisite course resulted in the highest Calculus completion.



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Note: **STEM students** who started **directly in College Algebra, Trigonometry, Precalculus or STEM Calculus 1** between fall 2012 and summer 2019 who were given t**wo-years to successfully complete STEM Calculus 1** between fall 2012 and summer 2022. **Highest STEM placement level** includes students with a GPA >= 3.4.

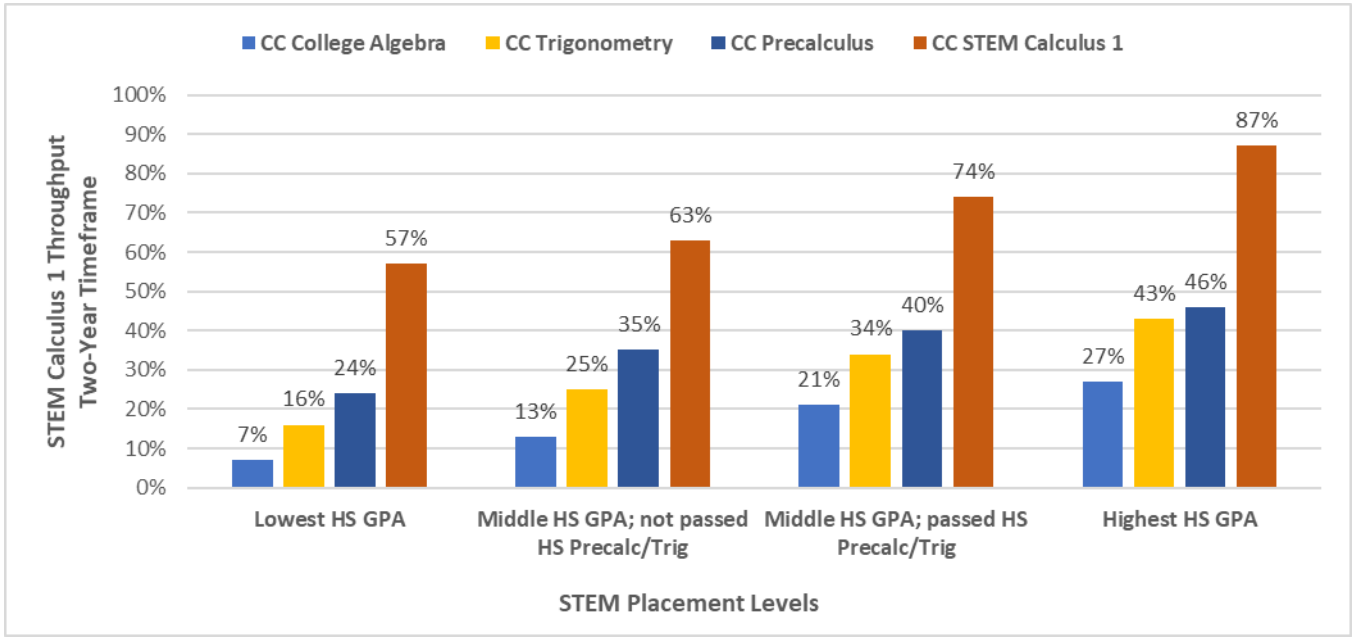
For students in the lowest placement level (HSGPA <=2.6) starting in STEM Calculus 1 rather than a transfer-level prerequisite course resulted in the highest Calculus completion. Enrolling in a lower-level course does not improve their persistence to and completion of Calculus 1.



Note: **STEM students** who started **directly in College Algebra, Trigonometry, Precalculus or STEM Calculus 1** between fall 2012 and summer 2019 who were given **two-years to successfully complete STEM Calculus 1** between fall 2012 and summer 2022. **Lowest high school preparation** includes students with a GPA <= 2.6.

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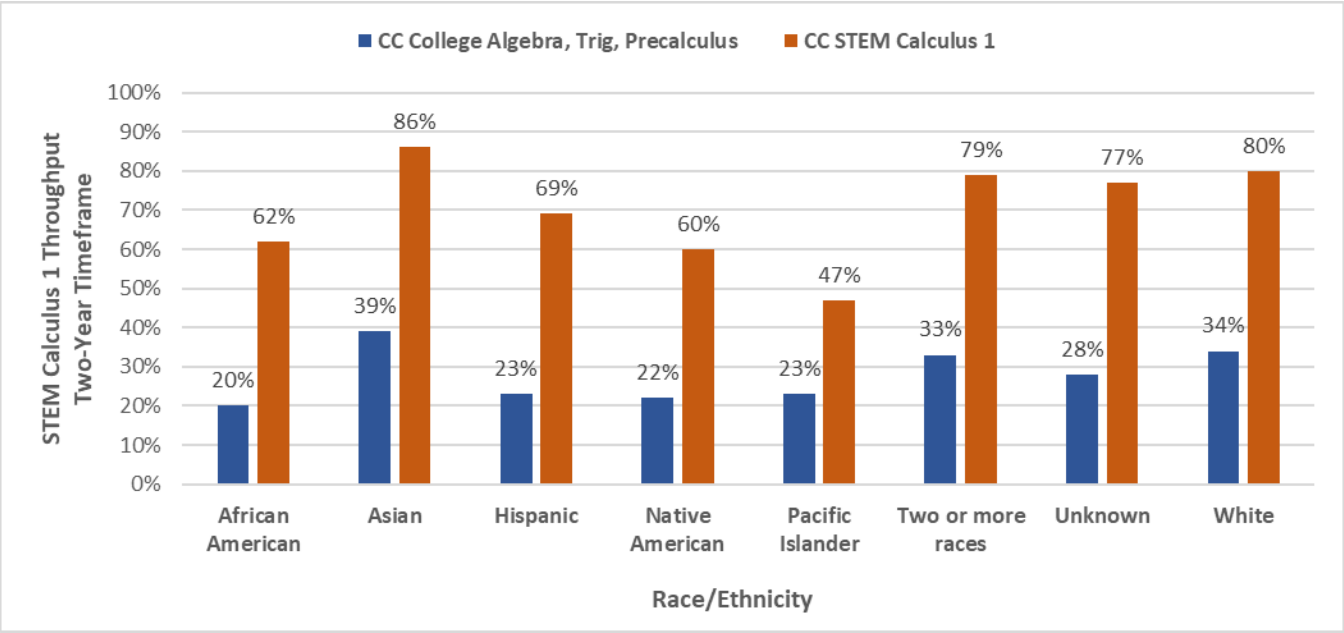
Across the four placement levels, students' completion of STEM Calculus 1 is highest when they start directly in Calculus instead of in transfer-level prerequisite courses.



Note: **STEM students** who started **directly in College Algebra, Trigonometry, Precalculus or STEM Calculus 1** between fall 2012 and summer 2019 who were given **two-years to successfully complete STEM Calculus 1** between fall 2012 and summer 2022 **by STEM placement level**. Students with missing high school data exhibit throughput rates of 12%, 30%, 44% and 60%, respectively.

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All racial/ethnic groups complete STEM Calculus 1 at higher rates when starting directly there instead of in transfer-level prerequisites.



Note: **STEM students** who started **directly in College Algebra, Trigonometry, Precalculus (combined) OR STEM Calculus 1** between fall 2012 and summer 2019 who were given **two-years to successfully complete STEM Calculus 1** between fall 2012 and summer 2022, **by ethnicity.**

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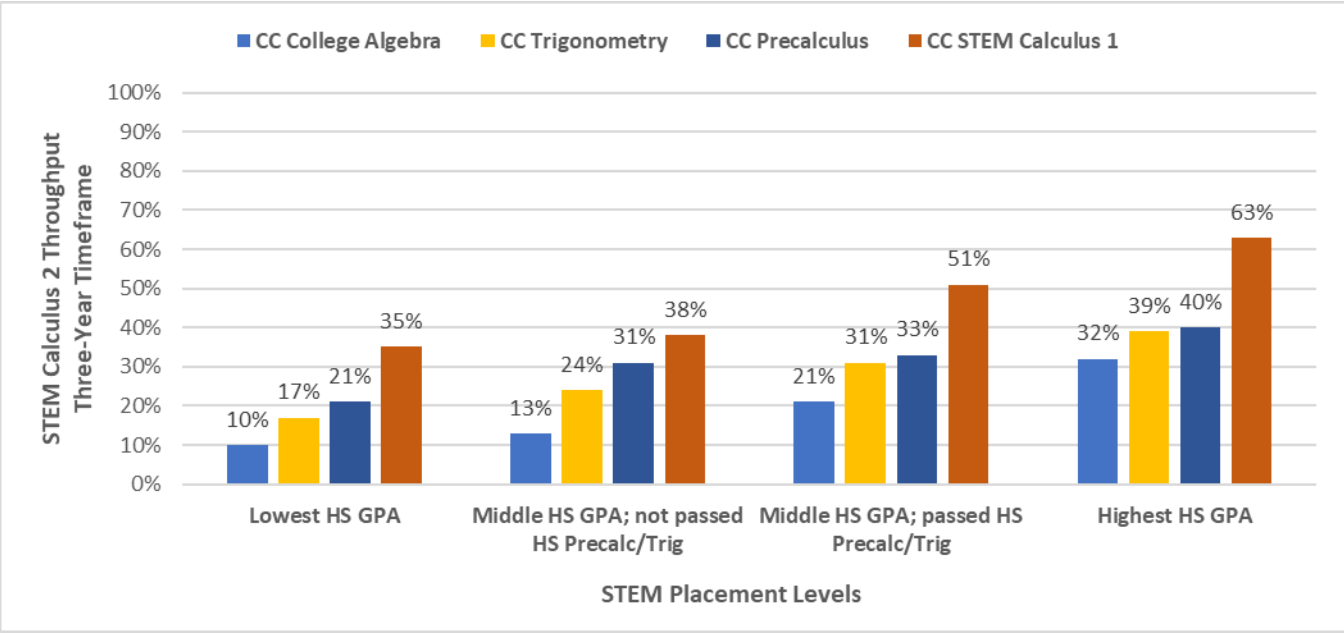
AB 1705 standards part (c): Does additional preparation prior to Calculus 1 “improve persistence to and completion of a second calculus course”

For each placement level:

- What is the starting point that gives STEM students (in majors that require STEM Calculus 2) the highest probability of entering and completing STEM Calculus 2?

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All student groups complete Calculus 2 at higher rates when starting directly in STEM Calculus 1.



Note: **STEM students** who started **directly in College Algebra, Trigonometry, Precalculus or STEM Calculus 1** between fall 2012 and summer 2019 who were given **three-years to successfully complete STEM Calculus 2** between fall 2012 and summer 2022 **by STEM placement level** based on **STEM default placement rules**. **Biology majors were excluded**, as Calculus 2 is not required for the major. Students with missing high school data exhibited throughput rates of 9%, 23%, 37% and 48%, respectively.

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Results are the same when …

- We disaggregate students by highest high school math course completed (instead of the STEM placement levels).

Discussion

Share your thoughts:

What does this analysis tell us about where and how we can innovate math course sequences?

What does this analysis not tell us? What's missing or needed?

How can this mandate be deployed in a way that also accomplishes the broader purpose of simplifying and streamlining STEM pathways?

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Thank you!

Survey opportunity for continued feedback will follow

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