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One-year Throughput Rate in Calculus for Business Administration Students 2020-2022 Research Brief #237

College of the Canyons

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Institutional Research, Planning, and
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Introduction

Background

AB1705 requires that institutions assess the effectiveness of pre-requisite courses that precede transfer-level, gateway Math courses. Transfer-level gateway courses meet requirements in the students' program of study. To continue offering these pre-requisite courses that do not meet any requirements for the degree program, colleges have to assess their pathways and examine data on students' access and throughput into these transfer-level gateway courses.

In light of this requirement, the Institutional Research, Planning and Institutional Effectiveness Office conducted analyses of one pathway identified in AB1705, the Business Administration program which currently has a transfer-level gateway course of Business Calculus (MATH-240) or Calculus I (MATH-211) which each have a pre-requisite of College Algebra (MATH-103) and Pre-Calculus (MATH-104).

Research Questions

- What is the one-year throughput rate in Business Calculus/Calculus I (MATH-240/MATH-211) among students pursuing a Business Administration program of study?
- How does the throughput rate in Business Calculus/Calculus I (MATH-240/MATH-211) vary for those who start in different levels of STEM courses (Trigonometry, College Algebra (MATH-103), Pre-Calculus (MATH-104) and/or Calculus (MATH-240/211)?
- How does the college's data compare to the statewide throughput rates based on a [recent CCCCCO report?](#)

Methodology

Referential student demographics files were used to identify two cohorts of first-time students in 2020-21 and 2021-22 (sb15=1 and std7 official headcount status). These first-time students could be fall starters, or previous summer starters, with an enrollment in the subsequent fall term. Enrollment records from referential files (usx) for academic year (summer through subsequent spring) were used to identify and delimit the cohort to students who attempted their first Math course in that academic year.

These first-time students were further delimited to those pursuing a Business Administration program of study (Business Administration for Transfer (5030.BUS.AS-T), & Business Administration for Transfer 2.0 (5040.BUS-CSUI.AS-T). Additionally, the final denominator was delimited to students whose first attempt in the Math sequence is a STEM course.

The identified cohorts were then tracked to assess completion of Business Calculus (MATH-240) and/or Calculus I (MATH-211) for one academic year starting in summer through spring. Both of these Calculus courses satisfy the requirement for the Business Administration programs. Business Calculus (MATH-240) currently has the pre-requisite of College Algebra (MATH-103) and Calculus I (MATH-211) currently has the pre-requisite of (MATH-104¹).

¹ Pre-Calculus (MATH104) can also meet the College Algebra (MATH-103) requirement for Business Calculus (MATH-240).

The definitions and methodology of this analysis are aligned with the CCCCO's [new MMAP study on Business Calculus completion](#).

Results

Among first-time students who had a declared major of Business Administration and attempted their first Math class in a transfer-level STEM course, the throughput rate for either Calculus course (MATH-240 or MATH-211), was 39% in 2020-21, and 38% in 2021-22. Table 1 and 2 below provides additional details.

Table 1. Business Calculus Throughput One-year Timeframe for Business Administration Students

Year	First-Time student Cohort ¹	Business Admin Major ²	Enrolled in any Math (started sequence)	First Math Enrollment is STEM (Trigonometry, College Algebra, Pre-Calculus or Calculus) ³	Attempted MATH-240 within 1 year	Attempted MATH-211 within 1-yr	1-year Throughput in any Calculus MATH-240 or MATH-211
2020-21	3,898	437	287	84	41	12	39% (33/84) 26 completed MATH-240, 7 completed MATH-211
2021-22	2,769	306	198	39	9	10	38% (15/39) 8 completed MATH-240, 7 completed MATH-211
2-year Totals	6,667	743	485	123	50	22	39% (48/123)

1. Delimited to First-time students (sb15=1 and official headcount status std7) in the fall, or summer (with fall enrollment).

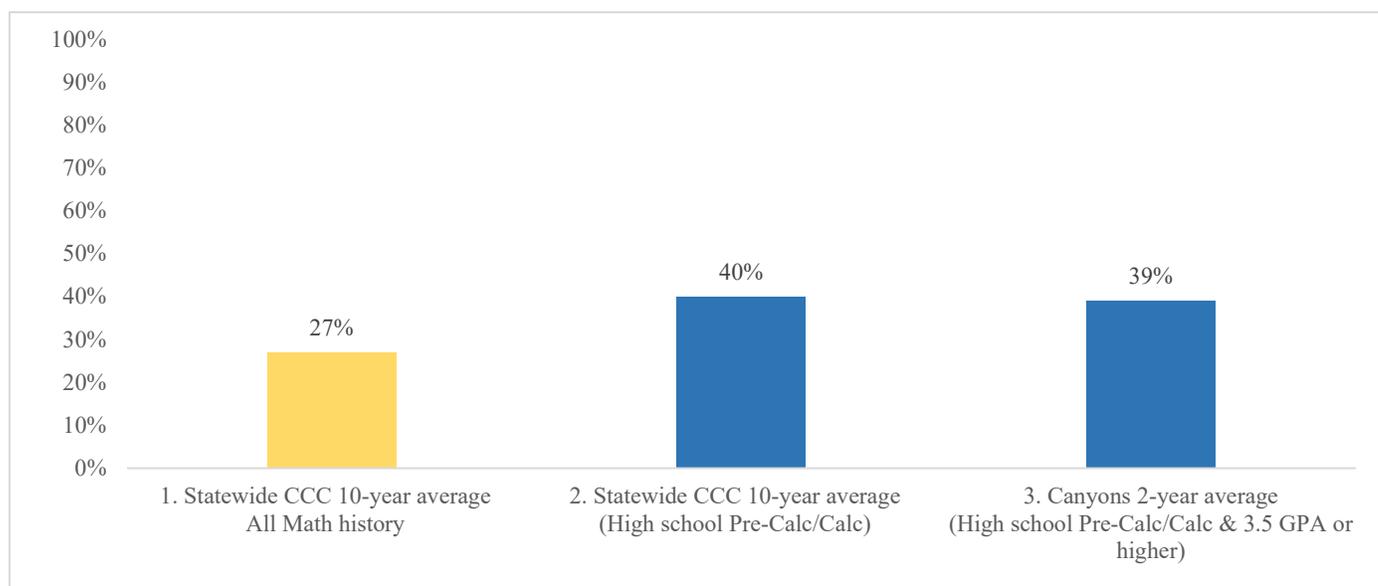
2. Programs include Business Administration for Transfer (5030.BUS.AS-T), & Business Administration for Transfer 2.0 (5040.BUS-CSUI.AS-T)

3. Use this for denominator* aligns with statewide CCCCO Business Administration throughput report.

4. Throughput tracks students for 1 academic year (4 terms) starting in summer through spring, and is calculated out of first-time students, with a declared Business Administration major who attempted their first Math course and that Math course was either Trigonometry, College Algebra, Pre-Calculus or Calculus.

The statewide CCC study on Calculus throughput for Business Administration² students shows that over a 10-year period the average throughput rate within a one-year timeframe was 27% whereas for Canyons this rate was 39% over the two years (2020-2022) of our data. However, when limiting the state’s data to only those students whose highest math course in high school was either Pre-calculus or Calculus (second bar in Figure 1), the statewide rate is 40%. This is an important distinction because during the selected time period, the College of the Canyons granted access to Pre-calculus (MATH-104) and Calculus (MATH-240/211) courses only for students who completed pre-calculus or calculus in high school and had a high school GPA of 3.5 or above.

Figure 1. Calculus/Business Calculus Throughput Rate for Business Administration Students within a one-year time frame Canyons vs. Statewide.



1. CCCCO Cohort is Business Administration students starting in a transfer-level math course in a calculus-based pathway at a CCC between summer 2012 and summer 2022, then successfully completed Business Calculus or STEM Calculus I within a one-year timeframe (numerator).

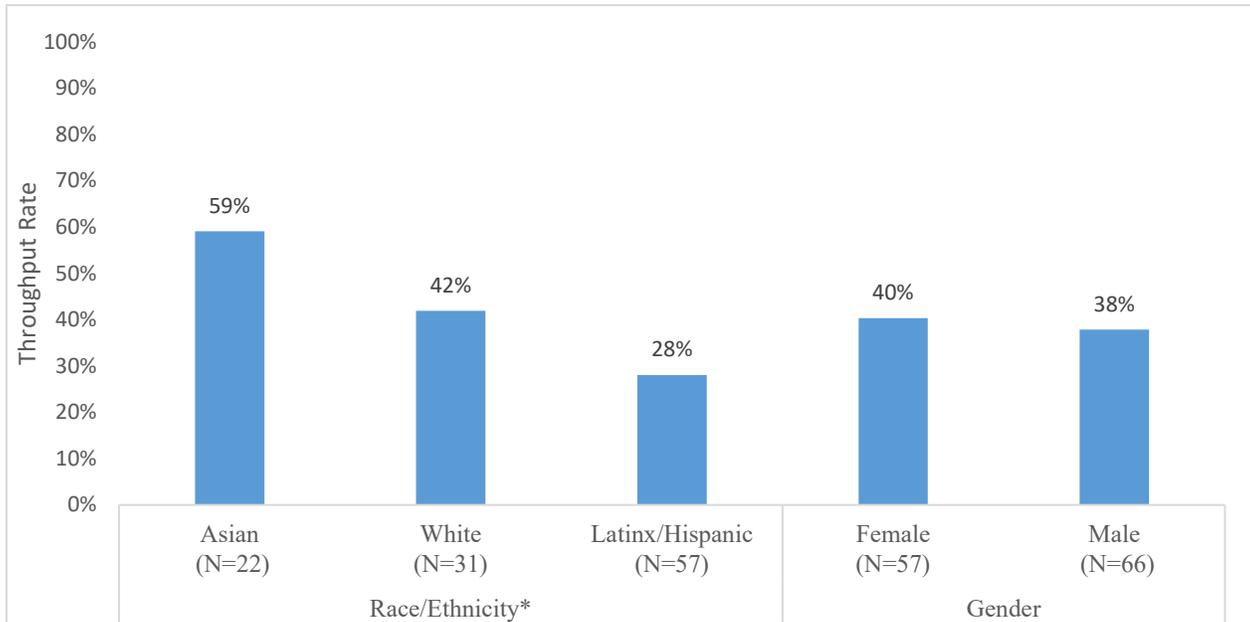
2. This rate is limiting the CCCCO cohort to those whose high school highest math was pre-calc or calc

3. This is the rate for Canyons which aligns with the limited CCCCO cohort. Only students who had High school GPA 3.5 or above and completed Pre-Calc/Calculus in High school were given access to College Pre-Calc and Calculus/Business Calculus

² [Maximizing Calculus Completion for Students Seeking the Business Administration Degree Business Administration](#). This report was produced in partnership between CCCCO and The RP Group’s Multiple Measures Assessment Project.

With regard to demographics of students pursuing Business Administration as their program of study, Asian students had the highest one-year throughput rate of 59% in Calculus/Business Calculus followed by 42% among White students and a 28% throughput rate among Latinx/Hispanic students. Males and female students had similar rates (40% vs. 38%).

Figure 2. Calculus/Business Calculus Throughput Rate within one-year time frame by Race/Ethnicity and Gender for 2020-2022



* Excludes African American/Black, Two or more races, and Unknown because their group sizes were less than 5

Throughput rates by students' first course varied more substantially with students starting directly in Calculus/Business Calculus had the highest one-year throughput rate (87%), and students who start in the transfer-level pre-requisite had a throughput rate of 33% (combined rate for MATH-103 and MATH-104).

Figure 3. Calculus/Business Calculus 2-year Average Throughput Rate within one-year time frame by First-Course

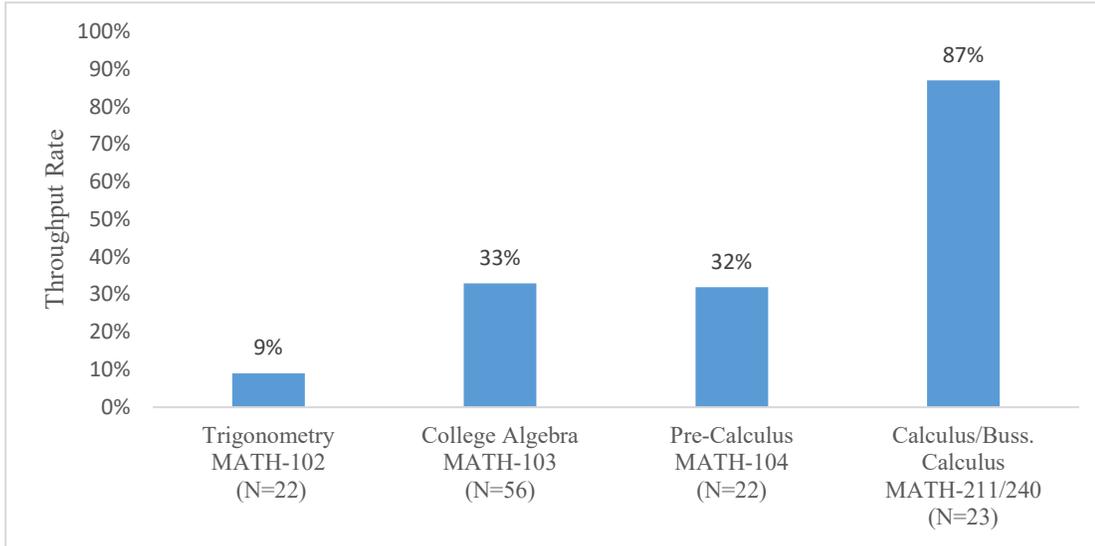


Table 2. Calculus/Business Calculus 2-year Average Throughput Rate within one-year time frame by First Math Course

First Course	2-year Total N	2-year Average Throughput Rate	2020-21	2021-22
MATH-102	22	9%	1 of 15	1 of 7
MATH-103	56	33%	14 of 40	5 of 16
MATH-104	22	32%	3 of 11	4 of 11
MATH-211/240	23	87%	15 of 18	5 of 11
Total	123	39%	33 of 84	15 of 39

Summary Findings

- When controlling for student high school record (pre-Calculus completion, 3.5 or higher GPA), the college’s one-year throughput is similar to the state average (39% for the college vs. 40% for the state)
- Business students who start in a calculus course (MATH-240 or MATH-211) for their program of study have more than double the one-year throughput rate of students who start one level below (MATH-103 or MATH-104), and an almost ten-fold one-year throughput rate of students beginning two levels below (MATH-102) -- 87% vs. 33% vs. 9%, respectively. Some of this difference is due to students in the lower level classes being less prepared for college mathematics and access to Calculus only being provided to students who have completed at least Pre-Calculus and have a high school GPA of 3.5 or higher).
- Although this analysis for the college’s data did not account for high school course work due to a small sample size, of note is statewide data indicating that students whose highest math course was Geometry or lower and started in Calculus have a throughput rate that is two times the throughput rate of students who completed Calculus in high school and started in Pre-Calculus (53% vs. 24%) (see APPENDIX A).

Implications

"The Institutional Research, Planning and Institutional Effectiveness office collects information on how data and research conducted assist the campus community in making evidence-based decisions. In light of this, we ask that requestors, and/or members of any department/area that utilize the data, provide action implications for each report."

Using the [Action Implication Form](#), please report actions and/or decisions that emerge from the data and findings presented in this report.

Upon review of the results of Business Calculus Throughput rates analysis, please report actions and/or decisions that emerge from the data and findings presented in this report using the following [Action Implication Form](#).

Recommendations

Upon review of the results of Business Calculus Throughput rates analysis (Research Brief# 237) the following recommendations should be taken into consideration:

- Consider reassessing throughput data after AB1705 implementation when enrollment in pre-requisites for Business Calculus are reduced and ultimately eliminated.
- Explore the development of with-support Business Calculus (MATH-240X) course to provide corequisite support for relevant content that was previously taught in the pre-requisite, College Algebra (MATH-103)

For questions, or more detailed information on this research brief, contact Preeta Saxena, Ph.D., Director Institutional Research, Planning and Institutional Effectiveness at preeta.saxena@canyons.edu.

APPENDIX A

Statewide MMAP Study Results for Calculus Throughput Rate with a one-year timeframe

Table 3. All First-Level Calculus Throughput One-Year timeframe by Highest High School Math and First Community College Course for Business Administration Students

		Highest High School Math Successfully Completed														
		Geometry or Lower			Algebra 2			Precalculus/Trig			Statistics			Calculus		
		Cohort		TP Rate*	Cohort		TP Rate	Cohort		TP Rate	Cohort		TP Rate	Cohort		TP Rate
First CCC Course	College Algebra	641	58	9%	2,326	209	9%	2,018	283	14%	7,033	1196	17%	318	73	23%
	Trigonometry	143	9	6%	645	45	7%	752	53	7%	986	79	8%	178	25	14%
	Precalculus	141	13	9%	744	97	13%	1,450	276	19%	323	78	24%	460	110	24%
	Calculus	158	84	53%	750	413	55%	2,813	1772	63%	480	326	68%	1,958	1390	71%
Total		1083	163	15%	4465	764	17%	7033	2383	34%	8822	1678	34%	2914	1599	34%

Source: Table above was extracted from the CCCCCO’s report on [Maximizing Calculus Completion for Students Seeking the Business Administration Degree Business Administration](#).