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# Comparative Throughput Analysis for AB 705 Compliance

Disaggregation by EOPS and DSPS  
Student Populations

MMAP Research Team

October 2018

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# Executive Summary

## Introduction

The Multiple Measures Assessment Project (MMAP)<sup>1</sup> is a collaborative effort led by the Research and Planning Group for California Community Colleges (RP Group) and the Educational Results Partnerships' (ERP) Cal-PASS Plus system, with input and support from the California Community College Chancellor's Office (CCCCO) and the Academic Senate for California Community Colleges (ASCCC). MMAP seeks to develop, pilot, and assess implementation of enhanced multiple measures, including the use of high school performance and non-cognitive variables, in student placement and advising. This project was part of the California Community College's Common Assessment Initiative (CAI) and now is supporting the implementation of AB 705,<sup>2</sup> which requires "that a community college district or college maximize the probability that a student will enter and complete transfer-level coursework in English and math within a one-year timeframe and use, in the placement of students into English and math courses, one or more of the following: high school coursework, high school grades, and high school grade point average."

The MMAP research team has conducted this study in order to examine whether student completion of a transfer-level course in math or English within one year varies by students' participation in either the Extended Opportunities Programs and Services (EOPS) program or the Disabled Students Programs and Services (DSPS) program. In addition, this study seeks to examine if throughput rates vary in relation to whether a student enters directly into a transfer-level English or math course compared to beginning the sequence one level below transfer.

The data examined in this report are disaggregated by students' EOPS and DSPS status and across high school grade point average (HSGPA) ranges associated with different levels of college course performance as determined by the Multiple Measures Assessment Project decision trees for transfer-level English, statistics, and pre-calculus. **Our research revealed that while variations occur within groups, students placed directly into transfer-level courses completed those courses at a higher rate than those placed one level below.**

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<sup>1</sup> <http://rpgroup.org/All-Projects/ArticleView/articleId/118/Multiple-Measures-Assessment-Project-MMAP>

<sup>2</sup> <https://assessment.cccco.edu/>

## Key Findings

### EOPS

The analysis conducted through this project produced the following key findings:

- EOPS students across all ranges of high school performance are one to two times more likely to complete transfer-level English if they start at transfer level than if they start one level below transfer.
- EOPS students across all ranges of high school performance are two to five times more likely to complete a statistics course if they start at that level than if they start one level below any transfer-level math course.
- EOPS students across all ranges of high school performance improved their throughput by almost 30 percentage points when placed directly into pre-calculus as opposed to starting one level below.

### DSPS

- DSPS students across all ranges of high school performance are one to three times more likely to complete transfer-level English if they start at transfer-level than if they start one level below transfer.
- DSPS students exhibited throughput rates more than two times higher than non DSPS students when placed into statistics than when placed below any transfer-level math course.

## Conclusion

This analysis did not find evidence that students would have higher throughput rates by being placed into basic skills courses, whether based on students' EOPS or DSPS status or high school performance. Thus, within the timeframe of data availability and given the curricular design and support structures that existed systemwide at this time, **we are unable to identify any group of students who complete transfer-level English, statistics, or pre-calculus courses at a lower rate when placed directly into those classes rather than one level below transfer.**

# Introduction

## Project Background

The Multiple Measures Assessment Project (MMAP)<sup>3</sup> is a collaborative effort led by the Research and Planning Group for California Community Colleges (RP Group) and the Educational Results Partnerships' (ERP) Cal-PASS Plus system, with input and support from the California Community College Chancellor's Office (CCCCO) and the Academic Senate for California Community Colleges (ASCCC). MMAP seeks to develop, pilot, and assess implementation of enhanced multiple measures, including the use of high school performance and non-cognitive variables, in student placement and advising. This project was part of the California Community College's Common Assessment Initiative (CAI) and now is supporting the implementation of AB 705,<sup>4</sup> which requires "that a community college district or college maximize the probability that a student will enter and complete transfer-level coursework in English and math within a one-year timeframe and use, in the placement of students into English and math courses, one or more of the following: high school coursework, high school grades, and high school grade point average."

## Purpose of the Project

There are two objectives of this report. The first objective is to examine whether student completion of a transfer-level course in math or English within one year (two semesters or three quarters) varies by participation in Extended Opportunities Programs and Services (EOPS) or Disabled Students Programs and Services (DSPS). The second objective is to determine any variance in throughput rates based on whether a student's first course in the discipline is at transfer-level or one level below transfer. Both of these data analyses were disaggregated across high school grade point average (HSGPA) ranges as determined by the Multiple Measures Assessment Project (MMAP) [decision trees](#) for transfer-level English, statistics, and pre-calculus, and by EOPS and DSPS status. It should be noted that within the data file available for analysis, only indicators for students' participation in EOPS and DSPS were available.

For EOPS and DSPS status, success rates in the gateway transfer-level course for students who started at transfer level<sup>5</sup> were compared to the successful completion of a gateway transfer-level course within one year for students who began one level below transfer for transfer-level English, statistics, and pre-calculus. Statistics was chosen as a key example of a transfer-level math course for students pursuing a social sciences or liberal arts pathway, and pre-calculus

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<sup>3</sup> <http://rpgroup.org/All-Projects/ArticleView/articleId/118/Multiple-Measures-Assessment-Project-MMAP>

<sup>4</sup> <https://assessment.cccco.edu/>

<sup>5</sup> Throughout rates for students who start at transfer-level or one term success rates.

was chosen as the most rigorous transfer-level entry point to a STEM pathway occurring after intermediate algebra across the California Community Colleges (CCCs).<sup>6</sup>

## In this Report

This report presents the throughput rates for students whose first course at a California Community College was either at transfer-level or one level below transfer in English, statistics, or pre-calculus to determine whether observations of higher throughput for direct placement are consistent across subpopulations in the CCCs. In the first section of the report, we briefly provide an important context for this study by describing MMAP’s use of decision trees and the ways in which MMAP analyses are now being utilized to advance compliance with newly adopted AB 705 requirements. The remainder of the report presents the success rates of students who entered English or math at transfer level and also analyzes the throughput rates for students who began at one level below and then went on to enroll in the transfer-level course. These success and throughput rates are examined by students’ EOPS and DSPS participation and are further disaggregated by students’ level of high school performance. The report concludes with a summary of the primary takeaways and overall recommendations.

## Methodology

In order to make best use of the data analyses described in this report, it is important to be able to place this project in the context of the overall MMAP initiative. This section describes the core work of MMAP and articulates how that work is now being focused on enabling compliance with the recently adopted Assembly Bill (AB) 705.

The MMAP decision tree<sup>7</sup> analyses include all students enrolled in an English or math course in the CCC system who also had four full years of high school data available in the California Partnership for Achieving Student Success (Cal-PASS Plus) data system, resulting in about 250,000 cases. As such, the MMAP research is based on retrospective data—students who had already been placed, enrolled, and completed courses in CCCs, mostly between 2007 and 2014. The decision trees summarize students’ success rates using course grades in the first English or math course they completed at a CCC and information on students’ high school achievement. Example high school achievement information included in the models includes cumulative unweighted high school grade point average (HSGPA), highest courses completed, type of course completed (by level and subject matter), and time between high school and college.

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<sup>6</sup> Starting in pre-calculus represents the highest possible bar and students with the same level of performance in high school would be expected to be less successful if placed directly there than if placed in a lower starting course like college algebra or trigonometry. Thus, if students placed directly into pre-calculus are more likely to successfully complete a transfer-level math course if placed there directly, similar students placed into college algebra, for example, would be even more likely to successfully complete that course when placed there directly.

<sup>7</sup> Decision trees are a form of data modeling that results in a set of “if-then” rules, where the if-then statements are referred to as “nodes” or “leaves” of the tree.

Placement recommendations were formed by setting certain criterion on the decision tree nodes, so that if students met or exceeded a minimum average probability of success at a certain level, they would be grouped together. The chosen criterion (70% predicted success rate at transfer level<sup>8</sup>) represents the minimum average successful completion rate of groups of students that the model places into that level of courses.

In the decision trees, a machine-learning algorithm divides the data to create groups or “nodes” of past students with similar success rates based on the inputs (high school transcript information). For example, students with an HSGPA below 1.9 had a 43% predicted success rate in transfer-level English (the lowest node), while students with an HSGPA greater than or equal to 3.1 had an 87% predicted success rate (the highest node). The original goal of MMAP was to identify students who are highly *likely* to succeed at a particular course level in order to determine who should be placed directly into transfer-level courses. In contrast, Assembly Bill (AB) 705 created new guidelines requiring the identification of students who are highly *unlikely* to succeed if directly placed into transfer-level and determine whether their outcomes are better (i.e., “maximized”) if they start directly at transfer-level rather than in basic skills coursework. Thus, to help CCCs comply with AB 705, the MMAP research team focused on students in the lowest nodes (i.e., with the lowest high school performance) with the lowest likelihood of success, as these students are theoretically least likely to succeed in the target course and presumably most likely to benefit from placement into developmental education courses. While the student characteristics identified in these lowest nodes involve only HSGPA, the utility of other aspects of high school achievement are examined throughout but prove more important, for example, in higher nodes for math courses, such as whether or not a student took pre-calculus.

Throughout this report, we examine the percentage of students who successfully complete transfer-level English or math courses with a grade of C or better within two primary semesters or three primary quarters of their first attempt in the discipline, also known as “throughput.” Importantly, throughput rates for students that start directly in a transfer-level course versus one level below are compared across three ranges of student high school performance as established by the original MMAP decision tree analysis. The top range is a combination of all nodes with success rates above 70%—students who are highly likely to succeed in the course as determined by the original MMAP research. The bottom range is the lowest terminal node, representing the lowest performing high school students who are least likely to succeed in the transfer-level course if placed there directly. The middle range comprises all of the nodes between the other two ranges of performance. Each of the three ranges for college composition (English), statistics, and pre-calculus are described in Table 1.

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<sup>8</sup> The criterion was determined by the statewide Multiple Measures Work Group, a subcommittee of the Common Assessment Initiative, with discipline and counseling faculty as well as assessment and registration staff stakeholders from across the state represented. This criterion represents the approximate average statewide success rate in transfer-level English courses and is slightly higher than that rate in transfer-level mathematics courses.

Table 1. Decision Tree Nodes by Transfer-Level Subject

Transfer-Level Subject	Range 1 (lowest node)	Range 2 (all intermediate nodes)	Range 3 (all nodes w/≥70% success rate)
English	HS GPA<1.9	HS GPA≥1.9 and <2.6	HS GPA≥2.6
Statistics <sup>9</sup>	HS GPA<2.3	HS GPA≥2.3 and <3.0	HS GPA≥3.0
Pre-calculus <sup>10</sup>	HS GPA<2.6 and no Pre-calculus in HS	HS GPA≥2.6 or Pre-calculus in HS	HS GPA≥3.4 or 11th grade GPA≥2.6 with Calculus in HS

## Successful Completion of Transfer-Level English

### Summary of Throughput Rates for English by EOPS Status

Comparing tables 2 and 3, EOPS students across all ranges of high school performance are one to two times more likely to complete the transfer-level course if they start at transfer-level than if they start one level below transfer. EOPS students in the lowest two ranges of high school performance are twice as likely to complete transfer-level English if they start there.

### Success Rates in Transfer-Level English for Students who Started at Transfer Level

Table 2 displays success rates by EOPS status for students who started at transfer-level English. There were no differences in completion rates in the lowest range of high school performance, a 5 percentage point difference in the middle range, and a two percentage point difference in the highest range when looking at EOPS status. A larger proportion of EOPS students comprise the highest high school performance ranges than the lower ranges.

Table 2. English Success Rates by EOPS Status—Transfer-Level

EOPS	Range 1		Range 2		Range 3	
	HS GPA<1.9		HS GPA≥1.9 & <2.6		HS GPA≥2.6	
	<i>Rate</i>	<i>N</i>	<i>Rate</i>	<i>N</i>	<i>Rate</i>	<i>N</i>
No	42%	6,644	59%	22,355	80%	49,643
Yes	42%	604	64%	1,580	78%	2,397

<sup>9</sup> Statistics includes a recommendation of at least successful completion of algebra I.

<sup>10</sup> Pre-calculus includes a recommendation of at least successful completion of Algebra II.



## Throughput Rates for Students Entering One Level Below Transfer

Table 3 displays throughput rates by EOPS status for students who started at one level below transfer-level English. Throughput rates were 8-13 percentage points higher for EOPS students than non-EOPS students across all ranges of high school performance.

Table 3. English Throughput Rates by EOPS Status—One level Below

EOPS	Range 1		Range 2		Range 3	
	HS GPA<1.9		HS GPA≥1.9 & <2.6		HS GPA≥2.6	
	Rate	N	Rate	N	Rate	N
No	16%	11,925	29%	26,517	44%	29,425
Yes	24%	1,249	39%	2,534	57%	2,367

## Summary of Throughput Rates for Transfer-Level English by DSPS Status

DSPS students in the lowest range of high school performance are two times more likely to complete a transfer-level course if they start at transfer-level than if they start one level below transfer. Moreover, DSPS students in the middle range of high school performance are twice as likely to complete transfer-level English if they start there, and students in the highest range complete transfer-level English at a rate that is 25 percentage points higher than if placed one level below.

## Success Rates in Transfer-Level English for Students who Started at Transfer Level

Table 4 displays success rates for students by DSPS status who started at transfer-level English. English success rates are similar when comparing DSPS and non-DSPS students; DSPS students complete transfer-level English courses at a rate that is just one percentage point higher in the lowest range of high school performance, one percentage point lower in the middle range, and at a rate three percentage points lower in the highest range.

Table 4. English Success Rates by DSPS Status—Transfer-Level

DSPS	Range 1		Range 2		Range 3	
	HS GPA<1.9		HS GPA≥1.9 & <2.6		HS GPA≥2.6	
	Rate	N	Rate	N	Rate	N
No	42%	7,040	59%	23,345	80%	50,851
Yes	43%	208	58%	590	77%	1,189

## Throughput Rates Through Transfer-level English for Students Starting One-Level Below Transfer

Table 5 displays the throughput rates by DSPS status for students who started at one level below transfer-level in English. English throughput rates are similar when comparing DSPS students to non-DSPS students in the two lowest ranges; DSPS students in the lowest range of high school achievement complete transfer-level English courses at the same rate as their non-DSPS peers, and DSPS students in the middle range complete transfer-level English at a rate that is two percentage point lower than their non-DSPS peers. However, DSPS students in the highest range of high school performance have English throughput rates that are eight percentage points greater when compared to non-DSPS students.

Table 5. English Throughput Rates by DSPS Status—One level Below

DSPS	Range 1		Range 2		Range 3	
	HS GPA<1.9		HS GPA≥1.9 & <2.6		HS GPA≥2.6	
	Rate	N	Rate	N	Rate	N
No	17%	12,724	30%	28,071	44%	30,743
Yes	17%	450	28%	980	52%	1,049

## Statistics

### EOPS

#### Summary of Throughput Rates for Statistics by EOPS Status

EOPS students in the lowest range of high school performance are nearly five times more likely to complete a transfer-level math course if they start in statistics than if they start one level below in mathematics. In addition, EOPS students in the higher ranges of high school performance are more than twice as likely to complete a transfer-level math course if they start in statistics.

#### Success Rates in Statistics for Students who Started in Statistics

Table 6 on the next page displays the success rates by EOPS status for students whose first math course was statistics. EOPS students exhibit higher success rates compared to non-EOPS students in the lowest range of high school performance, a five-percentage point difference.

However, success rates were lower for EOPS students compared to non-EOPS students in both the middle and highest ranges of high school achievement, with a three and five percentage point difference, respectively.

A smaller proportion of EOPS students were enrolled in statistics courses during the timeframe of this study compared to EOPS students enrolled in transfer-level English.

Table 6. Statistics Success Rates by EOPS Status

EOPS	Range 1		Range 2		Range 3	
	HS GPA<2.3		HS GPA≥2.3 & <3.0		HS GPA≥3.0	
	Rate	N	Rate	N	Rate	N
No	39%	1,352	57%	4,707	82%	7,350
Yes	44%	133	54%	368	77%	365

## Throughput Rates to Statistics for Students Starting One-Level Below Statistics

Table 7 displays throughput rates by EOPS status for students who started one level below any transfer-level math course. Throughput rates are similar for EOPS and non-EOPS students across all ranges of high school performance, with differences not exceeding three percentage points.

Table 7. Statistics Throughput Rates by EOPS Status

EOPS	Range 1		Range 2		Range 3	
	HS GPA<2.3		HS GPA≥2.3 & <3.0		HS GPA≥3.0	
	Rate	N	Rate	N	Rate	N
No	9%	10,225	18%	16,542	29%	9,647
Yes	9%	1,084	21%	1,437	32%	739

## DSPS

### Summary of Throughput Rates for Statistics by DSPS Status

Comparing tables 8 and 9, our analysis found that DSPS students in the middle and highest ranges exhibited throughput rates at least two times higher when placed directly into transfer-level statistics than if placed below any transfer-level math course.

In the lowest range of high school performance, DSPS students exhibited throughput rates eight times higher when placed directly into transfer-level statistics than if placed below any transfer-level math course.

### Success Rates in Statistics for Students who Started in Statistics

Table 8 on the following page displays the success rates by DSPS status for students whose first math course was statistics. DSPS students exhibited higher success rates in the lowest range by 11 percentage points but lower success rates than non-DSPS students in the middle and highest ranges of high school performance, with success rates that were six and fourteen percentage points lower, respectively.

Table 8. Statistics Success Rates by DSPS Status

DSPS	Range 1		Range 2		Range 3	
	HS GPA<2.3		HS GPA≥2.3 & <3.0		HS GPA≥3.0	
	Rate	N	Rate	N	Rate	N
No	39%	1,451	57%	4,976	82%	7,573
Yes	50%	34	51%	99	68%	142

## Throughput Rates to Transfer-Level for Students Starting One-Level Below Transfer

Table 9 displays throughput rates by DSPS status for students who started one level below transfer-level math. There was no more than a three-percentage point difference between the throughput rates of DSPS and non-DSPS students, with DSPS students having slightly higher throughput rates in the two highest ranges of high school performance.

Table 9. One level Below Transfer-Level Throughput Rates by DSPS Status

DSPS	Range 1		Range 2		Range 3	
	HS GPA<2.3		HS GPA≥2.3 & <3.0		HS GPA≥3.0	
	Rate	N	Rate	N	Rate	N
No	9%	11,004	18%	17,504	29%	10,127
Yes	6%	305	21%	475	30%	259

## Pre-Calculus

### Summary of Throughput Rates for Pre-Calculus by EOPS Status

EOPS students in the lowest high school performance range who start in pre-calculus are almost three times as likely to complete that course than students who begin the business-STEM (BSTEM) math sequence at one level below transfer are to complete any transfer-level math class.

Additionally, across all ranges of high school performance, throughput rates improved by 28 percentage points when students were placed directly into pre-calculus compared to starting one level below any transfer-level math course.

## EOPS

### Success Rates to Pre-calculus for Students who Started in Pre-Calculus

Table 10 on the next page displays success rates by EOPS status for students whose first math course was pre-calculus. Success rates for EOPS students were four percentage points higher

than for non-EOPS students in the lowest range of high school performance. In the middle and highest ranges of high school performance, success rates for EOPS students and non-EOPS students differed by only one percentage point with EOPS students performing slightly higher in the middle range and slightly lower in the highest range.

Table 10. Pre-Calculus Success Rates by EOPS Status

EOPS	Range 1		Range 2		Range 3	
	HS GPA<2.6 and no Pre-calculus in HS		HS GPA≥2.6 or Pre-calculus in HS		HS GPA≥3.4 or 11th grade GPA≥2.6 with Calculus in HS	
	Rate	N	Rate	N	Rate	N
No	38%	1,587	58%	4,458	78%	1,976
Yes	42%	166	59%	323	77%	138

### Throughput Rates to Pre-calculus for Students Starting One-Level Below Transfer

Table 11 displays throughput rates to completion of any business-STEM transfer-level math course by EOPS status for students whose first course was one level below transfer-level. Throughput rates for EOPS students were one to two percentage points higher than those of non-EOPS students in the lowest and highest ranges of high school performance. In the middle range of high school performance, EOPS students had throughput rates 2 percentage points lower than those of non-EOPS students.

Table 11. Pre-Calculus Throughput Rates by EOPS Status

EOPS	Range 1		Range 2		Range 3	
	HS GPA<2.6 and no Pre-calculus in HS		HS GPA≥2.6 or Pre-calculus in HS		HS GPA≥3.4 or 11th grade GPA≥2.6 with Calculus in HS	
	Rate	N	Rate	N	Rate	N
No	14%	17,265	32%	16,867	47%	3,281
Yes	15%	1,652	30%	1,351	49%	257

## DSPS

### Summary of Throughput Rates for Pre-calculus by DSPS Status

DSPS students in the lowest high school performance range who are placed directly into pre-calculus have throughput rates that are 33 percentage points higher than those of students who start one level below transfer-level in mathematics. In the middle high school performance range, DSPS students who are placed directly into pre-calculus have throughput rates that are 13 percentage points higher than those of students who start one level below transfer-level in

mathematics. Students in the highest high school performance band have throughput rates that are 18 percentage points higher than students who start one level below transfer-level in mathematics.

The highest performing DSPS students resulted in a small sample size (77 students), and are more likely to complete any BSTEM transfer-level math if they start one-level below than if they start in pre-calculus. However, given the very small sample size, the difference fails to approach significance. Further, the adjustments applied to the samples, particularly for BSTEM work well for large sample sizes, but are less appropriate for small samples.

## Success Rates in Pre-calculus for Students who Started in Pre-Calculus

Table 12 displays success rates by DSPS status for students whose first math course was pre-calculus. The success rate for DSPS students in the lowest high school performance range was eight percentage points higher than non-DSPS students in the same range. However, DSPS students in the middle and highest ranges had lower success rates in precalculus than non-DSPS students, with differences in success rates ranging from eight to ten percentage points lower for DSPS students.

Table 12. Pre-Calculus Success Rates by DSPS Status

DSPS	Range 1		Range 2		Range 3	
	HS GPA<2.6 and no Pre-calculus in HS		HS GPA≥2.6 or Pre-calculus in HS		HS GPA≥3.4 or 11th grade GPA≥2.6 with Calculus in HS	
	Rate	N	Rate	N	Rate	N
No	38%	1,719	58%	4,689	78%	2,064
Yes	46%	34	48%	92	70%	50

## Throughput Rates to Business-STEM Transfer-Level Course for Students Starting One Level Below Transfer

Table 13 on the next page displays throughput rates through any business-STEM transfer-level math course by DSPS status for students whose first course was one level below transfer. There was almost no difference in the success rates of DSPS and non-DSPS students in the lowest range of high school performance. However, DSPS students had higher throughput rates than non-DSPS students in the middle and highest ranges of high school performance, a 2 to 18 percentage point difference, respectively.

Table 13. One Level Below Business-STEM Transfer-Level Courses Throughput Rates by DSPS Status

DSPS	Range 1		Range 2		Range 3	
	HS GPA<2.6 and no Pre-calculus in HS		HS GPA≥2.6 or Pre-calculus in HS		HS GPA≥3.4 or 11th grade GPA≥2.6 with Calculus in HS	
	Rate	N	Rate	N	Rate	N
No	14%	18,414	32%	17,759	46%	3,461
Yes	13%	503	35%	459	88%	77

## Conclusion

For all three gateway courses, all student groups had higher levels of success at the transfer level when they were placed directly into those transfer-level courses rather than beginning at a lower level. Throughput rates were one to five times higher among students whose first course was transfer-level English, statistics, or pre-calculus—an advantage that held across EOPS/DSPS status as well as all ranges of high school performance. Moreover, the benefit of direct enrollment at the transfer level was strongest for students in the lowest range of high school performance.

Within the timeframe of data availability and given the curricular design and support structures that existed systemwide at this time, **virtually every student group<sup>11</sup> is more likely to successfully complete transfer-level courses when placed directly into the transfer-level course in all subjects examined.**

It is recommended that each college conduct its own analysis to compare throughput rates for students who begin below transfer-level to success rates among those who start at transfer-level at each level of high school achievement, disaggregated by special population status, both with and without specialized support, such as co-requisites, to ensure that local data align with the statewide findings. Further, colleges are encouraged to evaluate and assess their placement process, curricular design, concurrent supports and non-curricular support as well as determine and address disproportionate outcomes for historically underrepresented populations.

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<sup>11</sup> With only a few minor exceptions of low sample size. The types of adjustments used in this report are not well suited for small sample sizes. The BSTEM adjustment in particular works for large populations but is less appropriate for some sub-populations. Further, the success rates for these groups if placed directly into pre-calculus (compared to their throughput to any BSTEM course) very strongly suggests that they are not at all close to highly unlikely to succeed and so still should not be placed one-level below transfer-level.