November 2020

AB705 Impact on Mathematics Fall 2019 Report #329

College of the Canyons

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Institutional Research, Planning, and Institutional Effectiveness

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COLLEGE OF THE CANYONS

Table of Contents

Table of Figures

Tables

Introduction & Background

As part of the evaluation of the impact of AB705 on outcomes related to Mathematics coursework, the office of Institutional Research, Planning and Institutional Effectiveness conducted analyses examining placement, enrollment, success, retention, and throughput data.

Effective fall 2019, the Mathematics department implemented changes in placement and course offerings in compliance with AB-705[1]. These changes included the following:

- All students were given eligibility to enroll in a Transfer-level Mathematics course
- Transfer-level placements varied based on high school performance measures (i.e. High school GPA, Highest Mathematics course completed, Grade in highest Mathematics course completed).
- Transfer-level course offerings included the addition of co-requisite/with-support courses namely Trigonometry with support (MATH-102/092), College Algebra with support (MATH-103/092), Introduction to Statistics with support (MATH-140/090).
- A new transfer-level Liberal Arts Mathematics (MATH-100) course was offered

Method

Placement data were closely monitored through monthly reports that were obtained through the Assessment Center. For a period of approximately 8 months, between January and August 2019, **6,217** students[2] took the assessment and received placement(s) that were reflective of the changes. The grades report from Informer was used to assess enrollment rates, the success, retention and throughput rates for students Mathematics courses in fall 2019. Additionally these outcomes were further disaggregated (e.g., those who 'newly assessed' vs. others in the same course, demographics, etc.).

Results

Assessment Levels and Rates

In compliance with the goal of AB705, to maximize the probability of completion of transfer-level courses in Mathematics, all students were provided access to transfer-level courses. This change closed the access gap which was gradually being addressed through the various efforts which included disjunctive placement into transfer-level Statistics and B-STEM courses based on high school performance measures. Figure 1 provides a visual of how rates of placement into transfer-level changed since 2015 when Accuplacer was being used to assess students' Mathematics preparation level.

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[1] AB 705 is a bill signed by the Governor on October 13, 2017 that took effect on January 1, 2018. The bill requires that a community college district or college maximize the probability that a student will enter and complete transfer-level coursework in English and Mathematics within a one-year timeframe.

[2] In the previous year approximately 4,500-5,000 students assessed. Lower numbers of students assessing in previous years was largely due to changes going into effect in January instead of March in 2019 and students were eligible to reassess in order to provide more access to transfer-level courses.

Figure 1. Percent Placing into Transfer-level Mathematics by Race/ethnicity.

Data on reported high school information from the prior year was used to project the rates of students assessing into each level in 2019 (Figure 2). Projections were higher than the actual rate in level 1 both with regard to missing data as well as level 1 based on criteria. For levels 2, 3 and 4, actual rates were higher than the projections.

Figure 2. Placement Rates Projected (2018) vs. Actual (2019) by Level

Of the total number of placements in the given time period, a plurality of students were given eligibility for placement level 2 which includes transfer-level B-STEM courses (MATH-102/092,103/093) with support and transfer-level Liberal Arts courses without support (i.e. MATH-140, 100, and 130). The next largest level was Level 3 with 17% of the students receiving eligibility to enroll in BSTEM Transfer courses without-support. Table 1 provides details on each level's course eligibility, high school performance criteria and proportion assessing in each level.

Table 1. Mathematics course Eligibility and Criteria by Placement Level

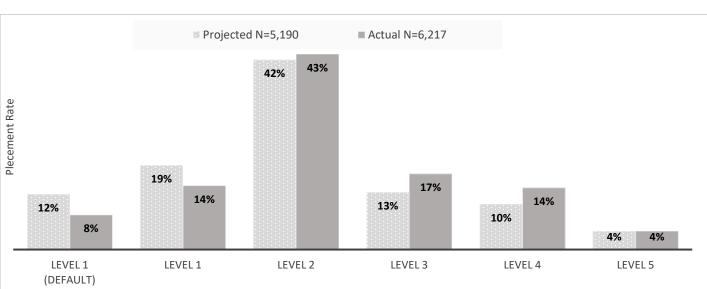|	Criteria	Course Eligibility	Percentages Assessing in each Level 2019 (N=6,217)
Level 1 (Default)	Default, missing High School information on last course and/or GPA	MATH-102/92, MATH- 103/93, MATH-140/090	7.7%
Level 1	Completed course below Algebra 2 and GPA < 3.0 *or* Completed course below Algebra 1 and GPA >3.0	MATH-102/92, MATH- 103/93, MATH-140/090	14.2%
Level 2	Completed Algebra 2 or higher and GPA < 3.0 *or* Completed Algebra 1 or higher and GPA >3.0	MATH-102/92, MATH- 103/93, MATH-140	43.4%
Level 3	Completed Calculus and GPA < 3.0, *or* Completed Trig. with A or a higher course and GPA > 3.0 *or* Completed Algebra 2 or higher and GPA >3.5	MATH-102, MATH-103, MATH-140, MATH-111	16.8%
Level 4	Completed Trig. with A or a higher course and GPA > 3.5	MATH-102, MATH-103, MATH-104, MATH-140, MATH-111	13.7%
Level 5	Completed Calculus with A/B and GPA >3.5	MATH-102, MATH-103, MATH-104, MATH-140, MATH-111, MATH-240, MATH-211	4.1%

*Each level subsumes course eligibility given in levels below.

Assessed and Enrolled

The number of students who enrolled in a Mathematics course in the fall term in 2019 remained similar to the numbers in prior recent years. The enrollment rate however, decreased in 2019 (32% vs. 45% in the prior year) partly due to the larger pool of assessments (6,217 students vs. approximately 4300 in prior years). When disaggregated, level 1 students had the lowest enrollment rate, 22% of level 1 students enrolled in the subsequent fall term vs. 35% average for other levels.
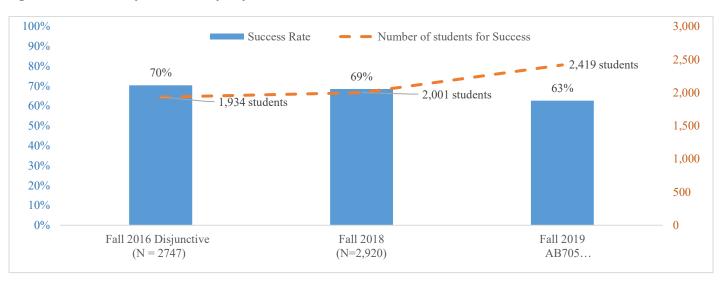
Table 2. Enrollment in Mathematics in fall term after Assessment

	2016	2017	2018	2019
Total Newly Assessed[3]	4,363	4,196	4,353	6,217
Enrolled in Mathematics (fall term)	1,691	1,936	1,976	1,985
Enrollment Rate	39%	46%	45%	32%

Success and Retention

The overall rate and volume of students successfully completing a transfer-level Mathematics course was compared for the last 3 fall terms. Although the success rate decreased from 70% to 63%, the number of students who successfully completed a transfer-level Mathematics course increased by 25% in 3 years (from 1,934 students in 2016 to 2,419 students in 2019).

Figure 3. Success in Transfer Mathematics for 3 fall terms

An aggregated examination of success and retention rates for entry-level transfer courses, and below-transfer level courses was compared between fall 2018 and fall 2019 (Table 3). First, in 2019, enrollment for below-transfer courses was one-fourth the size of the enrollment in transfer-level courses in the prior fall term. Moreover, success and retention rates in below-transfer level courses were lower in the fall 2019 term (success 39% vs. 53% and retention 68% vs. 79%). Similarly for transfer-level courses in the B-STEM pathway, success and retention rates were substantially lower in the AB705 term in comparison to the previous term (success 42% vs. 66% and retention 82% vs. 64%). Transfer-level courses in the Statistics/Liberal Arts Pathway had a 65% increase in enrollment and the course success rate was slightly lower (72% vs. 77%) and retention remained similar.

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[3] Newly-assessed students are those who assessed in the given year between January/March through August. Although it includes first-time students entering the college, it is not limited to them, and also includes students who were given the eligibility to re-assess in spite of having enrolled in a Math course previously (in 2019).

Table 3. Success and Retention Rates Aggregated for Transfer/Below-Transfer levels fall 2018 vs. fall 2019

	# of Sections		Enrollment	(N)	Success	(%)	Retention	(%)
	2018	2019	2018	2019	2018	2019	2018	2019
Transfer-Level: BSTEM[1]	19	25	573	687	66%	42%	82%	64%
Transfer-Level:Statistics/ Liberal Arts[2]	39	63	1195	1977	77%	72%	88%	87%
Transfer-Level: Other[3]	36	37	1152	1198	61%	59%	78%	72%
Below-Transfer[4]	88	29	2,546	638	53%	39%	79%	68%

* Excludes courses with fewer than 2 sections offered in the fall term.
1. B-STEM (Trigonometry and College Algebra)
2. Liberal Arts Mathematics (Statistics and Liberal Arts Mathematics)
3. Other (PreCalc, Calc I-III, Diff.Eq, Linear Alg., Mathematics Analysis)
4. Below-transfer (Pre-Alg, Elem. Alg., Interm.Alg, Interm.Alg. for Statistics, Geometry)

With-Support Transfer-level Courses

AB705 implementation included transfer-level course sections with newly offered support co-requisites. The success rates for these courses were examined and compared to the prior fall term. Figure 2 provides the rates for each course: Trigonometry MATH-102, College Algebra (MATH-103) and Introduction to Statistics (MATH-140).

In Trigonometry, the success rate in the prior fall term was highest (71%) with the success rate dropping in fall 2019 to 56% in the main course and to 24% in the sections with support. Additional information about student experiences in Trigonometry sections with support is provided in Research Brief # 196 (Saxena, and Meuschke 2020) where results of surveys administered in fall 2019 are summarized.   In College Algebra success rates for the main course also dropped since the prior fall term (57% in fall 2018 vs. 37% in fall 2019). The with-support sections of College Algebra had a success rates of 47%. Following the same pattern as College Algebra, the success rate for Statistics was highest in the prior fall term and lowest in the main course in fall 2019 (73% vs. 77%). Co-requisite sections of Statistics had an overall success rate of 69%.

Figure 4. Success Rates in with-support, entry-level Transfer Courses

Course Success Rate

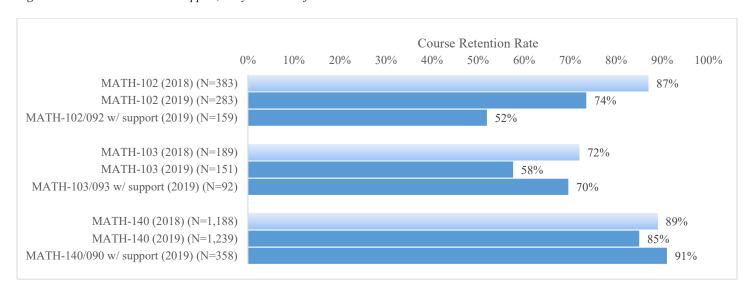| Course	Success Rate
MATH-102 (2018) (N=383)	71%
MATH-102 (2019) (N=283)	55%
MATH-102/092 w/ support (2019) (N=159)	24%
MATH-103 (2018) (N=189)	57%
MATH-103 (2019) (N=151)	37%
MATH-103/093 w/ support (2019) (N=92)	47%
MATH-140 (2018) (N=1,188)	77%
MATH-140 (2019) (N=1,239)	70%
MATH-140/090 w/ support (2019) (N=358)	73%

With-support co-requisite course sections required that students enroll in, and earn a separate grade for the support component. Some students completed the main course and not the support course and vice-versa. Where there was a mismatch, nearly all students passed the support course and not the main course. This pattern was present for College Algebra (MATH-103) and Statistics (MATH-140), and comprised 5% of the total enrollments.

Table 4. Grade match between Main course and Co-requisite

	Trigonometry (MATH-102/092)	College Algebra (MATH-103/093)	Statistics (MATH-140/090)
Passed main, not support	0	0	2
Passed Support, not main	1	15	20
Passed both courses	38	43	259
Did not pass either	120	34	77
Total Enrollment	159	92	358

Figure 5. Retention Rates in with-support, entry-level Transfer Courses

Liberal Arts Mathematics

The Mathematics department began offering a new transfer-level course, Liberal Arts Mathematics (MATH-100) with the first cohort of students enrolling in fall 2019. Among the 377 students who enrolled in the first term of the course, the course success rate was 59% and the retention rate was 87%. When the data were further disaggregated by whether students were 'newly assessed' or 'other', the success rate was lower and the retention rate was higher for students who assessed during the AB705 implementation year (2019). Students in Liberal Arts Mathematics who newly assessed were largely from level 1 and level 2 of the placement groups. Additional information about student experiences in this course is provided in Report#328 (Saxena, and Meuschke 2020) where results of surveys administered in fall 2019 are summarized.
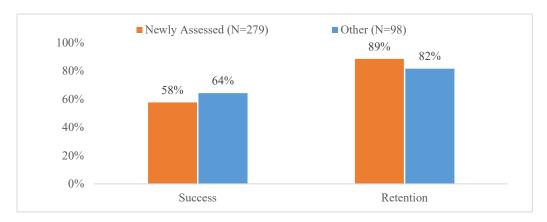
Figure 6. Success and Retention Rates in Liberal Arts Mathematics by Newly Assessed vs. Other students.

Other Courses

Success and retention rates for courses that were not presented above, were compared between fall 2018 and fall 2019 and the largest decreases (of at least 3 percentage points) were observed in the following courses. Below-transfer courses with the decreases in success rates included MATH-070 (28% vs. 52%), MATH-075 (63% vs. 77%), followed by MATH-083(43% vs. 50%). Enrollments for below transfer courses in fall 2019 were also a fraction of the size of the enrollments in the prior fall term.

Among transfer-level courses for which enrollment counts were similar in both terms, MATH-130, MATH 215 and MATH-211 had substantial decreases. Table 5 provides details by course.

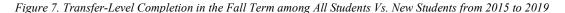*Table 5. Success and Retention Rates by Course 2018 fall vs. 2019 fall*

Course	Fall 2018			Fall 2019			Success	Retention
	Enrolled (N)	Success (%)	Retention (%)	Enrolled (N)	Success (%)	Retention (%)	Percentage Point Change	Percentage Point Change
MATH-070	776	51.8%	74.7%	317	28.4%	59.9%	-23.4%	-14.8%
MATH-075	505	76.6%	89.9%	88	62.5%	84.1%	-14.1%	-5.8%
MATH-130	37	89.2%	97.0%	38	76.3%	92.0%	-12.9%	-5.0%
MATH-215	51	72.5%	90.0%	50	62.0%	74.0%	-10.5%	-16.0%
MATH-211	281	52.3%	70.5%	297	44.4%	71.0%	-7.9%	0.5%
MATH-083	143	50.3%	70.6%	58	43.1%	65.5%	-7.2%	-5.1%
MATH-104	361	63.4%	83.9%	247	60.7%	81.8%	-2.7%	-2.1%
MATH-240	61	72.1%	80.3%	36	70.6%	84.3%	-1.5%	4.0%
MATH-060	674	41.2%	78.0%	127	40.2%	74.0%	-1.0%	-4.0%
MATH-212	230	58.7%	72.0%	230	57.8%	76.5%	-0.9%	4.5%

Course	Fall 2018			Fall 2019			Success	Retention
MATH-214	63	73.0%	82.5%	61	79.2%	88.3%	6.2%	5.8%
MATH-058/059	451	50.0%	80.3%	48	58.0%	75.0%	8.0%	-5.3%
MATH-213	103	61.2%	84.0%	86	77.9%	93.0%	16.7%	9.0%

Throughput: Completion of Transfer-level Mathematics

The primary goal of AB705 was to increase access to transfer-level courses, and in-turn, increase the number of students who complete transfer-level courses within a shorter time frame than they would have through enrollment in various below-transfer courses and completing the primarily Algebra-based sequence. Throughput is defined as the percentage of newly-assessed students who completed at least one transfer-level Mathematics course in the fall term.

This throughput data was examined for the fall 2019 term in comparison to the previous 4 terms, starting with a baseline of 2015 before disjunctive and mixed-placement were implemented. The throughput rate was the highest in the 2019 fall term when AB705 changes were implemented yielding an increase of 24 percentage points among newly assessed students over than prior fall term. For newly assessed students, throughput rates nearly doubled when disjunctive assessment was implemented, and quadrupled with AB705 changes.

Figure 7. Transfer-Level Completion in the Fall Term among All Students Vs. New Students from 2015 to 2019

*Percentage is out of students who assessed and enrolled in a Math course in the given term.

Although with disjunctive placement in 2016, the throughput rates increased for all students, disproportionate impact with regard to race/ethnicity still remained an issue. Disaggregating throughput rate by race/ethnicity showed that rates of transfer-level completion in Mathematics increased for all groups substantially (Figure 8).
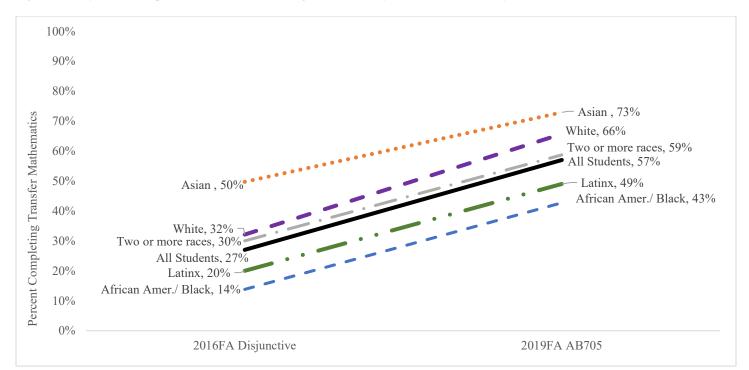
Figure 8. Transfer-level Completion in the Fall Term among New Students by Year and Race/Ethnicity

Disproportionate impact (D.I.) analyses using the 80% benchmark of the rate for all students completing transfer-level Mathematics, indicated that the gap was significantly reduced for previously identified D.I. groups (i.e. African American/Black students and Latinx students). As presented in Table 6, if a group's completion rate is below 80% of the average rate then that group is disproportionately impacted. In 2016, African American/Black students' rate was at 50% of the 80% benchmark, and increased to 74% of the 80% benchmark in 2019. Among Latinx students, disproportionate impact for throughput in Mathematics was also substantially reduced between 2016 and 2019.

Table 6. Group Sizes and Disproportionate Impact for Throughput Rate (80% Benchmark)

	80% of Overall		80% of Other[4]	
	2016FA Disjunctive	2019FA AB705	2016FA Disjunctive	2019FA AB705
African American/Black	**50%**	**75%**		
Asian	181%	127%		
Latinx	**73%**	86%	**59%**	**77%**
White	117%	115%		
Two or more races	111%	102%		

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[4] Since Latinx- identifying students represent the largest group in the overall student population, the 80% of 'Other' measure was used to assess disproportionate impact when the group's rate is removed and compared to the rate of all other race/ethnicity groups, combined.

As a visual representation, Figure 9 provides each group's rate (percentages) by year (2016, unbolded vs. 2019, bolded), while depicting the 80% threshold (dashed/red line) of the reference rate (the rate of all students combined). A rate below the dashed/red line is considered a group that is disproportionately impacted, and the distance below is the degree to which there is a gap.
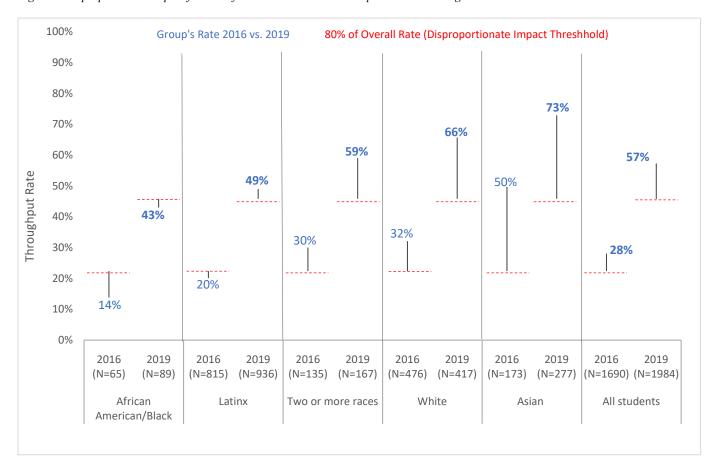
Figure 9. Disproportionate Impact for Transfer-Level Mathematics Completion Rate among New Students 2016 vs. 2019

Other demographics such as age and gender were also assessed for disproportionate impact in completion of transfer-level Mathematics. Figure 10 presents the rate change in transfer-level Mathematics completion by age group and gender between 2016 and 2019. The rate for each group at least doubled in 2019.

Disproportionate impact was eliminated for previously identified DI age groups (ages 20 years or more) (Table7). Disproportionate impact for gender was not found in 2016, and remained so in 2019.
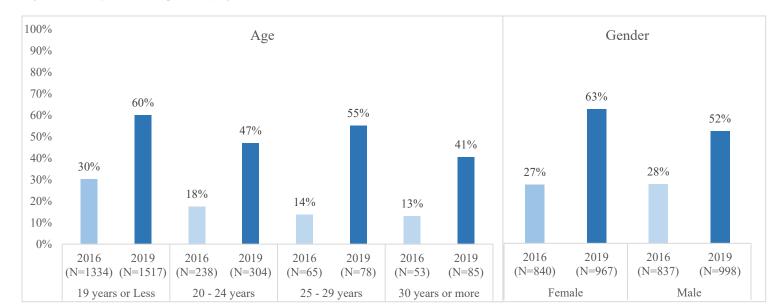
Figure 10. Transfer Math completion by Age and Gender

Table 7. Disproportionate Impact for Transfer Mathematics completion for Age group

Age	80% of Overall	
	2016FA Disjunctive	2019FA AB705
19 years or less	110.5%	104.7%
20 -24 years	**64.0%**	82.2%
25-29 years	**50.2%**	96.2%
30 years or more	**48.0%**	82.2%

Recommendations

Upon review of the results of Mathematics AB705 data analyses, the following recommendations should be taken into consideration:

- Explore options for providing support and guidance for students in transfer-level BSTEM courses (i.e. MATH-102 and MATH-103) especially for students assessing into level 1.

- Consider department-wide discussions surrounding low success rates in MATH-102/092.

- Continue monitoring data to assess the impact on throughput beyond the first-semester with regard to the following research questions:

  o How many students re-enroll in the subsequent terms once they do not successfully complete the transfer-level course?
  o How do students fair when repeating the transfer-level courses?

For more detailed information on this research brief, please contact Preeta Saxena, Ph.D., Senior Research Analyst (661)362-3072, or Daylene Meuschke, Ed.D., Associate V.P. Institutional Research, Planning and Institutional Effectiveness at 661.362.5329.