Math Assessment

An Examination of Placement, Enrollment, Success, Disproportionate Impact, and Multiple Measures

Parts 1 through 4 of this report summarize data on math placements, course enrollments, course success, and disproportionate impact among students who took the math assessment at Cypress College between March 1, 2014 and September 30, 2014. Parts 5 and 6 are based on a cohort of first-time fall 2014 students who were submitted to Cal-PASS Plus for a match to obtain multiple measures placements.

Part 1: Math Placements

The assessment instrument currently being utilized to recommend math placements at Cypress College is the MDTP, or the Math Diagnostic Testing Project. A total of 2,668 students took the MDTP at Cypress College between March 1, 2014 and September 30, 2014 (see Table 1). The MDTP has four tests that students may take to receive their recommended placement: 1) Algebra Readiness Test, 2) Elementary Algebra Test, 3) Intermediate Algebra Test, and 4) Pre-Calculus Test. Students may be required to take more than one test to receive a recommended placement if they score below a certain threshold, however some students do not come back to retest and therefore do not have a recommended placement (see "Need Retest" group in Table 1).

Table 1. Math Placements based on MDTP between March 1, 2014 and September 30, 2014

Recommended Placements	Took MDTP	
	N	%
MATH 150A	103	3.9%
MATH 100, 120, 115, 130A, 141, 142	473	17.7%
MATH 30, 38, 40	325	12.2%
MATH 20	234	8.8%
MATH 15	1,079	40.4%
MATH 10	228	8.5%
Need Retest	226	8.5%
Total	**2,668**	**100.0%**

Part 2: Course Enrollments

Of the 2,668 students that took the MDTP at Cypress College between March 1, 2014 and September 30, 2014, 81.3% (n = 2,169) enrolled at Cypress College in the subsequent year (summer 2014, fall 2014, spring 2015, or summer 2015). Alternatively, 18.7% (n = 499) did not enroll in any course at Cypress college in the subsequent year.

More specifically, we found that only 53.0% (n = 1,415) of the 2,668 students that took the MDTP enrolled in a math course in the subsequent year (see Table 2).

Table 2. Math Enrollment among MDTP Test Takers

Recommended Placements	Took MDTP	Enrolled in Math	
	N	N	%
MATH 150A	103	81	78.6%
MATH 100, 120, 115, 130A, 141, 142	473	302	63.8%
MATH 30, 38, 40	325	247	76.0%
MATH 20	234	159	67.9%
MATH 15	1,079	502	46.5%
MATH 10	228	46	20.2%
Need Retest	226	78	34.5%
Total	**2,668**	**1,415**	**53.0%**

We also examined whether students who enrolled in a math course did so in a course that was consistent with their MDTP placement recommendation, or in a course that was above or below where they assessed (in other words, rejecting their MDTP placement recommendation). To address this issue, we looked at the *first* math class students enrolled in during the subsequent year. Overall, we found that 92.5% of students enrolled in a course at their placement level, 4.9% of student enrolled in a course above their placement level, and 2.6% of students enrolled in a course below their placement level (see Table 3).

Table 3. Alignment of Math Placement and Enrollment

Recommended Placement	Enrolled in a Course AT Placement Level		Enrolled in a Course ABOVE Placement Level		Enrolled in a Course BELOW Placement Level		Total	
	N	%	N	%	N	%	N	%
MATH 150A	75	92.6%	0	0.0%	6	7.4%	81	100.0%
MATH 100, 120, 115, 130A, 141, 142	271	89.7%	4	1.3%	27	8.9%	302	100.0%
MATH 30, 38, 40	242	98.0%	4	1.6%	1	0.4%	247	100.0%
MATH 20	158	99.4%	1	0.6%	0	0.0%	159	100.0%
MATH 15	458	91.2%	43	8.6%	1	0.2%	502	100.0%
MATH 10	33	71.7%	13	28.3%	0	0.0%	46	100.0%
Total	**1,237**	**92.5%**	**65**	**4.9%**	**35**	**2.6%**	**1,337**	**100.0%**

Note. Students that enrolled in a math class but did not receive a recommended placement due to a needed retest were excluded from this portion of the analysis (n = 78).

Part 3: Math Course Success

Course success in relation to math placement and enrollment was also examined (see Table 4). The success rate of the 1,237 students who enrolled in a math course at their placement level was 64.4%, which is slightly lower than the success rates of students who enrolled above (66.2%, n = 65) or below (68.6%, n = 35) their placement level.

Table 4. Course Success by Alignment of Math Placement and Enrollment

Recommended Placement	Enrolled in a Course AT Placement Level		Enrolled in a Course ABOVE Placement Level		Enrolled in a Course BELOW Placement Level		Total	
	N	Success Rate	N	Success Rate	N	Success Rate	N	Success Rate
MATH 150A	75	78.7%	0	0.0%	6	100.0%	81	80.2%
MATH 100, 120, 115, 130A, 141, 142	271	58.7%	4	50.0%	27	59.3%	302	58.6%
MATH 30, 38, 40	242	59.9%	4	50.0%	1	100.0%	247	59.9%
MATH 20	158	72.8%	1	100.0%	0	0.0%	159	73.0%
MATH 15	458	64.8%	43	65.1%	1	100.0%	502	64.9%
MATH 10	33	66.7%	13	76.9%	0	0.0%	46	69.6%
Total	**1,237**	**64.4%**	**65**	**66.2%**	**35**	**68.6%**	**1,337**	**64.6%**

Part 4: Disproportionate Impact

Title 5 states:

> *"For the purpose of assessment, disproportionate impact is when the percentage of persons from a particular racial, ethnic, age, or disability group, who are directed to a particular service or course placement based on an assessment test or other measure is significantly different from the representation of that group in the population of persons being assessed, and that discrepancy is not justified by empirical evidence demonstrating that the assessment test or other measure is a valid and reliable predictor of performance in the relevant educational setting."*

Due to limitations of demographic data currently available for students who took the MDTP, the disproportionate impact analysis will focus only on ethnicity. The ethnic breakdown of students that took the MDTP are presented in Table 5 alongside the ethnic breakdown of the population that became eligible for college-level math as a result of the MDTP. To evaluate disproportionate impact, we first identify the highest performing group—in this case, the group with the highest rate of placement into college-level math. We then use the "80% rule" based on the EEOC guidelines to see whether any group is placing into college-level math at less than 80% of the rate of the highest performing group. As can be seen in the last column of Table 5, all ethnic groups show evidence of disproportionate impact with placement rates into college-level math at less than 80% of the rate of Asian/Pacific Islander students.

Table 5. Math Placements and Eligibility for College-Level Math by Ethnicity

	Took MDTP	Not Eligible for College Math		Eligible for College Math		Disporportionate Impact
	N	N	%	N	%	
African American	127	107	84.3%	20	15.7%	Yes
American Indian/Alaskan Native	6	5	83.3%	1	16.7%	Yes
Asian/Pacific Islander	472	217	46.0%	255	54.0%	Reference Group
Filipino	157	105	66.9%	52	33.1%	Yes
Hispanic	1,262	1,095	86.8%	167	13.2%	Yes
White	404	327	80.9%	77	19.1%	Yes
Not Reported	14	10	71.4%	4	28.6%	Yes
Total	**2,442**	**1,866**	**76.4%**	**576**	**23.6%**	
80% of Reference Group (Asian/PI)					**43.2%**	

Note 1. Students who took the MDTP but did not receive a placement level due to a needed retest were excluded (n = 226).

Note 2. Eligibility for college-level math includes placement into Math 100 or higher.

Parts 5 and 6 of this report focus on a cohort of first-time students who attended Cypress College for the first time either in summer or fall 2014. Data on 2,220 these students were submitted to Cal-PASS Plus in order to obtain additional information regarding recommended multiple measures placements and high school data where we received a match for 649 students. Parts 5 and 6 are further narrowed by only including those students who enrolled in a math course in fall 2014. The number of students examined varies by table due to missing data, incomplete placements, and differences in enrollments.

Part 5: Comparison of Placement Test and Multiple Measures

The amount of students being placed into each course level was also examined and compared for traditional placement methods and multiple measures. Traditional placement measures have indicated that most students place below transfer level for math. The most evident differences when comparing traditional placement and multiple measures for math are observed when examining the number of students placing three and four levels below. Utilizing multiple measures, students who would traditionally place four levels below could receive a bump to take a higher level course. Similarly, 69.8% of students who placed three levels below using traditional placement would be bumped up using multiple measures.

Table 6. Math Placements by Traditional Placement and Multiple Measures

Placement Level	Placement by Test	Multiple Measures Equivalent		Multiple Measures Level Lower		Multiple Measures Level Same		Multiple Measures Level Higher	
	N	*N*	%	*N*	%	*N*	%	*N*	%
Transfer Level	210	177	27.3%	103	49.0%	107	51.0%	N/A	N/A
1 Level Below	119	108	16.6%	64	53.8%	21	17.6%	34	28.6%
2 Levels Below	52	215	33.1%	17	32.7%	19	36.5%	16	30.8%
3 Levels Below	222	149	23.0%	0	0.0%	67	30.2%	155	69.8%
4 Levels Below	46	0	0.0%	N/A	N/A	0	0.0%	46	100.0%
Total	**649**	**649**	**100.0%**	**184**	**28.3%**	**214**	**33.0%**	**251**	**38.7%**

Overall, most students are currently enrolling in courses that are indicative of their suggested placements using multiple measures; however, the amount of students enrolling, at, above, and below their suggested placements using multiple measures are very similar. The most significant finding from this analysis relates to the success rates of students who enroll at, above, and below their multiple measures suggested placements. Students' who enrolled in courses at their multiple measures level of placement were more successful than those who enrolled in a course above or below their multiple measures recommended placements.

Table 7. Course Success by Alignment of Multiple Measures and Math Enrollment

MMAP Placement Level	Placement by MMAP	Enrolled in a Course AT MMAP Level		Enrolled in a Course ABOVE MMAP Level		Enrolled in a Course BELOW MMAP Level		Total	
	N	*N*	Success Rate	*N*	Success Rate	*N*	Success Rate	*N*	Success Rate
Transfer Level	134	82	84.1%	N/A	N/A	52	78.8%	134	82.1%
1 Level Below	75	24	79.2%	12	50.0%	39	66.7%	75	68.0%
2 Levels Below	143	24	70.8%	76	48.7%	43	55.8%	143	54.5%
3 Levels Below	94	26	57.7%	62	38.7%	6	50.0%	94	44.7%
Total	**446**	**156**	**76.9%**	**150**	**44.7%**	**140**	**67.1%**	**446**	**63.0%**

Part 6: The Relationships between High School Data and Placements

Bivariate correlations were analyzed to compare the relationships between all available students' high school math grades, MDTP placements, and their grades in their first math course taken at Cypress College (see Table 8). Overall, multiple measures placements correlated more strongly with students' grades in their first college math course and students' high school grades per math course.

Table 8. Placement Correlations with High School and College Data

Correlations with Traditional Placement	Correlations with Multiple Measures (MM) Placement
• Cumulative GPA ○ $r = .31$, $p < .001$ ○ weak positive relationship with traditional placement	• Cumulative GPA ○ $r = .87$, $p < .001$ ○ very strong positive relationship with MM
• MDTP Scores ○ $r = .51$, $p < .001^{***}$ ○ moderately positive relationship with traditional placement	• MDTP Scores ○ $r = .18$, $p < .001^{***}$ ○ very weak positive relationship with MM
• Grade in College Math Course ○ $r = -.02$, $p > .05$ ○ No relationship	• Grade in College Math Course ○ $r = .33$, $p < .001^{***}$ ○ weak positive relationship with MM
• HS Standardized Test Scores ○ $r = .12$, $p = .03^{*}$ ○ very weak positive relationship with traditional placement	• HS Standardized Test Scores ○ $r = .02$, $p > .05$ ○ no relationship with MM
• Algebra I High School Grade ○ $r = .33$, $p < .001^{***}$ ○ weak positive relationship with traditional placement	• Algebra I High School Grade ○ $r = .43$, $p < .001$ ○ weak to moderately positive relationship with MM
• Algebra II High School Grade ○ $r = .49$, $p < .001^{***}$ ○ moderately positive relationship with traditional placement	• Algebra II High School Grade ○ $r = .62$, $p < .001$ ○ moderate to strong positive correlation with MM
• Trigonometry High School Grade ○ $r = .51$, $p < .001^{***}$ ○ moderately positive relationship with traditional placement	• Trigonometry High School Grade ○ $r = .55$, $p < .001^{***}$ ○ moderately positive relationship with MM
• Pre-Calculus High School Grade ○ $r = .08$, $p > .05$ ○ no relationship	• Pre-Calculus High School Grade ○ $r = .56$, $p < .001$ ○ moderately positive relationship with MM
• Calculus High School Grade ○ $r = .00$, $p > .05$ ○ no relationship	• Calculus High School Grade ○ $r = .56$, $p < .001$ ○ moderately positive relationship with MM