

Multiple Measures Assessment Project (MMAP) Summary of Methodology for English and Math Phase II Rule Sets and AB 705 Adjustments

The goal of the original MMAP placement recommendations was to identify students who were highly likely to succeed at any given level of an English and math course. The results suggested that many students had been placed too low by traditional assessment tests, with underrepresented minority and female students placed disproportionately lower than their non-minority and male peers, especially in math. The passage of AB 705 required the field to approach placement and curricular design differently and determine how to maximize the likelihood that students successfully complete a transfer-level course (“throughput”) in one year rather than determining who is highly likely to succeed in a particular course, regardless of level. The throughput rate is the percentage of students who complete transfer-level English or math courses with a grade of C or better within two primary semesters or three primary quarters.

MMAP Methodology

The MMAP [decision tree analysis](#)¹ included all students enrolled in an English or math course in the California Community College (CCC) system who also had four years of high school data available in the California Partnership for Achieving Student Success (Cal-PASS Plus) data system, resulting in 250,000 cases. As such, MMAP research is based on retrospective data—students who had already been placed, enrolled, and completed courses in the CCC system, primarily between 2007 and 2014. The decision tree analysis classifies students by attributes of high school achievement into groups of students with similar success rates in their first English or math course attempted at a CCC. As many attributes from students’ high school achievement as possible were examined, including cumulative unweighted high school grade point average (HSGPA), highest course completed in the discipline, type of course completed (by level and subject matter), and delay between high school and college.

Working with stakeholders from across the state in the Multiple Measures Work Group and the Common Assessment Initiative, the criterion at transfer-level was set at a 70% success rate (roughly equivalent to the average statewide success rate in transfer-level English) representing the minimum average successful completion rate of groups of students who were placed into that course level.

AB 705 Adjustments to the Rule Sets

In the decision trees, a machine-learning algorithm split the data to create groups or “nodes” of students with similar success rates based on the inputs (high school achievement). For example, students with a HSGPA below 1.9 achieved a 43% success rate in transfer-level English (the lowest node), while students with a HSGPA greater than or equal to 3.1 have an 87% success rate (the highest node). To meet AB 705 compliance, the MMAP research team focused on the lowest nodes of students with the lowest likelihood of success, as these students theoretically should be least likely to succeed in the target course and presumably most likely to benefit from placement into basic skills courses, and thus were the group used to determine throughput if

¹ 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.

placed into basic skills. While these lowest node characteristics involve only HSGPA, higher nodes for math courses involve other characteristics, such as completion of Algebra II (Intermediate Algebra).

The success rates of students in the lowest node, however, represent the rates of success among students with the lowest HSGPA who were also eligible to enroll into the transfer-level course, a potential source of selection bias. It is possible that the lowest HSGPA students who were also historically placed below transfer level might be academically lower performers than similar students historically placed into transfer-level and, thus, their success rates may be lower if placed directly into transfer-level than students who historically were placed into transfer-level.

To estimate and control for possible selection bias, the MMAP research team used the same data set used to develop the original MMAP rule sets and focused on transfer-level English, statistics, and pre-calculus² and the characteristics of the students in the lowest node of the decision tree. The MMAP research team obtained ACCUPLACER scores for a subset³ of English and math students and applied multiple approaches to estimate direct placement success rates for the students in the lowest node. These multiple approaches included fitting a regression model that predicts success in target courses based on high school GPA and ACCUPLACER scores. The result was a set of regression-adjusted success rates for each course.⁴

Conclusion

Based on the analysis described above, for all three courses analyzed (transfer-level English, statistics, and pre-calculus), **students who are placed directly at transfer-level complete the transfer-level course at a higher rate than students who begin below transfer-level, regardless of HSGPA.** Direct transfer-level completion in English among students in the lowest node (HSGPA < 1.9) was 42% (adjusted one-semester success rate) compared to 12% among students who started at one level below transfer-level. For statistics, direct transfer-level completion for the lowest node (HSGPA < 2.3) was 29% (adjusted one-semester success rate), compared to 8% for students who started at one level below. For pre-calculus, the completion rate in the lowest node (HS GPA < 2.6 and no pre-calculus) was 28% (adjusted one-semester success rate) compared to 13% for students who started at one level below.

This analysis did not find evidence that students with a low HSGPA would have higher throughput rates by being placed into basic skills courses. Therefore, within the timeframe where data was available and given the curricular design and support structures that existed systemwide at this time, we are unable to identify any group of students who are highly unlikely to succeed if directly placed into transfer-level English, statistics, or pre-calculus.⁵ It is recommended that each college conduct their own analyses to compare throughput rates below transfer-level to success rates at transfer-level at each level of high school achievement, 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 underserved populations.

² Entry-level transfer-level STEM courses after intermediate algebra vary by college ranging from college algebra to trigonometry to pre-calculus. Pre-calculus was chosen because it is the most difficult of the entry-level transfer-level math courses and thus any rules developed based on success rates in pre-calculus based on a particular level of high school achievement should lead to higher success rates in courses prior to pre-calculus.

³ English – Students in the lowest node = 7,294; students in the regression adjusted model = 1,749; students who started one level below = 13,241. Statistics – Students in the lowest node = 1,485; regression adjusted model = 809; students who started one level below = 11,309. Pre-Calculus – Students in the lowest node = 1,753; regression adjusted model = 661; students who started one level below = 18,917.

⁴ Technical report on regression-adjustments (available September 2018): <https://bit.ly/2NNly04>

⁵ Research brief (available September 2018) of AB 705 adjustments for [EOPS/DSPS](#) students and by [gender and ethnicity](#).