

Executive Summary | September 2018

Multiple Measures Placement Using Data Analytics

An Implementation and Early Impacts Report

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CENTER FOR THE ANALYSIS OF
POSTSECONDARY READINESS



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Overview

Many incoming college students are referred to remedial programs in math or English based on scores they earn on standardized placement tests. Yet research shows that some students assigned to remediation based on test scores would likely succeed in a college-level course in the same subject area without first taking a remedial course if given that opportunity. Research also suggests that other measures of student skills and performance, and in particular high school grade point average (GPA), may be useful in assessing college readiness.

CAPR is conducting a random assignment study of a multiple measures placement system based on data analytics to determine whether it yields placement determinations that lead to better student outcomes than a system based on test scores alone. Seven community colleges in the State University of New York (SUNY) system are participating in the study. The alternative placement system we evaluate uses data on prior students to weight multiple measures — including both placement test scores and high school GPAs — in predictive algorithms developed at each college that are then used to place incoming students into remedial or college-level courses. Over 13,000 incoming students who arrived at these colleges in the fall 2016, spring 2017, and fall 2017 terms were randomly assigned to be placed using either the status quo placement system (the control group) or the alternative placement system (the program group). The three cohorts of students will be tracked through the fall 2018 term, resulting in the collection of three to five semesters of outcomes data, depending on the cohort.

This interim report, the first of two, examines implementation of the alternative placement system at the colleges and presents results on first-term impacts for 4,729 students in the fall 2016 cohort. The initial results are promising. The early findings show that:

- While implementing the alternative system was more complex than expected, every college developed the procedures that were required to make it work as intended.
- Many program group students were placed differently than they would have been under the status quo placement system. In math, 14 percent of program group students placed higher than they would have under a test-only system (i.e., in college-level), while 7 percent placed lower (i.e., in remedial). In English, 41.5 percent placed higher, while 6.5 percent placed lower.
- Program group students were 3.1 and 12.5 percentage points more likely than control group students to both enroll in and complete (with a grade of C or higher) a college-level math or English course in the first term.

(Enrollment and completion rates among the control group were 14.1 percent in math and 27.2 percent in English.)

- Women appeared to benefit more than men from program group status in math on college-level math course placement, enrollment, and completion (with a grade of C or higher) outcomes; Black and Hispanic students appeared to benefit more than White students from program group status in English on college-level English course placement and enrollment outcomes, but not on completion (with a grade of C or higher).
- Implementation of the alternative system added roughly \$110 per student to status quo fall-term costs for testing and placing students at the colleges; ongoing costs in the subsequent fall term were roughly \$40 per student above status quo costs.

The final report, to be released in 2019, will examine a range of student outcomes for all three cohorts, including completion of introductory college-level courses, persistence, and the accumulation of college credits over the long term.

Executive Summary

Two thirds of students who attend community colleges and two fifths of students who attend public four-year colleges enroll in one or more remedial courses (also known as developmental education courses) to strengthen their skills for college-level coursework (Chen, 2016). Remedial courses may be helpful to some students, but they also require students to make a substantial investment of limited time and money that could otherwise be applied to college-level coursework, and studies suggest that the effects of remedial courses on student outcomes are at best mixed for those who are thought to be on the cusp of needing additional academic support (Jaggars & Stacey, 2014). Further, students who start college in remedial coursework are less likely to graduate (Attewell, Lavin, Domina, & Levey, 2006). It is therefore important to decide which incoming students ought to enroll in remedial courses.

Currently, most students who participate in remediation in math or English (or both) are referred to these programs based on the scores they earn on standardized placement tests, which they typically take when they arrive at college. Yet in recent years, questions have arisen about how useful these standardized tests are for placing incoming students into remedial and college-level coursework. Research shows that some students assigned to remediation based on test scores would likely pass a college-level course in the same subject area without first taking a remedial course if given that opportunity; it also suggests that using multiple measures of student skills and performance, and in particular high school grade point average (GPA), may be useful in assessing college readiness (Belfield & Crosta, 2012; Scott-Clayton, 2012).

Partly in response to these findings, an increasing number of colleges are now exploring or beginning to use multiple measures to place incoming students into remedial or college-level courses (Rutschow & Mayer, 2018). Multiple measures placement systems often make use of placement test results but also consider other relevant data on incoming students, such as high school GPA. While studies suggest that using multiple measures may result in the improved placement of students into remedial and college-level courses, little evidence to date has shown that using a multiple measures placement system influences other student outcomes.

To address this gap, CAPR is conducting a random assignment study of a multiple measures placement system to determine whether it yields placement determinations that lead to better student outcomes than a system based on test scores alone. Seven community colleges in the State University of New York (SUNY) system are participating in the study. The placement system CAPR researchers are evaluating uses data on prior students to develop predictive algorithms at each college to weight multiple measures — including placement

test scores, high school GPA, years since high school graduation, and in some cases other measures — that are then used to place incoming students into remedial or college-level courses. Over 13,000 incoming students who arrived at these colleges in the fall 2016, spring 2017, and fall 2017 terms were randomly assigned to be placed using either the status quo placement system (the control group) or the alternative placement system (the program group). The three cohorts of students will be tracked through the fall 2018 term, resulting in the collection of three to five semesters of outcomes data depending on the cohort.

CAPR researchers and personnel from the seven colleges worked together to develop the data analytics algorithms and the alternative system for placement. Given differences among the SUNY community colleges participating in the study, the data analytics algorithms employed to assess program group students were created for each college individually (one each for math and English), using historical data from 2011–14. Data on multiple measures — such as high school GPA, years since high school graduation, and placement test scores — as well as data on outcomes in college-level courses were used to create algorithms that weight each measure in the most appropriate way for predicting student performance in initial college-level math and English courses.

After the algorithms were developed, historical data were also used to predict placement and success rates in initial college-level courses in each subject area at a range of cut points. Faculty at each college then created placement rules by choosing the cut points that would be used to place program group students into remedial or college-level math and English courses.

Development of the algorithms using historical data showed that placement accuracy is a concern for all colleges in the study. Between one third and one half of prior students were estimated to have been “misplaced” in math and English at the colleges. Misplaced students include “underplaced” students, who were placed in a remedial course but would likely have been able to complete an initial college-level course with a grade of C or higher, as well as “overplaced” students, who were placed into and failed a college-level course. With one exception (math misplacement rates at one college), historical rates of underplacement were higher than historical rates of overplacement for both math and English at each of the colleges, and in most cases much higher.

Implementation Findings

The seven colleges in this study all followed very similar status quo placement procedures before beginning their involvement with this project. Most of the colleges relied heavily on the results of ACCUPLACER or other single tests for placement. CAPR research teams visited each of the seven participating colleges on two separate occasions to learn what college personnel thought about both the status quo and alternative placement systems and to better understand the processes required to implement the alternative system.

While most interviewees at the colleges were quick to point out weaknesses in the status quo system, they also emphasized two strengths of that system: (1) the straightforward nature of comparing a student's score on a test with an established cut score to place students (compared with the relative opacity of using the algorithm score produced under the alternative system, which combines weighted values from a number of different sources), and (2) the related efficiency of the status quo system, which allows students to be placed into coursework very quickly, and without need to obtain additional information.

In terms of weaknesses, interviewees frequently reported their belief that the placement tests used under the status quo system were not doing a good job of placing students into the appropriate level of coursework. They also expressed strong concerns that students do not recognize how important the tests are and that some students proceed through the tests too quickly.

Overall, implementation of the multiple measures, data analytics placement system created a significant amount of up-front work to develop new processes and procedures that, once in place, generally ran smoothly and with few problems. At the beginning of the project, colleges underwent a planning process of a year or more, in close collaboration with the research team, in order to make all of the changes required to implement the alternative placement system.

Among other activities, each college did the following: (1) organized a group of people to take responsibility for developing the new system, (2) compiled a historical dataset in order to create the college's algorithms, (3) developed or improved processes for obtaining high school transcripts for incoming students and for entering transcript information into IT systems in a useful way (which in some cases was time-consuming and challenging), (4) created procedures for uploading high school data into a data system where it could be combined with test data at the appropriate time, (5) changed IT systems to capture the placement determinations derived from the use of multiple measures, (6) created new placement reports for use by students and advisors, (7) provided training to testing staff and advisors on how to interpret the new placement determinations and communicate with

students about them, and (8) conducted trial runs of the new processes to troubleshoot and avoid problems during actual implementation.

While these activities were demanding, every college was successful in overcoming barriers and developing the procedures needed to support the operation of the data analytics placement system for its students. Five colleges achieved this benchmark in time for placement of students entering in the fall of 2016, while the other two colleges did so in time for new student intake in the fall of 2017.

While many interviewees believed that the alternative system would place students more fairly and accurately, they also reported challenges and concerns. These issues largely involved: (1) undertaking such an extensive reform so quickly and establishing the buy-in to do so, (2) obtaining and entering large amounts of high school transcript data into the college's computer system, (3) adjusting classroom and faculty assignments based on changed proportions of students in developmental and college-level courses, (4) not having placement information immediately available to students under the alternative system (in some cases, students had to wait a day or more to get their placement determinations), and (5) the potential limiting of access to support programs intended for underprepared (low-placing) students.

Cost Findings

We calculated costs for the five colleges participating in study intake for the fall 2016 cohort using the ingredients method (Levin, McEwan, Belfield, Bowden, & Shand, 2017). Costs are derived from the inputs used at each college, multiplied by standardized prices per input. Relative to the status quo system, new resources were required to create the algorithms, to set up and administer the collection of data used in the algorithms, and to run the alternative system at the time of placement testing. Across the five colleges, implementation of the alternative placement system added \$603,550 — or \$110 per student — to status quo fall-term costs for testing and placing students. The per-student net implementation costs ranged from \$70 to \$320 at the different colleges, with lower costs generally associated with higher numbers of students at each college. More enrollments lead to lower costs per student because the costs of creating the algorithms for the new system are mostly fixed; they do not vary with the number of students involved.

Ongoing costs in the subsequent fall term were much lower than the first-term implementation costs. Ongoing per-term costs were estimated at \$215,300 — or \$40 per student — above status quo costs. The per-student net ongoing costs ranged from \$10 to \$170 at the different colleges.

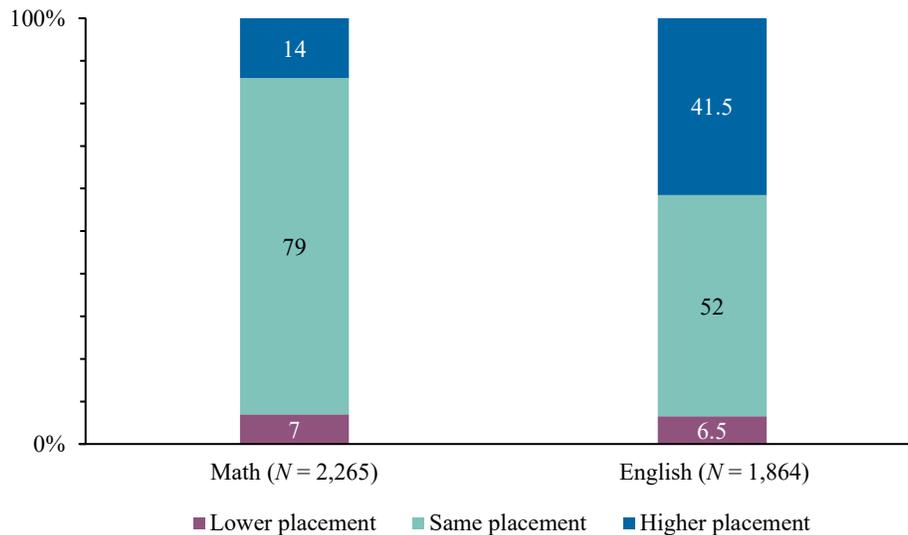
When information on the outcomes of the alternative placement system is available, cost estimates can be used as part of a cost-effectiveness analysis. Findings from such an analysis will be included in the final report.

Placement Determinations of Program Group Students

Because the multiple measures, data analytics placement system uses a different set of criteria than the status quo system, we might expect at least some changes in placement levels in math and English courses among program group students relative to what they would have been under the status quo. Importantly, however, any new placement procedure will not change the placement determinations of some students. Of the 2,455 students assigned to the program group, 92 percent took a placement test in math, and 76 percent took a placement test in English. Figure ES.1 shows how the placement determinations of such program students differed from what they would have been under the status quo. As expected, based on prior research, the proportion of higher placements outweighed the proportion of lower placements in both subject areas, particularly in English, where nearly half of program group students were placed differently than they would have been otherwise.

Figure ES.1

Observed Difference in Placement Relative to Status Quo Among Program Group Students Who Took a Placement Test in Each Subject Area



Early Impacts Findings

In this experimental study, incoming students who took a placement test were randomly assigned to be placed using either the multiple measures, data analytics system or the status quo system. This assignment method creates two groups of students — program group and control group students — who should, in expectation, be similar in all ways other than their form of placement. The overall sample for our analysis of first-term outcomes consists of 4,729 students who took a placement test at the five colleges at the time of fall 2016 entry, of whom 3,865, or about 82 percent, enrolled in at least one developmental or college-level course of any kind during the fall 2016 term. Because some students in the sample took either a math or an English placement test rather than both, the sample for our analysis of math outcomes is reduced to 4,371 students, and the sample for analysis of English outcomes is reduced to 3,533 students. We find that differences in student characteristics and in placement test scores between program and control group students are generally small and statistically insignificant, which provides reassurance that the randomized treatment procedures undertaken at the colleges were performed as intended.

Our analyses were conducted using ordinary least squares regression models in which we controlled for college fixed effects and student characteristics such as gender, race/ethnicity, age, and financial aid status as well as proxies for college preparedness.

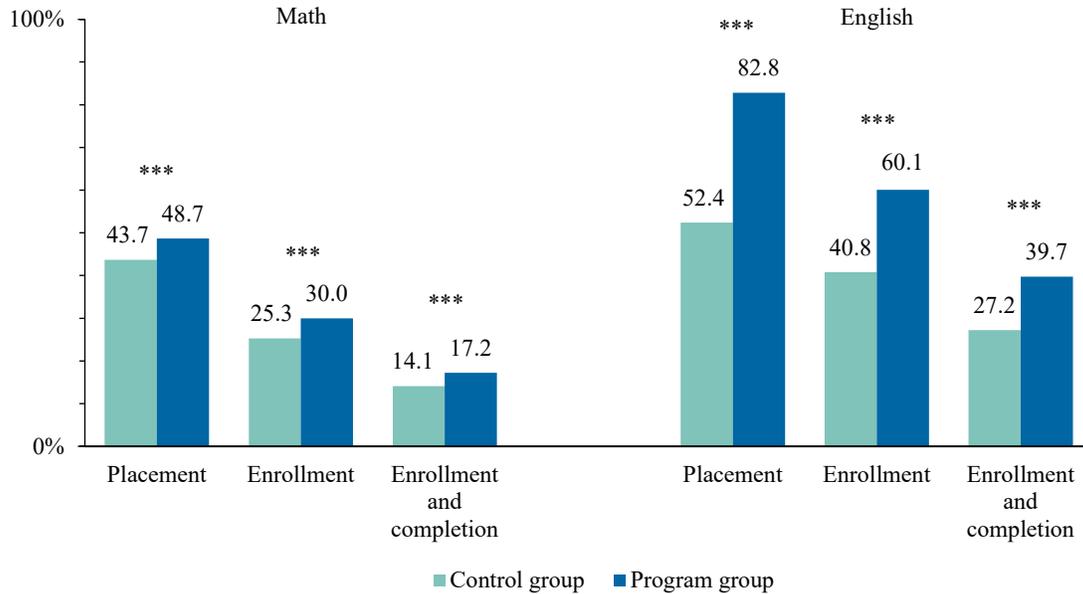
For both math and English, we consider three outcomes as shown in Figure ES.2: the rate of college-level course placement (vs. remedial course placement) in the same subject area, the rate of college-level course enrollment in the same subject area, and the rate of college-level course completion with a grade of C or higher in the same subject area.

As is shown, assignment to the program group produced positive and statistically significant effects on all three outcomes in both math and English. The impacts in English were substantially larger than the impacts in math. In math, students in the program group were, on average, 3.1 percentage points more likely to enroll in and complete (with a grade of C or higher) a college-level math course during their first term, after controlling for the full set of covariates. In English, students in the program group were 12.5 percentage points more likely to enroll in and complete a college-level English course.

We also carried out analysis on the full sample to measure the effect that assignment to the program group had on earning college-level credits in any course or courses in the first term. Students in the program group earned, on average, 0.60 more college-level credits than students in the control group ($p < .01$; control group student students earned 5.17 credits, while program group students earned 5.77 credits).

Figure ES.2

College-Level Course Outcomes in Math and English



*** $p < .01$, ** $p < .05$, * $p < .10$.

Finally, to examine whether program assignment led to differential first-term impacts by race/ethnicity (Black, Hispanic, White), Pell recipient status (yes, no), or gender (female, male), we conducted subgroup analyses and tested the significance of interaction effects for each subgroup. We limited these analyses to only those students who enrolled in any course at the college (because demographic information on students who did not enroll was unavailable), so the results of this analysis are not strictly causal. It is also worth noting that small sample sizes used in this first-term impacts analysis may limit the extent to which some subgroup effects are found to be statistically significant.

In math, we find that most subgroups benefitted from program group status in terms of college-level math placement, enrollment, and enrollment and completion (with a grade of C or higher) outcomes ($p < .1$); the exceptions are that we find no statistically significant treatment impacts for men across all math outcomes considered and also find no statistically significant impacts on math course completion for Black and White students.

Again in math, we find that interactions between the treatment status and each of the race/ethnicity and Pell recipient subgroups we considered are not statistically significant. This suggests that *gaps* in placement, enrollment, and completion rates in math between subgroups (other than the gender subgroups) may not have been affected by the treatment. We do find,

however, that while men had higher math outcomes than women in both the control and program groups, women benefitted more from program group status in math on all three outcomes considered. For example, the male–female gap in the rate of enrollment in and completion (with a grade of C or higher) of college-level math narrowed from 4.5 percentage points among control group students to 0.4 percentage points among program group students. (The male control group rate was 19.5 percent.)

In English, we find that all subgroups benefitted from program group status on all three outcomes considered ($p < .01$). Although significance testing on interaction effects in most cases failed to reveal differential impacts by subgroup, we do find evidence of differential treatment effects by racial/ethnic subgroup on two of the three considered outcomes. White students in the control group had higher English outcomes than Black and Hispanic students in the control group, but under program group status, the racial/ethnic gaps in both the rate of placement and the rate of enrollment in college-level English narrowed or even reversed. Yet we do not find evidence that program group status narrowed the gap in the rate of completion (with a grade of C or higher) of college-level English between White and Black or between White and Hispanic students.

Looking Ahead

These early results are broadly promising, but they are based on analyses of merely one semester of data. Additional impact analyses using data that are not yet available will be performed to further evaluate the effects of using a multiple measures, data analytics system to place incoming students. The final report from this study, to be released next year, will examine a range of student outcomes for all three cohorts for a period of three to five semesters after students' initial entry into college at seven SUNY community colleges.

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