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Making It Through: Interim Findings on Developmental Students' Progress to College Math with the Dana Center Mathematics Pathways

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Overview

Many students enter community college underprepared in math and must take multiple semesters of developmental (remedial) classes. Far too few of these students ever enroll in – let alone pass – an introductory college-level math course, but without those credits, they cannot graduate. Among the many reforms practitioners are undertaking to try to improve students' success, the use of math pathways, which diversify and accelerate students' math course options to align with their career interests, is a popular approach. This brief provides a preliminary look at the experimental results of one such model, the Dana Center Mathematics Pathways (DCMP), developed by the Charles A. Dana Center at the University of Texas at Austin. Program group students made strides in both enrolling in and passing college-level math during their second and third semesters, indicating that the DCMP is helping students reach a critical college milestone. Full results from the study will be published in 2019.

Introduction

In the last decade, researchers, practitioners, and policymakers have argued that passing developmental (remedial) math is one of the key challenges to community college students' success. With many students entering community college underprepared and requiring multiple semesters of developmental classes, far too few make it to – let alone pass – an introductory college-level math class.¹ Without it, they cannot graduate.

Community college practitioners are trying multiple types of reforms to improve developmental students' progress to and through college-level math, ranging from breaking developmental math courses into smaller units of study (“modularized” courses)² to enrolling developmental students directly into college-level math classes with supplemental support (“corequisite” courses).³ Math pathways is another popular reform, offering developmental students accelerated and distinct math course sequences aligned with their programs of study rather than focusing heavily on algebra for all students. Research has demonstrated the promise of this approach in both descriptive and experimental studies, with math pathways often associated with notable increases in developmental students' completion of a gateway college-level math course within one year.⁴ This brief provides a preliminary look at the experimental results of one such model, the Dana Center Mathematics Pathways (DCMP, formerly the New Mathways Project), and its effects on helping students advance through developmental and college-level courses.

The math pathways model offers developmental students accelerated and distinct math course sequences aligned with their programs of study.

The DCMP Model and Evaluation

The DCMP, developed by the Charles A. Dana Center at the University of Texas at Austin, has goals similar to those of other math pathways models: to improve students' progress in developmental and college-level math, their college credit accumulation, and, ultimately, their college completion. Students' progress to and through a college-level math course is a critical first step in this process and is a primary outcome being analyzed in this study. In the DCMP model, specifically, colleges are encouraged to develop three math pathways: a statistics pathway for students in the social sciences and health professions, a quantitative reasoning pathway for those majoring in the humanities and liberal arts, and a path to calculus for science, technology, engineering, and math (STEM) students. The pathways start with an accelerated and revised developmental math course, which allows students with developmental needs traditionally requiring two or more semesters' worth of courses to complete their requirements in one semester. In addition, the Dana Center has developed revised curricula for the DCMP developmental and college-level math courses. These curricula focus more heavily on statistics and quantitative reasoning content relative to algebra, and instruction is framed around more student-centered and active learning approaches with material presented in the context of real life.

Beginning in 2014, researchers at the Center for the Analysis of Postsecondary Readiness (CAPR), a partnership between MDRC and the Community College Research Center (CCRC) at Teachers College, Columbia University, joined with the Dana Center to launch a randomized controlled trial of the DCMP at four colleges in Texas (Brookhaven College and Eastfield College, both part of the Dallas County Community College District; El Paso Community College; and Trinity Valley Community College in East Texas). Randomized controlled trials represent the gold standard for assessing the impact of an intervention, and this evaluation is one of only two known randomized studies being conducted of math pathways in the country.⁵ In this study, the four colleges implemented the quantitative and statistics pathways and integrated the DCMP's curricula in their DCMP developmental course. As part of the study, interested and eligible students were randomly assigned either to the program group, which had the opportunity to enroll in the DCMP sequence, or to the standard group, which received their colleges' traditional developmental and college-level math course sequences.⁶ This randomization controls for preexisting differences among the students, meaning that changes

in program students' outcomes can be attributed with a high level of confidence to the impact of the DCMP.

Instruction is framed around more student-centered and active learning approaches with material presented in the context of real life.

Starting in fall 2015, nearly 1,500 students have been enrolled in CAPR's study of the DCMP. Early results from the study (with 594 students) were promising: The initial two program group cohorts who entered the study in fall 2015 and spring 2016 had developmental math course pass rates nearly 11 percentage points higher than those in the standard group. Program group students were having qualitatively different classroom experiences from those of students in traditional courses, reporting more engaged learning environments and

positive attitudes toward math. Aligning math requirements with those of four-year transfer colleges was still a concern in a few cases, but the majority of colleges had signed agreements with their partner colleges to ensure seamless transfers for most majors.⁷

While still preliminary, the research presented in this brief provides a snapshot of how the first two cohorts of students fared in their second and third semesters in college, when many DCMP students were eligible to take college-level math. A final report analyzing the progress of all students in the study and the colleges' experiences with math pathways will be published in 2019.

How Are Students Progressing?

As discussed in CAPR's 2017 brief, 83 percent of the fall 2015 and spring 2016 student cohorts placed two levels below college-ready, meaning that traditionally they would need to complete two semesters of developmental math to become eligible to enroll in college-level math courses.⁸ After their first semester, 49 percent of DCMP students had passed a developmental math course, meaning they were eligible to enter a college-level math course.⁹ In contrast, only 37 percent of students in the standard group passed a developmental course; most of them would still need an additional semester for college-level eligibility.

In analyzing both program group and standard group students' progress during their second and third semesters after entering the study, the preliminary results continue to be encouraging, as shown in Table 1. Program group students made strides in passing college-level math during both their second and third semesters. Their greatest strides were made in the second semester, when 27 percent of program group students enrolled in college-level math and 18 percent passed the course, rates more than double those of students in the group taking traditional courses. This gap narrowed slightly in the third semester, but program group students continued to show gains. By the third semester, 36 percent of program group students had enrolled in a college-level math course and 25 percent had passed, rates that were 15 percentage points and 8 percentage points, respectively, higher than the enrollment and pass rates of standard group students. Each of these findings is statistically significant, meaning it is highly unlikely that they are due to chance.

Consistent with their success in passing college-level math, program group students also attempted and earned more college-level math credits. More specifically, students in the program group attempted an average of 0.6 more college-level math credits and earned 0.3 more math credits than students in the standard group (roughly equivalent to about 6 percent more students passing a 5-credit class), with both findings statistically significant. Additionally, by the third semester, program students had attempted significantly fewer developmental math credits, probably because they were getting into college-level courses more quickly than those in the standard group.

The DCMP may be helping students reach a critical college milestone: making it to and through a college-level math course.

DCMP students' success in completing a college-level math course and earning college-level math credits, relative to students in the standard group, indicates that the DCMP is helping students reach a critical college milestone: making it to and through a college-level math course. Because students were able to complete developmental math more quickly, the accelerated nature of the DCMP developmental math course, along with program students' higher rates of enrollment in developmental math in the first semester, may be an important part of program students' success. However, the fact that students sustained progress over three semesters indicates that these results may be due to other factors as well, such as the revised math content in the DCMP courses or the more active, student-centered instructional methods integrated within the developmental courses. Previously reported results from this study's student survey hint at the importance of these instructional factors, as program students indicated learning a different set of skills and having a different understanding of math during their first semester.¹⁰ While this study will not be able to fully disentangle these effects, CAPR's final report on the DCMP, which will provide a more in-depth examination of the curricular and instructional models within the DCMP courses, may help further answer some of these questions.

While these early findings are promising, it should be noted that the DCMP courses do not, as of yet, appear to have affected students' college persistence rates – an important factor in

TABLE 1. Academic Outcomes Through Three Semesters, Fall 2015 and Spring 2016 Cohorts

Outcome	Program Group	Standard Group	Difference	Standard Error
One semester				
Registered in first semester (%)	89.4	86.8	2.6	2.7
Ever enrolled in developmental math class (%)	79.0	67.9	11.1 ***	3.6
Ever passed developmental math class (%)	48.5	37.5	11.0 ***	4.1
Two semesters				
Registered in second semester (%)	60.9	63.1	-2.1	4.0
Ever enrolled in developmental math class (%)	83.5	76.3	7.2 **	3.3
Ever passed developmental math class (%)	53.8	45.9	7.9 *	4.2
Ever enrolled in college-level math class (%)	27.4	10.1	17.2 ***	3.3
Ever passed college-level math class (%)	18.4	7.6	10.8 ***	2.8
Three semesters				
Registered in third semester (%)	46.8	43.4	3.3	4.1
Ever enrolled in developmental math class (%)	84.9	77.2	7.7 **	3.2
Ever passed developmental math class (%)	55.8	48.4	7.3 *	4.1
Ever enrolled in college-level math class (%)	35.8	21.2	14.6 ***	3.7
Ever passed college-level math class (%)	24.9	17.0	7.9 **	3.4
Total math credits attempted	4.8	4.8	0.0	0.3
Developmental	3.6	4.1	-0.6 ***	0.2
College-level	1.3	0.7	0.6 ***	0.1
Total math credits earned	2.9	2.6	0.4	0.2
Developmental	2.1	2.0	0.0	0.2
College-level	0.8	0.5	0.3 ***	0.1
Sample size (n = 594)	358	236		

SOURCE: MDRC calculations using transcript data provided by Dallas County Community College District, El Paso Community College, and Trinity Valley Community College.

NOTES: Rounding may cause slight discrepancies in sums and differences.

Estimates are adjusted by site-cohort interactions.

Statistical significance levels are indicated as: *** = 1 percent; ** = 5 percent; * = 10 percent.

students' progression through and completion of college. Over 85 percent of students from both groups were registered for courses during their first semester in the study, but less than 50 percent were still enrolled in college by their third semester. Although these findings are a snapshot of only a few semesters, they underscore the daunting challenge community colleges continue to face in helping their students persist from semester to semester.

What's Next?

Full results from this study, including an analysis of all four cohorts of students from fall 2015 to spring 2017 (with approximately 900 additional students), will be published in 2019. That report will present a full year of quantitative data for all cohorts, including data on passing the introductory college-level math course, math credit accumulation, overall credit accumulation, and completion of a degree or transfer. The report will also examine colleges' implementation of the DCMP model, including an analysis of DCMP instructors' use of the course curricula, the differences that may have existed across the four colleges, and how the DCMP courses contrasted with the colleges' traditional math courses. Finally, the report will analyze the cost effectiveness of the DCMP model in concert with its impacts on student success.

Notes

1. Bailey, Jeong, and Cho (2009); Biswas (2007); Texas Higher Education Coordinating Board (2017).
2. Kalamkarian, Raufman, and Edgecombe (2015); Gardenhire, Diamond, Headlam, and Weiss (2016).
3. Tennessee Board of Regents (2016); Complete College America (2018).
4. Logue, Watanabe-Rose, and Douglas (2016); Hayward and Willett (2014); Sowers and Yamada (2015); Zachry Rutschow and Diamond (2015).
5. The other study was a randomized controlled trial of a statistics math pathways model implemented at three of the City University of New York's community colleges, which randomly assigned developmental students to one of three math pathways: (1) a developmental algebra course followed by a college-level statistics course; (2) a developmental algebra course with corequisite support followed by a college-level statistics course; or (3) direct enrollment in a statistics course with corequisite support. See Logue, Watanabe-Rose, and Douglas (2016).
6. The traditional sequence of courses would require students with two developmental needs to take two developmental algebra courses (often termed as "beginning" or "introductory" algebra and "intermediate algebra") over two semesters, followed by a college-level algebra course (often called "college algebra").
7. Zachry Rutschow, Diamond, and Serna-Wallender (2017).
8. Zachry Rutschow, Diamond, and Serna-Wallender (2017).
9. Semesters are defined as either a fall semester or the spring and summer semesters combined. Some outcomes shown here differ from those presented in CAPR's 2017 report because of the inclusion of summer semester information, which was previously unavailable.
10. See Zachry Rutschow, Diamond, and Serna-Wallender (2017).

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