

Title of Practice: **Math Pathways: Developmental Education Reform**

College/District: Cuyamaca College

Submitted by: Julianna Barnes, College President and Tammi Marshall, Math Department Chair

Website: <https://www.cuyamaca.edu/>

Fast Facts

Fall 2017 Headcount: 9,145

Fall 2017 FTES: 2,513

Fall 2016 FTEF: 358

Location: El Cajon, CA

Structure: Multi-college district

Background and Purpose

Cuyamaca College is the first community college in California to undertake a full-scale transformation of mathematics instruction. The college has made three critical changes: 1) the assessment and placement of students into math courses, 2) the paths students take to reach and complete transfer-level math, and 3) the experience students receive in the classroom. Most students at Cuyamaca can complete their math requirements in one semester. Instead of requiring students to take remedial courses that delay their progress toward a degree, Cuyamaca allows students to enroll directly into transfer-level math with 2-units of additional support from their instructors (corequisite support). Among first-time students who previously would have placed in remediation but enrolled in transfer-level math with support, 67 percent successfully completed the course in one year, up from 10 percent of those starting in traditional remediation the year prior.

Process and Procedures

Cuyamaca's Math Department initiated the work to transform its math curriculum in 2010-11 when they implemented an accelerated statistics pathway for non-STEM majors. With the implementation of this pathway the Math Department found student completion rates increased while the equity gaps for both its African American and Latino students decreased. As a result, the Math Department began to consider how acceleration in math coursework might affect all students even those in STEM.

Members of the department attended the California Acceleration Project (CAP) gatherings and brought back ideas for how the Math Department could completely restructure math. The department set the significant goal to "Annihilate the achievement gap at Cuyamaca College," met with their new college President, and applied for grant funds to support the work.

Assessment and Placement into Math

In Fall 2015, the Math Department faculty were interested in implementing multiple measures (using academic high school performance such as GPA and progress in math courses) to place students into math. However, at that time, the District still used a placement test as the significant determination of placement into its math curriculum. As a result, the math department created concurrent support courses (corequisite model) for each of their math courses and placed students into a support course based on the higher of their self-reported high school GPA and course taking history or placement test score.

Students placed into a specific concurrent support course, such as PreCalculus, could register and enroll in the support course and then be automatically enrolled in the corresponding PreCalculus course. The courses were linked so that the same students who enrolled in a specific concurrent support course (e.g. PreCalculus Support Section A) were also enrolled in the linked parent course (Pre-Calculus Section A), thus creating a cohort model of instruction.

The District has since decided to move to multiple measures placement beginning in Summer 2018. Students will have access to the parent course (e.g., PreCalculus, Calculus) if they meet the placement level in accordance with the required high school performance and the multiple measures placement model adopted by the District.

With the implementation of multiple measures district-wide, at Cuyamaca College, students who successfully complete high school Algebra II and meet the GPA criterion established in the multiple measures model can enroll in a first-tier transfer-level course (e.g., Quantitative Reasoning, Statistics, PreCalculus, Business Calculus). If students complete high school Algebra II but do not meet the GPA criterion, they are still eligible to enroll in the first-tier transfer-level course but must also enroll in the corresponding concurrent support course. The next section describes the concurrent-enrollment support model in more detail.

Math Pathways

At Cuyamaca College, the longest pathway through transferable math is two courses, and math at two or more levels below transfer is no longer offered. In lieu of the traditional basic skills math pipeline, students classified as underprepared enroll in the following courses and corequisite support courses (depending on their major and placement): 1) Intermediate Algebra with concurrent-enrollment support, 2) an accelerated PreStatistics course or Statistics course with concurrent-enrollment support, 3) Intermediate Algebra, or 4) a transfer-level math course with concurrent-enrollment support.

In the concurrent-enrollment support model, students enroll in a regular math class (Intermediate Algebra, Statistics, Business Calculus, College Algebra, or PreCalculus) with an additional two or three hours of instruction each week through a corequisite support course. The additional instruction is taught by the same teacher and is intermingled within the regular math class to provide just-in-time remediation. As a result, students classified as underprepared attain prerequisite skills if and when those skills are needed. The support course and the regular math

course must be taken together and constitute a one-semester course combo that students experience as a single class. Consequently, in just one short semester, students who enroll in a transfer-level math course with support could complete their math requirement for the two-year degree at Cuyamaca College and the four-year degree at many universities.

To help students determine the “right” math courses to take, the Math Department created a series of math pathways based on five career clusters or pathways (meta-majors). Students have access to math flow charts for each of the pathways and the department regularly meets with the Counseling Department to ensure both full-time and part-time counselors understand the pathways. Depending upon a student’s designated career choice and/or major, students are directed into one of the math pathways.

Classroom Experience

Cuyamaca College students study in activity-based math classrooms with contextualized teaching and learning. In this learning model, the focus of activity shifts from the teacher to the learner. Class time is spent on discussion, collaborative work, productive struggle, and just-in-time remediation. Additionally, teaching and learning is tailored to fit the needs of small groups of students as they work through brains-on activities and review prerequisite skills. This model also employs a teacher-guided-discovery process that allows the instructor to identify gaps in student learning and use class time to remediate those gaps before moving on to the next topic. Consequently, students master prerequisite concepts and skills needed to succeed in the transfer-level course.

Since many teachers, and in particular math teachers, do not typically teach this way, Cuyamaca math faculty developed and implemented a training program. Through the Community of Practice meetings and job-shadow experiences, math instructors learn how to facilitate learning in the activity-based math classroom, lead group discussions that honor every student’s contribution, and encourage productive struggle while preventing that struggle from devolving into frustration. The primary goal of the program is to teach teachers how to lead students to developing important connections for themselves.

Cuyamaca applied for and received the California Community College’s Chancellor’s Office Basic Skills and Student Outcome Transformation program grant which enabled math faculty at Cuyamaca College to produce and implement classroom materials, detailed lesson plans, assessment materials, and materials for the Community of Practice training program. The grant will allow faculty to assess, revise, and re-assess these materials as needed. The materials are readily shared with other colleges through this Box address:

<https://app.box.com/s/vkpu5kutm8lz5ozm65flpjcbvug8vpf>

Additional Information Related to Process

Showing data and having a vision for the transformation helped the math department communicate to the rest of the college the need for the change. Training and communication were critical elements during the transformation and continue to be critical throughout continued implementation. Part-time faculty were engaged in the transformation from the start and professional development for math instructors, including part-time faculty, was supported through grant funding. In addition, the Math Department chair meets regularly (each semester) with the Counseling faculty to ensure they understand the various math pathways and to answer questions about the courses themselves.

Finally, College and District leadership support for innovation was key to the success of this transformation. From the new college president to the Chancellor, to the Board, the vision of Math Pathways aligned with the District's goal to "move the needle" on student success and equity. Leadership provided support for the grant and worked to remove barriers and challenges including significant technical support to modify the technology infrastructure in order to implement multiple measures placement.

Outcomes and Effectiveness

Among first-time students who previously would have placed in remediation but enrolled in transfer-level math with support, 67 percent successfully finished the course in one year, up from 10 percent of those starting in traditional remediation the year prior. In addition, the impact on the college's equity gaps is significant. The equity gap for African Americans decreased from 2.6 to 1.4 (a value of 1.0 means no equity gap exists) and the equity gap for Latinx students was eliminated (1.4 to 1.2). While the primary outcome measure for Cuyamaca's Math Pathway program is completion of transfer-level math, math course success rates have remained stable and in math transfer courses with support, rates have increased. With respect to enrollments, the College has observed an overall increase in math enrollments in addition to observing increases in enrollment in the higher-level math courses. The elimination of the College's basic skills math curriculum and implementation of multiple measures did not lead to a decrease in enrollment. Future evaluation plans include an assessment of how students perform in subsequent higher-level math courses and other courses requiring quantitative skills, as well as an examination of overall completion outcomes (e.g., degree, certificate, transfer). The Math Department plans to facilitate student focus groups to identify what is working well in the Math Pathway program, and where there might be opportunities for improvement.

The College encountered several challenges and lessons learned while developing and implementing this program including;

- Curriculum; making sure everyone across the campus understood what we were doing,
- Articulation; making sure the changes we made did not affect the articulation of our courses,
- Counseling; we needed to work closely with counseling to ensure they understood the changes and the Math Pathways we created for students; we also learned a lot from these

meetings making changes to courses/assessment/placement; this is an ongoing thing we do with counseling and has worked really well; a good relationship with counseling is essential,

- Information Systems – IS/IT; ensuring the technology will work smoothly with the changes made e.g., assessment, placement, and registration,
- Student and Teacher Expectations; making sure we understand the expectations of both students and teachers and how to best change those with the courses we now offer
- Marketing; making sure current students understood what their next courses would be once the changes were established,
- Faculty Training; this has continued to evolve as the program has evolved; training needs to be often and faculty need to be paid for this training, and
- Administration; making sure that administration is on board.

Benefits

The most significant benefit of the Math Pathway program is the impact it has had on students, especially students considered traditionally disadvantaged and/or unprepared for transfer-level math coursework. Success is contagious. English and English as a Second Language are also accelerating their pathways and Cuyamaca College is the only college in California to truly transform all of its basic skills programs.