

# Alternative Approaches to Developmental Math

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**P**ostsecondary education is the ticket to upward mobility for many Americans. But a large fraction of college students are placed into developmental (or remedial) mathematics programs from which they never emerge. In particular, 59 percent of incoming community college students are placed into developmental math courses (CCRC, <http://bit.ly/1QbXpAh>), but fewer than one-fifth of these students move past developmental math to earn degrees.

Nationwide, four broad areas are being addressed to increase student success through developmental mathematics: (1) placement, (2) pedagogy, (3) curriculum, and (4) noncognitive factors. In this article we describe some of the more promising reforms.

## Improving Placement

Failing a class is not the only barrier to gaining a degree. More developmental students drop out of college before completing their first mathematics class than do those who fail a class. In addition, the length of the developmental math path defeats many students, who exit the sequence, which may include three or more courses, before reaching a college-level course. (“Student Progression Through Developmental Sequences in Community Colleges,” Thomas Bailey, Dong Wook Jeong, and Sung-Woo Cho, <http://bit.ly/1Uk6Hc9>). To reduce the number of exit points, every effort should be made to place students into the highest appropriate math level.

Many entering students need only a brief review to improve their algebra skills. Some colleges now offer a summer program called Math Jam, typically an intensive two-week review scheduled just before placement exams are administered. Cañada College found that 62 percent of Math Jam students improved their math placement by at least one level, and Math Jam students showed both higher retention rates (93 percent vs. 77 percent stay enrolled until the end of the semester) and success rates (77 percent vs. 53 percent achieve grades of A, B, C, or Satisfactory) in their math courses, compared with other students (<http://bit.ly/CCEmathjam>).

The placement instrument itself, typically a machine-graded standardized test, could be improved. The “multiple measures” of high school GPA, how recently previous math courses were completed, and the student’s weekly work hours and total course load have better predictive value than a single test (<http://bit.ly/25MCOJP>). Some schools have abandoned placement entirely and, instead, offer supplementary resources, such as extra study sessions or corequisite review courses, for students in credit-bearing classes.

## Modifying Pedagogy

Many institutions are also changing the way material is presented. The methods we mention here have had some

success in moving students through developmental math.

So-called compressed courses can be used to reduce attrition. Students enroll in two consecutive math courses during one term and, by meeting for twice the usual contact hours, are essentially immersed in math. Instructors lecture for short intervals, then guide students practicing in small groups. And the increased contact hours help build community among developmental students, who typically commute and leave campus after class (Pierce College ASAP, <http://bit.ly/1sGOHzs>).

Modularized courses offer another way to shorten the developmental sequence, by allowing students to spend time only on the topics they need to study. However, these courses often require a dedicated testing center and detailed administrative oversight, resources not available to many community colleges.

Institutions are also trying to use technology to facilitate remedial math courses, with mixed results. The Emporium Model relies on software to provide instruction and testing, with human interaction largely limited to one-on-one tutoring in a computer lab. Of necessity, such courses concentrate on mastering skills (<http://wapo.st/1PJh5v6>).

Technology also plays a key role in MOOCs (massive open online courses). The “massive open” aspects of MOOCs, however, appear not to improve student success, compared with existing online developmental math courses (<http://bit.ly/SanJoseMOOC>; Pamela Burdman, “Changing Equations,” <http://bit.ly/1HPbKJ8>).

Other colleges and universities use software to produce flipped or hybrid classes. In a flipped course, students view the lectures online before coming to class, and class time is used to answer questions and work on assignments. In a hybrid course, students complete drill and practice problems on a computer, either individually or in a lab, and work on more significant and conceptual problems in class (<http://bit.ly/1VN35BA>; <http://bit.ly/1tarbec>; <http://bit.ly/1tarvJQ>).

## Adjusting the Curriculum

A 2014 position paper from the American Mathematical Association of Two-Year Colleges (AMATYC) states, “Prerequisite courses other than intermediate algebra can adequately prepare students for courses of study that do not lead to calculus” (<http://bit.ly/1PrTEFS>).

Numerous pathways have been created to reduce the developmental sequence for non-STEM students. Such courses omit some of the topics traditionally included in intermediate algebra, but lead to a transferable math course, typically statistics or quantitative reasoning. Here are four promising examples:


CRAFTY (Curriculum Renewal Across the First Two Years) is a subcommittee of the MAA’s Committee on the Undergraduate Program in Mathematics (CUPM). This is the third in a series of articles about general recommendations to renew mathematics course work and instruction. The first two stories are in the *MAA FOCUS* archive.

- Path2Stats is part of the California Acceleration Project, based on a program developed at Los Medanos College (<http://bit.ly/263sSs9>).
- Statway and Quantway are projects of the Carnegie Foundation for the Advancement of Teaching (<http://bit.ly/1U9YDbG>).
- The Dana Center has developed Math Pathways for both STEM and non-STEM students (<http://bit.ly/1KUqb5o>).
- Mathematical Literacy for College Students and Algebraic Literacy grew out of an AMATYC project to develop alternative pathways (<http://bit.ly/23bTS6Z>).
- David Yeager's research suggests that the performance gap in math suffered by women and other underrepresented groups can be eliminated by specific brief interventions (<http://bit.ly/23bTZzE>).
- City University of New York's Accelerated Study in Associate Programs (ASAP) helps students design a program of study based on their career goals. ASAP stipulates full-time enrollment and provides participants with academic advisement, career services, tutoring, financial supports, and specially blocked or linked courses (<http://bit.ly/1dOprzL>).

## Addressing Noncognitive Factors

There are other strategies for increasing student success beyond modifying course content or methods of presentation (Core Principles for Transforming Remediation within a Comprehensive Student Success Strategy, [core-principles.org](http://core-principles.org)). Here are a few notable ones:

- Carol Dweck's research indicates that students with "growth mindsets" persist and succeed better than their peers with "fixed mindsets." And, importantly, students can learn to move from one to the other (<http://n.pr/1wZf679>).

Remedial mathematics classes have become a barrier preventing college students from graduating and moving upward economically. Although postsecondary institutions are trying to remedy the situation, more work needs to be done. Institutions can take advantage of recent educational and cognitive research to design more effective developmental math programs. 

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An application includes (i) a letter of application explaining one's qualifications; (ii) a CV, and (iii) names of three pertinent references. These materials should be submitted electronically to [hr@maa.org](mailto:hr@maa.org). Questions may be directed to Paul Zorn, chair of the search committee. Review of completed applications will begin August 15, 2016.

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