

# Compelling Case Studies in Corequisite Support: Students Can Succeed in Transfer-level Math Without Traditional Remediation

By Hal Huntsman and Myra Snell, California Acceleration Project, August 2018

California's new AB 705 legislation restricts colleges from requiring students to enroll in non-transferable math courses that lengthen their time to degree. Under AB 705 it will be difficult to place a student into a pre-transfer-level math course. But the law does include provisions for providing students with additional concurrent support during the same semester that they take a transfer-level mathematics course—nationally known as “corequisite” support.

Corequisite models are the most powerful strategy for increasing completion of transfer-level math for students designated “not college ready.” In states that have replaced traditional remediation with corequisite models, such as Georgia, Indiana, Tennessee and West Virginia, students are completing transfer requirements in math at nearly three times the national average<sup>1</sup>, and in half the time (or less).

The first California colleges to broaden access to transfer-level math through co-requisite support have produced dramatic gains in completion of transfer-level math for all demographic groups<sup>2</sup>, including students previously placed into the lower levels of remediation.<sup>3</sup> Further, corequisite students are passing these courses at rates similar to their “college ready” peers.

What does corequisite support at the transfer-level look like?

There are many ways to implement corequisite support: pair a transfer-level course with a support course, extend instructional time through additional lab hours, or require supplemental instruction. In all of these models, remediation and support are tailored to the transfer-level math students are taking for their major, such as Business Calculus, Precalculus, or Statistics. All of these models maintain the rigor and learning goals of the transfer-level course while providing support to build the skills and knowledge essential to success in the higher-level course.

Below are highlights from a variety of successful corequisite support models:

- Linked Support Labs for Transfer-level Math—*Community College of Denver*
- Linked Support Courses for Transfer-level Math—*Cuyamaca College*
- Embedded Lab Support for Statistics—*College of the Siskiyous*
- Accelerated Statway—*Five community colleges from across the U.S.*
- Supplemental Instruction for Statistics—*Three CUNY community colleges*

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<sup>1</sup> <http://completecollege.org/spanningthedivide/#the-bridge-builders>

<sup>2</sup> <http://www.ppic.org/publication/remedial-education-reforms-at-californias-community-colleges-early-evidence-on-placement-and-curricular-reforms/>

<sup>3</sup> [http://accelerationproject.org/Portals/0/Documents/Cap\\_Leading\\_the\\_Way\\_Web\\_Final.pdf](http://accelerationproject.org/Portals/0/Documents/Cap_Leading_the_Way_Web_Final.pdf)

- New on-ramp to STEM: Integrated Algebra and Trigonometry–*LaGuardia Community College*

### **Linked Support Labs for Transfer-level Math**–*Community College of Denver*

The Community College of Denver (CCD) serves a student population that is predominantly non-White (67%), and 74% of students attends part time<sup>4</sup>.

Developmental math reforms occurred at CCD in a challenging environment for change, but within a supportive ecosystem of grants and state policy. According to the Math Department Chair Teresa Adams, the college culture held tightly to deficit-based beliefs about CCD's core student population and resisted shifts to the corequisite model. College-wide “change fatigue” made matters worse.<sup>5</sup>

Despite the challenges, CCD replaced their traditional four levels of math remediation with corequisite support labs linked to introductory transfer-level math courses.<sup>6</sup> All students can enroll in introductory transfer-level math if they also enroll in the lab course. The placement process is optional and only used as a way for students to bypass the lab requirement or to place higher.

Faculty feared that transfer math success rates would plummet but success rates increased slightly 59% to 63% after the change with underrepresented students earning significantly more college credits in their first year.<sup>7</sup>

To understand how the corequisite lab works, consider College Algebra and its two-hour-a-week lab, which is the default placement for STEM students. Lab students meet with their instructor the hour before their College Algebra class to actively practice skills that are essential for understanding that day's College Algebra lesson. In this way remediation is just-in-time and directly relevant. In the College Algebra class, lab students are mixed with students who opted to complete the placement process and were deemed “college ready.” This model creates a strong community among lab students who often become leaders in the College Algebra class.

Even with the additional support, some students feel overwhelmed. So CCD offers a late-start non-credit remedial algebra refresher for students who want to step back. These sections do not always fill, but they exist for those students who want them.

Next steps for the CCD Math Department? They are currently creating more interactive and structured lab experiences for students.

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<sup>4</sup> <https://www.ccd.edu/administration/non-academic-departments/institutional-research-planning/enrollment-statistics-sets>

<sup>5</sup> Teresa Adams' presentation at the ColoMATYC conference on March 2, 2018

<sup>6</sup> <https://utexas.app.box.com/s/gssx8oomr9jw3a4tq72ta798vwj8p38>

<sup>7</sup> Teresa Adams' presentation at the ColoMATYC conference on March 2, 2018

## **Linked Support Courses for Transfer-level Math–Cuyamaca College**

Cuyamaca College in California is a Hispanic-serving institution located near the border with Mexico. Nearly 40% of their students are the first in their families to attend college. Cuyamaca is the first community college in California to replace their traditional developmental math program with corequisite support courses at the transfer-level.

At Cuyamaca students previously placed into traditional remediation now enroll in 2-unit corequisite courses attached to Business Calculus, Precalculus, and Statistics<sup>8</sup>. The department no longer offers courses below Intermediate Algebra, and students only take Intermediate Algebra if they are in a Business or STEM major and they have not passed it in high school.

Corequisite support courses are linked to designated sections of transfer-level courses, with the same instructor teaching the pair. The paired courses are scheduled back-to-back and remediation is blended with the more advanced material. Instructors meet frequently to discuss how to facilitate “brains-on” activities and to troubleshoot issues related to the active classroom environment that is the department norm.

With the move to corequisites, one-year completion of transfer-level math for “underprepared” students has jumped from 10% to 67%, with impressive gains for students of color. Among African-American students taking transfer-level courses with support, one-year completion of transfer-level math is over four times the state average (55% vs. 13%). For Latinx students it is over three times the state average (65% vs. 19%). Among students placed into Elementary Algebra – those who traditionally would have taken a year of remedial courses – 60% pass transfer-level Business and STEM courses with support, and 70% pass Statistics with support.

The Math Department works closely with the college’s institutional researchers to monitor outcomes data. They are currently focused on improving student outcomes in Precalculus and addressing AB 705 requirements.

## **Embedded Lab Support for Statistics–College of the Siskiyous**

College of the Siskiyous is a small rural community college in northern California with a student body that is as diverse as some larger urban colleges. In 2016, nearly 70% of Siskiyous students were over the age of 24; 60% were non-White and 39% were from families with parents or guardians who had never attended college.

In 2016 Siskiyous revamped their placement policies and permitted all students to enroll in Statistics. To support students in Statistics, they increased the weekly

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<sup>8</sup> <http://accelerationproject.org/Publications/ctl/ArticleView/mid/654/articleId/69/Leading-the-Way-Cuyamaca-College-Transforms-Math-Remediation>

contact hours from four hours to six by switching one lecture hour to three lab hours. The course remained four units so students did not pay for the extra time with their instructor. The additional lab hours allowed for embedded tutoring and group-centered activities. This simple approach was effective. Pass rates in Statistics remained steady.

Even more impressive, this one change quadrupled the share of students enrolling directly in transfer-math from 16% to 67%. As a result, Siskiyous led the state in one-year transfer-level math completion in 2016 (58% up from 22% the previous year, double the 2016 statewide average of 28%).<sup>9</sup>

### **Supplemental Instruction for Statistics**–*City University of New York*

The City University of New York (CUNY) includes seven community colleges serving an ethnically and linguistically diverse student population that is 85% non-White with half speaking a native language that is not English.

The unique aspect of this story is that the supplemental instruction intervention was studied as part of a large randomized controlled experiment that allowed students to bypass remediation. In the experiment students placing into elementary algebra were randomly assigned to a baccalaureate-level statistics course with extra support provided through a weekly peer-led workshop, or they were assigned to elementary algebra, either with or without the similar extra support.

Three years later, students who enrolled directly in Statistics with supplemental support were much more likely to pass their initial math course, complete baccalaureate quantitative reasoning and physical science requirements, and complete advanced math courses when compared to their peers assigned to algebra remediation. In addition, the statistics group was 50% more likely to graduate with an associate’s degree. Notably, course success and graduation rates for the Statistics group did not differ by race/ethnicity.<sup>10</sup>

### **Accelerated Statway**<sup>TM</sup>–*Five colleges across the U.S.*

Statway<sup>TM</sup> is part of WestEd’s Carnegie Math Pathways (CMP). In its standard format, Statway<sup>TM</sup> is a two course “stretch” model that covers topics common to introductory college Statistics and embeds remediation that is needed for success. It was originally designed for developmental math students who have demonstrated arithmetic readiness.

In 2015-2016 Statway<sup>TM</sup> students had triple the success in completing transfer-level math credit (50% vs. 16%) and did so in half the time when compared to similar

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<sup>9</sup> <http://www.ppic.org/publication/remedial-education-reforms-at-californias-community-colleges-early-evidence-on-placement-and-curricular-reforms/>

<sup>10</sup> <https://bit.ly/2NnUPqS>

students assigned to remediation. As impressive as these results are, concurrent support models adopted at scale in other states produce higher completion of transfer math than the standard two-course Statway™.

This is not surprising given the impact of inevitable attrition in a sequence. Across the broader Statway™ network, attrition between the first and second courses within the standard Statway™ sequence has persisted as an impediment to student success, accounting for 36% of all students who did not complete the sequence in the 2016-17 academic year, according to a CMP report.<sup>11</sup>

When Statway™ is reconfigured into a one-semester model, success rates increase as anticipated because the attrition problem within a two-course sequence is eliminated. Across five colleges that developed a one-course accelerated version of Statway™, 67% of students successfully achieved college math credit *within one term* versus 50% of standard Statway™ students in one-year. Some colleges implemented both forms of Statway™ and consistently across these colleges success rates in accelerated Statway™ were higher than the sequence completion rate for standard Statway™.

In fall 2018 Carnegie Math Pathways will release Statway Corequisite™ and Quantway Corequisite™. Corequisite resources can be flexibly adapted to fit support configured as one- to three- contact hours depending on student and program needs. These new corequisite options incorporate the successful pedagogical strategies that are the trademark of Carnegie Math Pathways.

### **New on-ramp to STEM: Integrated Algebra and Trigonometry–LaGuardia Community College**

LaGuardia Community College in New York City serves predominantly students of color and students with yearly family income less than \$25,000.<sup>12</sup>

Building on a successful Statway™ program, LaGuardia math faculty developed MAT117, a three unit introductory transferable STEM course. The course combines topics from elementary and intermediate algebra with trigonometry and qualifies students to take Precalculus. It is an intensive 7-hour-a-week experience designed for students who traditionally would be taking elementary algebra.

MAT117 integrates some Statway™ design features, such as a pedagogy that promotes productive persistence and conceptual understanding as well as procedural competence. Faculty teaching MAT 117 trained at Statway institutes and view professional development as essential to the success of their model.

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<sup>11</sup> <https://carnegiemathpathways.org/reports/adaptation-integrity-origin-evolution-accelerating-statway-single-term/>

<sup>12</sup> <https://www.laguardia.edu/About/Fast-Facts/>

Early data is promising. In one semester, nearly 60% of the students passed with at least a C with big gains in Precalculus-readiness for students of color. Latinx students were over twice as likely to be eligible for Precalculus than if they had followed their placement into Elementary Algebra, with similar gains for African American students.

MAT117 developers are working together to improve the course using math education research and research methods. In the future they plan to track longitudinal data, such as pass rates in math intensive technical courses for various programs of study and graduation rates.

## **Which model is best?**

At this point you may be wondering which corequisite model is best. Comparative studies of different types of corequisite support have yet to be conducted, but in multiple studies corequisite support has substantially outperformed the following types of remediation redesign<sup>13</sup>:

- Emporium model: computerized, self-paced remediation in a lab with instructor or tutor support
- Modularized remediation: a diagnostic test identifies a student's deficits and remediation is chunked and targeted at specific deficits
- Boot camps: short, non-credit courses designed to help students pass the placement test or bypass levels of remediation
- Remedial stretch courses: remediation is stretched out over two semesters to provide students more time to master concepts
- Fast-track block scheduling: a remedial course followed by a transfer-level course in one semester

States that are ahead of California in replacing stand-alone remediation with corequisite support at the transfer-level are not prescriptive about which models colleges use, though some states have provided guidelines.<sup>14</sup> Regardless, completion of one-year completion of transfer-level math has tripled in these states despite the use of different approaches.<sup>15</sup>

The California Acceleration Project provides resources to support California community colleges in complying with AB 705 to equitably optimize student outcomes in math. See CAP's [AB705 Math Recommendations](#) and other resources posted under Publications at [accelerationproject.org](http://accelerationproject.org).

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<sup>13</sup> <https://static.newamerica.org/attachments/12907-how-to-fix-remediation-at-scale/How-to-Fix-Remediation-at-Scale.61f8602de1cd43c6b7b6d70105fbc45a.pdf>

<sup>14</sup> [http://www.pstcc.edu/curriculum/\\_files/pdf/cdc/1415/Features%20of%20Corequisite%20Remediation%20-%20Memo.pdf](http://www.pstcc.edu/curriculum/_files/pdf/cdc/1415/Features%20of%20Corequisite%20Remediation%20-%20Memo.pdf)

<sup>15</sup> <http://completecollege.org/spanningthedivide/#the-bridge-builders>

## **Lessons Learned in the Transition to Corequisite Support**

Change is hard and it is messy. In our conversations with faculty, we heard many stories of bumps on the road to implementing corequisite support models. Here are some of the lessons learned.

### **Communicate with your registration, admissions, and IT folks**

In fall 2016, the default math placement for all students at the Community College of Denver became the transfer-level math class appropriate for each student's area of study with a linked corequisite support lab. The intention was to create cohorts of students taking the transfer-level math class and the support lab, together, while also allowing higher placing students into the same sections of the transfer-level math course.

Unfortunately, even though the math faculty had been talking with all stakeholders all along, somehow the "linked" part did not get coded in the registration system. The oversight allowed students to register in *any* corequisite support section, even if it was supporting a different course. For example, students in College Algebra registered for a support lab for Finite Math and vice versa. Even when students were in the right support lab for the course they were taking, it may have the wrong section, so students taking College Algebra from multiple instructors ended up in the same lab section. After a lot of confusion and work, many students were able to move to the correct support sections, but not all.

*Tip:* Many colleges have experienced problems with linked course registration in Banner and Colleague. Ask your administration to conduct dry runs with fictitious students to make sure everything is working properly and to monitor early enrollments as a double check. Be prepared to troubleshoot.

### **Communicate with your counselors and assessment staff**

Queensborough Community College offered four sections of College Algebra with corequisite support in fall 2016, using an ALP model – 12 students who placed into College Algebra with support were combined with 12 students who were not required to take corequisite support. Results were positive (69% of students in the corequisite passed College Algebra), but college counselors were not informed about the program. In addition, many students do not see counselors before they enroll in math and this option had not been added into the placement advisements for students. As a result, in spring 2017, the college had to cancel all of the planned sections due to low enrollments.

*Tip:* Many colleges have struggled with low enrollment when piloting or transitioning to new course models. Work with assessment staff to integrate new course options into the placement and advisement information students receive.

Work with counselors to produce clear written guidance for advising students of new options; send out written reminders to all counselors (including adjuncts!) every semester.

### **The structure of support can affect faculty buy-in and student engagement**

When faculty at Community College of Denver (CCD) started offering transfer-level math courses with corequisite labs, students required to take the lab were comingled in the regular course with students whose higher placement allowed them to bypass the lab. The lab was scheduled after class and corequisite students were required to stay for an additional hour to get help on homework. The instructor was available to answer questions but the lab essentially functioned like a study hall.

Instructors complained that students from the corequisite labs were unprepared, unable to do the work, and slowing the class down. "I'm never going to be able to cover all of the material," was a common faculty complaint heard by Math Department Chair Teresa Adams.

After a lot of discussion, CCD moved the corequisite labs to the hour before the transfer-level class. Based on their experience, faculty knew which topics were going to be hard and they created lab activities to provide just-in-time remediation to prepare students for class. And an amazing thing happened ... the corequisite lab students gained confidence and became class leaders. As one previously disgruntled faculty member put it, "The lab students know what I want them to do now. I am able to sit back and let them work in groups with the other students without having to hold their hands."

Tip: Effective just-in-time remediation does not have to be a heavy lift for faculty. Design backwards from the day's lesson and identify prerequisite skills. If this is done well, students will be empowered to succeed and faculty will buy-in.

### **Options can be a bad thing**

At Los Medanos College (LMC) most students take Statistics to meet transfer requirements. To allow more students to have access to Statistics, LMC developed a corequisite support course. At the time they did not have corequisites for STEM math courses and continued to offer multiple levels of developmental algebra remediation.

The first semester the corequisite for Statistics was offered, they had to cancel 25% of the sections due to low enrollment. The same semester, prealgebra classes were full with long waitlists. Puzzled by this, the department surveyed all prealgebra students on the first day of class and discovered that 60% were underplaced and could have taken Statistics with concurrent support or the accelerated algebra course one-level below transfer. Underplacement has dire consequences for a

student's likelihood of meeting math requirements for the associate degree or for transfer.

*Tip:* If you give students the option to take a lower-level course, many will take it. Do not offer options for students that reduce their chance of success.

### **Faculty training matters**

When the math department at LaGuardia Community College implemented the Statway™ program, they sent teams of faculty to the Statway™ Institutes. But they also continued to meet throughout the semester to support each other in learning to teach in this new way. As they increased the section offerings and brought more instructors on board, they developed their own one-day intensive training session. Now that they are rethinking their approach to STEM, they are building on a new pedagogical culture in their department, where collaborative learning and attention to the affective side of learning are integral.

"I'm learning all the time," says Milena Cuellar, co-developer of the new integrated Algebra and Trigonometry course. "At the beginning, I was stiff, but now my students and I are more engaged. The pedagogy becomes more yours. You own it, and you bring the same approach into your other classes. My classroom became more human."

*Tip:* The need for professional development was echoed throughout our interviews, and most colleges have developed course-specific trainings that are a combination of an intensive pre-semester workshop followed by mentoring or ongoing meetings to support instructors new to teaching the course.

### **Intentionally address faculty expectations**

At Cuyamaca College math faculty went "all in" and jumped full throttle into a complete redesign of their program. In one year they developed corequisite support courses for all of their introductory transfer-level math courses, complete with lesson plans and activity packets. When the Math Pathways program rolled out the following fall, the course schedule no longer contained anything below intermediate algebra. When asked about lessons learned, Math Department Chair, Tammi Marshall, has many, but the top of her list is "pay attention to faculty expectations."

Not surprisingly, faculty expressed many worries: What were they supposed to be doing in the support course? Would students be able to handle challenging material with just a quick review of the prerequisite skills? What about their maturity, both mathematically and as students? What if a few were struggling and slowed down the rest of the class?

But when the semester started, the issues that came up in the weekly Community of Practice (COP) meetings were frequently not about the math; it was problematic

student behaviors that faculty complained about. So faculty leaders began to put students affective needs front and center of their professional development activities. For example, at one COP meeting, math faculty discussed excerpts from Rebecca Cox's *The College Fear Factor*. They realized that students who they had thought were lazy or lacked motivation may in fact have been afraid. This realization shifted the ways that faculty interacted with their students and classes began to coalesce into strong supportive communities.

*Tip:* Faculty perceptions of their students will influence how they respond to their students, particularly if they think the students are not prepared. Build intentional opportunities for faculty to reflect on the affective side of learning and develop strategies for building more supportive classrooms.

### **Students are more capable than we think they are**

Georgia implemented corequisite models attached to baccalaureate level math but did not allow all students access to them. They initially started with a more cautious approach that placed some students into Foundations of Mathematics, a stand-alone remedial course. After all, the thinking goes, surely some students are not going to be able to handle baccalaureate-level math even with support. But data gathered over four years now shows what many other studies have shown to be true: remediation does not produce better outcomes for students. German Vargas, who initially led the statewide Math Task Force that created the model, explains their findings using the idea of statistical twins. Students just above the cut-off who were allowed access to baccalaureate math with support completed math requirements at much higher rates than their statistical twins just below the cut-off who were placed into remediation.

In Tennessee students who are designated “underprepared” in math enroll in baccalaureate-level math with corequisite support. Statewide community college data shows that the students with the lowest ACT scores saw the biggest gains in completion of math requirements for transfer.

Over and over, faculty working in programs around that country said that when they expected students to do more and supported them in that, the students rose to the occasion.

“The more access we gave, the more successful students were. Students are more capable than we thought. The experience was better than expected. Faculty fears about the students and the corequisite class did not materialize. These students can do it. Students are capable. It’s us who have labeled them as not capable.” – James Gray, Community College of Aurora