CAP Design Principles For High-Challenge, High-Support Curricula and Pedagogy

• Backward design from transfer-level courses

Traditional remediation often mirrors high school math curricula without regard for its relevance to a student’s program of study. This design principle addresses this misalignment by tailoring remediation to the content and learning goals of the transfer-level course.

• Relevant, thinking-oriented curriculum

Traditional developmental math instruction often focuses solely on procedures and asks students to mimic algorithmic approaches to template problems. In a relevant, thinking-oriented curriculum, instruction centers on problems that require students to engage in non-algorithmic thinking, to wrestle with open-ended tasks, to make connections among different mathematical representations, to interpret and defend their conclusions.

• Just-in-time remediation

Traditional remediation often drills discrete sub-skills in isolation as opposed to just-in-time remediation that contextualizes skill development or review as it is needed in the context of transfer-level coursework.

• Low-stakes, collaborative practice

Traditional remediation is often lecture-based with students working alone on homework after class. In a class that utilizes low-stakes, collaborative practice students have frequent opportunities to work together on challenging tasks and to receive feedback before being graded.

• Intentional support for students’ affective needs

The teacher designs activities and uses pedagogical practices to reduce students’ fear, increase their willingness to engage with challenging tasks, and make them less likely to sabotage their own success in a class.
___ Communicate to students their rights under AB 705 to take transfer-level courses. Consider matriculation materials, college website, emails, signage, brochures, handouts, etc.

___ Develop a guided placement process to assure that students without high school records are ensured their rights under AB705, e.g., a default placement into transfer-level with support with clear instructions for how to challenge the corequisite support requirement.

___ If students will have the option to enroll into pre-transfer-level coursework, develop strategies and processes to ensure that students understand the consequences of choosing options that lower their likelihood of completing transfer requirements, e.g. require students to obtain a counselor and/or dean’s signature if they want to underplace themselves.

___ Develop a process for granting continuing students access to transfer-level courses and notify continuing students of the changes mandated by AB 705.

___ Develop a plan for shifting the schedule of classes to accommodate the enrollment of the vast majority of students in introductory transfer-level courses and plan for adequate sections of support.

___ Provide training for faculty teaching support sections, both up-front and on-going.

___ Coordinate with staff who oversee tutoring centers, labs, and other out-of-class support services, including Disabled Student Services, to plan for increased usage and for the training of tutors and other service providers in the new support paradigm.

___ Work with counselors to develop math pathway advising and positive, encouraging messages about beginning in transfer-level coursework.

___ Work with Assessment Center staff on messaging that relates to math pathways and encourages students to follow their transfer-level placement.

___ Coordinate with other disciplines that have courses with developmental math prerequisites to ensure that student access and success are not impacted, e.g. use multiple measures to satisfy prerequisites, update prerequisites to allow higher-level math coursework, and/or develop concurrent support.

___ If using linked co-requisite support courses, meet with relevant staff (Information Technology, Admissions and Records, etc.) to ensure that registration works smoothly. Do a dry run!

___ Determine the needs of dual enrollment students and determine how to place them.
CAP Math Concurrent Support Sheet

May 3, 2018 Under AB 705 many more students will be placed into transfer-level math course. Some will need support. This document contains information about concurrent support courses linked to transfer-level math courses. Some are currently offered; others will be offered for the first time in Fall 2019.

**Statistics**

<table>
<thead>
<tr>
<th>College Contact Person</th>
<th>Brief Description</th>
<th>Placement into Statistics (no support)</th>
<th>Placement Into Support Course</th>
<th>Class Size</th>
<th>Coreq Grading</th>
<th>What happens in the coreq class?</th>
<th>Extra Information</th>
<th>Links to the CORs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cuyamaca College</strong></td>
<td>Designated sections of 4-unit Statistics course linked to 2-unit support course taught by the same instructor in back-to-back time slots. Contact hours: 6 hours a week</td>
<td>Through spring 2018 Accuplacer score: Algebra (86-120) OR CLM (20-54) Starting summer 2018 Integrated Math II or Algebra 2 and a HS GPA of 3.0 or greater, self-reported.</td>
<td>Open to everyone</td>
<td>42-45 (depends on the classroom)</td>
<td>Pass/no pass. Students who receive a C or better in the Statistics course pass the co-req course; students who do not pass Statistics do not pass the co-req.</td>
<td>“Math interludes” review math skills for Statistics and GE the physical/life sciences courses; contextualized within Stats content when possible. Activity-based to promote effective learning skills and foster an academic growth mindset.</td>
<td>The Statistics + Support primarily for students in the Social Sciences, Arts and Humanities. Instructors participate in a community of practice that meets throughout the semester. “Brains on” activity-based pedagogy in a collaborative, community-oriented space with attention to the affective side of learning.</td>
<td>Cuyamaca CORs Click on Math 160 Math 060</td>
</tr>
<tr>
<td>Tammi Marshall</td>
<td><a href="mailto:Tammi.marshall@gcccd.edu">Tammi.marshall@gcccd.edu</a></td>
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<tr>
<td><strong>Los Medanos</strong></td>
<td>Designated sections of 4-unit Statistics course linked to 2-unit support course taught by the same instructor in back-to-back time slots. Contact hours: 8 hours a week Math Lab: 2 hours a week</td>
<td>Completion of HS Algebra 2 with a C- or better, or the equivalent, self-reported.</td>
<td>Pre-FA17: Algebra I =&gt;C FA18: open to all</td>
<td>32 in both traditional and coreq classes</td>
<td>Student choice letter grade or pass/no pass. Currently, grading schema for co-req is the same as that in Statistics and students receive same grade in both.</td>
<td>Group activities to develop a conceptual understanding of hard concepts from Statistics; just-in-time remediation; work in the affective domain.</td>
<td>Teaching Community meets throughout the semester to support instructors teaching Stats +support Materials: Open Learning Initiative’s Concept of Statistics course with a locally developed activity packet and StatCrunch.</td>
<td>Los Medanos Transfer-Level Stats COR Los Medanos Co-Req COR</td>
</tr>
<tr>
<td>College/Contact</td>
<td>Brief Description</td>
<td>Placement (no support)</td>
<td>Placement Into Support Course</td>
<td>Class Size</td>
<td>Coreq Grading</td>
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<tr>
<td><strong>Cuyamaca College</strong></td>
<td>Some sections of 4-unit Business Calc course linked to 2-unit support course taught by the same instructor in back-to-back time slots. Cohorted: both sections same students</td>
<td>Through spring 2018 Accuplacer score: Algebra (86-120) OR CLM (20-54)</td>
<td>Pre SU18: Algebra 2 and a HS GPA of 2.8 or greater SU18: Algebra 2 and a HS GPA below 3.3, self-reported.</td>
<td>42-45 (depends on the classroom)</td>
<td>Pass/No Pass. Students who receive a C or better in Business Calculus pass the co-req course; students who do not pass Business Calculus do not pass the co-req.</td>
<td>Review as needed Intermediate Algebra skills pertinent to Business Calculus; contextualized and just-in-time approach. Instructors use activities to promote affective learning skills and foster an academic growth mindset.</td>
<td>Instructors participate in a community of practice that meets throughout the semester. “Brains on” activity-based pedagogy in a collaborative, community-oriented space with attention to the affective side of learning.</td>
<td>Cuyamaca CORs</td>
</tr>
<tr>
<td>Tammi Marshall</td>
<td><a href="mailto:Tammi.marshall@gccc.edu">Tammi.marshall@gccc.edu</a></td>
<td>Contact hours: 6 hours a week.</td>
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<td><strong>Los Medanos</strong></td>
<td>A section of 4-unit Applied Calc course linked to 2-unit support course; same instructor, back-to-back time slots. Comingled: mixed support and non-support students in same section of Applied Calc.</td>
<td>Completion of HS Algebra 2 with a C- or better, or the equivalent, self-reported.</td>
<td>Open to all</td>
<td>36 in both traditional and coreq classes</td>
<td>Grade not linked to Business Calc. Pass support course but fail Business Calc? Enroll in Business Calc without support. Pass Business Calc but fail support course? No further remediation</td>
<td>Group activities to prep for calculus concepts; just-in-time remediation on algebra skills; work in the affective domain.</td>
<td>Materials: Applied Calculus textbook, supplemental locally developed activities, graphing software</td>
<td>Los Medanos Math Course Outlines</td>
</tr>
<tr>
<td>Julie Von Bergen</td>
<td><a href="mailto:jvnonbergen@losmedanos.edu">jvnonbergen@losmedanos.edu</a></td>
<td>Contact hours: 6 hours a week Math Lab: 2 hours a week</td>
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</tr>
<tr>
<td>College/Contact</td>
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<tr>
<td><strong>Cuyamaca College</strong>&lt;br&gt;Tammi Marshall&lt;br&gt;<a href="mailto:Tammi.marshall@gcccd.edu">Tammi.marshall@gcccd.edu</a></td>
<td>Some sections of 6-unit Precalc course linked to 2-unit support course; same instructor, back-to-back time slots. Cohorted: both sections same students Contact hours: 8 hours a week.</td>
<td>Through spring 2018 Accuplacer score ... Algebra (86-120) OR CLM (20-54) Starting summer 2018 Integrated Math III or Algebra 2 and a HS GPA of 3.3 or greater</td>
<td>Through spring 2018 Algebra 2 and a HS GPA of 2.8 or greater Starting summer 2018 Algebra 2 and a HS GPA below 3.3, self-reported</td>
<td>42-45 (dependin on the classroom)</td>
<td>Pass/No Pass. Students who receive a C or better in Precalculus pass the co-req course; students who do not pass Precalculus do not pass the co-req.</td>
<td>Review Intermediate Algebra skills as needed for success in Precalculus, contextualized just-in-time approach. Instructors use activities to promote effective learning skills and foster an academic growth mindset.</td>
<td>Instructors participate in a community of practice that meets throughout the semester. “Brains on” activity-based pedagogy in a collaborative, community-oriented space with attention to the affective side of learning. Trig is embedded in Precalculus, not a separate requirement</td>
<td>Cuyamaca CORs Click on Math 176 Math 076</td>
</tr>
<tr>
<td><strong>Los Medanos</strong>&lt;br&gt;Julie Von Bergen&lt;br&gt;<a href="mailto:jvonbergen@losmedanos.edu">jvonbergen@losmedanos.edu</a></td>
<td>A section of 4-unit Precalculus course linked to 2-unit support course; same instructor, back-to-back time slots. Comingled: mixed support and non-support students in same section of Precal. Contact hours: 6 hours a week Math Lab: 2 hours a week</td>
<td>Completion of HS Algebra 2 with a C- or better, or the equivalent, self-reported.</td>
<td>Open to all</td>
<td>36 in both traditional and coreq classes</td>
<td>Grade not linked to Precalculus Pass support course but fail Precalc? Enroll in Precalc without support. Pass Precalc but fail support course? No further remediation</td>
<td>Group activities to prep for Precalculus concepts; just-in-time remediation on algebra skills; work in the affective domain.</td>
<td>Materials: Precalculus textbook, supplemental locally developed activities, graphing software Trig is embedded in Precalculus, not a separate requirement</td>
<td>Los Medanos Math Course Outlines</td>
</tr>
</tbody>
</table>
### Community College of Denver

Teresa Adams
Teresa.Adams@ccd.edu

**Linked support labs attached to all introductory transfer-level math courses** (Liberal Arts Math, Stats, College Algebra, Trig, Finite Math)

Lab: two hours per week, **before** the supported class. Usually taught by the same instructor as the supported class. Co-mingled: 50% or more of students in the supported class are in the lab support.

**Completion of Algebra II or Math III with a B or better and HS GPA of 2.75 or better OR Accuplacer (Elementary Algebra) 85 or better OR ACT 23 or better OR SAT Math 560 or better**

Open to everyone. The default placement for all incoming students is the transfer-level math course appropriate for their program of study with a concurrent support lab.

Students can opt to go through the placement process to try to place out of the concurrent support lab.

**15 is max size in support lab; transfer-level course has a total of 27.**

**Student choice:** Satisfactory or Unsatisfactory

Instructor decides what students need to do in the lab to prepare them for the supported class in the next hour. Focus on collaboration and active learning, with more specific activities in development for the lab.

Community College of Denver has 5 different introductory transfer-level math courses and 3 specialized math courses for associate degree programs. All use the same concurrent support lab structure and allow all students to enroll with support.

Students take the one that is most appropriate for their course of study.
### Other states: Enhanced course model

**Integrated Algebra and Trigonometry (MAT 117) Course:** Students who traditionally took three semesters to complete a transfer-level course can now do so in 1 or 2 semesters

<table>
<thead>
<tr>
<th>College/ Contact</th>
<th>Brief Description</th>
<th>Placement into MAT 117</th>
<th>Class Size</th>
<th>Coreq Grading</th>
<th>What happens in the coreq class?</th>
<th>Extra Information</th>
<th>Links to the CORs</th>
</tr>
</thead>
<tbody>
<tr>
<td>LaGuardia Community College</td>
<td>MAT 117, 3-unit introductory transferable STEM math course, 7 hours a week. Combines topics from elementary and intermediate algebra with trigonometry and qualifies students to take Precalculus.</td>
<td>Open to students placing into Elementary Algebra at the college</td>
<td>25</td>
<td>Letter grade</td>
<td>MAT117 integrates some of the Statway design features, such as strategies for building productive persistence, group work, and a focus on conceptual understanding as well as procedural competence.</td>
<td>Faculty teaching MAT 117 were initially trained at Statway institutes and see professional development as essential to the success of their model. After successfully completing MAT 117, most students go on to take Precalculus.</td>
<td>Course descriptions, Accelerating Math Education</td>
</tr>
</tbody>
</table>
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, and in half the time (or less).

The first California colleges to broaden access to transfer-level math through corequisite support have produced dramatic gains in completion of transfer-level math for all demographic groups, including students previously placed into the lower levels of remediation. 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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1 http://completecollege.org/spanningthedivide/#the-bridge-builders
• 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. 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.

Despite the challenges, CCD replaced their traditional four levels of math remediation with corequisite support labs linked to introductory transfer-level math courses. 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.

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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4 https://www.ccd.edu/administration/non-academic-departments/institutional-research-planning/enrollment-statistics-sets
5 Teresa Adams’ presentation at the ColoMATYC conference on March 2, 2018
6 https://utexas.app.box.com/s/gssx8oomr9jw3a4tq72ta798vwj8p38
7 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. 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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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%).

**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.

**Accelerated Statway™—Five colleges across the U.S.**

Statway™ is part of WestEd’s Carnegie Math Pathways (CMP). In its standard format, Statway™ 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™ 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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10 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.¹¹

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 $25,000.¹²

Building on a successful Statway™ program, LaGuardia math faculty developed MAT 117, 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.

MAT 117 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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¹¹ https://carnegiemathpathways.org/reports/adaptation-integrity-origin-evolution-accelerating-statway-single-term/
¹² 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:\(^\text{13}\):

- **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.\(^\text{14}\) Regardless, completion of one-year completion of transfer-level math has tripled in these states despite the use of different approaches.\(^\text{15}\)

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.

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\(^{13}\) [https://static.newamerica.org/attachments/12907-how-to-fix-remediation-at-scale/How-To-Fix-Remediation-at-Scale.61f8602de1cd43c6b7b6d70105fbc45a.pdf](https://static.newamerica.org/attachments/12907-how-to-fix-remediation-at-scale/How-To-Fix-Remediation-at-Scale.61f8602de1cd43c6b7b6d70105fbc45a.pdf)


\(^{15}\) [http://completecollege.org/spanningthedivide/#the-bridge-builders](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 commingled 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
Attending to the Affective Domain

When developmental students aren’t successful in their classes, the core issue is often not their ability to handle the course content. They have the capacity to write a good essay or solve a particular math problem; however, something happens at a more psychological and emotional level that gets in their way. When they encounter a difficult task, or receive critical feedback, or feel afraid that they’re not cut out for college, or start to feel hopeless about their prospect of success, many community college students will disengage, withdraw effort, avoid turning in work, and even disappear from class.¹

Being an effective teacher requires that we understand the dynamics behind student disengagement and other self-sabotaging behaviors, and that we have intentional practices in place to help students be successful. We have grouped strategies for addressing the affective domain into 6 categories, with sample strategies for each. This is a summary of a longer document available on our website.

1. Establishing & Maintaining Positive Relationships

Community-building activities (e.g. ice breakers, early group projects); building in time for one-on-one work with students; watching out for our own emotional reactions and establishing a routine for talking individually with students who are exhibiting behaviors that impede their own or other students’ learning

2. Providing Class Time for Students to Process Content & Practice Skills

Small group discussions, speed dating activities, student presentations, debates, independent and group activities in computer lab

¹ See Katie Hern’s inquiry into the “Academic Sustainability Gap” in her Chabot accelerated classes; Carol Dweck’s article “Brainology” at http://gallery.carnegiefoundation.org/collections/windows_on_learning/katie_hern/index.html; http://www.nais.org/publications/ismagazinearticle.cfm?ItemNumber=150509; Rebecca Cox’s amazing book The College Fear Factor; and a good overview of “self-handicapping” and attribution theory at http://education.calumet.purdue.edu/vockell/edPsybook/Edpsy5/edpsy5_attribution.htm
3. Regular Opportunities for Students’ Metacognitive Reflection

Providing materials on topics connected to learning and asking students to write about how these connect to their experience; quick self-assessments connected to key assignments; longer self-reflection pieces; providing samples of strong student work and asking students to write about how they can improve their own performance next time

4. Incentives and Accountability for Coming to Class and Doing the Work

“Fess up” routines for when students haven’t done assignments, incentives for perfect attendance, firm policies on attendance, limitations on turning in late work

5. Intrusively Intervening when Students Show Signs of Struggle or Disengagement

Keeping a “worry list” and reaching out by email, initiating one-on-one conversations after class; monitoring who has turned in work and touching base with those who haven’t; asking students to reach out to those who miss class

6. Maintaining a “Growth Mindset” Approach to Feedback and Grading

Syllabus policies that allow students to recover from a weak start; providing feedback that explicitly appreciates the thinking/skills students are exhibiting and guides them re: next things to work on; intentionally using re-do’s and rewrites to foster growth; expectations that progress through major assignments over term
Many who have attended CAP programs over the past year have asked for our recommendations relative to AB 705 compliance. The recommendations that follow are designed to help colleges produce the most dramatic and equitable improvements in completion of transfer-level math in light of AB 705 mandates. Below, you will also find our answers to frequently asked questions about a range of issues that arise as colleges develop their AB 705 plans to reform math placement practices and academic support for students.

1. **Create math pathways for students by program or meta-major** so that students are placed into math most relevant to their program of study.

   **Transfer-intent:** Typical math pathways for students with transfer-intent include Business (e.g. Applied Calculus, Finite Math), STEM (e.g. College Algebra, Precalculus, Trigonometry), Quantitative Reasoning (e.g. Math for Liberal Arts), Statistics and Elementary Teacher Education.

   **Career-Technical:** For math intensive CTE programs develop program-specific courses that satisfy the A.A math requirement or a general “math for the trades” course, e.g. ETEC 009 for the Electrical Technology Program at Los Medanos College or Math 10 Applied Career-Technical Mathematics at College of the Redwoods. We do not recommend intermediate algebra as the terminal goal for CTE programs unless required by an outside regulatory agency.

   Students in CTE associate degree programs that are not math intensive (e.g. Criminal Justice Administration or Child Development) will benefit from placement into a transfer-level liberal arts math or Statistics course, either with or without support. These courses build more useful general quantitative literacy skills and streamline the transition from CTE to related transfer programs.

2. **Use the CCCCO default placement rules or guided placement** to give all transfer-bound students access to transfer-level math relevant to their program or major, either with or without concurrent support depending on their predicted success.

   The Multiple Measures Assessment Project (MMAP) conducted AB 705-compliant placement research using statewide data and found that transfer-bound students are more likely to complete math requirements for transfer if placed directly into introductory transfer-level math. The default placements rules are based on this research and indicate that all students should be eligible for Statistics/Liberal Arts Math and students who have earned a C or better in a course equivalent to Algebra 2 should also be eligible for introductory transfer-level Business and STEM math.

   Concurrent support can be provided to improve outcomes for students with lower predicted success rates. Research both inside and outside California indicates that concurrent support at the transfer-level produces dramatic improvements in transfer math completion for all demographic groups and placement levels.
When high school data is not available, AB 705 allows for guided placement. Guided placement policies should comply with the intent of AB 705 and give transfer-bound students the best chance of completing transfer-level math. Since the placement research to date has not identified any group of students who benefit from a placement below transfer-level, we therefore recommend that colleges place students without accessible high school records, including returning adults, into program-appropriate transfer-level math with required concurrent support if it is offered. All students should be informed of their Title 5 right to challenge a corequisite requirement.

3. **Develop low-unit concurrent support for introductory transfer-level math courses** to support students with lower predicted success.

Principles for effective concurrent support design:

- **Design backwards from the transfer-level course** – Concurrent support should focus on the knowledge and skills truly needed for success in the transfer-level course rather than covering the entire traditional cannon of arithmetic and algebra procedures;
- **Use just-in-time remediation** – Contextualize relevant skill building within the transfer-level content, as opposed to decontextualized drill that is poorly aligned with instruction in the transfer-level course;
- **Use a thinking-oriented high challenge, high support pedagogy** rather than concentrating solely on the demonstration and mimicry of algorithms;
- **Build frequent opportunities for low stakes collaborative practice**, e.g. paired problem-solving, speed-dating, poster presentations, group quizzes.
- **Integrate intentional strategies, classroom policies and activities** to address the affective side of learning and to create a supportive and welcoming classroom environment.

AB 705 cautions us to minimize impact of concurrent support on financial aid and unit accrual. It also limits placement into pre-transfer-level courses that lengthens time to degree. Both inside and outside of California, one- to two-unit co-requisite support courses (with one to four contact hours) have successfully supported students deemed “underprepared” in math. We do not recommend higher unit support courses that will limit students’ availability to take courses in other disciplines during the same semester they are enrolled in math and thus lengthen time to degree.

4. **Shorten STEM pathways** to improve completion of Calculus I. Students who have successfully completed Algebra 2/Integrated Math 3 should have access to introductory, transfer-level STEM courses (e.g. Precalculus), either with or without co-requisite support (2 units or less). Students with weaker algebra backgrounds should also have access to introductory, transfer-level STEM courses, with well-designed co-requisite support that is more intensive (e.g. 2 units with up to four additional contact hours).

Replace stand-alone College Algebra and Trigonometry courses with a single Precalculus course that integrates trigonometry. This will remove an exit point and improve completion rates of preparatory work for Calculus I.

5. **Adjust the class schedule to reflect the anticipated distribution of students by meta-majors**, in particular plan for many more sections of Statistics and Liberal Arts Math and few (if any) sections of pre-transfer-level math.
Frequently Asked Questions:

Can we place students into a one-year (two course) sequence that culminates in transfer-level math, such as a stretch model?

We do not recommend two-course models because they do not maximize the probability that a student will complete transfer math in one year, even if the student has a low placement assessment.

AB 705 restricts placement of students into pre-transfer math that lengthens time to degree. Pathways in which students start in non-transferable coursework (e.g. an accelerated two-semester sequence or stretch models) are AB 705 compliant if the college is able to demonstrate that the program serves students who are highly unlikely to succeed in transfer-level math and the program maximizes those students’ likelihood of completion of the transfer-level math within two semesters (or three quarters). This is a high bar. An MMAP analysis of statewide data was unable to identify any group of students who would have higher completion rates if placed into pre-transfer-level math.

In general, a sequence is problematic because of inevitable attrition due in part to students who do not persist from the first course to the second even if they pass the first course. Providing concurrent support at the transfer-level produces better outcomes. For example, according to a Public Policy Institute of California (PPIC) report, in 2016 49% of students in a two-course statistics pathway at 45 California community colleges completed transfer-level math in one year, but the average transfer math completion rates in states that have transitioned to corequisite models at the transfer-level (e.g. Georgia, Indiana, Tennessee, West Virginia and Colorado) fall between 61-64%.

Another example is Statway. The one-semester Statway models yield higher completion rates of Statistics than the original two-semester model. A Statway study of five colleges that developed their own one-semester adaptations shows that completion rates ranged from 60-92%, substantially higher than the two-semester version when offered at the college and better than the 50% average completion rate for all two-semester Statway courses.

Should we keep our traditional developmental math courses as a student option?

No. We do not recommend traditional stand-alone pre-transfer-level math courses as an option for students. This recommendation comes from lessons we learned at three colleges that were early implementers of multiple measures placement differentiated by math pathway, e.g. students were given a Statistics placement and a BSTEM pathway placement (which often was pre-transfer-level.) At all three colleges, students consistently and severely under-placed themselves at high rates. For example, at Los Medanos College in Fall 2016 about 60% of students enrolled in prealgebra or pre-statistics were eligible to take Statistics with support. At College of the Canyons, 95% of students eligible to take Statistics chose instead to enroll in elementary algebra or lower. These high rates of under-placement occurred despite work with counseling faculty and assessment staff around pathway advisement. Underplacement in math has dire consequences for a student’s chances of completing transfer math requirements. We should not continue to offer options that produce poor outcomes.

If your college continues to offer a few sections of elementary or intermediate algebra, create barriers for students to register for those courses. Yes, you read that right; in contrast to the current system, with its barriers to transfer-level math, we recommend that colleges make it difficult for students to opt to register for pre-transfer-level classes that lower their chance of completing math milestones to degree or transfer. For example, students might have to see a counselor and also get a dean’s signature before being allowed to enroll in courses below their placement advisement.
What about BSTEM-intent students who have not completed Algebra 2?

CAP recommends that all BSTEM-intent students have access to transfer-level BSTEM math, some with required support. For students who have not completed Algebra 2 or its equivalent, we recommend placement into introductory transfer-level BSTEM with no more than 2-units or four additional hours of concurrent algebra support. We do not recommend placement into a stand-alone intermediate algebra course because of the inevitable attrition in a two-course sequence that substantially lowers completion of transfer-level math. Instead, we encourage colleges to develop low unit concurrent support at the transfer-level similar to the two-hour a week lab model at Community College of Denver (for more information on the CCD model, see the CAP resource titled Compelling Case Studies in Corequisite Support: Students Can Succeed in Transfer-level Math Without Traditional Remediation.)

What about AA degree students that need Intermediate Algebra to complete their degree?

We do not recommend intermediate algebra for students in associate degree programs unless required by an outside regulatory agency. Title 5 allows any math course at the level of intermediate algebra to satisfy the math requirement for the associate degree and AB 705 stipulates an exception for associate degree programs “with specific requirements that are not met with transfer-level coursework;” therefore, we recommend the development of contextualized math courses for associate programs that require math intensive preparation. For associate programs that do not have specific math needs, we recommend placement into transfer-level quantitative reasoning courses (e.g. Statistics or Liberal Arts Math) that are more germane to building quantitative literacy for an educated citizenry and position the student to more easily transition into transfer preparation.

Should we also allow students to place into Calculus I?

Yes. Some colleges have always allowed students who passed Precalculus in high school with a C or better to enroll in Calculus I. Other colleges are using the original MMAP placement rules to use high school GPA and course-taking to place students into Calculus I.

What if a student fails the transfer-level course? What do we do about the fact that they only have three attempts at a course?

Students who fail can retake the course, just as they do now. We hear this question often because faculty fear that success rates will plummet under AB 705 mandates, but there is no evidence that this fear is warranted. The PPIC study Remedial Education Reform at California’s Community Colleges: Early Evidence on Placement and Curricular Reforms shows that transfer-level success rates “remained steady” at the four colleges in 2016 with the greatest increase in transfer math placement after multiple measures placement reform. At the two colleges with concurrent support models, “underprepared” students in concurrent support had comparable pass rates to “college ready” students enrolled in regular transfer math sections.

What should we do to support students who fail in their first attempt? More intensive math remediation is probably not the answer. In Tennessee, among students enrolled in concurrent support who failed their transfer-level math course, more than two-thirds failed every course they attempted, a pattern that suggests that more may be going on than just math readiness. As we transition into new placement and support systems under AB 705, it will be important to study and try to determine the source of students’ difficulties and develop innovative solutions, such as proactive interventions for students repeating a course.
What do we do about courses outside of math with pre-transfer-level math prerequisites?

Colleges have implemented the following strategies to deal with this issue:

- Use placement as a mechanism for satisfying prerequisites. For example, the default placement rules allow STEM majors who have completed Algebra 2 to enroll in an introductory transfer-level STEM math. This placement can clear enrollment in any science course that has an intermediate algebra prerequisite. STEM-intent students who have not completed Algebra 2 but are allowed to enroll in introductory transfer-level STEM math with support can simply wait a semester to take STEM science courses with intermediate algebra prerequisites.

- Use high school work to satisfy the prerequisite for the target course. For example, at many colleges the Chemistry course required of nursing majors has an elementary algebra prerequisite. Statewide 90-95% of community college students have completed Algebra I, or its equivalent, with a C or better. Therefore, almost all students have met the prerequisite prior to college admissions and the use of multiple measures would clear them for enrollment.

- Develop a low-unit concurrent math support course for science courses. For example, College of the Redwoods has a one-unit math review course for Chemistry.

- Include topics relevant to science or economic courses in the concurrent support for transfer math. For example, at Cuyamaca College the support course for Statistics includes “math interludes” that address math skills needed in Economics and Chemistry for general education. Students who complete Statistics support can take the GE Economics and Chemistry courses.

Can we still list a prerequisite that we no longer offer, for example an elementary algebra prerequisite for a science course?

Yes, as long as there are other easily available mechanisms for students to demonstrate readiness and gain access to the course. High school work can be used to meet the prerequisite and alternative concurrent support can be offered for those who need to develop the skills and knowledge to succeed.

Do we have to rearticulate a course if we use a corequisite to support some students?

No. A concurrent support option does not change the articulated course. A concurrent support course is an alternative mechanism for ensuring that students develop the skills and knowledge needed for success at the transfer-level, but not all students need the corequisite. Therefore, the concurrent support course should not appear as a co-requisite on the transfer-level course outline. Instead, the transfer-level course is listed as a co-requisite on the support course outline. Because no change is made to the transferable course, re-articulation is not necessary.

Will changes to placement required by AB 705 affect articulation agreements with CSU and UC?

No. The CCCCO, CSU CO and UCOP have discussed this issue. Changes to placement required by AB 705 will not impact articulation agreements. Students may access introductory transfer-level course work through the placement process based on high school multiple measures regardless of the stated prerequisite. Students can be required to participate in concurrent support simultaneous with enrollment in the transfer-level course if there are concerns that the student needs additional support in developing the skills and knowledge to succeed in that course.

Need further guidance to maximize your college’s student outcomes in math?
Email californiaaccelerationproject@gmail.com.