Central Valley
Math Pathways Task Force

Central Valley Math Pathways Recommendations

Bakersfield College • Cero Coso College • Clovis Community College • College of the Sequoias • Columbia College • CSU, Bakersfield • CSU, Fresno • CSU, Stanislaus • Fresno City College • Fresno Pacific University • Merced College • Modesto Junior College • Porterville College • Oxnard College • Reedley College • San Joaquin Delta College • Taft College • West Hills College Coalinga • West Hills College Lemoore • UC Merced

Students do better when they are engaged in work that counts toward a degree or credential in their academic or career area of interest. Completing a set of gateway courses in the first year is a critical step toward college completion.[1]

Overview

The Central Valley Higher Education Consortium (CVHEC), in collaboration with the Charles A. Dana Center of the University of Texas, Austin (Dana Center), has launched an initiative to improve students' success and completion rates in mathematics at colleges and universities in California's Central Valley. Faculty from the participating institutions formed the Central Valley Math Pathways Task Force (Task Force) in Fall 2017. The Task Force developed their mission, goal and objectives statements to inform recommended solutions to increase Central Valley Math Completion rates. The Task Force met over a period of six months to develop this document.

The Task Force had representation from the following CVHEC member institutions: Bakersfield College; Cero Coso College; Clovis Community College; College of the Sequoias; Columbia College; CSU, Bakersfield; CSU, Fresno; CSU, Stanislaus; Fresno City College; Fresno Pacific University; Merced College; Modesto Junior College; Porterville College; Oxnard College (not a CVHEC member); Reedley College; San Joaquin Delta College; Taft College; West Hills College Coalinga; West Hills College Lemoore; and UC Merced.

I. Central Valley Math Pathways Task Force Combined Mission Statement and Problem Statement

A. Mission and Goal Statement

The mission and goal of the Task Force is to raise student completion rates at Central Valley colleges and universities by redesigning and creating pathways in transfer level mathematics, aligned with students' programs of study, that provide clear direction for completing mathematics courses in a timely manner. The mission and goal will be achieved in accordance with legislation from the California Legislature (Student Success Act, Assem. Bill 705 codified as EDC § 78213) and executive orders from California State University Chancellor (EO 1100 revised August 2017), including direction that mathematics courses with prerequisites reflect only skills and knowledge required in the course.

A. Objectives

The objectives of the Task Force are to:

- Communicate the importance of better alignment of mathematics pathways and courses with programs of study.

- Identify and recommend well-defined math pathways from developmental to transfer-level courses, aligned with programs of study for certificates, AA/AS degrees and transfer degrees.
- Develop guidelines for corequisite courses and prerequisite courses one level below transfer, for various math pathways and in compliance with Assembly Bill 705 (EDC § 78213).
- Recommend evidence-based practices for placement, such as Multiple Measures Assessment Project (MMAP), and advising in math pathways and courses that increase equitable access to programs of study.
- Research opportunities for professional learning for faculty teaching mathematics on innovative teaching strategies, using instructional delivery options, technologies, and tools to support student learning.
- Provide a venue for communication between area colleges and universities on articulation issues.

The Task Force mission, goal, and objectives respond to a large and growing body of evidence that demonstrates better ways to serve students in mathematics through accelerated math sequences, math courses using evidence-based pedagogy and curriculum, and holistic placement strategies.

Today, it has become clear that sequences of fragmented, reductive coursework that students must complete before entering college-level courses are not a reliable on-ramp to college for most students who have traditionally been judged to be underprepared. [2]

B. **Problem Statement**

The Task Force has identified a set of significant research findings, which, taken together, form a Problem Statement that informs the Task Force mission, goal, and objectives. The Problem Statement begins with a broad conclusion about mathematics as a barrier to student success and completion, followed by a set of specific, research-based factors that result in poor success and completion rates among community college students.

- Completion of the first transfer-level mathematics course, or, in the case of associate degrees, at the level of intermediate algebra, is a predictor of student success. Unfortunately, **mathematics has been shown to be a barrier for many students, as demonstrated by these data points**:

  First math enrollment at a California community college is 2 to 4 levels below transfer level, and the completion rate for a course within six years at the level of intermediate algebra is 34%. (CCCCO Scorecard 2010-2011 cohort tracked through 2015-2016.)

Student enrollment in math at any level below transfer-level during the first year at a California community college and completion of a transfer-level math course within one year is 17%. (CCCCO Scorecard 2015-2016 cohort.)

- **Current placement practices place the majority of students into developmental education courses.**

  "California community colleges identify more than 75% of its students as underprepared and refer this overwhelming majority of students to remedial courses." (Student Success Act, Assemb. Bill 705 § 1 subd. (a)(2).) *"There is evidence that when used as the primary criterion for placement, these tests tend to under place students—leading colleges to assign students to remedial courses when those students could have succeeded in college-level courses. The reliance of test scores as the determinant factor for high-stakes placement decisions runs contrary to testing industry norms."* (Student Success Act, Assemb. Bill 705 § 1 subd. (a)(12).)

- **Students in traditional developmental education sequences are less likely to complete transfer-level math credit compared to students in accelerated models.**

  "Students placed into remediation are much less likely to reach their education goals. According to the Student Success Scorecard, just 40 percent go on to complete a degree, certificate, or transfer outcome in six years, compared to 70 percent for students allowed to enroll directly in college-level courses." (Student Success Act, Assem. Bill 705 §1 subd. (a)(5).)

- **A single mathematics pathway does not allow sufficient options for students to make mathematics meaningful to their academic and career goals.**

  "There is also growing consensus among the professional associations of mathematicians that intermediate algebra and college algebra should not be the default requirement for programs that do not depend on their content." ("Acceleration Strategies That Produce Powerful Results: A Planning Resource for Community Colleges," August 2015.) (California Acceleration Project, http://cap.3csn.org/ les/2015/09/Powerful- Acceleration-Strategies-CAP.pdf.)

- **Community colleges report that they are constrained from addressing the points above by articulation issues.** Challenges related to articulation between community college and public universities have a long and complex history in California. Challenges found through research include the following:

- System and Institutional Silos
- Faculty Autonomy
- Un-Common Academic Calendars
- Underprepared Community College Students
- University Capacity
- The Master Plan and Lack of Statewide Coordination
- Lack of Funding (Center for the Study of Community Colleges, 2010, "Reforming Transfer and Articulation in California Four Statewide Solutions for Creating a More Successful and Seamless Transfer Path to the Baccalaureate.")

- **Data show equity gaps exist across disciplines and are significant in mathematics.** Disaggregated data from the Central Valley institutions of higher education show achievement gaps across various demographic groups, including race, socio-economic status, and non-traditional students.

  "The choice of assessment instruments and placement policies has serious implications for equity, since students of color are more likely to be placed into remedial courses." (Student Success Act, Assem. Bill 705 §1 subd. (a)(3).)

II. Central Valley Math Pathways Implementation: Challenges and Possible Solutions

Responding to the CVHEC Math Pathways Task Force's Mission, Goals and Problem Statement, the Task Force has identified several challenges to implementation and scaling of multiple mathematics pathways across the CVHEC higher education institutions.

Challenges identified by the Task Force, outside of the actual mathematics curriculum, include:

- Scheduling and classroom space issues
- Impacts on students' financial aid (in particular, if students do not pass an 8-unit course)
- Students' total units for transfer
- Students who may change majors
- Student athlete and categorical program impacts, including basic skills funding

Challenges identified by the Task Force affecting mathematics curriculum – courses and learning objectives - focus on articulation and transferability to specific CSU and UC majors for statistics and other quantitative reasoning courses when offered within different tracks or with different pre-requisites.

Individual institutions will have to make decisions on compliance with the Student Success Act, Assembly Bill 705 codified as Education Code section 78213, Student Matriculation, and CSU Executive Orders (depending on system). Corequisites and/or pre-statistics courses, cohorts or comingling, different statistics tracks for different majors, team teaching, and learning

communities. These decisions are and will be difficult and time consuming, but the difficulty is compounded without clear articulation guidelines. The challenges identified by the Task Force related to faculty and pedagogy would include significant training needs for faculty. There will be an increased number of quantitative reasoning and statistics courses offered at each institution, along with co-requisite courses. Current math faculty, along with academic advisors and counselors, will need to be engaged and trained.

The following are possible solutions identified by the Task Force.

Develop Articulation and Transferability Guidelines

Responding to the challenges, the Task Force has identified several possible, prioritized solutions. Because many of the challenges require collaboration with institutional units outside of academics, such as Financial Aid, Admissions & Records, Articulation, and high school stakeholders, among others, the Task Force recommends creating a series of recommendations for action that target the aforementioned groups to both inform and to solicit their assistance in overcoming the challenges of articulation and transferability. Thus, the first priority for possible solutions is to develop articulation and transferability guidelines for the community colleges, CSU, UC and private systems and institutions serving the Central Valley, which should include appropriate math pathways for programs/majors and meta-majors, as well as implications for articulation with high school mathematics curricula.

CVHEC Higher Education Institutions Support

Attendant to the first priority and responding to recent legislation (EDC § 78213 Student Matriculation) affecting community colleges and an Executive Order (EO 1100 revised August 2017) affecting CSU, the Task Force recognizes that prioritized ultimate solutions will include the assumption that CVHEC higher education institutions support and guide students to begin and complete transfer and general education mathematics courses early in their college careers. This assumption carries implications for all of the possible, prioritized solutions and includes assessment of achievement gaps and action to achieve equity for all student populations.

Explore Research-based Curricula and Professional Development

In addition, many of the challenges identified require curriculum modifications, or pedagogical shifts. Therefore, the task force has identified as a possible, prioritized solution that CVHEC institutions explore both research-based curricula and professional development opportunities to identify, and subsequently initiate, an optimal marriage of materials and instruction, informed by disaggregated data that identify learning and achievement gaps among diverse student populations. Specifically, the Task Force will recommend professional development for faculty regarding statistics instruction, including alternative co-requisite models.

Define and Clarify Multiple Mathematics Pathways

The Task Force has identified as a possible, prioritized solution that would have the CVHEC institutions define and clarify the multiple mathematics pathways and how they are aligned intersegmentally with programs of study.

Train Counselors and Faculty on Math Pathways

The Task Force also has identified as a possible, prioritized solution for training counselors and faculty on mathematics pathways, leading to the development of placement guidelines for use by department faculty, counselors, and advisors.

Fund Professional Development

The Task Force has identified as a possible, prioritized solution that CVHEC institutions commit to shifting existing funding and securing new funding to conduct professional development and training in the identified areas.

Comprehensive Communication and Broad Engagement

Finally, the Task Force has identified as a possible, prioritized solution that should inform implementation of all forthcoming recommendations. Comprehensive, ongoing communication and broad engagement among all CVHEC institutions are essential to the success of implementation and, ultimately, to the success of students.

III. CVHEC Math Pathways Recommendations

Following development of challenges and possible solutions to mitigate the problems and barriers to improving student success and outcomes in mathematics, the Task Force has identified four recommendations. The Task Force intends that CVHEC institutions implement the recommendations with as much inter-institutional continuity and consistency of policies and practices as possible.

1. Placement/Equity

The Task Force recommends that CVHEC institutions use multiple measures to ensure the highest, most appropriate placement for students. A student should be encouraged, and if possible required, to see an academic advisor/counselor to ensure proper placement. Communication between student, faculty and counselor should be on-going and consistent. Training may be necessary for faculty and staff to work toward highest possible, most accurate placement for all students. The training should address under-placement and equity issues. All staff should maintain a positive attitude regarding placement and student success, and this attitude should be reflected when communicating with students. (See Appendix A for a draft statement of "Guiding Principles," which should inform implementation of this recommendation.) The following is a summary of the recommendation and its implementation:

What: Place each student in the highest-level math course using multiple measures and maintain good communication between the student, faculty, and counselor. Provide training and establish placement protocols for highest possible placement.

How: Implementation of multiple measures and required professional development.

Why: To resolve the under-placement issue and close any equity gaps.

Who: Faculty, counselors and administration.

Timeline: This recommendation should be the first implemented and completed as soon as possible.

2. Co-requisite Course

The Task Force recommends that all CVHEC institutions develop and implement course co-requisite options. Training and communication on co-requisite course models should be provided for math faculty, and possibly curriculum committees. The co-requisite strategy should not just be another math course in a sequence, but one that provides students with the opportunity to receive the necessary assistance for successful completion of a transfer level math course. The purpose of the co-requisite strategy is to increase success in transfer level courses. The following is a summary of the recommendation and its implementation:

What: Create corequisite models that solely support transfer level courses, providing necessary training and communication.

How: Creation of new corequisite courses by math faculty.

Why: To increase success rates in the transfer level courses.

Who: Faculty and the curriculum committees.

Timeline: In accordance with the California Community College Chancellor's Office AB 705 Implementation Timeline, corequisite courses should be developed and approved by the curriculum committees in time for Fall 2019 enrollment.

3. Meta-Majors

The Task Force recommends that CVHEC institutions ensure consistency and appropriate alignment of transfer level math courses within meta-majors. Mathematics courses should align with each meta-major yielding one math pathway within each meta-major. Clearly

identifying the path for each meta-major will aid students in moving toward program completion. Faculty and counselors will need to maintain communication with CSU, UC and private universities to ensure the math courses within the meta-majors continue to meet their requirements for transfer. The following is a summary of the recommendation and its implementation:

What: Identify math courses for each meta-major.

How: Coordination among articulation officers, departments and divisions to align meta-major courses.

Why: Help students toward program completion and clearly identify the path for each meta-major.

Who: Articulation officers and math faculty with regard to courses within a met-major and counselors for communication with UC, CSU and private universities.

Timeline: Alignment should start as soon as possible, and discussion should be maintained yearly to sustain consistency.

4. Articulation

The Task Force recommends the creation of guiding principles for math pathways development and articulation for CVHEC institutions. (See Draft – Appendix A.) These guiding principles should support AB 705 implementation and clarify articulation requirements and processes in order to support math pathways options for both general education and lower division major preparation. In particular, the guiding principles should support the articulation of math options for general education as described in the CSU Executive Order 1100 revised August 2017, build on the use of Transfer Model Curricula (and associated Associate Degrees for Transfer) as mandated by the Student Transfer Achievement Act (Senate Bill 1440 codified as EDC §§ 66745, 66746), and encourage the use of course-to-course articulation when necessary, as part of Lower Division Major Preparation Agreements when Transfer Model Curricula does not exist for the major.

To develop this resource, Task Force members, articulation officers, math faculty, and other interested parties met April 20, 2018 to surface articulation issues that are currently impeding development and articulation of math pathways among CVHEC institutions and to develop guiding principles to resolve these issues on a regional basis. The Task Force will approve the guiding principles as part of this report. The following is a summary of the recommendation and its implementation:

What: Develop guiding principles for math pathways development and articulation in the Central Valley.

How: Regional meetings of math faculty and articulation officers and other interested parties, with a subgroup authoring the Guiding Principles; endorsement by CVHEC Board.

Why: Clarify and build on existing articulation processes to support increased transfer rates.

Who: CVHEC and a subgroup of the Central Valley Math Task Force.

Timeline: Endorsement of guiding principles by CVHEC Board by June 2018.

IV. Action Taken as of April 2018

Leading up to the development of solutions and, ultimately, recommendations, the Task Force has taken the following actions in support of the mission and objectives of the Initiative:

- Professional Development Opportunity: At the December 1, 2017 CVHEC Math Pathways Task Force meeting, an invitation was made for the Task Force members to attend a Cuyamaca College Presentation to be held at College of the Sequoias on January 12, 2018. The event was co-hosted by CCCSN and CAP. The purpose of the meeting was to share the study on Cuyamaca's math project. It was recommended that teachers, articulation counselors, and articulation officers attend.

- Leadership Opportunities:
  The Task Force and CVHEC presented a workshop in April on intersegmental articulation. This workshop was designed to bring teams together from throughout the valley to discuss math articulation between regional colleges and universities, the implementation of AB 705 (EDC § 78213) , in addition to learning more about what fellow faculty members have been working on throughout the year, regarding Math Pathways and math co-requisite remediation. As a result of this workshop, articulation officers have asked to be members of the CVHEC Math Pathways Taskforce.

  The Task Force, CVHEC, CAP, and the Dana Center are organizing a Regional Math Summit/Conference in Fall 2018, focusing on corequisite curriculum strategies. The audience for this event would be curriculum chairs, math instructors and articulation chairs. The event would be a two-day event on a Thursday and Friday. CVHEC will provide logistical support. Task Force members will co-chair the event and set the agenda. The Task Force agreed to the proposal and to move forward with planning.

[1] Jenkins, D., & Cho, S. (2012). "Get With the Program: Accelerating Community College Students' Entry Into and Completion of Programs of Study." (CCRC Working Paper No. 32). New York, NY: Columbia University, Teachers College, Community College Research Center. http://ccrc.tc.columbia.edu/publications/get-with-the-program.html

[2] Bailey, T., Jeong, D.W., & Cho, S.W. (2010). "Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges." *Economics of Education Review,* 29, 255–270. http:// ccrc.tc.columbia.edu/publications/referral-enrollment-completion- developmental-education.html

Appendix A

Guiding Principles for Math Pathways Development and Articulation in the Central Valley

To meet AB 705 or Education Code section 78213 requirements, improve student outcomes, and prepare students for success in math courses for their programs of study at Central Valley universities, our region endorses the following guiding principles for math pathways development and articulation within the Central Valley:

1. The use of corequisites in lieu of prerequisites for all first-tier transfer-level math courses as a mechanism to support student success in math under AB 705 (EDC § 78213).

2. The use of multiple measures placement compliant with AB 705 (EDC § 78213) in lieu of placement testing or course-completion to determine student eligibility for access to transfer-level course work.

3. The development and articulation of statistics and other math options for students who are completing the quantitative reasoning requirement to meet CSU and UC general education requirements, as described in CSU Executive Order 1100 (revised August 2017) and the Intersegmental General Education Transfer Curriculum (IGETC) Standards.

4. The development of Associate Degrees for Transfer (ADTs) as mandated by Student Transfer Achievement Act (Senate Bill 1440 codified as EDC §§ 66745, 667456), and the acceptance of those ADTs at CSUs as a mechanism for streamlining transfer into the major when the ADT is deemed similar to lower division requirements for a major at a CSU campus.

5. Recognition that the Associate Degree for Transfer, when deemed as similar to the lower division requirements for a major at a CSU campus, permits students to be accepted to a major in lieu of all published lower-division major preparation transfer requirements and insures completion of the baccalaureate degree with no more than 60 units at the CSU

campus following transfer (per Student Transfer Achievement Act, Senate Bill 1440 codified as EDC §§ 66745, 66746).

6. Course-to-course articulation and the development of Lower Division Major Preparation Agreements for majors at Central Valley CSUs that do not accept associate degrees for transfer as 'similar" or for majors for which an associate degree for transfer has not been developed.

    a. In Lower Division Major Preparation Agreements course-to-course articulation based on the merits of the transfer-level course outline with prerequisites/corequisites that contain only the skills and knowledge needed for success in the target course; with the recognition that the community college may use multiple measures to determine if the student is eligible for the transfer-level course.

    b. In instances where a Lower Division Major Preparation Agreement requires a math course that has an intermediate algebra prerequisite in addition to a statistics course, statistics courses with an alternative pre-requisite to intermediate algebra that have CSU-GE B4 and IGETC 2A certification will receive course-to-course articulation and be included in the Lower Division Major Preparation Agreement.