

Ongoing Refinement of the STEM Pathway in Mathematics at CSUDH

As part of our response to EO1110, CSUDH redesigned our pathway for students in majors requiring Calculus as follows:

2019-2020 Level 2 Path

Summer	Fall	Spring
MAT 195 (CSA)	MAT 153 (PreCalc)	MAT 191 (Calc I)
	OR MAT 191 (Calc I)	OR MAT 193 (Calc II)

2019-2020 Level 4 Path

Summer	Fall	Spring
MAT 103 (Intro to College Algebra)	MAT 151 (College Algebra & Trig)	MAT 191 (Calc I)

Level 3 students can choose either of the above paths.

Below is brief description of each of the summer course offerings in 2019.

MAT 195

- 1 unit CR/NC problem solving course
- Student work collaboratively on solving non-routine problems, with a focus on shifting students thinking about mathematics
- Mini lessons on algebra topics identified by faculty as areas of need
- Students review on their own with ALEKS, and can place into Calc I with proctored ALEKS placement tests

MAT 103

- 4 unit graded (A-C-/NC) course that is first half of MAT 153 (Pre-Calculus)
- Algebra review topics set in the context of functions
- Uses standards based grading and active learning
- Students have SI study sessions and access to dedicated tutors
- Moves students toward completing requirements to be ready for Calc I

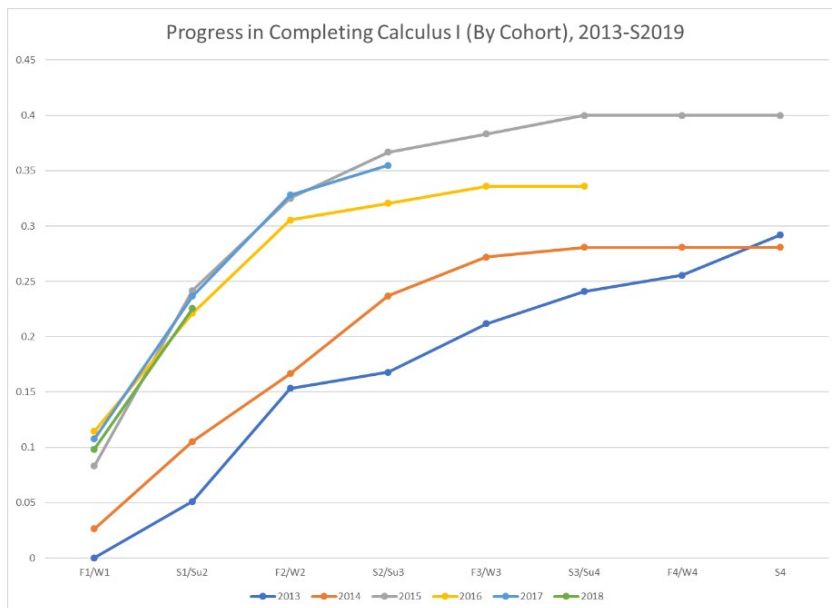
Note that in the summer of 2018, for Level IV students, the pathway was MAT 151 in the summer and MAT 195 Special Topics: Precalculus in the Fall. In 2018 & 2019, many students successfully completed one of these courses in summer:

2018 Cohort

Course	Summer Enrolled	Summer Passed (Rate)
MAT 151 College and Intermediate Algebra	60	45 (75%)
MAT 195 Special Topics: Calculus Success Academy	53	51 (96%)

2019 Cohort

Course	Summer Enrolled	Summer Passed (Rate)
MAT 103 Introduction to College Algebra	88	60 (68%)
MAT 195 Special Topics: Calculus Success Academy	71	67 (94%)



In addition, STEM students in the 2018 cohort seem to be progressing toward completion of Calc I at a rate comparable to previous cohorts.

The STEM path was designed so that all students who begin in summer (whether in MAT 195 or MAT 103) can complete Calculus I in their first year. However, students who began in MAT 195 were much more likely to complete Calculus I in their first year than students who began in MAT 103.

Progress of 2018 Cohort (Started in MAT 195)

	Su 2018		F 2018		Sp 2019	
MAT195	n=53	51 p 2 np				
MAT153			n=21	13 p 8 np	n=5	4 p 1 np
MAT191			n=20	18 p 2 np	n=9	6 p 3 np
MAT193					n=13	8 p 5 np
Other			n=7	6 p 1 np	n=6	5 p 1 np
None Att			n=5		n=20	

53 students started in MAT 195 in Summer 2018, 24 (45%) finished Calc I by Spring 2019.

Progress of 2018 Cohort (Started in MAT 151/103)

	Su 2018		F 2018		Sp 2018	
MAT151	n=66	45 p 21 np	n=12	8 p 4 np		
MAT195			n=32	22 p 10 np		
MAT153			n=8	6 p 2 np	n=11	6 p 5 np
MAT191					n=22	10 p 12 np
Other			n=2	1 p 1 np	n=8	7 p 1 p
None Att			n=12		n=25	

66 students started in MAT 151 in Summer 2018, 10 (15%) finished Calc I by Spring 2019.

It is worth noting that not all students who began in MAT 151 in Summer 2018 enrolled in an appropriate STEM path course in Fall 2018 (whether or not they were successful in MAT 151 in summer). It is unclear why these students left the STEM path, but one possibility is that enrolling students in a 6 week, 4 unit summer course might be a difficult first experience:

- MAT 103 is the right content needed for Calculus, but may not be the right first experience for students.
- MAT 103 seemed to be a negative experience for some students, while MAT 195 is a positive experience for most students.
- The MAT 103 curriculum is very difficult for some students.
- The compressed timeline of 103 makes it hard for students to remediate skills, even if they are motivated.
- Students should opt-in to taking a 6 week 4 unit course. Level 4 students are told they must take MAT 103 in Summer.

Based on the above data and reflections, we have modified the STEM path so that all students, regardless of their CO placement, will be enrolled in MAT 195 (Calculus Success Academy) for Summer 2020. It is our hope that providing students with a collaborative, problem-solving-focused class will increase students' sense of belonging and encourage more students to persist in their STEM major.

Summer 2020 Calculus Success Academy Proposal

- 2 unit course, similar to current MAT 195:
 - Most time in class will be spent on collaborative problem solving.
 - Students will be given mini lessons on Algebra review.
 - Students will have time in class to work on ALEKS and take ALEKS Assessments.
 - There will be no SI study sessions, but course will have embedded tutors and available drop-in tutoring.
- No designated courses for Level 2 and Level 3/4 students. Students from all levels will be placed together in the same sections.
- Results of ALEKS Placement will help us advise students into MAT 103, MAT 153 or MAT 191 (based on ALEKS scores). This allows students who would have started in MAT 103 to 'place up' to Pre-Calculus or Calculus if they demonstrate mastery of Algebra topics.

We will reevaluate this change to the STEM path in Spring 2021 to see if Level 3 & 4 students persist in their STEM major at higher rates and how the number of students completing Calc I in their first year is affected.