SAN DIEGO MESA COLLEGE
Institutional Research

STEM Core Three-Year Program Report (2017/18-2019/20)

Introduction

STEM Core's main objective is to help students complete pre-requisite courses in order to major in the sciences. It was launched at Mesa College in the fall of 2017 with the support of *STEM Conexiones*, Mesa's Title III, Part F Grant, and Saddleback College's NSF STEM Core Alliance Partner Grant. STEM Core is a cohort-based one-year program with an emphasis on Math. Cohort participants are enrolled in the same course sections and are encouraged to participate in career exploration activities. The program has run for three consecutive years at San Diego Mesa College. Course enrollment and other program requirements have changed each academic year with program improvement in mind. The chart below outlines the course sequences for each cohort. This report focuses on the academic component of STEM Core. It summarizes demographic characteristics of participants as well as their course outcomes while seeking to answer the following research question: Is the STEM Core program successful at helping students complete the pre-requisite courses?

Course Sequence

Academic Year	Track	Fall Term				Spring Term			
2017/18	N/A	MATH096 10 weeks	**MATH104** 6 weeks				**MATH141** 16 weeks		
2018/19	Track 1	MATH096 16 weeks				**MATH104** 6 weeks	**MATH141** 10 weeks		CHEM152+ CHEM152L 16 weeks
	Track 2		**MATH104** 6 weeks	**MATH141** 10 weeks				MATH150 16 weeks	CHEM152+ CHEM152L 16 weeks
2019/20	N/A		**MATH104** 6 weeks	**MATH141** 10 weeks	PERG120 16 weeks			MATH150 16 weeks	

Note. The 2018/19 STEM Core Cohort is the only one involving two different tracks.

Course Description

Course	Course Title
MATH096	Intermediate Algebra & Geometry
MATH104	Trigonometry
MATH141	Precalculus
MATH150	Calculus/Analytical Geometry I
CHEM152	Intro to General Chemistry
CHEM152L	Intro to General Chemistry Lab
PERG120	College Success

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

Methodology

Course requirements varied per cohort. Yet, comparisons were possible due to parallels between the cohorts' sequences. For example, both the 2017/18 and the 2018/19-Track 1 cohorts started the math sequence with MATH096 and ended with MATH141. Likewise, both the 2018/19-Track 2 and 2019/20 cohorts started the math sequence with MATH104 and ended with MATH150. Given these similarities across cohorts, this report focused on the courses mentioned above when seeking to answer the research question. Comparisons were made between different cohorts as well as between cohort and non-cohort students attempting a comparable math sequence.

Cohorts: When evaluating STEM Core outcomes, only the enrollments in the math cohort sections were examined. This means that if a student left the cohort and took a different section of the same course, that particular outcome was excluded.

Comparison Group: Comparison groups consisted of non-cohort students who took the first course in the math sequence during the relevant fall term, and then proceeded to enroll in a higher level of math (within the course sequence) at Mesa during the same academic year.

Definitions

Headcount: unduplicated count of students; one record per individual.
Enrollment: duplicated count of students; one record for each enrollment at Mesa College.
Course Retention Rate: percentage of students who complete a course with a letter grade of A, B, C, D, F, P, NP, I or RD (any grade other than a W) divided by total official census enrollments (Retention Counts / Enrollment).
Course Success Rate: percentage of students who complete a course with a passing grade (A, B, C, or P) divided by total official census enrollments (Success Counts / Enrollment).
*Excused withdrawals are excluded from the standard course success calculation.
Course GPA: the total grade point average of all students for a given course.

Data Caveats

STEM Core is a small cohort-based program. This means that any reported outcomes were based on low student counts. While a lot can be learned from this analysis, it is important to keep in mind that the lower the counts, the less generalizable results are. Accumulating multiple cohorts was not a viable solution, because the year-to-year changes meant that different cohorts were receiving different treatments. Moreover, the campus closure due to Covid-19 affected student outcomes in ways that are yet to be studied. One direct consequence of Covid-19 in the Spring semester was the increase of Excused Withdrawals (EW grades). This resulted in inflated course success rates because EW grades are excluded from the standard calculation of course success. For these reasons, all data included in this report should be interpreted with caution.

It should also be noted that this report included a limited number of demographic variables. This was due to SDCCD's decision not to convert all application data as it transitioned into the Peoplesoft system in Summer 2019. As a consequence, several demographic variables are not available for all students. In addition to missing application data, some calculated variables no longer exist in the same shape or form in the new database. For example, "financial aid status," a proxy variable for low income students no longer exists in the new database. For these reasons, demographic data were limited to gender, ethnicity, and age in this report. These are provided to better understand the cohort composition, however, due to small counts, student outcomes (retention, success, and GPA) were not disaggregated by these variables to ensure student confidentiality.

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

Highlights

Demographics

- With the exception of one cohort (2018/19-Track 2), Latinx students made up more than half (57%-73%) of STEM Core students. This suggests that the program is adequately targeting the ethnic population it seeks to serve.
- Female students were under-represented in the 2017/18 and 2019/20 cohorts (36% and 43%, respectively) when compared to the overall female student population at Mesa.

MATH096 → MATH104 → MATH141 Sequence

A total of 43% of students in the 2017/18 Cohort (6 out of 14) and 23% of students in the 2018/19-Track 1 Cohort (5 out of 22) successfully completed the sequence as STEM Core participants.

- Among their respective Non-STEM Core comparison groups, the completion rates were at five percent for 2017/18 and eight percent for 2018/19. This is part due to limited availability of accelerated courses that allow students to complete in one year.
- The choice of term—fall or spring—and course duration for the 2017/18 cohort appeared to be more effective at getting students to complete the course in one year.

MATH104 → MATH141 → MATH150 Sequence

A total of 45% of students in the 2018/19-Track 2 Cohort (17 out of 38) and 31% of students in the 2019/20 Cohort (11 out of 35) successfully completed the math sequence as STEM Core participants.

- Among their respective comparison groups, the completion rates were at one percent for 2018/19 and nine percent for 2019/20. The sharp increase between years might in part be due to an increase in the availability of accelerated math course sections in 2019/20. This suggests that students can reach their academic goals faster if they are allowed to take all three courses within two semesters.
- Spring 2020 was impacted by the campus closure due to Covid-19. However, most of the attrition in the 2019/20 Cohort took place before the college was impacted by Covid-19.

Demographics Analysis

Ethnicity

As an HSI Title III, Part F program, STEM Core focuses on serving Mesa's Latinx population. With this focus, one would expect an over-representation of Latinx students. For example, since the overall Latinx student representation at Mesa ranged between 37 to 39% (fall terms) during the life of the program, then one would expect STEM Core's Latinx population to be above that range. The Tables below show that this was exactly what happened. The data suggests that Latinx students were targeted as beneficiaries of this program with relative success. The lowest representation observed corresponded to the 2018/19-Track 2 cohort, which consisted of 42% Latinx students (still higher that the Latinx representation at the campus level). The 2018/19-Track 2 cohort led to the achievement of a higher level of math (MATH150) than its parallel Track 1 cohort; it is unfortunate that fewer Latinx students (42%) had the opportunity to achieve that milestone.

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

STEM Core Cohorts by Ethnicity

	2017/18 Cohort		2018/19-Track 1 Cohort		2018/19-Track 2 Cohort		2019/20 Cohort	
	Students	%	Students	%	Students	%	Students	%
African American	0	0%	3	14%	7	18%	0	0%
Asian	2	14%	0	0%	5	13%	4	11%
Latinx	8	57%	16	73%	16	42%	24	69%
Native American	0	0%	0	0%	1	0%	4	11%
White	4	29%	3	14%	7	18%	2	6%
Other	0	0%	0	0%	2	5%	1	3%
Total	14	100%	22	100%	38	100%	35	100%

Gender

While Mesa's overall female population remained steady at 54-55% (fall terms) during the life of the STEM Core program, female students were for the most part underrepresented in the STEM Core program. With the exception of the 2018/19-Track 1 cohort, where female students represented 64% of participants, female students accounted for less than half of participants, and in some cases as low as 36%.

STEM Core Cohorts by Gender

	2017/18 Cohort		2018/19-Track 1 Cohort		2018/19-Track 2 Cohort		2019/20 Cohort	
	Students	%	Students	%	Students	%	Students	%
Female	5	36%	14	64%	19	50%	15	43%
Male	9	64%	8	36%	19	50%	20	57%
Total	14	100%	22	100%	38	100%	35	100%

Age

Across all cohorts, the great majority of STEM Core participants were 18-29 years old. Only the last cohort, 2019/20, included students under 18. This suggests that STEM Core students were increasingly recruited right after high school, which is in alignment with the program's goals of speeding up students' journeys to careers in the sciences.

STEM Core Cohorts by Gender

	2017/18 Cohort		2018/19-Track 1 Cohort		2018/19-Track 2 Cohort		2019/20 Cohort	
	Students	%	Students	%	Students	%	Students	%
Under 18	0	0%	0	0%	0	0%	8	23%
18 - 24	8	57%	18	82%	29	76%	22	63%
25 - 29	5	36%	3	14%	8	21%	5	14%
30 - 39	1	7%	0	0%	1	3%	0	0%
40 - 49	0	0%	1	5%	0	0%	0	0%
Total	14	100%	22	100%	38	100%	35	100%

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

Outcomes Analysis

MATH096 → MATH104 → MATH141 Sequence

Both the 2017/18 and the 2018/19-Track 1 Cohorts attempted this sequence through the academic year, with some differences in when a given course was taken (fall or spring) and how fast a course was taught (measured in weeks; see Course Sequence Table on page 1). The 2017/18 Cohort took MATH096 for 10 weeks and MATH141 for 16 weeks, while the 2018/19-Track 1 Cohort took MATH096 for 16 weeks and MATH141 for 10 weeks. Both cohorts took MATH104 over a period of six weeks. In addition to the math sequence, the 2018/19-Track 1 Cohort enrolled in CHEM152 with lab during the spring term.

A total of 43% of students in the 2017/18 Cohort (6 out of 14) and 23% of students in the 2018/19-Track 1 Cohort (5 out of 22) successfully completed the math sequence. While these numbers were low, the percentage of students completing the math sequence in the comparison group was much lower. A total of five percent in the 2017/18 and eight percent in the 2018/19-Track 1 comparison groups completed the math sequence. However, the rate of successful completions varied significantly between the two STEM Core cohorts. Large variations are common when cohorts are small, but the difference might suggest that that the term placement and course length of the 2017/18 Cohort led to better course outcomes. Since the 2017/18 Cohort was placed in MATH096 and MATH104 during the same term, no students were lost in the transition from one course to the other. Moreover, the course success rates and GPA for MATH 141 seemed to be better in the 16-week format versus the 10-week format. However, it is also possible that the relative underperformance of the 2018/19-Track 1 Cohort was in part due to a heavier course load.

For obvious reasons, the low or complete lack of availability of accelerated math courses likely contributed to the low number of non-cohort students who were able to move through the entire sequence within one academic year. However, the MATH104 outcomes of STEM Core students compared to Non-STEM students suggested that cohort participation left students better prepared to transition into MATH141. None of the students in the 2017/18 Cohort dropped out of the MATH104 section and 86% of them completed the course successfully. In contrast, while the MATH104 retention rate of the comparison group was 86%, its success rate was only 58%. The MATH104 outcomes for the 2018/19-Track 1 Cohort were lower, but still higher than the corresponding comparison group. Out of the 14 2018/19-Track 1 students who successfully completed MATH096 and enrolled in MATH104, none dropped the course and 79% successfully completed the course. In contrast, the MATH104 retention rate of the comparison group was 84% with a 66%success rate.

Sequence Completion Rates

	STEM Core	Comparison Group
2017/18	43%	5%
2018/19-Track 1	71%	8%

2017/18 Cohort Outcomes

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Course GPA
MATH096	10	14	14	14	100%	14	100%	3.14
MATH104	6	14	14	14	100%	12	86%	2.71
MATH141	16	10	10	9	90%	6	60%	2.22

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

2017/18 Comparison Group Outcomes

Course	# Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Course GPA
MATH096	Any	76	80	80	100%	75	94%	3.06
MATH104	Any	73	73	63	86%	42	58%	2.03
MATH141	Any	6	6	*	*	*	*	*

*Note. There were 1116 students that attempted MATH096 in Fall 2017 and 76 of them proceeded to take a higher level of math at Mesa (MATH104, MATH141, or MATH150) in the same academic year. The comparison group excludes students who did not attempt a higher level of math after MATH096. Students enrolled in MATH141 did not necessarily enroll in MATH104 at Mesa. *Outcomes are suppressed for student counts below 10.*

2018/19-Track 1 Cohort

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Course GPA
MATH096	16	22	22	21	96%	14	64%	2.29
MATH104	6	14	14	14	100%	11	79%	2.36
MATH141	10	14	14	10	71%	5	36%	1.90

2018/19-Track 1 Comparison Group

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Course GPA
MATH096	Any	100	100	100	100%	98	98%	3.21
MATH104	Any	89	89	75	84%	59	66%	2.65
MATH141	Any	10	10	8	80%	8	80%	3.63

Note. There were 1,166 non-STEM Core students that attempted MATH096 in Fall 2018 and 100 of them proceeded to take a higher level of math at Mesa (MATH104, MATH141, or MATH150) in the same academic year. The comparison group excludes students who did not attempt a higher level of math after MATH096. Students enrolled in MATH141 did not necessarily enroll in MATH104 at Mesa.

MATH104 → MATH141 → MATH150 Sequence

Both the 2018/19-Track 2 and the 2019/20 Cohorts attempted this sequence during one academic year. Both cohorts enrolled in the same courses, at the same duration, and during the same terms (fall or spring in their respective academic years). MATH104 and MATH141 were taken in the fall over 6 and 10-weeks, respectively. MATH151 was taken in the spring over 16 weeks. The main difference between these two cohorts was that the 2018/19-Track 2 Cohort also enrolled in CHEM152 with lab during the spring term, while the 2019/20 Cohort enrolled in a College Success course (PERG120) during the fall term.

A total of 45% of students in the 2018/19-Track 2 Cohort (17 out of 38) and 31% of students in the 2019/20 Cohort (11 out of 35) successfully completed the math sequence. While less than half completed the sequence in either cohort, the percentage of students completing the math sequence in the comparison groups were lower. Only one percent in the 2018/19-Track 2 comparison group and nine percent in the 2019/20 comparison group completed the math sequence. While there was variation in successful completion rates between the two cohorts, the variation here was lower for students enrolled in this sequence than for students in the MATH096-starting sequence. This was perhaps due to both cohorts following very similar paths, as mentioned earlier. Both cohorts were required to take MATH104 and MATH141 during the fall term and both effectively transitioned all MATH104 successful completers into MATH141. In

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

other words, no students dropped out of the program during the MATH104 to MATH141 transition if they successfully completed MATH104. However, there was a larger rate of successful MATH104 completion in the 2018/19-Track 2 Cohort (92%) than in the 2019/20 Cohort (77%), which significantly contributed to the latter's higher level of attrition.

Comparisons involving the 2019/20 academic year should be made with additional caution. As a result of the disruptions caused by Covid-19 during the Spring 2020 term, students were given the choice to withdraw from a course very late into the semester. Given the special circumstances, the district made the choice to change W grades into EW grades. Excused withdrawals are excluded from the denominator when calculating success rates, which led to higher than usual success rates. For this reason, an alternate success rates that treats EW grades as W grades was included for the 2019/20 Cohort and its comparison group. It is important to note that even though Covid-19 might have led some 2019/20 STEM Core students to withdraw from MATH150, a lot of the attrition took place at two earlier key transition points: Between MATH104 and MATH141, and between Fall and Spring terms.

Unlike in the 2018/17 academic year, in 2019/20 a large number of non-STEM Core students enrolled in an accelerated 6-week MATH104 course (38 students). In 2019/20, more students managed to successfully complete the sequence (21 students) outside of STEM Core than within STEM Core (11 students). This suggests that students can reach their academic goals faster if they are allowed to take all three courses within two semesters.

Sequence Completion Rates

	STEM Core	Comparison Group
2018/19-Track 2	45%	1%
2019/20	31%	9%

2018/19-Track 2 Cohort

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Course GPA
MATH104	6	38	38	38	100%	35	92%	2.74
MATH141	10	35	35	32	91%	30	86%	2.78
MATH150	16	20	20	20	100%	17	85%	2.3

2018/19-Track 2 Comparison Group

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Course GPA
MATH104	Any	202	202	202	100%	200	99%	3.09
MATH141	Any	198	199	164	82%	130	65%	2.76
MATH150	Any	4	4	*	*	*	*	*

*Note. There were 611 non-STEM Core students that attempted MATH104 in Fall 2018 and 202 of them proceeded to take a higher level of math at Mesa (MATH141 or MATH150) in the same academic year. The comparison group excludes students who did not attempt a higher level of math after MATH104. Students enrolled in MATH150 did not necessarily enroll in MATH141 at Mesa. *Outcomes are suppressed for student counts below 10.*

Sources: SDCCD DataMart; SDCCD Institutional Research Database.

2019/20 Cohort

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Success Rate***	Course GPA
MATH104	6	35	35	34	97%	27	77%	77%	2.62
MATH141	10	27	27	27	100%	19	70%	70%	2.33
MATH150	16	16	16	12	75%	11	92%	69%	3.17

**** In Spring of 2020 was impacted by Covid-19This alternative success rate does not remove Excused Withdrawals (EW) from the denominator.*

2019/20 Comparison Group

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Success Rate***	Course GPA
MATH104	Any	230	235	228	97%	217	93%	92%	3.11
MATH141	Any	224	226	182	81%	163	86%	72%	2.96
MATH150	Any	27	27	21	78%	21	91%	78%	3.14

Note. There were 630 non-STEM Core students that attempted MATH104 in Fall 2019 and 230 of them proceeded to take a higher level of math at Mesa (MATH141 or MATH150) in the same academic year. The comparison group excludes students who did not attempt a higher level of math after MATH104. Students enrolled in MATH150 did not necessarily enroll in MATH141 at Mesa.
**** In Spring of 2020 was impacted by Covid-19This alternative success rate does not remove Excused Withdrawals (EW) from the denominator.*

2019/20 Comparison Group by Course Length

Course	# of Weeks	Students	Enrollment	Retention Counts	Retention Rate	Success Counts	Success Rate	Success Rate***	Course GPA
MATH104	6	38	38	37	97%	37	97%	97%	3.35
	8	7	7	*	*	*	*	*	*
	16	181	182	176	97%	167	92%	92%	3.08
	18	8	8	*	*	*	*	*	*
MATH141	10	42	42	38	91%	36	88%	86%	2.95
	16	182	184	144	78%	127	85%	69%	2.97
MATH150	16	27	27	21	78%	21	91%	78%	3.14

**** In Spring of 2020 was impacted by Covid-19This alternative success rate does not remove Excused Withdrawals (EW) from the denominator. *Outcomes are suppressed for student counts below 10.*

For Further Inquiry

1. The 2018/19-Track 2 Cohort was the best performing STEM Core cohort, yet the one with the lowest Latinx student representation. What are some improvements (e.g. culturally relevant pedagogy) that could be made to better serve this population?
2. Scheduling classes in a way that allows for the completion of a sequence is the first step in enabling students to complete these pre-requisites in one year. What needs to happen at Mesa to continue to offer faster-pace math courses beyond STEM Core? What campus resources could be leveraged to offer the necessary support for students (e.g. STEM Tutoring, Embedded Tutors, etc.)?
3. What interventions could be done at key transition points (between the first and the second course/between fall and spring semester) to lower the attrition rate of students seeking to complete their math pre-requisites in one year?

Sources: SDCCD DataMart; SDCCD Institutional Research Database.