



# ENcourage Engineering Math Program FA21 Findings

This report provides a descriptive picture of the Summer 2021 (SM21) [ENcourage Engineering Math Program](#) participants and highlights some preliminary findings regarding their FA21 academic behavior and performance. Key findings summarize takeaways from the tables located in the [Tables](#) section at the end. To provide additional context, ENcourage students are compared to new, main campus undergraduates who enroll in WSCOE in FA21 (“EG FA21” reference students) where applicable. (See [Table 1](#)). On a final note, we define “Calculus Ready” as “Math 160 Ready” for the purposes of this initial report.

A total of 62 incoming students were invited to attend the ENcourage summer math program. Of that group, 51 (82%) students attended, including 28 in the June virtual program and 23 in the August in-person program.<sup>1</sup>

## Key Findings

### Demographics

- Compared to EG FA21 students, the 62 ENcourage invitees are mostly representative of the incoming engineering class, with a slightly higher share of first generation (FG) and racially minoritized (RM) students, but with a slightly lower share of Pell recipients. ([Table 1](#))
- The demographics shift slightly when we focus just on the 51 ENcourage attendees. Females, Colorado residents, and RM students are particularly overrepresented among attendees as compared to EG FA21 students overall.
  - However, a more apt comparison may be between ENcourage attendees (N=51) and those EG FA21 students who were not “Math 160 Ready” before the start of the semester (N=127).<sup>2</sup> This group represents a pool of potential ENcourage attendees.
  - Attendees and this smaller reference group diverge demographically in meaningful ways. Females and Colorado residents are overrepresented among attendees by 8-10 percentage points (PP). Attendees are also about 5 PP less likely to be FG and Pell students compared to the reference group. Attendees have a mean high school/transfer GPA that is 0.16 points higher than the reference group as well.
  - The only traditionally underserved identity that is overrepresented among attendees is RM status: the share of RM attendees is 4.6 PP higher than the share of RM reference students (39.2% compared to 34.6%).
- There are notable differences in the demographics between June (virtual) and August (in-person) attendees. A higher share of June attendees are female, and the June group has a significantly higher mean HS/transfer GPA compared to August attendees (3.96 vs. 3.80). All 28 June attendees identify as “White” among other racial/ethnic identities they may hold.

<sup>1</sup> Technically 63 students were invited to attend, and this one additional student did participate in the June virtual program; however, they did not enroll at CSU in FA21. Because this report focuses on academic behavior at CSU, we drop this student from the analysis. The June virtual program was from June 21 – June 25 while the in-person August program ran from August 9 – August 11. Two of the 23 August attendees participated virtually due to covid19.

<sup>2</sup> These 127 EG FA21 students refer to those who did not participate in ENcourage in SM21, did not enroll in a calculus or higher-level math course in FA21, and who did not meet the prerequisites for Math 160 before the start of the semester.

- In comparison, a much higher share of August attendees are FG, Pell, and RM. The starkest difference is seen in the representation of RM students: 60.9% of August attendees compared to 21.4% of June attendees.
- Of the 51 ENcourage attendees, 49 enroll in WSCOE in FA21. One student enrolls in the College of Agricultural Sciences and the other enrolls as an Intra-University student with an Exploratory Studies Engineering Interest focus. ([Table 2](#))
  - Of the 49 students who enroll in WSCOE, the department enrollment breaks down as follows: 19 (39%) in Engineering Intra-College, 13 (27%) in Mechanical Engineering, 10 (20%) in Civil and Environmental Engineering, 5 (10%) in Electrical and Computer Engineering, and 2 (4%) in Chemical and Biological Engineering.

## FA21 Outcomes

### Math 160 Readiness<sup>3</sup>

- Out of the 51 ENcourage attendees, 62.7% (n=32) are “Math 160 Ready” before the start of the FA21 semester. Among the EG FA21 reference group of students who did not participate in ENcourage, this share is 70.7% (or 331 out of 468 students). ([Table 3](#))
  - There are differences in Math 160 Readiness between the June and August versions of ENcourage: 89.3% (n=25) of June attendees are Math 160 Ready, while only 30.4% (n=7) of August attendees are Math 160 Ready before FA21.
  - This large gap in readiness may relate to the fact that June attendees had more time after their ENcourage experience and before the start of FA21 to meet Math 160 prerequisites.
  - It may also relate to underlying differences in the demographics of June and August attendees. Pell, FG, and RM students are overrepresented among the 21 ENcourage attendees who remain not Math 160 Ready. ([Table 1](#))

### FA21 Math Enrollment

- Of the 51 ENcourage attendees, 96.1% enroll in any math course in FA21 compared to 95.5% of the non-ENcourage FA21 EG reference group and 91.3% of the EG reference group that was also not Math 160 Ready.
  - 35.3% of attendees enroll in Pre-Calculus compared to 26.3% of the non-ENcourage EG reference group. All of the 91.3% of math enrollees in the EG FA21 reference group not Math 160 Ready enrolled in Pre-Calculus in FA21.
  - Meanwhile, 56.9% of attendees enroll in Calculus compared to 43.8% of the non-ENcourage EG reference group. All Calculus enrollees, except for 1 reference group student, enroll in Math 160 as their version of calculus in FA21. ([Table 4](#))

### First 3 Weeks Calculus Center Use by ENcourage Attendees

- Out of 51 attendees, 29 enrolled in calculus in FA21. Of those 29, 17 (59%) attended the Calculus Center at least once in the first 3 weeks of classes. Visitors attended the center a total of 46 times, averaging about 2.7 visits per student. ([Table 5](#))

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<sup>3</sup> A student is considered Math 160 Ready if they passed (i.e., earned a score of 1 or 2 on) all five math placement exams (MC17, MC18, MC24, MC25, and MC26) or earned equivalent credit via AP/transfer/etc. credits. Students are also considered Math 160 Ready if they transferred in with credits fulfilling Math 141, Math 160, or Math 161.

### FA21 End-of-term (EOT) Outcomes

- Out of 51 attendees, 98% (N=50) are enrolled at FA21 EOT compared to 96.8% (n=453) of the EG FA21 reference group that is also not in ENcourage, and 96.1% (n=122) who were not in ENcourage and who were Not Math 160 Ready before FA21. This latter group serves as a potential pool of ENcourage attendees, and a more appropriate reference group in many ways for key academic outcomes.
  - 16.0% (n=8) of ENcourage attendees are on academic probation at the end of FA21 compared to 21.3% (n=26) of EG FA21 Not Math 160 Ready group. The probation rate for the larger EG reference group of non-ENcourage participants is 14.1% for comparison.
  - ENcourage attendees' mean term GPA is 2.93 compared to 2.59 for the EG FA21 Not Math 160 Ready reference group and 3.03 for the EG FA21 Not in ENcourage reference group. ([Table 6](#))

### FA21 Pre-Calculus and Calculus Course Outcomes (among those at EOT)

- **Pre-Calculus:**
  - 72.2% (or 13 out of 18) of ENcourage students in Pre-Calculus had a successful course completion<sup>4</sup> in FA21 which aligns with the 72.3% (or 81 out of 112) we observe for the EG FA21 Not Math 160 Ready reference group.
  - However, only 5.6% (n=1) of ENcourage attendees had a course withdrawal compared to 25% (n=28) for the Not Math 160 Ready reference group.
  - By the start of SP22, 77.8% (n=14) of ENcourage attendees in Pre-Calculus are Math 160 ready compared to 55.4% (n=62) for the Not Math 160 Ready reference group in Pre-Calculus.
- **Calculus:**
  - Among the students enrolled in Math 160, rates of successful course completion and withdrawal rates are similar between ENcourage attendees and the EG FA21 Not in ENcourage reference group. 82.1% (n=23) of ENcourage attendees and 82.4% (n=164) of the EG reference group successfully complete Math 160. 3.6% (n=1) of attendees and 3.5% (n=7) of the reference group withdraw from Math 160. ([Table 7](#))

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<sup>4</sup> For Pre-Calculus courses, students can be enrolled in more than one course, so successful course completion and course withdrawal statistics count whether a student had any successful completion and any withdrawal from the set of Pre-Calculus courses they were enrolled in during FA21. A successful completion is considered an A, B, C, or S, while a course withdrawal is a W.

# Tables

**Table 1. Demographic Characteristics**

	ENcourage Students						Engineering (EG) Reference Students <sup>1</sup>		
	All Encourage Invitees	Non-Attendees	Attendees			ENcourage Remaining Not Math 160 Ready <sup>2</sup>	EG FA21 Overall	EG FA21 Not in ENcourage	EG FA21 Not Math 160 Ready
			All	June	August				
<i>N</i>	62	11	51	28	23	19	516	468	127
Female	30.6%	18.2%	33.3%	35.7%	30.4%	36.8%	27.1%	26.7%	23.6%
CO Resident	62.9%	54.5%	64.7%	64.3%	65.2%	57.9%	60.3%	59.6%	56.7%
Mean HS/Transfer GPA	3.83	3.58	3.89	3.96	3.80	3.78	3.91	3.91	3.73
First Generation	16.1%	18.2%	15.7%	7.1%	26.1%	21.1%	14.3%	14.3%	20.5%
Pell	9.7%	0.0%	11.8%	7.1%	17.4%	21.1%	12.6%	12.8%	17.3%
Racially Minoritized <sup>3</sup>	33.9%	9.1%	39.2%	21.4%	60.9%	63.2%	26.9%	25.6%	34.6%
American Indian	1.6%	0.0%	2.0%	0.0%	4.3%	5.3%	1.9%	1.9%	2.4%
Asian	11.3%	0.0%	13.7%	7.1%	21.7%	15.8%	9.5%	9.0%	8.7%
Black	6.5%	9.1%	5.9%	0.0%	13.0%	10.5%	4.1%	3.8%	6.3%
Hawaiian/Pac. Islander	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.4%	1.6%
Hispanic	19.4%	0.0%	23.5%	14.3%	34.8%	47.4%	14.3%	13.5%	20.5%
Multi-Racial	11.3%	0.0%	13.7%	7.1%	21.7%	21.1%	7.0%	6.2%	7.1%
White	90.3%	90.9%	90.2%	100.0%	78.3%	84.2%	88.2%	87.8%	82.7%
International	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	3.0%	3.9%
SRS	1.6%	0.0%	2.0%	3.6%	0.0%	0.0%	1.0%	0.9%	3.1%
SRS because Low Math	1.6%	0.0%	2.0%	3.6%	0.0%	0.0%	0.4%	0.2%	0.8%

**Notes:**

<sup>1</sup>The EG Reference group includes main-campus undergraduates new to CSU in FA21 who enroll in WSCOE. This includes 516 students overall, and 468 of which did not also participate in the ENcourage SM21 program. Please note that 2 ENcourage attendees did not subsequently enroll in WSCOE in FA21 including 1 who enrolled in the College of Ag Sci, 1 who enrolled as as Intra-University. Another ENcourage attendee is not included in the EG FA reference group because they were not "New" to CSU starting in FA21. Of the 468 group, 127 (27%) did not enroll in any calculus course in FA21 and were considered to not be Math 160 Ready before the start of the fall semester.

<sup>2</sup>Math 160 Ready means a student passed (i.e., earned a score of 1 or 2 on) all five math placement exams (MC17, MC18, MC24, MC25, and MC26) or earned equivalent credit via AP/transfer/etc. credits. Students are also considered Math 160 Ready if they transferred in with credits fulfilling Math 141, Math 160, or Math 161. These 19 students did not meet the following criteria before or after they participated in the ENcourage SM21 math program. "Math 160 Ready" is equivalent to "Calculus Ready" for our purposes here.

<sup>3</sup>Racially Minoritized includes all students who do not identify as White, Non-Hispanic. The individual race and ethnicity categories allow students to be grouped in as many bins as they identify. For example, a student who identifies as American Indian, Hispanic, and White would be grouped into all 3 categories. The race/ethnicity percentages, therefore, sum to greater than 100%.

**Table 2. FA21 Enrollment for ENcourage Attendees**

<u>College, Department, and Program</u>	<u>All</u>	<u>June</u>	<u>August</u>
<i>N</i>	51	28	23
<b><u>Agricultural Sciences</u></b>	<b>1</b>	<b>1</b>	
<i>Horticulture &amp; Landscape Archtctr</i>	1	1	
Landscape Architecture	1	1	
<b><u>Intra-University</u></b>	<b>1</b>	<b>1</b>	
<i>Provost / Acad Vice President</i>	1	1	
Exp St: Eng Int	1	1	
<b><u>Walter Scott Jr College of Engr</u></b>	<b>49</b>	<b>26</b>	<b>23</b>
<b><i>Chemical and Biological Engineering</i></b>	2	1	1
Chemical & Biological Engineer	2	1	1
<b><i>Civil and Environmental Engineering</i></b>	10	5	5
Civil Engineering	5	3	2
Environmental Engineering	5	2	3
<b><i>Electrical and Computer Engineering</i></b>	5	2	3
Computer Engineering	2		2
Electrical Engineering/Electrical Engineering	3	2	1
<b><i>Engineering Intra-College</i></b>	19	12	7
Biomedical Engineering with CB	4	2	2
Biomedical Engineering with ME	8	6	2
Engineering Open Option	7	4	3
<b><i>Mechanical Engineering</i></b>	13	6	7
Mechanical Engineering	13	6	7

**Table 3. Math 160 Readiness, % (N)**

	<b>ENcourage Attendees</b>			<b>EG FA21 Not in ENcourage</b>
	<b>All</b>	<b>June</b>	<b>August</b>	
<i>N</i>	51	28	23	468
Math 160 Ready before FA21	62.7% (32)	89.3% (25)	30.4% (7)	70.7% (331)
<i>Highest Math Passed<sup>1</sup></i>				
MC00	3.9% (2)	-	8.7% (2)	6.2% (29)
Math 117	9.8% (5)	3.6% (1)	17.4% (4)	6.0% (28)
Math 118	5.9% (3)	-	13.0% (3)	4.5% (21)
Math 124	9.8% (5)	-	21.7% (5)	4.9% (23)
Math 125	5.9% (3)	3.6% (1)	8.7% (2)	6.8% (32)
Math 126	60.8% (31)	85.7% (24)	30.4% (7)	36.3% (170)
Calculus <sup>2</sup>	3.9% (2)	7.1% (2)	-	34.8% (163)
No Math Information	-	-	-	0.4% (2)

*Notes:*

Cells display percentages with headcounts in parentheses.

<sup>1</sup>The highest math passed for the FA21 term incorporates both math placement exam information and transfer credit information from pre-calculus and calculus courses. Some students were not considered Math 160 Ready before FA21 but became ready by scoring a 1 or 2 on the MC26 exam after the start of the FA21 term (this includes 1 ENcourage attendee and 2 EG FA21 reference students).

<sup>2</sup>Calculus students are those with transfer credits in Math 141, Math 160, or Math 161.

**Table 4. FA21 Math Course Enrollment**

	ENcourage Attendees			EG Reference Students	
	<u>All</u>	<u>June</u>	<u>August</u>	EG FA21 Not in ENcourage	EG FA21 Not Math 160 Ready
<i>N</i>	51	28	23	468	127
Any Math	96.1% (49)	100% (28)	91.3% (21)	95.5% (447)	91.3% (116)
Pre-Calculus	35.3% (18)	10.7% (3)	65.2% (15)	26.3% (123)	91.3% (116)
Calculus	56.9% (29)	82.1% (23)	26.1% (6)	43.8% (205)	-
Math 160	56.9% (29)	82.1% (23)	26.1% (6)	43.6% (204)	-

*Notes:*

Cells display percentages with headcounts in parentheses. Pre-Calculus courses refer to Math101, Math117, Math118, Math124, Math125, Math126, Math181A1, and Stat100. Calculus courses refer to M141, M155, M160, MCC141, MCC155, MCC160, Math141, Math155, Math157, Math159, Math160, Math180A1, Math180A2, Math180A3, and Math180A4.

**Table 5. First 3 Weeks Calculus Center Use by Encourage Attendees**

	<u>All</u>	<u>June</u>	<u>August</u>
<i>N</i>	51	28	23
Enrolled in Calculus FA21	29	23	6
Attended Calculus Center Ever	17	14	3
<i>Attendance Statistics</i>			
Average # of Times	2.7	2.9	2
Total # of Times	46	40	6

*Notes:*

All Calculus Center attendees were enrolled in Math 160 in FA21.

**Table 6. FA21 End-of-term (EOT) Academic Standing**

	ENcourage Students						Engineering (EG) Reference Students		
	All Encourage Invitees	Non-Attendees	Attendees			ENcourage Remaining Not Math 160 Ready <sup>2</sup>	EG FA21 Overall	EG FA21 Not in ENcourage	EG FA21 Not Math 160 Ready
			All	June	August				
<i>N</i>	62	11	51	28	23	19	516	468	127
Enrolled at EOT	96.8% (60)	90.9% (10)	98.0% (50)	96.4% (27)	100% (23)	100% (19)	96.9% (500)	96.8% (453)	96.1% (122)
On academic probation	13.3% (8)	0% (0)	16.0% (8)	14.8% (4)	17.4% (4)	15.8% (3)	14.4% (72)	14.1% (64)	21.3% (26)
Term GPA	2.94	2.98	2.93	3.14	2.68	2.74	3.02	3.03	2.59

Notes:

Cells display percentages with headcounts in parentheses.

**Table 7. FA21 Course Outcomes Among Those Enrolled at EOT**

	ENcourage Attendees			EG Reference Students	
	All	June	August	EG FA21 Not in ENcourage	EG FA21 Not Math 160 Ready
<i>N</i>	50	27	23	453	122
<b>Among those enrolled in Pre-Calculus</b>					
<i>N</i>	18	3	15	-	112
Successful course completion	72.2% (13)	66.7% (2)	73.3% (11)	-	72.3% (81)
Course withdrawal	5.6% (1)	33.3% (1)	0% (0)	-	25% (28)
Math 160 Ready at start of SP22	77.8% (14)	66.7% (2)	80% (12)	-	55.4% (62)
<b>Among those enrolled in Math 160</b>					
<i>N</i>	28	22	6	199	-
Successful course completion	82.1% (23)	86.4% (19)	66.7% (4)	82.4% (164)	-
Course withdrawal	3.6% (1)	0% (0)	16.7% (1)	3.5% (7)	-

Notes:

Cells display percentages with headcounts in parentheses. Successful course completion is earning an A, B, C, or S.

<sup>1</sup>For Pre-Calculus courses, students can be enrolled in more than one course, so successful course completion and course withdrawal statistics count whether a student had any successful completion and any withdrawal from the set of Pre-Calculus courses they were enrolled in during FA21.