



# **OUTCOMES & ASSESSMENT**

General Education Learning Outcome (GELO) Assessment

## **CCSF Area C: Natural Sciences**

**Course Completion and SLO Data Fall 2018 - Spring 2022**

Assessment Report, Fall 2023

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## Executive Summary

- Overall, 36,636 assessments of SLOs mapped to Area C were analyzed in this report, drawn from eight semesters (fall 2018 – spring 2022), with an overall proficiency of 76.1% “meets SLO”. This includes 26,409 assessments in Area C1, Biological Science, from 24 courses, with an overall proficiency of 78.1%, and 10,227 assessments in Area C2, Physical Science, from 21 courses, with an overall proficiency of 70.8%.
- Enrollments in this period totaled 18,769 students in C1 and 15,961 students in C2. This means there were, on average, more than 1 assessment per student per section in C1 and less than 1 assessment per student per section in C2, but it is unknown how this may affect the data set, if at all.
- The percentage of students meeting the SLOs in this four-year period was higher than that reported in the prior assessment in [2017](#) (67%, for Area C as a whole).
- The data set reflects the dynamic nature of curriculum at CCSF in several ways.
  - In the normal curriculum update process, course SLOs were mapped to the new C1 and C2 outcomes for most Area C courses at some point during the study period.
  - Only active SLO-to-GELO mappings associated with the most recent course outline were available in the data export. For cases where SLO language changed, the assessments associated with the prior SLOs were excluded. Where SLO language stayed the same, if a large number of assessments had been submitted in prior semesters, a time-intensive manual matching process was used to provide as much assessment data as possible for that SLO.
  - Some Area C courses were taught very few times during the study period, or SLOs were assessed in few if any sections.
- In Area C1, proficiency was higher during the five pandemic semesters (spring 2020-spring 2022) compared to the pre-pandemic semesters (fall 2018-fall 2019). In Area C2, there was no notable pattern of difference in proficiency in the pandemic versus pre-pandemic semesters.
- Patterns of attainment among the sub-elements in Area C varied.
  - In Area C1, students attained proficiency (met SLO) at roughly 77% for the first three sub-elements, with the fourth sub-element being an outlier at 80.661%. The fourth sub-element reads, “Apply biological science knowledge and reasoning to human interaction with the natural world and issues impacting society.”
  - In Area C2, students attained proficiency (met SLO) at roughly 71% for the first, second, and fourth sub-elements, with the third sub-element being an outlier at 67.3%. The third sub-element reads, “Apply scientific principles, theories or models to explain the behavior of natural physical phenomena.”
- Outcome data disaggregated by age (age alone) did not show an opportunity gap<sup>1</sup> for younger students in Area C (as the gap between the percent meeting the SLO and the overall proficiency was less than 3%). In Area C1, Biological Sciences, an opportunity gap for students over age 60 was identified, but this is a small number of students (just 95).
- Significant opportunity gaps remain for students in equity populations (a 6% gap in C1 and a 5% gap in C2).
  - When age and equity status were cross-tabulated, opportunity gaps were largest for the youngest students (under age 25, in both C1 and C2), as well as among the small group

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<sup>1</sup> An opportunity gap is defined by CCCCO as a difference of more than 3% in student achievement between any identified demographic and the average for all students. We are applying this language and the same standard of a 3% difference to discuss opportunity gaps in SLO attainment, as well.

- of students in the 50-59 age group in C1. Strategies that are both age-conscious and race-conscious may be useful in closing opportunity gaps.
  - When disaggregated by race/ethnicity, the biggest gaps were identified in C1 for Black/African American and Pacific Islander/Native Hawaiian students, and in C2 for Latino/a/x and Filipino/a/x students. Course success data show similar opportunity gaps, with an 8% gap in both C1 and C2 for students in equity populations.
  - Foster and former foster youth experience an opportunity gap in both C1 and C2, and veterans experience an opportunity gap in C2. Only one gender-based opportunity gap in SLO attainment was identified, for nonbinary students in C2.
- In addition to analyzing data for CCSF Area C outcomes, this report shows SLO results for laboratory classes mapped to IGETC 5C and CSU B3, with 15,161 assessments mapped to IGETC 5C and 18,499 assessments mapped to CSU B3. (Many classes map to both IGETC and CSU.) Overall, 75.3% of students met the outcomes mapped to IGETC 5C and 75.1% met the outcomes met to CSU B3. Among the 3 sub-elements for laboratory science, achievement was highest for the second one, “Analyze and evaluate data from the natural world,” at 76.5% (IGETC) and 76.5% (CSU).

## Introduction

This report presents the findings of the third assessment of General Education Area C, Natural Sciences. This report is part of an ongoing effort, in accordance with the [CCSF Institutional Assessment Plan](#), to regularly assess teaching and learning in individual General Education Areas. These reports are intended more specifically to document aggregate student learning outcome proficiency and course completion data, explore equity issues and opportunity gaps, and look more deeply at the outcomes and core concerns in the Area. This assessment process facilitates dialogue around teaching and assessment and helps to ensure the integrity of programs at CCSF.

Area C includes two sub-areas, which match up to the CSU Area B1 and B2 and IGETC Area 5A and 5B. In addition, outcome data on laboratory courses that map to IGETC 5C and CSU B3 (but may not map to our CCSF science outcomes) were also analyzed. The Area C plus Laboratory Activity outcomes are below.

Upon completion of this coursework, a student will be able to:

### C1: BIOLOGICAL SCIENCE

1. Apply scientific inquiry and investigation of evidence to critically evaluate biological science arguments.
2. Communicate scientific ideas and theories effectively.
3. Apply scientific principles, theories, or models to explain the behavior of natural biological phenomena.
4. Apply biological science knowledge and reasoning to human interaction with the natural world and issues impacting society.

### C2: PHYSICAL SCIENCE

1. Apply scientific inquiry and investigation of evidence to critically evaluate physical science arguments.

2. Communicate scientific ideas and theories effectively.
3. Apply scientific principles, theories, or models to explain the behavior of natural physical phenomena.
4. Apply physical science knowledge and reasoning to human interaction with the natural world and issues impacting society.

#### Laboratory Activity Outcomes for IGETC 5C / CSU B3

1. Investigate natural phenomena through a variety of scientific inquiry techniques.
2. Analyze and evaluate data from the natural world.
3. Apply scientific principles, theories, or models to predict and explain the behavior of natural phenomena.

Courses that meet Area C come from a range of departments, including Astronomy, Behavioral Sciences, Biology, Chemistry, Earth Sciences, Engineering & Technology, Health Education, and Physics.

This report includes a variety of quantitative data prepared by the Office of Research and Planning based on course completions and CRN-level SLO mastery levels for the Fall 2018 – Spring 2022 period. Summer semesters were excluded. The SLO Coordination Team conducted faculty outreach in Area C during the Fall 2022 and Fall 2023 semesters to supplement this numerical data with discussion and anecdotes that round out the snapshot this report provides on the Area. Comments in the report noted as being views of faculty (or faculty/staff) come from these conversations and may or may not reflect wider views of all faculty.

Meetings were held to gather responses to the SLO and course completion data with the following groupings:

- School of STEM meeting (Dean David Yee, department chairs)
- SLO Committee
- The STEM/MESA student support center
- Flex Day workshop, October 2023

### **CCSF Courses that meet the CCSF, CSU and IGETC (UC) area requirements.**

The list of CCSF courses that meet the CCSF Natural Sciences Requirement can be viewed in the 2022-2023 [CCSF General Education Worksheet](#).

The list of CCSF courses that meet CSU B2 and B3 can be viewed in the 2022-2023 [CSU Transfer Worksheet](#).

The list of CCSF courses that meet IGETC Area 5 can be viewed in the 2022-2023 [IGETC Transfer Worksheet](#).

## CCSF Area C Requirement Outcome Mapping

### Data considerations:

The mapping of outcomes from courses to GE areas is vetted during the curriculum approval process by the Curriculum Committee.

Area C underwent a change of wording<sup>2</sup> in Fall 2017 to better align to the IGETC and CSU outcomes. The singular area C outcomes split into C1 and C2, specifying biological and physical sciences.

During the period covered by this study (fall 2018 - spring 2022), the majority of Area C courses went through the normal six-year curriculum re-approval process and had their SLOs mapped to the newly designated Areas C1 or C2. Data availability was limited in several ways, however. First, some courses were taught very few times during the study period, or SLOs were assessed in few if any sections. Second, only active SLO-to-GELO mappings associated with the most recent course outline were available in the data export. For cases where SLO language changed, the assessments associated with the prior SLOs were excluded. Where SLO language stayed the same, if a large number of assessments had been submitted in prior semesters, a manual matching process was used to provide as much assessment data as possible for that SLO. Resource limits precluded using manual matching on a broader basis.

Data were also impacted by the Covid-19 pandemic. The total number of assessments decreased in Spring 2020, the first semester of the pandemic, as SLO reporting was made optional that semester to support faculty as they pivoted to remote instruction and coped with the direct and indirect effects of the pandemic. Course modality changed from primarily in-person (with some percent of online courses offered) up through March 2020 to all remote and online instruction for the remainder of Spring 2020. For most courses, remote and online instruction continued through the study period (through spring 2021). Some remote instruction was synchronous, usually over Zoom, and some was asynchronous.

The study period includes three semesters of data pre-pandemic and three semesters of data during the pandemic. The resulting data *may not be directly comparable* to prior semesters. Rather, these data provide a “snapshot in time” of student proficiency in Area C.

The data below are stratified by various demographic factors, to better identify opportunity gaps that could be addressed. There may be additional confounding factors, demographic or otherwise, that are not analyzed in the data presented.

For a listing of the 24 C1 courses and the 21 C2 courses from which SLO assessment data are included for this report, including the semesters of mapped data included in the data draw and/or manually added as described above, please see Appendices.

No confidence intervals or standard deviations are shown, because the data presented constitute the entire universe of data available for the period of the study; the data were not sampled, nor can they be

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<sup>2</sup> Academic Senate Resolution 2017.10.18.05, see [Academic Senate minutes, pg. 6](#)

considered a randomized sample for some larger universe. They offer a snapshot in time of student learning in Area C at the college.

## Follow-up on Recommendations in the 2017 Math/Area C GELO Report

In the 2017 GELO report on Area C and the Math Requirement, recommendations were made, and the college has taken action on several of them in recent years. The recommendations and subsequent actions taken are summarized below:

- The 2017 report recommended “to continue (or add) tutoring, other support strategies/services, professional development, and the development of effective learning spaces in conjunction with the Office of Student Equity in order to address remaining achievement gaps” for what was then termed “underrepresented minority students.”
  - Tutoring, professional development, and other support strategies have been implemented, including embedded tutors in some Area C courses.
  - Increasingly, the college has recognized that the opportunity gaps cannot be closed by tutoring or remediation alone, and the Student Equity Plan for 2022-2025 emphasizes race-conscious structural changes and instructional changes intended to close the gap.
- The 2017 report noted that “More needs to be done to improve student success for young students” and this continues to be the case. Some of the actions recommended in 2017 have been or are being implemented, including:
  - Improved early alert system, which is still a work in progress.
  - Acceleration in the math, English, and ESL sequences, which has been achieved. Outcomes in Area C courses may be improved by more students completing college-level math and English within their first year (an equity metric that CCSF has improved on).
  - First-year experience and/or first-year learning communities, which have been implemented on a small scale through the Metro program and other learning communities at the college; planning is underway for their expansion.
- The 2017 data did not show an equity gap based on sex/gender (nor did we identify one in this report), but faculty in 2017 expressed concern about the drop-off of enrollment of non-male students in the upper levels of math and science.
- The 2017 report recommended separating the biological and physical sciences outcomes in Area C, and that was accomplished in fall 2017. The outcomes continue to align to the requirements at CSU and the UC, and we are monitoring any further changes that may be needed in the implementation of the new CalGETC transfer sequence.
- The 2017 report put a lot of emphasis on fostering positive learning spaces and environments on campus; with the pandemic, efforts at creating physical environments were redirected toward improving virtual environments. The college is currently in a process of reinvigorating campus life, face-to-face, including multiple construction projects. Fostering positive spaces on campus for students to study, get help, interact, etc., should continue to be a priority in this process.
- The 2017 report also emphasized the value to student success of proper sequencing of courses, with the use of prerequisites, corequisites and co-instructional courses to support student success. The college as a whole and, in particular, the Curriculum Committee have continued to work toward that end.

## Data Analysis and Discussion

### Overall Outcome Assessment Results

In this section, we present the total counts of assessments in Area C, as well as the breakdown of SLO assessment results. A brief analysis and summary of the comments from area faculty follow each set of tables and graphs. A full listing of the courses included in this data set, along with notation of which semesters of SLO assessment were included for each course, can be found in the Appendices.

### Count of Assessments

**Table 1.** Count of assessments in Area C1. Biological Science and Area C2. Physical Science, Fall 2018 – Spring 2022

All Terms	Area C1. Biological Science	Area C2. Physical Science	Area C total
<b>TOTAL Fall 2018- Spring 2022</b>	<b>26,409</b>	<b>10,227</b>	<b>36,636</b>

**Table 2.** Count of assessments in Area C1. Biological Science and Area C2. Physical Science, *Pre-pandemic Semesters* Fall 2018 - Fall 2019

Pre-Pandemic Term	Area C1. Biological Science	Area C2. Physical Science	Area C total
<b>Fall 2018</b>	3,581	599	4,180
<b>Spring 2019</b>	4,030	975	5,005
<b>Fall 2019</b>	4,119	883	5,002

**Table 3.** Count of assessments in Area C1. Biological Science and Area C2. Physical Science, *Pandemic Semesters* Spring 2020 - Spring 2022

Pandemic Term	Area C1. Biological Science	Area C2. Physical Science	Area C total
<b>Spring 2020*</b>	1,102	131	1,233
<b>Fall 2020</b>	4,019	1,940	5,959
<b>Spring 2021</b>	3,979	1,928	5,907
<b>Fall 2021</b>	2,729	1,737	4,466
<b>Spring 2022</b>	2,850	2,034	4,884



### Discussion and commentary on the number of assessments

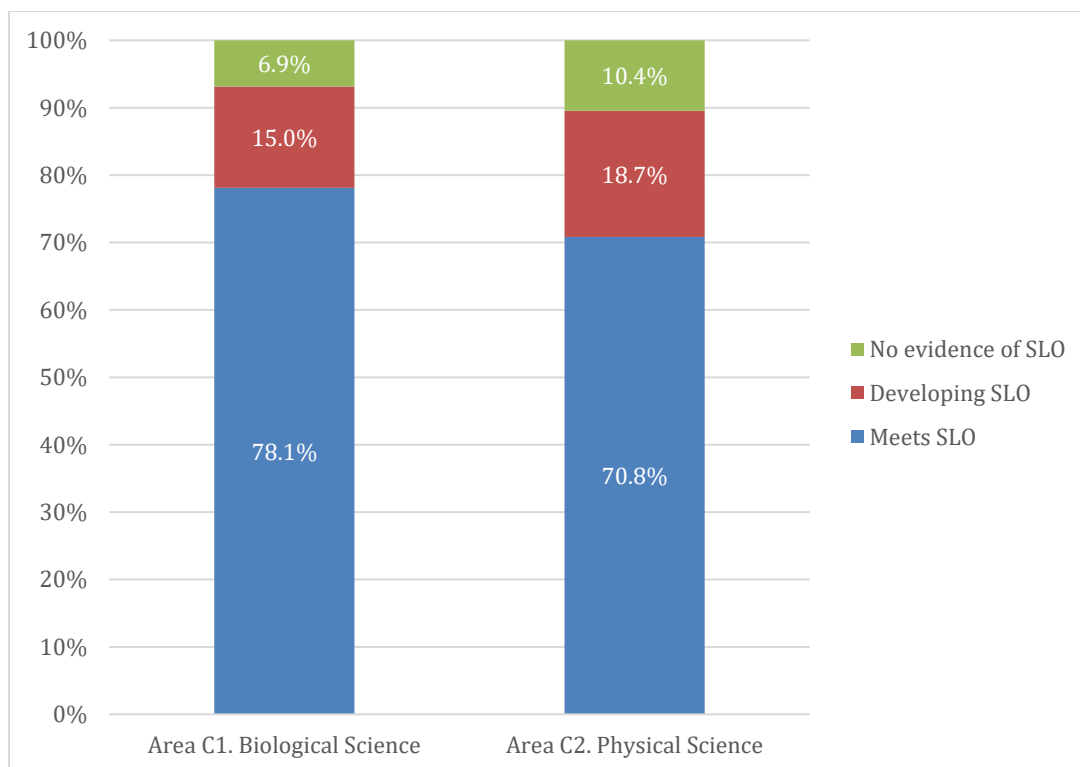
- € Total assessments include 17,396 for C1, 5,093 for C2 (making a total of 22,489 for Area C as a whole). In the prior Area C GELO assessment, in 2017, 17,515 assessments for Area C were reported, so the current report includes approximately 29% more assessments of Area C, despite overall enrollment at the college having declined (and despite excluding outcomes mapped to the old GELO wording).
- € The count of assessments in Spring 2020 was lower than usual due to the lifting of the requirement to file SLO reports for that semester. The number of assessments completed in the later pandemic semesters were on par with the prior semesters in C1, biological sciences, and exceeded the prior semesters in C2, physical sciences.
- € Enrollments in this period totaled 18,769 students in C1 and 15,961 students in C2. This means there was, on average, more than 1 assessment per student per section in C1 and less than 1 assessment per student per section in C2, but it is unknown how this may affect the data set, if at all.
- € Data is disaggregated by C1 and C2 because that is how the outcomes are mapped. Faculty discussion pointed to a sense that the *population of students* in C1 and C2 are different; while the salient differences for understanding learning outcomes may not be demographic, the data available allow us to at least highlight a few differences between the C1 and C2 students for whom student learning outcome is available in this study period:
  - o In C1 43.5% are members of equity populations; in C2, that figure is 41.5%.
  - o In C1, 63.0% identify as female; 34.8% as male; 2.2% as nonbinary, trans, or decline to state; in C2, 47.7% identify as female; 49.9% as male; 2.4% as nonbinary, trans, or decline to state.
- € Discussion of the results of assessments follows the next set of tables and figures.

### Results of Assessments (overall)

Table 4. Results of SLO assessments in Area C, Fall 2018 - Spring 2022 (N=36,636)

Assessment Area	Meets SLO	Developing SLO	No evidence of SLO
Area C1. Biological Science Percentage	78.1%	15.0%	6.9%
Area C2. Physical Science Percentage	70.8%	18.7%	10.4%
Area C Total (C1 & C2) Percentage	76.1%	16.1%	7.9%
Area C Total (C1 & C2) Count	<b>27,877</b>	<b>5,880</b>	<b>2,879</b>

Figure 1. Percentage breakdown of SLO assessments results in Area C, Fall 2018 - Spring 2022



**Table 5:** Comparison of SLO attainment over time

Assessment Level	Meets SLO	Developing SLO	No Evidence of SLO	Total SLO assessments
2014 report Area C: Fa-Sp 2013 data	69%	21%	10%	Not available
2017 report Area C: Fa-Sp 2016 data	67%	22%	11%	17,5151
2023 report Area C1: Fa 2018-Sp 2022 data	78%	15%	7%	26,409
2023 report Area C2: Fa 2018-Sp 2022 data	71%	19%	10%	10,227
2023 report Area C combined: Fa 2018-Sp 2022	76%	-	-	36,636

**Table 6.** SLO count of assessments and outcomes in Area C1. Biological Science and Area C2. Physical Science, *Pre-pandemic Semesters* Fall 2018 - Fall 2019

Pre-Pandemic Term	C1. Count of Assessments	C1. Percentage met outcome	C2. Count of Assessments	C2. Percentage met outcome	Area C Total Count of Assessments	Area C Overall % met Outcome
Fall 2018	3,581	75.9%	599	67.4%	4,180	74.7%
Spring 2019	4,030	74.8%	975	72.6%	5,005	74.4%
Fall 2019	4,119	74.6%	883	77.7%	5,002	75.2%

**Table 7.** SLO count of assessments and outcomes in Area C1. Biological Science and Area C2. Physical Science, *Pandemic Semesters* Spring 2020-Spring 2022

Pandemic Term	C1. Count of Assessments	C1. Percentage met outcome	C2. Count of Assessments	C2. Percentage met outcome	Area C Total Count of Assessments	Area C Total % met Outcome
Spring 2020	1,102	**	131	**	1,233	**
Fall 2020	4,019	83.5%	1,940	72.3%	5,959	79.8%
Spring 2021	3,979	78.7%	1,928	66.9%	5,907	74.8%
Fall 2021	2,729	77.9%	1,737	70.4%	4,466	75.0%
Spring 2022	2,850	82.2%	2,034	69.6%	4,884	76.9%

\*\* = The number of assessments is too small to make meaning of.

**Table 8.** Total SLO count of assessments and overall percentage of outcomes met in Area C1. Biological Science and Area C2. Physical Science, combined for all pre-pandemic and pandemic Semesters, **Fall 2018- Spring 2022**

C1. Count of Assessments	C1. Percentage met outcome	C2. Count of Assessments	C2. Percentage met outcome	Area C Total Count of Assessments	Area C Total % Met Outcome
26,409	78.1%	10,227	70.8%	36,636	76.1%

### ***Discussion and commentary on the overall results of assessments***

- On average, students demonstrated proficiency (met SLOs) in Area C at the rate of 76.1% in the study period. That breaks down to 78.1% for C1, Biological Sciences, and 70.8% for C2, Physical Sciences.

- Attainment of SLO proficiency is higher in the current period than shown in the past two GELO C reports for Area C as a whole and for both biological (C1) and physical (C2) sciences, separately. The current report also reflects more semesters and more total assessments than the past reports.
  - In the prior GELO assessment report for Area C (2017), lower rates of proficiency (“meets SLO”) for Area C were reported (67%). We do not have a clear explanation for the increase of approximately 9% in Area C overall, compared to 2017, or 7%, compared to 2013.
  - It is possible that this is partially a result of the shift to teaching predominantly online in the pandemic period (and a growing number of online courses prior to the pandemic, as well), or to the acceleration of the math sequence that has increased the chances that a student in the sciences has already studied college-level math.
  - It is also true that each GELO report is a “snapshot in time” – this data in this report, given the unusual circumstances of the pandemic, may simply not be comparable to past reports.
- The percentage of students meeting SLOs varied considerably across the different semesters.
  - In Area C1, SLO proficiency generally increased in the pandemic semesters, compared with the pre-pandemic semesters.
  - In Area C2, SLO proficiency in pre-pandemic and pandemic semesters had some variation, but without a clear pattern of increase or decrease.
  - The shifts in SLO proficiency across semesters are difficult to interpret. Factors identified by faculty that may have influenced the results:
    - Selection bias in students who chose to attempt science classes during the pandemic may have favored students who are less intimidated or struggle less with science or math;
    - Remote instruction and the improvements to teaching materials that resulted for some faculty may have been good for student learning;
    - A difference in assessment methodologies (e.g., change of testing approaches or challenges in maintaining the integrity of remote tests);
    - A greater degree of flexibility with assignments on the part of faculty during this crisis;
    - Variation in the level of comfort and preparation for remote instruction among faculty (e.g., differences among those who were already teaching online versus those who were new to remote instruction);
    - Improvements in reading comprehension in recent semesters, noted by at least one faculty member;
    - Fear or anxiety about math, which may influence student learning in physical sciences more than biological sciences;
    - Other unknown factors.

## Results Disaggregated by Sub-Element<sup>3</sup>, fall 2018-spring 2022.

Table 9. C1 Biological Science - SLO attainment by sub-element, with the number of assessments

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<sup>3</sup> From data run on 9/7/2023.

Area C1 sub-element	Meets SLO Count	Meets SLO %	Developing SLO Count	Developing SLO %	No evidence Count	No evidence %
<b>C1-1. Apply scientific inquiry and investigation of evidence to critically evaluate biological science arguments.</b>	3350	77.7 %	691	16.0 %	270	6.3 %
<b>C1-2. Communicate scientific ideas and theories effectively.</b>	4977	76.9%	1042	16.0 %	454	7.0 %
<b>C1-3. Apply scientific principles, theories, or models to explain the behavior of natural biological phenomena.</b>	5201	77.7%	1078	16.1%	414	6.2 %
<b>C1-4. Apply biological science knowledge and reasoning to human interaction with the natural world and issues impacting society.</b>	3422	80.6 %	585	13.8 %	238	5.6%

**Table 10. C2 Physical Science** - SLO attainment by sub-element, with the number of assessments

Area C2 sub-element	Meets SLO Count	Meets SLO %	Developing SLO Count	Developing SLO %	No evidence Count	No evidence %
<b>C2-1. Apply scientific inquiry and investigation of evidence to critically evaluate physical science arguments.</b>	1402	69.6%	362	18.0%	251	12.5%
<b>C2-2. Communicate scientific ideas and theories effectively.</b>	1367	71.9%	360	18.9%	173	9.1%
<b>C2-3. Apply scientific principles, theories, or models to explain the behavior of natural physical phenomena.</b>	1370	67.3%	437	21.5%	227	11.2%
<b>C2-4. Apply physical science knowledge and reasoning to human interaction with the natural world and issues impacting society.</b>	1455	71.2%	362	17.7%	225	11.0%

**Discussion and commentary on the overall results of sub-elements for C1 and C2**

- In Area C1, the range of proficiency (meets SLO) on the four sub-elements ranged from 76.9% to 80.6%. The results clustered around 77% for the first three sub-elements, with the fourth sub-element coming in a little higher.
- In Area C2, the range of proficiency (meets SLO) on the four sub-elements ranged from 67.3% to 71.9%. The results clustered around 71% for the first, second, and fourth sub-elements, with the third sub-element coming in a little lower.
- The courses that meet Area C1 mostly also meet CSU B2 and IGETC 5B; likewise, courses that meet Area C2 mostly also meet CSU B1 and IGETC 5A. The language of the outcomes is aligned across CCSF, CSU, and IGETC. For comparison, a chart of sub-element SLO attainment for CSU B1 and B2 and IGETC 5A and 5B are included in the Appendices. The variation in achievement (based on which set of courses are included in each set of assessments for CCSF, CSU, or IGETC)

is modest. In both Biological and Physical Sciences, the achievement for the CCSF outcomes is generally slightly higher than that for the CSU and IGETC outcomes.

### Outcomes disaggregated by sub-element for Laboratory Activity Courses

Many laboratory activity courses in the sciences do not map to C1 or C2 at CCSF; however, they do map to IGETC 5C and CSU GE area C3. (Many, but not all, laboratory classes map to both.) Outcome attainment data for these laboratory courses is presented in the following tables and figure.

**Table 11.** SLO assessment rates for IGETC Area 5C -Laboratory Activity, Fall 2018 - Spring 2022

Assessment Level	Meets SLO	Developing SLO	No evidence of SLO	Total
<b>1. Investigate natural phenomena through a variety of scientific inquiry techniques.</b>	74.8%	15.0%	10.2%	4,741
<b>2. Analyze and evaluate data from the natural world.</b>	76.6%	14.2%	9.2%	5,343
<b>3. Apply scientific principles, theories, or models to predict and explain the behavior of natural phenomena.</b>	74.6%	15.5%	9.9%	5,077
<b>Overall count of assessments</b>	<b>11,422</b>	<b>2,261</b>	<b>1,478</b>	<b>15,161</b>

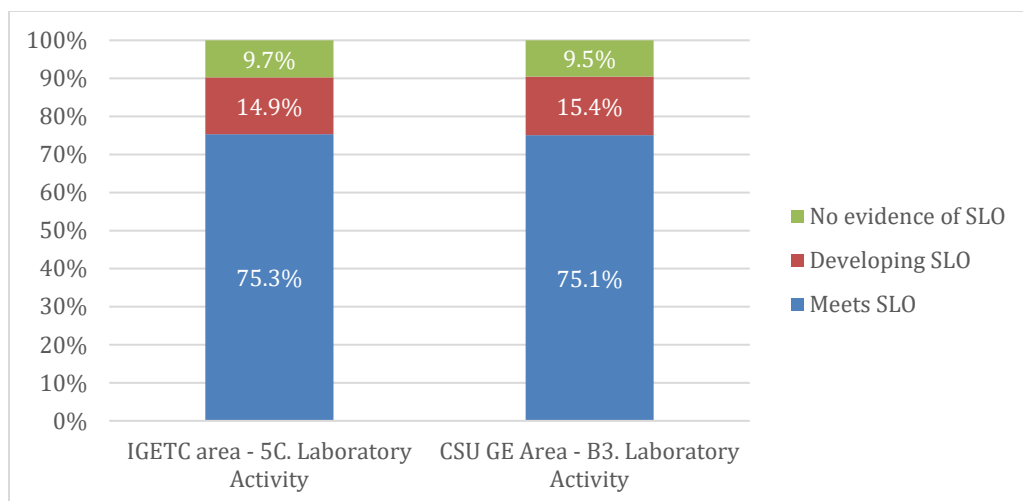
*Disaggregated data are not available for courses in IGETC area 5C*

**Table 12.** SLO assessment rates for CSU GE Area - B3. Laboratory Activity, Fall 2018 - Spring 2022

Assessment Level	Meets SLO	Developing SLO	No evidence of SLO	Total
<b>1. Investigate natural phenomena through a variety of scientific inquiry techniques.</b>	74.6%	15.3%	10.1%	5,552
<b>2. Analyze and evaluate data from the natural world.</b>	76.5%	14.5%	9.0%	6,431
<b>3. Apply scientific principles, theories, or models to predict and explain the behavior of natural phenomena.</b>	74.2%	16.3%	9.5%	6,516
<b>Overall count of assessments</b>	<b>13,892</b>	<b>2,844</b>	<b>1,763</b>	<b>18,499</b>

*Disaggregated data are not available for courses in CSU GE Area - B3*

**Figure 2.** Percentage breakdown of SLO assessments results in IGETC Area 5C -Laboratory Activity and CSU GE Area - B3. Laboratory Activity, Fall 2018 - Spring 2022 (primary terms)



### ***Discussion and commentary on the overall results of sub-elements for Lab Activity courses mapped to IGETC 5C and CSU B3***

- Overall SLO proficiency on the laboratory activity courses is higher than on the C1 and C2 classes (which are mostly not labs, although there is one Astronomy lab currently mapped to C2 and there are some combined lab-lecture courses in both C1 and C2).
- For both sets of laboratory activity courses (which largely overlap), the highest achievement was on the second sub-element, “Analyze and evaluate data from the natural world.”
- In faculty discussion, faculty noted that it can be challenging to assess how students change how they view the natural world.
- A question raised for future exploration: If students are generally doing better (higher SLO attainment) in a lab, are they also doing better in the lecture classes linked to labs? And if so, would this suggest that students would benefit from taking a lab in conjunction with both their physical and biological science courses (whereas only one lab is currently required)?
- The importance and values of laboratory activity courses for supporting students to apply theories and models to observable situations was emphasized. While labs are costly to implement, their value is notable. The value of making an explicit connection between instruction or assignments and the SLOs was also noted.

### **Results Disaggregated by Demographics**

In this section, we present data on SLO attainment by several demographic characteristics, including the following:

- Age
- Ethnicity/race
- Sex/Gender
- Equity Populations, collectively and disaggregated by type
- Age cross tabulated with Equity Population

#### **Age**

**Table 13.** SLO assessments by age group in Area C1. Biological Science, Fall 2018-Spring 2022

Age Group	Count of assessments	% met outcome
19 or Less	5,396	75.5%
20-24	9,182	76.8%
25-29	5,503	80.5%
30-34	3,146	81.0%
35-39	1466	80.6%
40-49	1243	79.5%
50-59	378	77.2%
60+	95	72.6%
<b>Area C1 total</b>	<b>26,409</b>	<b>78.1%</b>

**Table 14.** SLO assessments by age group in Area C2. Physical Science, Fall 2018-Spring 2022

Age Group	Count of assessments	% met outcome
19 or Less	3,173	69.1%
20-24	3,324	70.3%
25-29	1671	70.4%
30-34	947	71.7%
35-39	536	74.1%
40-49	428	76.4%
50-59	97	86.6%
60+	51	98.0%
<b>Area C2 total</b>	<b>10,227</b>	<b>70.8%</b>

### ***Comments and analysis on age***

- The majority of students assessed in Area C classes are under age 25 (55% in C1, 64% in C2).
- Across many GE Areas, we tend to see lower SLO proficiency among younger students, with roughly continuous improvement of attainment with age, sometimes dropping off in the oldest age group. In the data presented above, we see only a loose approximation of that pattern. For C1, the group with the highest SLO attainment is ages 30-34; for C2, 60+. In addition, the size of the gap between the youngest students and the overall average attainment is smaller than 3% (and therefore not considered an opportunity gap).
- In one discussion with science faculty, the idea of “exit interviews” or surveys with students who leave the college and/or who fail science classes but continue at the college was proposed, to better understand the needs of these learners. It could help pinpoint differing needs by age group (or another demographic).
- While the gap between younger students and middle-aged or older students did not amount to an opportunity gap, some faculty noted that younger students often struggle in sciences. Among the reasons posited for why younger students may struggle more in this current period than past periods could be the impact of the pandemic itself and pandemic-related changes to education. Younger college students arrive at CCSF with significant learning loss resulting from



school closures and remote instruction. There is some evidence low-income students and Black and Latino/a/x students have experienced disproportionate learning loss.<sup>4</sup> In addition, many students have lost family members and family friends to the pandemic itself, experienced job loss within their households, and/or have witnessed or experienced increased rates of violence of various types during this pandemic period (racialized violence and hate crimes, gun violence, intimate partner violence, etc.). The effects of trauma on learning are well known. Older students may have also experienced many of these forms of trauma; however, their high school educations were not affected by covid.

- Dr. Fred Moore of the [MESA/STEM Center](#) highlighted some capabilities that all students in the sciences need, yet younger students seem to struggle with more. Because succeeding in high school science classes often relies mainly on memorization and pattern recognition, students get little practice in conceptual understanding, which is necessary in college-level science classes, especially advanced ones. In the MESA program, students gain skills in conceptualization, recognizing gaps in knowledge, and replacing older (inaccurate or out of date) understandings with new knowledge. They build cognitive skills for integrating new knowledge, analyzing a situation to identify which concept or formula applies to it, and breaking down a process. They also develop their emotional skills, an often-overlooked part of the toolkit needed to succeed in science, including emotional self-awareness, positive attitude, increased persistence, and greater self-efficacy. Skills in time management and stress management are also taught. The MESA program, however, reaches a fairly small slice of the students studying in Area C (up to 125 students a semester, and currently lower than that). There could be benefit in integrating these skills across the curriculum or in a first-year experience course with broad reach.
- Possibly new approaches to meet the needs of younger students discussed by faculty include a first-year experience course (part of the Equity Plan for 2022-2025) to assist with the transition to college and developing support courses for the sciences akin to those currently implemented for English and Math.

## Ethnicity/Race

**Table 15.** SLO assessments by ethnicity/race in Area C1. Biological Science, Fall 2018-Spring 2022

Ethnicity/Race	Count of assessments	% met outcome
American Indian or Alaska Native	45	75.6%
Asian	9,536	82.2%
Black or African American	1,276	64.1%
Filipino	2,266	73.5%
Latino/a/x	6,309	71.2%
Native Hawaiian or Other Pacific Islander	115	58.3%
Two or more races	1,536	76.2%
White	4,678	85.9%

<sup>4</sup>See for example Kuhfeld M. and Lewis, K. (2022, July). Student achievement in 2021–2022: Cause for hope and continued urgency. Northwest Evaluation Association. <https://www.nwea.org/uploads/2022/07/Student-Achievement-in-2021-22-Cause-for-hope-and-concern.researchbrief-1.pdf> Notably, there is variation across states and across school districts – I haven’t found data specific to SFUSD.

Unknown/Not reported /Other	648	81.0%
<b>Area C1 total</b>	<b>26,409</b>	<b>78.1%</b>

**Table 16.** SLO assessments by ethnicity/race in Area C2. Physical Science, Fall 2018-Spring 2022

<b>Ethnicity/Race</b>	<b>Count of assessments</b>	<b>% met outcome</b>
American Indian or Alaska Native	‡	‡
Asian	3,845	73.7%
Black or African American	494	67.0%
Filipino	620	64.8%
Latino/a/x	2,278	64.5%
Native Hawaiian or Other Pacific Islander	93	72.0%
Two or more races	659	68.6%
White	1,931	75.4%
Unknown/Not reported /Other	282	76.6%
<b>Area C2 total</b>	<b>10,227</b>	<b>70.8%</b>

‡ Data not displayed where count is less than 30.

### **Comments and analysis on race/ethnicity**

- Significant opportunity gaps persist across multiple groups of students, disaggregated by ethnicity/race.
  - Black/African American, Latina/o/x, and Filipino/a/x students all experience significant (over 3%) opportunity gaps across Area C1, C2.
  - Pacific Islander/Native Hawaiian students also experience significant (over 3%) opportunity gaps in Area C1, but not in Area C2.
- Faculty noted a particular concern for Latino/a/x students who represent the group with the greatest opportunity gap in C2 and still a substantial opportunity gap in C1, given their large numbers (close to one quarter of all students in the data set). An effective approach toward closing the opportunity gaps for Latino/a/x students would have a broad impact.
- Isolation for students of color, especially from less well-represented populations, was noted as a concern. The significant stress on students who find themselves the only member of their race or ethnicity in a science course was highlighted as a factor by at least one tutor participating in the flex day discussion.
- Data on students' SLO proficiency by race/ethnicity and age, combined, is reported below.

### **Sex/Gender**

**Table 17,** SLO assessments by sex/gender in Area C1, Biological Science, Fall 2018-Spring 2022

<b>Sex/Gender</b>	<b>Count of Assessments</b>	<b>% Met outcome</b>
Female/Woman	16,626	78.1%
Male/Man	9,198	77.9%

Sex/Gender	Count of Assessments	% Met outcome
Neither/Other, Unknown/Not reported	585	81.0%
<b>Area C1 all students</b>	<b>26,409</b>	<b>78.1%</b>

**Table 18**, SLO assessments by sex/gender in Area C2, Physical Science, Fall 2018-Spring 2022

Sex/Gender	Count of Assessments	% Met Outcome
Female/Woman	4,877	72.1%
Male/Man	5,104	69.7%
Neither/Other, Unknown/Not reported	246	67.5%
<b>Area C2 all students</b>	<b>10,227</b>	<b>70.8%</b>

### **Comments and analysis on sex/gender**

- While there is a difference in SLO attainment by sex/gender, the differences are small (less than a 3% variation from the overall student average), with one exception: there is an opportunity gap in C2 for nonbinary students (to be more precise, those students who identify their sex/gender as “neither/other” or who do not identify a gender at all).
- Some faculty wondered about the intersection of sex/gender with STEM/nonSTEM courses, in Area C courses. There is a perception that more men/males enroll in advanced science courses.

### **Equity Populations, disaggregated by type**

**Table 19**, SLO assessments by equity subpopulations in Area C1, Biological Science, Fall 2018-Spring 2022

Student demographic group	Count of Assessments	% Met Outcome
<b>Foster youth and former foster youth</b>	250	64.4%
<b>Veterans</b>	1487	75.7%
<b>Students with disabilities</b>	2,261	77.2%
<b>Low-income students</b>	16,658	76.0%
<b>Area C1 overall</b>	<b>26,409</b>	<b>78.1%</b>

**Table 20**, SLO assessments by equity subpopulations in Area C2, Physical Science, Fall 2018-Spring 2022

Student demographic group	Count of Assessments	% Met Outcome
<b>Foster youth and former foster youth</b>	104	67.3%

Student demographic group	Count of Assessments	% Met Outcome
Veterans	884	62.0%
Students with disabilities	1,069	68.6%
Low-income students	6,656	69.9%
<b>Area C2 overall</b>	<b>10,227</b>	<b>70.8%</b>

### Comments and analysis on equity populations by four demographic groups

- Foster youth and former foster youth experience a gap in both C1 and C2. Faculty were not surprised that foster youth and former foster youth – while a small population – skew lower in SLO attainment. They noted that programs like Guardian Scholars could use more resources, tutors and counselors to assist this population.
- Veterans experience an opportunity gap in C2, but not in C1. In the Flex Day discussion faculty noted that many veteran students in recent years live far from the college and may therefore be less involved, less connected to support services at the college, or otherwise impacted in their ability to succeed in Area C courses. It is unclear why this would have a larger effect on C2 proficiency compared to C1 proficiency. In the discussion with department chairs, they were surprised that veterans achieved proficiency at a lower rate in C2, as their anecdotal experience was that veterans were high achievers.
- Low-income students (a group that includes more than half of all students in this Area C assessment) do not experience an opportunity gap at CCSF, nor do students with disabilities.

### Equity Populations, collectively

**Table 21.** SLO Assessments by student equity/not equity group for Area C1, Biological Science, Fall 2018-Spring 2022

Term	Not in equity group	In equity group(s)	All students	Percentage point gap for equity group
Fall 2018	81.3%	68.9%	75.9%	0.07
Spring 2019	80.9%	66.1%	74.8%	0.09
Fall 2019	79.5%	69.3%	74.6%	0.05
Spring 2020*	**	**	**	**
Fall 2020	86.3%	79.8%	83.5%	0.04
Spring 2021	83.4%	72.3%	78.7%	0.06
Fall 2021	84.8%	69.7%	77.9%	0.08
Spring 2022	85.4%	78.1%	82.2%	0.04

*"No Gap" displayed when percentage point gap is less than 0.03*

\* Spring 2020 data omitted due to low reporting rates as the reporting requirement was waived

**Table 22.** Area C1 Biological Science Overall Percentage and Count of Students by equity/not equity group who met the outcome, Fall 2018-Spring 2022

Not in Equity group – number of assessments	Not in Equity group - percentage met outcome	In Equity group(s) - number of assessments	In Equity group(s) - percentage met outcome	All Students number of assessments	All Students percentage met outcome	Percentage point gap for equity group
14,882	83.0%	11,527	71.9%	26,409	78.1%	0.06

**Table 23.** SLO Assessments by equity/not equity student groups for Area C2, Physical Science, Fall 2018-Spring 2021

Term	Not in equity group	In equity group(s)	All students	Percentage point gap for equity group
Fall 2018	70.1%	63.7%	67.4%	0.04
Spring 2019	76.9%	64.7%	72.6%	0.08
Fall 2019	82.7%	69.6%	77.7%	0.08
Spring 2020*	**	**	**	**
Fall 2020	76.4%	66.2%	72.3%	0.06
Spring 2021	69.5%	62.8%	66.9%	0.04
Fall 2021	73.0%	67.4%	70.4%	0.03
Spring 2022	71.7%	66.9%	69.6%	No Gap

“No Gap” displayed when percentage point gap is less than 0.03

\* Spring 2020 data omitted due to low reporting rates as the reporting requirement was waived

**Table 24.** Area C2 Physical Science Overall Percentage and Count of Students by equity/not equity group who met the outcome, Fall 2018-Spring 2021

Not in Equity group - number of assessments	Not in Equity group - percentage met outcome	In Equity group(s) - number of assessments	In Equity group(s) - percentage met outcome	All Students number of assessments	All Students percentage met outcome	Percentage point gap for equity group
5,986	<b>74.1%</b>	4,241	<b>66.3%</b>	10,227	<b>70.8%</b>	<b>0.05</b>

***Comments and analysis on equity populations collectively***

- CCSF students in equity populations continue to experience significant opportunity gaps (6% gap overall in C1 and 5% gap overall in C2).
- There was some discussion among faculty about whether students in equity populations are more or less likely to access academic support services like tutoring, and how intersectionality might influence students’ access to services (for example, we know students from historically minoritized populations are overrepresented among the foster care population; students with disabilities from varied class or ethnic/racial backgrounds might have different levels of ease in obtaining and using accommodations; etc.).
- Access to courses in Area C for students from equity populations, especially those who are student parents, was raised by a student participating in the flex day workshop as an equity concern, as some students may experience being discouraged from signing up for courses or majors that are considered too demanding. As this report does not include data related to access, this concern could be explored further in other fora related to student equity.
- While we do not see a clear trend indicating a change in the size of the opportunity gap for students from equity populations in comparing the pre-pandemic to the pandemic semesters, discussing with faculty and staff in the Flex Day workshop did highlight some particular challenges that students from equity populations experienced, due the racial strife and disappointing “racial reckoning” of 2020 and the disproportionate impacts of the pandemic itself on communities of color.

### Cross-tabulation of age and equity status

The following two tables show the intersection of age and equity status (member or not of an equity group).

**Table 25.** SLO assessment results by age and equity/not equity group for Area C1. Biological Science, Fall 2018 - Spring 2022

Age Group	Not in equity group Count of Assessment	Not in equity group % met outcome	In equity group Count of Assessment	In equity group % met outcome	All students % met outcome	Percentage Point Gap
19 or Less	3,289	81.2%	2,107	66.5%	-	0.12
20-24	5,227	81.7%	3,955	70.3%	-	0.08
25-29	2,942	85.5%	2,561	74.8%	-	0.03
30-34	1,692	84.5%	1,454	77.0%	-	No Gap
35-39	806	86.2%	660	73.6%	-	0.04
40-49	654	84.1%	589	74.4%	-	0.04
50-59	205	83.4%	173	69.9%	0.08	
60+	67	73.1%	-	-	-	
<b>C1 Overall</b>	<b>14,882</b>	<b>83.0%</b>	<b>11,527</b>	<b>71.9%</b>	<b>78.1%</b>	<b>0.06</b>

\* Data not displayed where count is less than 30.

**Table 26.** SLO assessment results by age and equity/not equity group for Area C2. Physical Science, Fall 2018 - Spring 2022

Age Group	Not in equity group Count of Assessment	Not in equity group % met outcome	In equity group Count of Assessment	In equity group % met outcome	All students % met outcome	Percentage Point Gap
19 or Less	2,059	72.0%	1,114	63.8%	-	0.07
20-24	1,938	74.5%	1,386	64.5%	-	0.06
25-29	845	71.1%	826	69.7%	-	No Gap
30-34	522	75.9%	425	66.6%	-	0.04
35-39	305	81.0%	231	64.9%	-	0.06
40-49	224	78.1%	204	74.5%	-	No Gap
50-59	58	93.1%	39	76.9%	-	No Gap
60+	35	100.0%	-	-	-	-
<b>C2 Overall</b>	<b>5,986</b>	<b>74.1%</b>	<b>4,241</b>	<b>66.3%</b>	<b>70.8%</b>	<b>0.05</b>

\* Data not displayed where count is less than 30.

### **Comments and analysis on cross tabulation of age with equity population**

- In Area C courses, there is a slightly different pattern observed in C1 compared to C2.
  - In Area C1, an opportunity gap at all ages except 30-34 is observed. The gap is largest among students age 19 and under, and also large for students 20-24 and 35-39.
  - In Area C2, an opportunity gap is observed among students under 25 and those 30-39, but not for those age 25-29 or age 40 or older. The gap is largest for students 19 and under, and also significant for students 20-24 and 35-39.
- Given the high enrollment numbers of younger students, addressing the barriers for students under age 25 from equity populations would have a large impact on the opportunity gap overall. Some ideas that arose in conversations with faculty included
  - Use of first-year experience courses.
  - Assisting students in the transition from a more structured learning environment in high school to a less structured learning environment in college.
  - Build into Area C courses attention to conceptualization, time management, and other academic success skills, including the social/emotional dimensions as well as the cognitive dimensions of academic success.

- Expand use of LERN 50 / IDST 50 for new students / younger students.
- Consider developing support courses for the Sciences, as is now implemented in English and Math.
- Build in more attention to the importance of homework to mastering Area C skills.
- Linking more students to the STEM/MESA Center and its programs and supports.
- Opportunity barriers for equity populations persist in some older age groups, even if not as severely as at the younger ages, especially the age group of 35-39. It is possible that strategies for younger students could also benefit middle-aged students, or further exploration of the needs of these learners could be warranted.

## Course Completion Data Compared with SLO Attainment Data

Course completion or course success refers to a student finishing a course with a grade of A, B, C, or P. A course is not considered to be successfully completed if a student finished with a grade of D, F, NP, W, or EW. The data set for course completion included 18,769 students in C1 and 15,961 students in C2. The data set for SLO attainment included 26,409 assessments in C1 and 10,227 assessments in C2.

**Table 27.** Course Success Rates by Equity / Not Equity Group for Area C1, Biological Science, Fall 2018-Spring 2022

Term	Not in equity group - Course success %	In equity group(s) - Course success %	All Students Course success %	Percentage point gap for equity group
Fall 2018	80.6%	64.1%	72.8%	0.09
Spring 2019	82.6%	63.1%	73.7%	0.11
Fall 2019	80.0%	66.7%	73.3%	0.07
Spring 2020	82.8%	69.3%	76.5%	0.07
Fall 2020	83.5%	68.3%	75.9%	0.08
Spring 2021	83.0%	68.3%	76.3%	0.08
Fall 2021	80.7%	63.4%	72.3%	0.09
Spring 2022	83.5%	72.9%	78.4%	0.06
<b>Fall 2018-Spring 2022</b>	<b>82.1%</b>	<b>66.9%</b>	<b>74.9%</b>	<b>0.08</b>

**Table 28.** Course Success Rates by Equity / Not Equity Group for Area C2, Physical Science, Fall 2018-Spring 2021

Term	Not in equity group – Course Success %	In equity group – Course Success %	All Students – Course Success %	Percentage point gap for equity group
Fall 2018	68.8%	54.2%	62.0%	0.08
Spring 2019	70.4%	54.6%	63.0%	0.08



Fall 2019	73.0%	51.4%	62.7%	0.11
Spring 2020	74.9%	61.2%	68.3%	0.07
Fall 2020	71.4%	56.4%	64.0%	0.08
Spring 2021	77.0%	61.3%	69.7%	0.08
Fall 2021	70.6%	57.4%	64.1%	0.07
Spring 2022	76.9%	59.1%	68.6%	0.09
<b>Fall 2018- Spring 2022</b>	<b>72.7%</b>	<b>56.7%</b>	<b>65.1%</b>	<b>0.08</b>

**Table 29.** SLO Assessment Results for C1, Biological Sciences, Fall 2018-Spring 2021

Area C1. Biological Science - Metric	Not in equity group	In equity group(s)	All students	Percentage point gap for equity group
% Met SLO standard	83.0%	71.9%	78.1%	0.06
% Course success	82.1%	66.9%	74.9%	0.08

**Table 30.** SLO Assessment Results for C2, Physical Sciences, Fall 2018-Spring 2021

Area C2. Physical Science - Metric	Not in equity group	In equity group(s)	All students	Percentage point gap for equity group
% Met SLO standard	74.1%	66.3%	70.8%	0.05
% Course success	72.7%	56.7%	65.1%	0.08

### **Comments and analysis on course completion with equity data**

- We see differences in the rates of course completion versus SLO attainment (for Area C1, 78.1% met the SLO versus 74.9% successfully completed the course; for Area C2, 70.8% met the SLO versus a 65.1% course success rate). This pattern is commonly found in other GELO reports, as well, and may be explained by the fact that students who withdraw from a class are not assessed for SLO attainment but are included in course success data. In addition, course grades reflect all of a student’s work for the semester, while SLO assessment usually focuses on a subset of assignments or exams that assess *one* SLO. It is not surprising that the two indicators are not identical.
- The size of the opportunity gaps in course completion also exceeded the size of the SLO opportunity gaps (6% vs. 8% in C1, 5% vs 8% in C2).
- In one conversation with the science faculty, there was interest in taking a closer look at the students who meet the SLO assessed (and perhaps meet all the SLOs) yet still fail to pass the class. It brought up a discussion about the extent to which grading reflects behavior versus knowledge – for example, the removal of points for turning in an assignment late, regardless of

the quality of the assignment. In the view of at least some faculty, a focus on knowledge or competency assessment instead of behaviors would be a more accurate assessment of which students are ready to proceed to the next level and could potentially also reduce opportunity gaps for students in equity populations.

- Surveying students who withdraw from a class to better understand the reasons for their withdrawal was also recommended, as some of the causes might be able to be addressed or prevented.

## Synthesis of Discussion and Conclusions

- This report analyzes results from 36,636 SLO assessments, across 24 courses that meet C1 Biological Sciences and 21 courses that meet the C2 Physical Sciences requirement for graduation.
- The average SLO attainment in this period was 76.1% proficiency (“meets SLO”) for Area C overall (78.1% for C1 and 70.8% for C2). In C1, we saw a higher attainment in the pandemic semesters compared to the pre-pandemic semesters. Average SLO attainment was notably higher than in the prior assessment of the Area C GELOs in 2017 (67%).
- Data were not gathered to adequately explain why proficiency in both C1 and C2 improved in this period, compared to past GELO reports. Among the possible answers were that acceleration in the English and Math sequences as a result of AB 705 increased the baseline of math skills and/or reading proficiency of students in Area C courses; shifts in student composition (for example, students with more anxiety about sciences not enrolling in remote courses during the pandemic); greater flexibility/leniency in assessments especially during the pandemic; and improvements in instruction.
- Higher SLO attainment was noted in laboratory activity courses, compared with C1 and C2 courses that are mostly classified as lecture courses. The value of labs to student learning was highlighted.
- In Biological Sciences, C1, we saw some evidence of a trend toward higher SLO proficiency in the pandemic semesters, compared to pre-pandemic semesters. We did not see the same trend in Physical Sciences, C2. This prompted rich discussion about the ways that instructional changes and/or selection bias in enrollment may have influenced this trend.
- As is consistent with most other GELO assessment reports, we see significant opportunity gaps for students in equity populations.
  - Opportunity gaps affect Black/African American, Latino/a/x, Pacific Islander, and Filipino students. The size and distribution of racial/ethnic opportunity gaps varied somewhat between C1 and C2; for example, Pacific Islander/Native Hawaiian students experienced an opportunity gap in C1 but not in C2; African American students experienced a larger gap in C1 than in C2; Filipino/a/x students experienced a larger gap in C2 than in C1; Latino/a/x students experienced similar sized opportunity gaps in both C1 and C2.
  - Veteran students were noted by faculty a population of particular concern, given their opportunity gap in C2 (though not in C1); an increase in the number of veterans who live far from the college was suggested as a possible explanation.
  - While there is not a defined opportunity gap for young students per se, when the data is broken down by both ethnicity and age, we see that the opportunity gap is to some extent concentrated in young students in equity. This suggests that interventions focused specifically on young students in equity groups would be warranted, to close this opportunity gap.

- Numerous ideas for how to reduce opportunity gaps, especially for young students from equity populations, were highlighted and could potentially be addressed through a first-year experience course or the teaching of cognitive and social/emotional skills that support success in science.

### **Any recommendations to changes of wording.**

- No changes recommended.

## **APPENDICES**

1. Presentations and resolutions
2. Methodological notes
3. Area C mappings (course to GELO)
4. SLO mappings by course for Area C included in report.
5. SLO attainment of sub-elements for CSU and IGETC

### **Presentations and Resolutions Appendix**

Student Learning Outcomes Committee of the Academic Senate

Initial discussion in 2022-23 (several meetings); report approval, November 3, 2023

[Link to 2022-2023 meeting minutes](#)

[Link to 2023-2024 meeting minutes](#)

Executive Council of the Academic Senate

November 29, 2023

[Resolution 2023.11.29.7C](#) Endorsement of the GE Area C GELO report

Additional presentations and discussion of these results:

[Flex Day](#), October 2023

### **Methodological Notes**

#### **Definitions**

Primary term refers to fall semester or spring semester. Student equity groups included in this dataset:

- American Indian or Alaskan Native,
- Black or African American,
- Filipino,
- Latino/a/x,
- Native Hawaiian or other Pacific Islander,
- current or former foster youth,
- students with disabilities,
- students experiencing homelessness, and

- students who identify as transgender or non-binary gender identities.

In Spring 2018, the CCCCCO added students who identify as LGBT as a student equity group. That group, in its entirety, is not identified in this dataset because the college does not currently maintain any local data regarding student’s sexual orientation. CCSF does have an incomplete subset of locally available data regarding student’s gender identity, thus students who identify as transgender or a non-binary gender identity are included as students belonging to a student equity group. While it is understood the terms gender and sex represent separate, distinct constructs, they are displayed together in order to accurately represent the underlying data. The language on the questionnaire that collects this demographic data has changed over time and some response options have referred to sex and others to gender, creating a dataset that includes response categories for both gender and sex, combined. Financial aid, disability services, foster youth, housing, and military service statuses each include all students who have ever received the services or benefits for that group.

Percentage point gap is a method developed by California Community Colleges Chancellors’ office to measure disproportionate impact, with guidelines to better understand the disaggregated subgroups that are significantly impacted. The detection of disproportionate impact uses a threshold which is adjusted by the sample size of the subgroup, to compare with the percentage point gap. In this report,

- percentage point gap (PPG) = [ (% of subgroup) – (overall %) ] \* (-1)
- threshold = 3% based on the sample size of subgroup (n ≥ 800) If percentage point gap (PPG) ≥ 3%, a disproportionate impact with statistical significance was detected, otherwise no gap exists.

Because small sample sizes do not provide statistically meaningful results, in order to protect student privacy when disaggregating student data, the following thresholds were set for data display:

- Where the count of students is less than 30, the data are not displayed. However, while cells with small counts are masked from display, overall totals and averages always include all assessments among all groups.
- To keep counts above 30 wherever possible, this analysis aggregates across terms or combines groups as appropriate.

Source Prepared by: Carol Liu, Research Analyst

Databases: CurriQunet data extracted 06-11-2023, Banner data extracted: 07-17-2023 [internal location: [AreaC memo 09-12-23.pdf](#)

[https://citycollegesf.sharepoint.com/:b:/s/CCSFSLOCoordinators/ETQ1niYqcfBOI-j1sQZvjYUBIb88IWkiZ\\_8-TpC4CbqwOA?e=MD3PUU](https://citycollegesf.sharepoint.com/:b:/s/CCSFSLOCoordinators/ETQ1niYqcfBOI-j1sQZvjYUBIb88IWkiZ_8-TpC4CbqwOA?e=MD3PUU) ]

Data on SLOs disaggregated by sub-elements for Area C1 and C2 is based on CurriQunet reports pulled on 10-02-23. [Internal location: [List Course SLO GELO C1 C2 10-2-23.xlsx](#)

[https://citycollegesf.sharepoint.com/:x:/s/CCSFSLOCoordinators/ETis2KSYdcRHqIsM\\_QqWvSkB0emL-1LTpOKae\\_QmZH7xsA?e=5EQpoz](https://citycollegesf.sharepoint.com/:x:/s/CCSFSLOCoordinators/ETis2KSYdcRHqIsM_QqWvSkB0emL-1LTpOKae_QmZH7xsA?e=5EQpoz) ]

## **SLO mappings for Area C (course to GELO)**

Link to [SLO mappings Area C spreadsheet in Sharepoint](#)

## SLO Mappings by Course for Area C included in Report

The following tables show the courses whose assessments were included in the main data set used in this report. While approximately 23 Area C courses are not included in the data set for this report, it is because they were not offered or SLOs were not assessed in those courses during the study period.

The laboratory activity courses that map to IGETC 5C and CSU C3 are not included in this list whose data is included in the laboratory section of the report are not detailed here.

**Table 31.** Courses with SLO Assessments that map to the Area C1. Biological Science, by Semester Assessed, Fall 2018 – Spring 2022 (primary terms)

Subject Course	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021	Spring 2022	Numbers of semesters assessed	total
ANTH 1						X	X	X	3	79.6%
ASTR 4						X	X	X	3	80.0%
BIO 10	X		X		X		X		4	22.2%
BIO 100A	X	X	X	X	X	X	X	X	8	84.3%
BIO 100B		X	X	X	X	X	X	X	7	90.9%
BIO 106	X	X	X	X	X	X	X	X	8	69.6%
BIO 108	X	X	X	X	X	X	X	X	8	72.5%
BIO 11			X	X	X	X	X	X	6	79.5%
BIO 112	X	X	X		X	X	X	X	7	85.2%
BIO 114		X				X			2	70.2%
BIO 120							X	X	2	70.4%
BIO 121							X	X	2	81.1%
BIO 130	X	X	X		X				4	97.3%
BIO 132	X	X	X	X	X	X	X	X	8	65.8%
BIO 134	X	X	X	X	X	X	X	X	8	78.2%
BIO 19	X	X	X		X	X	X	X	7	98.7%
BIO 20	X	X	X	X	X	X	X	X	8	94.3%
BIO 32				X		X		X	3	89.3%
BIO 33			X		X		X		3	93.6%
BIO 40						X			1	100.0%
BIO 51		X		X		X	X	X	5	86.4%
BIO 9	X	X	X	X	X	X	X	X	8	75.3%
ENVS 31						X	X	X	3	98.6%
PSYC 1B							X		1	89.0%

*Not all courses that were mapped onto C1 or C2 could be incorporated into this data set because available data only includes the most recent SLO-to-GLO mappings for courses.*

**Table 32.** Courses with SLO Assessments that map to the Area C2. Physical Science, by Semester Assessed , Fall 2018 – Spring 2021 (primary terms)

Subject Course	Fall 2018	Spring 2019	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021	Spring 2022	Number of semesters assessed	total
ASTR 1								X	1	79.7%
ASTR 16						X		X	2	100.0%
ASTR 19								X	1	63.6%
BIO 10	X								1	81.0%
BIO 19	X	X	X		X	X	X	X	7	98.7%
BIO 20		X	X	X	X	X	X		6	95.9%
CHEM 101A						X	X		2	49.4%
CHEM 32					X	X	X		3	53.8%
CHEM 40					X		X	X	3	54.6%
ENRG 3							X		1	50.0%
ENVS 31						X	X	X	3	98.9%
GEOG 1			X	X	X	X	X		5	84.6%
GEOL 10		X	X	X	X	X	X	X	7	70.1%
GEOL 11								X	1	54.5%
OCAN 1		X	X	X	X	X	X	X	7	75.3%
P SC 11					X	X	X	X	4	81.0%
PHYC 10	X	X	X		X	X	X	X	7	89.0%
PHYC 20					X	X	X		3	88.5%
PHYC 2A		X	X		X		X		4	67.0%
PHYC 41	X	X	X		X		X		5	71.3%
PHYC 4A						X	X	X	3	68.5%

*Not all courses that were mapped onto C1 or C2 could be incorporated into this data set because available data only includes the most recent SLO-to-GLO mappings for courses.*

## SLO attainment of sub-elements for CSU and IGETC

**Table 33.** Outcomes for Physical Science, CSU-B1 and IGETC-5A

<i>Outcome</i>	Meets SLO	Developing SLO	No evidence of SLO	# assessments
<i>CSU-B1-1. Apply scientific inquiry and investigation of evidence to critically evaluate physical science arguments.</i>	68.42%	21.55%	10.03%	5750
<i>IGETC-5A-1. Apply scientific inquiry and investigation of evidence to critically evaluate physical science arguments.</i>	67.02%	21.93%	11.05%	6115
<i>CSU-B1-2. Communicate scientific ideas and theories effectively.</i>	68.01%	22.76%	10.73%	6020
<i>IGETC-5A-2. Communicate scientific ideas and theories effectively.</i>	67.95%	22.01%	10.04%	5906
<i>CSU-B1-3. Apply scientific principles, theories, or models to explain the behavior of natural physical phenomena.</i>	67.42%	22.33%	10.25%	7158
<i>IGETC-5A-3. Apply scientific principles, theories, or models to explain the behavior of natural physical phenomena.</i>	67.21%	22.53%	10.26%	7088
<i>CSU-B1-4. Apply physical science knowledge and reasoning to human interaction with the natural world and issues impacting society.</i>	66.58%	22.75%	10.67%	5126
<i>IGETC-5A-4. Apply physical science knowledge and reasoning to human interaction with the natural world and issues impacting society.</i>	67.53%	22.28%	10.19%	4663

**Table 34.** Outcomes for Biological Science, CSU-B2 and IGETC-5B

<i>Outcome</i>	Meets SLO	Developing SLO	No evidence of SLO	# assessments
<i>CSU-B2-1. Apply scientific inquiry and investigation of evidence to critically evaluate biological science arguments.</i>	77.49%	15.44%	7.08%	5850
<i>IGETC-5B-1. Apply scientific inquiry and investigation of evidence to critically evaluate biological science arguments.</i>	79.08%	14.07%	6.22%	4565
<i>CSU-B2-2. Communicate scientific ideas and theories effectively.</i>	77.16%	16.16%	6.68%	9329

<i>IGETC-5B-2. Communicate scientific ideas and theories effectively.</i>	77.70%	15.99%	6.30%	7790
<i>CSU-B2-3. Apply scientific principles, theories, or models to explain the behavior of natural biological phenomena.</i>	77.06%	16.12%	6.81%	9949
<i>IGETC-5B-3. Apply scientific principles, theories, or models to explain the behavior of natural biological phenomena.</i>	77.02%	16.26%	6.53%	8202
<i>CSU-B2-4. Apply physical science knowledge and reasoning to human interaction with the natural world and issues impacting society.</i>	78.26%	14.91%	6.82%	6022
<i>IGETC-5B-4. Apply physical science knowledge and reasoning to human interaction with the natural world and issues impacting society.</i>	78.09%	14.97%	6.94%	5518