Instructional Annual Program Review and Planning Update Form Fall 2023

BACKGROUND:

Program review is an integral part of the campus planning process. As programs and areas monitor their progress on the current comprehensive four-year program review, changes in need and scope can be expected. This Annual PR Update form is designed to outline and request modifications to the current program review that occur between comprehensive four-year review cycles, as needed.

Examples of a requested change include new information such as action plans, outcomes modifications, personnel changes, technology needs, and capital expenditures requirements. As programs and areas monitor their progress on the previous comprehensive four-year program review, the form provides the basis to suggest a change in plans and processes to improve student success and institutional effectiveness.

DIRECTIONS:

This form shall be completed annually by **all** instructional programs.

- Instructional programs must submit their Annual Program Review Update form to their dean by 5pm on Monday, November 27, 2023.
- Deans will forward the completed form to the Program Review and Planning Committee Chairs by 5pm on Monday, December 4, 2023.
- Questions or concerns?
  - Committee contacts:
    - Co-chairs Mary Bogan (mbogan@fullcoll.edu) and Bridget Kominek (bkominek@fullcoll.edu)
    - Division representatives on the Program Review and Planning Committee
  - Office of Institutional Effectiveness

SUBMISSION:

Program: Chemistry Division: Natural Sciences Date: 11/27/2023

☐ We have reviewed our most recent self-study and **have not identified** any significant changes that necessitate resource requests for the upcoming academic year. *(Complete part 1 only)*

☒ We have reviewed our most recent self-study and **have identified** significant changes that necessitate additional resource requests, which are attached in our submission. *(Complete parts 1 and 2)*

Principal Author Signature: *Stephanie Nobles* Printed Name: Stephanie Nobles

Date: November 27, 2023

Dean Signature: Bridget Salzameda Printed Name: Bridget Salzameda

Date: November 27, 2023

Part 1: Review of Data

Institution Set Standards (ISS)

1. **Use the data provided by the Office of Institutional Effectiveness (OIE) to review your course completion and success rates and provide a comparison to the Institution Set Standards for course completion and success rates.**

According to the data provided by the OIE, the Chemistry Department, as a whole program, achieved a course success rate of 65.2%, above the Institutional-Set Standard (ISS) of 62.0%. In addition, the average course completion rate of 81.5% was above the Institution-Set Standard of 78.3%. These data were calculated using a total student enrollment of 1,758 for the 2022-2023 academic year.

Table 1. Course Data provided by OIE (2022-2023)
Course Success and Completion by Course

Course	Enrollments	Avg. Success (%)	Success Standard	Avg. Completion (%)	Completion Standard
CHEM 100F	158	72.2	+	88.6	++
CHEM 101F	326	64.1	+	80.7	+
CHEM 103F	54	66.7	+	70.4	Below Standard
CHEM 107F	543	59.7	Below Standard	81.2	+
CHEM 111AF	344	70.1	+	83.7	+
CHEM 111BF	200	65.0	+	76.0	+
CHEM 201F	21	61.9	Below Standard	66.7	Below Standard
CHEM 211AF	80	62.5	+	82.5	+
CHEM 211BF	32	93.8	++	93.8	++

The courses that exceeded both course success and completion targets set by the ISS were CHEM 100 F (Chemistry for Daily Life), CHEM 211BF (Organic Chemistry II), CHEM 101 F (Chemistry for Allied Health Science), CHEM 111AF (General Chemistry I), CHEM 111BF (General Chemistry II), and CHEM 211AF (Organic Chemistry I). The course that met the success standard but did not meet the completion standard was CHEM 103 F (Chemistry in a Changing World)/ CHEM 107 F (Preparation for General Chemistry) and did not meet the success standard but did meet the completion standard. And, the CHEM 201 F (Biochemistry for Allied Health Science) course did not meet either the completion or success standards.

2. **If your program meets or exceeds the standard for completion and success, to what do you attribute your success? If your program does not meet this standard, please examine the possible reasons, and note any actions that should be taken, if appropriate.**

This is an achievement for the Chemistry department as both the success and completion rates fell below the Institutional Set Standards in the previous program review update for academic year 2021-2022 (Table 2). The completion rates have climbed back up to the level that they were in the pre-pandemic academic years.

However, it should be noted that the success rates are still significantly lower than data reported for pre-pandemic academic years. For comparison, in the 2017 Program Review, the Chemistry Department observed steady success rates ranging from 72.3% to 73.8% for the period of 2013-2017, as well as steady retention rates ranging from 82.8% to 84.2% for the same five-year period. Starting with the onset of the pandemic, this data dramatically changed. First, in the 2019-2020 evaluation, the average success rate for CHEM 107 F exceeded the set standard in the 2018-2019 academic year. During this time, the average course completion rates for CHEM 107 F, CHEM 111BF, CHEM 201 F and CHEM 211AF exceeded the set standard.
The data from the previous program review update (AY 2021-2022), showed another drastic difference from pre-pandemic data. The average course completion rates for CHEM 100 F, and CHEM 211B F exceeded both

the success and completion standards while CHEM 201 F exceeded only the success rate standard. The remaining courses did not meet either the success nor retention set standards. It is important to stress that the 2019-2020, 2020-2021, and 2021-2022 academic years are not an appropriate representation or indicator of the overall course success and completion trends, that, under normal circumstances, would be observed.

Table 2: Key Performance Indicators Per Academic Year (AY) for the Chemistry Program.

	16/17	*17/18*	*18/19*	*19/20*	*20/21*	*21/22*	*22/23*
Enrollment	2126	2500	2506	2362	2217	1995	1758
**Completion*	84.1%	83.1%	82.3%	78.9%	76.4%	75.7%	81.5%
***Success*	72.6%	70.5%	69.4%	68.4%	66.4%	60.8%	65.2%

* Completion Institution-Set Standard: Above 74.1%
**Success Institution-Set Standard: Above 62.0%

Now, as we look at 2022-2023 academic year, we see that the courses that have met both the success and completion standards include CHEM 100 F (Chemistry for Daily Life), CHEM 211BF (Organic Chemistry II), CHEM 101 F (Chemistry for Allied Health Science), CHEM 111AF (General Chemistry I), CHEM 111BF (General Chemistry II), and CHEM 211AF (Organic Chemistry I).. (Table 1). The overall success rates observed in these courses can be attributed to several key components that are described below.

Hornets Tutoring

The faculty of the department are actively involved in Hornets Tutoring. Traditionally, embedded tutors have been assigned to difficult courses in order to provide regularly scheduled, out-of-class, peer-facilitated sessions. The program was expanded heavily in recent years to provide more tutors across campus. More importantly, this program continued to serve students after moving to remote instruction. The Chemistry Department has greatly benefited from this program and having embedded tutors has undoubtedly improved student retention and success across chemistry courses.

Peer Undergraduate Mentoring Program (PUMP)

PUMP, a mentoring program started in 2012, aims to improve student retention and successful completion in Science, Technology, Engineering and Mathematics (STEM) courses. PUMP pairs first year FC STEM students with academically outstanding STEM students from California State University, Fullerton. Offering individualized peer mentoring has been beneficial to the STEM students at Fullerton College (refer to data found in the 2017 Program Review).

STEM Success Learning Community (STEM-SLC)

The STEM-SLC is a program that assists first-year students as they navigate the rigorous curriculum associated with STEM major/career pathways. Students are arranged into cohorts, providing them with a supportive environment which fosters a sense of community with their peers. Students receive regular academic counseling to ensure they are progressing successfully towards their set transfer date. In addition, cohorts are enrolled in sections that are taught by full-time faculty, providing students with greater accessibility to faculty members. This is particularly important in the different chemistry sequences, where subsequent course enrollment and performance is vital to continued success.

Boot Camps

In partnership with STEM-SLC, the Chemistry Department offers Boot Camps for the most rigorous chemistry courses including CHEM 107 F, CHEM 111AF, CHEM 111BF, CHEM 211AF and CHEM 201 F. Boot Camps are workshops, led by full-time faculty, that are held just before the beginning of the fall and spring semesters (or shortly after). Students review topics that faculty have determined to be roadblocks for success in the courses. One of the main benefits for students that attend Boot Camps is getting a head-start in the courses. These Boot Camps have proven to be effective at preparing students, playing an important role in meeting the course success standards.

The lasting effects of the COVID -19 pandemic are uncertain and it will be challenging to propose and put forth a permanent resolution for unforeseen problems. To identify reasons for the observed deviation in the data and propose measures to improve course success and completion, careful analysis and examination of individual courses is important. Understanding that student populations can vary greatly among chemistry courses may

shed some light on specific areas that could be improved. For example, in CHEM 201 F, the average completion rate dropped significantly from 85.6% in 2018-2019 to 66.7% in 2019-2020, then rose slightly to 74.6% in 2021-2022 and then fell again to 66.7% in 2022-2023. The student population in CHEM 201 F, as well as other chemistry courses, includes many students that work in the health care industry. In the academic years 2019-2020 and 201-2022, many students were faced with the tough decision to return to work, change their work schedule or work extra hours in the midst of a public health crisis. An overall drop in course completion rates was also observed in CHEM 101 F, CHEM 111AF, CHEM 111BF and CHEM 211AF. The extent to which the pandemic directly impacted student retention and completion is not yet known, however, the data does suggest there is strong correlation.

A close examination of data reveals the lowest course success was observed in CHEM 107 F (59.7%) and CHEM 201F (61.9%). The lowest course completion rates were found in CHEM 201F (66.7%) and CHEM 103F (70.4%). Data from the 2021-2021 academic year showed that CHEM 107F met the completion standard (79.2) but had only a 61.2% success rate. The success rate dramatically dropped in the 2022-2023 academic year. This is mostly attributed to substantial loss of full time faculty which will be discussed below. For CHEM 201F, the data for the academic year 2022-2023 showed a dramatic decrease in both success and completion rates (61.9% and 66.7%) from the previous academic year (66.1% and 74.6%). The student population has changed drastically from pre-nursing students to students pursuing education in the nursing, medical, veterinarian, and other health related fields.

The Chemistry Department is fully committed to offering chemistry courses in all modalities. CHEM 103 F is currently being offered as an online course. Hybrid and online options have been approved for CHEM 100F, CHEM 101F, CHEM111AF, and CHEM 111BF. CHEM 211AF, and CHEM 211B have been approved for hybrid only. In addition, the Department is exploring new ways to move laboratory curriculum online, to increase its accessibility to students while maintaining the integrity of the curriculum.

Institutional Student Learning Outcomes (ISLOs)--Global Awareness ISLO.

1. **Describe your program's participation in assessment of Institutional Student Learning Outcomes (ISLO's). Specifically, how does your CSLO attainment, for the courses that are mapped to the Global Awareness ISLO, compare to Fullerton College's ISLO attainment?**

The Chemistry Department assesses Student Learning Outcomes on the course level (CSLOs) at least once during each program review cycle. There are currently two courses in our program that are mapped to the Institutional Student Learning Outcomes (ISLOs) currently with two additional courses that were previously mapped but do not currently show up in the ELumen Report*. (Table 3). Our priority now will be to map the remaining courses to Fullerton College's ISLOs.

Table 3. Courses that are mapped to the ISLOs.

	ISLO 1	ISLO 2	ISLO 5
CHEM 111A F General Chemistry I	X	X	X
CHEM 111B F General Chemistry II		X	
*CHEM 100 F Chemistry For Daily Life	X		
*CHEM 103 F Chemistry in a Changing World	X		

Read

The Chemistry Program has two courses with CSLOs that map to the "Read" component of the Communication ISLO, CHEM 100 F and CHEM 103 F. Both courses are designed to meet a general education requirement for non-science majors needing a physical science course; however, CHEM 100 F requires a laboratory component while CHEM 103 F does not.

Between the fall 2016 and spring 2020 semesters, CSLOs were assessed in both these courses (Table 4). Of the 358 students included in this survey, 89.4% were shown to either meet or exceed expectations, compared to 86.9% attainment of this ISLO campus-wide. The % attainment achieved within our program is comparable or very slightly larger than that obtained campus-wide.

Table 4. CSLO attainment results (Fall 2016 – Spring 2020) for all CSLOs mapped to the Read ISLO

	Exceeds	Meets	Does Not Meet	Total
# of students (% of total)	20 (5.6%)	300 (83.8%)	38 (10.6%)	358 (100.0%)

CHEMISTRY: 89.4% (358 students, 2 mapped courses) meets or exceeds expectations
COLLEGE: 86.9% (33,145 students, 411 mapped courses) meets or exceeds expectations (Fall 2016 – Spring 2019)

Write

The Chemistry Department has two courses with CSLOs that map to the "Write" component of the Communication ISLO, CHEM 100 F and CHEM 111BF. As already mentioned, CHEM 100 F is a non-science majors course that fills the general education requirement for a physical science course with a laboratory component. CHEM 111BF is the second-semester component of the general chemistry sequence which is geared towards students majoring in the sciences.

Between the fall 2016 and spring 2020 semesters, CSLOs were assessed in CHEM 100 F only (Table 4). Of the 124 students included in this survey, 93.6% were shown to either meet or exceed expectations, compared to 87.3% attainment of this ISLO campus-wide. The percent attainment for students within the program is 6.7% greater than what was obtained campus-wide. Given the small number of students assessed during this period of time, the value is not statistically significant.

Table 5. CSLO attainment results (Fall 2016 – Spring 2020) for all CSLOs mapped to the Write ISLO

	Exceeds	Meets	Does Not Meet	Total
# of students (% of total)	0 (0.0%)	116 (93.6%)	8 (6.5%)	124 (100%)

CHEMISTRY: 93.6% (124 students for 1 mapped course) meets or exceeds expectations
COLLEGE: 87.3% (43,088 students for 578 mapped courses) meets or exceeds expectations (Fall 2016 – Spring 2019)

2. Does the SLO data show significant achievement gaps among demographic groups in your program? If so, where are the gaps and what steps can your program take to shrink them? If not, to what do you attribute your success in minimizing the achievement gap?

The ISLO data was not available to address this question. Therefore, data involving the attainment of success and completion standards were disaggregated by ethnicity (Table 6) was analyzed here to look at possible achievement gaps.

Table 6. Overall Course Success and Completion Rates Disaggregated by Ethnicity

	Asian	Black/African American	Filipino	Hispanic	Pacific Islander	Two or More	Unknown	White
# of students assessed	325	32	1	968	1	191	38	202
Average Success	74.8%	43.8%*	100.0%	60.2%*	0.0%*	70.2%	71.1%	71.8%
Average Completion	84.0%	81.3%	100.0%	79.5%	100.0%	82.2%	86.8%	84.7%

*Below standard for the success set standard of 62.0%
**Below standard for the completion set standard 74.1%

All ethnicity groups were shown to be above the completion standard for the college. However, when analyzing the success standard of the program, overall, the Hispanic and Black/African American groups were disproportionately impacted. The Black/African American students make up approximately 1.8% of the students enrolled in the program but have an overall success rate of 43.8%. Whereas, the Hispanic group comprising 55% of the students enrolled obtained only a 60.2% success rate in the program. The number of Filipino and Pacific Islander students assessed was less than or equal to 1.0% so it was not possible to tell if they were also disproportionately impacted in this category.

Regarding CSLOs, some chemistry courses, like CHEM 100 F, use a two-point scale (meets/does not meet) while others like CHEM 103F use a three-point scale. It is possible to imagine that the difference between receiving “exceeds” vs. “meets” expectations could be a somewhat subjective judgement call that could be influenced by implicit bias. For this reason, the recommendation from the Institutional Integrity Committee, to report SLOs on a meets/does not meet scale, seems that it could potentially result in a more equitable assessment of CSLOs across all courses.

It would still be beneficial to ensure our means of assessment are equitable. For example, rubrics are used by some instructors that are or could be shared with all instructors of that course, making the assessment process less ambiguous and less susceptible to bias. A clearly defined rubric that states the criteria for meeting a particular benchmark empowers students as well by providing them with the knowledge of what they specifically need to do to achieve it. Additionally, using different types of assessments could lead to more equitable outcomes by allowing students to demonstrate knowledge and skills in a variety of ways. Some examples of assignments used in the assessment of CSLOs in our program are research papers, laboratory notebooks, poster presentations and standardized exams.

Part 2: Additional Resource Request Reasoning and Support

The Chemistry Department is requesting to hire three full-time faculty as replacements.

Is it imperative that this resource request be processed now rather than during the next comprehensive program review? Why?

The Chemistry Department is requesting to hire three full-time faculty as replacements. Chemistry courses are required courses or restricted electives on eighteen different program outlines (fifteen degrees and three certificates). Offering enough chemistry courses is vital for our students to complete degrees in a timely manner. According to our program review Section 3.4, to reliably staff our program, we would need to have a minimum of 16 full time faculty along with a team of 12-14 adjunct faculty. The Chemistry Department has faced several challenges since the last program review. The Department has experienced incredible difficulty with both the recruitment and retention of adjunct faculty. Two full time faculty left to other jobs, two full-time chemistry faculty members retired at the end of the Spring 2023 semester and the continuation of the large number of course offerings due to high demand had necessitated a higher percentage of adjunct faculty relative to standards in the field. The addition of three full-time faculty members is essential to maintaining the success of the Department.

Chemistry courses are required to complete degrees for many STEM related fields at FC. As stated in the summary above, chemistry courses are required for fifteen degrees and three certificates. The Chemistry Department has increased the number of sections offered to accommodate the demands of the students at FC, increasing enrollment by 4.3% since Fall 2016 despite the pandemic. A high demand for courses has necessitated a higher percentage of adjunct faculty. In our current semester, we have 21 adjunct faculty teaching courses. The college has recognized the need for full-time faculty positions in chemistry by approving past requests. However, the Department continues to face new challenges. The potential pool of adjunct faculty recruitment has been extremely limited and two full-time chemistry faculty members retired at the end of the Spring 2023 semester and one left for another position in the college.

Adjunct Recruitment and Retention Difficulties The Chemistry Department has made every effort to offer and staff the high-demand chemistry classes. Although the adjunct faculty recruitment occurs at an on-going basis, we have not been able to successfully maintain a high-quality adjunct pool. With the high turnover and last-minute resignation of adjunct faculty members, the Department has had to obtain permission to have several adjunct faculty members work beyond the 10-unit load limit, allowable once every three years. Unfortunately, this emergency work-around has been exhausted and now an immediate need exists for additional full-time instructors. Emergency hires have also been made, with instructors who have little or no teaching experience to avoid canceling classes that were filled, with students on waitlists. The challenge in finding an adequate pool of qualified adjunct faculty coupled with the high percentage of adjunct faculty, make it difficult to manage quality and safety in the classroom and, in particular, the chemistry laboratory. The students directly feel this burden and have made a number of serious safety and instruction-related complaints to both the Dean of Natural Sciences Division and the President of Fullerton College. The Chemistry Department struggles to both find and retain qualified adjunct faculty because of competition with local industry-related jobs and higher adjunct salaries at nearby colleges.

The 2021 Program Review Section 3.4, pages 33, addresses the need for 16 full-time chemistry faculty by 2023. However, with only 8 full time faculty members. We will be hiring one to replace a faculty member that retired in Spring 2022 to bring us back to 9. However, we are still requesting the additional faculty members to work our way to the required 16. The loss of full-time faculty creates a barrier for our students towards the completion of degrees and/or certificates in a timely manner at FC. In addition, although adjunct faculty recruiting occurs throughout all semesters, it has not been possible to successfully maintain a high-quality adjunct pool (as emphasized in the 2021 Program Review, section 3.4). The Chemistry Department is requesting two faculty as two replacement positions and one growth position to move closer to the intended

2023 goal of 16 full-time faculty.

The section count data presented in Table 7 provides evidence that the Chemistry Department has made an effort over the last five years to meet the demands of our growth. With our unexpected burdens, in 2020, it was necessary to cut classes.

High Percentage of Adjunct Faculty for Chemistry The positions we are seeking are intended for instructors to teach Preparation for General Chemistry (CHEM 107 F). More full-time faculty members are needed to provide both consistency of instruction and continuity for students who make connections with faculty as they progress through the chemistry sequence.

Table 7: Number of Faculty by Contract and Percent Faculty per Total Number of Sections

Academic Year	Adjunct Faculty	Full-Time Faculty	Number of Total Sections (Fall, Spring, Summer)	% FT Faculty/ Total Sections	% Adjunct Faculty/ Total Sections
2016-17	18	11	87	11.5	20.7
2017-18	18	13	87	14.9	20.7
2018-19	21	13	107	12.1	19.6
2019-20	21	13	100	13.0	21.0
2020-21	22	13	100	13.0	22.0
2021-22	22	12	97	12.4	22.7
2022-23	23	11	94	11.7	24.5
2023-24	23	8	91	**8.8**	**25.3**

The need for hiring of three full time faculty members is critically important for our Preparation for General Chemistry (CHEM 107 F) and Introduction to General, Organic, and Biological chemistry (CHEM 101F) courses. The chemistry department continues to struggle to meet the needs of these high demand courses. Staffing shortages limit what we can offer despite the high demand. Staffing these rapidly growing course sections has previously been challenging for quite some time, however, as the number of full-time faculty that teach these courses has been permanently reduced from 2 to 0 for CHEM 107F and 2 to 0 for CHEM 101F due to retirements and other factors, our need is now critical. These are critical courses that require full time faculty as they are the foundational courses in the allied health and chemistry degree pathways. In Fall of 2022, 86% of the CHEM 101F sections and 75% of the CHEM 107F sections were taught by adjunct faculty (Table 8). The loss of three full time faculty members at the end of the Spring 2023 semester resulted in 88% of the CHEM 101F courses and 90% of the CHEM 107F courses being taught by adjunct faculty in the Fall 2023 semester. The percent of sections in both CHEM 107F and CHEM 101F have been dramatically high in the past few years. The knowledge and experience of the full-time faculty within the Department cannot be replaced by adjunct faculty. Therefore, the increase in the number of sections taught by adjunct faculty presents an issue, particularly since our adjunct pool contains a significant number of inexperienced instructors. According to the data in Table 2, there is a continually high percentage of the sections in both CHEM 101F and CHEM 107F that are taught by adjunct faculty and given the limited pool, these sections are more at risk for cancellation despite the high demand. And, in the case of CHEM 101F, we cannot offer additional sections despite the demand because of staffing issues.

More full-time faculty members are needed to provide both consistency of instruction and continuity for students to make connections with faculty, as they begin the first course in a 5-course sequence, or start their sequence to an allied health degree, or meet the requirements of other STEM programs. Overall, our department has hired a large number of adjunct faculty each semester.

Table 8: Percentage of Adjunct Faculty Teaching Chem 101 and Chem 107 Sections

	Chemistry 101			Chemistry 107		
Term	Number of Sections	Number of Sections Taught by Adjuncts	% Sections Taught by Adjuncts	Number of Sections	Number of Sections Taught by Adjuncts	% Sections Taught by Adjuncts
Fall 2021	6	3	50%	12	8	67%
Spring 2022	6	6	100%	14	11	78%
Fall 2022	7	6	86%	12	9	75%
Spring 2023	7	6	86%	12	9	75%
Fall 2023	8	7	88%	10	9	90%

Staffing the CHEM 101F courses are particularly challenging in that they require expertise in general chemistry, organic chemistry, and biochemistry. This is sufficiently specialized that most instructors that have advanced degrees in chemistry may have never even taken a biochemistry course. Thus, finding adjunct faculty to teach these courses is very difficult, requiring qualified faculty to teach overloads to avoid canceling sections. This is not sustainable. These chemistry courses are in high demand with courses filling quickly along with the waitlists. The demand for CHEM 101F sections by students has increased even during our current period of decreased enrollment, but staffing issues have become a barrier. All six CHEM 101F courses in Fall 2022 had full wait lists with 10 students on each. In Fall 2023, seven CHEM 101F courses had full wait lists so an additional section was opened as well. Therefore, an additional section was opened up. Both the CHEM 107F and CHEM 101F sections fill up every semester and our department turn away roughly 60 students every semester. We are currently experiencing a critical nursing shortage that's expected to continue through 2030. Since CHEM 101F is the first in a two-course series for the allied health professions. This course is a prerequisite for the nursing programs. The addition of new faculty will allow the Chemistry department the flexibility to staff their courses as well as offer more sections, reducing the wait for students seeking chemistry classes and mitigating one of the barriers to completion.

Our department has made every effort to offer and staff our high demand chemistry classes. We currently have 20 adjuncts on contract to fill positions but still require additional adjuncts to staff additional course offerings. We are having difficulty finding and hiring adjuncts to fill our open positions. The pool of qualified adjunct faculty in the region is sufficiently small that trying to staff or even increase the number of course sections is not feasible. We have had to hire adjunct faculty every semester to keep up with the demand of the number of sections offered. We have experienced high turnover and last-minute resignations. Due to the lack of adjunct faculty, emergency hires have been made, with instructors who have little or no teaching experience to avoid canceling classes that were filled, with students on waitlists. Some classes had to be closed because they could not be staffed once the adjunct resigned. In some cases, the emergency hiring process has led to many student complaints and issues both inside and outside the classroom. The challenge in finding an adequate pool of qualified adjunct faculty coupled with our high percentage of adjunct faculty, make it difficult to manage quality and safety in the classroom and laboratory. Our students directly feel this burden and have made a number of serious safety and instruction-related complaints to both the Dean of Natural Sciences Division and the President of Fullerton College. Furthermore, the chemistry department struggles to both find and retain qualified adjunct instructors because we are competing with local industry-related jobs and higher adjunct salaries at nearby colleges.

In 2014, the Chemistry Department used an ACS Assessment Tool for Chemistry in Two-Year College Programs. The American Chemical Society (ACS), being the world leader in chemical education research, developed this resource to assist in the identification of strengths and opportunities for growth in two-year chemistry programs. In the Faculty and Staff section of the review, the Assessment Review Panel made the following comments regarding the department's current use of adjunct faculty:

"… it is recommended that a ***minimum*** of 75% of the courses be taught by full-time faculty, to ensure consistency of instruction throughout the program. If course assessments show challenges providing consistent, high-quality instruction to all students, it may be necessary to hire additional full-time faculty."

A safe laboratory environment is heavily dependent on the presence of faculty with experience in the safety and emergency response procedures specific to our program. Essentially all (95%) of the sections taught in the Chemistry Department have a laboratory component. As the percentage of adjunct faculty increases, maintaining a safe laboratory environment becomes more difficult. The high rate of turnover that is commonly observed with adjunct faculty results in a dangerous loss of experience that is essential to a safe laboratory environment. This coupled with the loss of stockroom staff has drastically increased the need for well-trained full-time faculty.

In the Natural Sciences division, Chemistry has the largest difference in full time equivalency faculty (FTEF) and number of Full-time Faculty . The data in Table 9 (also found in 2021 Program Review) provides an additional argument to support the hiring of additional faculty in the Chemistry Department. According to the Fall 2022 data, the Chemistry Department has both the largest Total FTEF and difference between the Number of FT Faculty and Total FTEF in the Natural Sciences Division. However, chemistry lab experiments involve more hazards than other labs. With 95% of our courses including a laboratory component, we will require additional full-time faculty to uphold our commitment to lab safety.

Table 9. Comparison of Number of FT Faculty Members in the Natural Sciences Division with FTEF

Department	Number of FT Faculty	Total FTEF	Difference
Anatomy and Physiology	5	5.55	-0.55
Biology	18	11.25	+6.75
Chemistry	**10**	**18.15**	**-8.15**
Earth Science	4	4.05	-0.05
Environmental Science	1	1.02	-0.02
Health Education	1	0.8	+0.2
Horticulture	2	2.28	-0.28
Nutrition and Foods	3	4.24	-1.24
Physics	4	4.2	-0.02

The Chemistry Department has always aimed to produce as many FTES as possible, thereby supporting both the students and Fullerton College. Our full-time faculty members have regularly taken overload to meet the demands of our students. The Chemistry Department is committed to curating a diverse faculty body and will continue to use new practices to do so in the upcoming hiring cycle upon being awarded with the ability to hire three new faculty members.

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

The Chemistry Department is proud that all of its faculty members participate in co-curricular activities. However, with the number of chemistry courses offered by the department, it has been essential for every faculty member, since our last Program Review, to act as a course coordinator. Some responsibilities of a course coordinator are developing and implementing curriculum, spearheading SLO assessment, and managing adjunct faculty to maintain consistency for each course. Course coordinators do not receive additional compensation for performing these duties.

Course coordinators do not receive additional compensation for performing these duties. With the Department struggles to retain adjunct faculty due to competing high-paying chemistry-related industrial positions, the full-time faculty are burdened with training new adjunct faculty in lecture and laboratory methods. With the Department's passion to keep our laboratory experiences modern, there is a serious strain that has deterred members from participating in additional college activities. By providing more full-time faculty positions, this strain can be alleviated. The members of the Department continue to lead student-centered programs and are engaged in supporting the college's goals. The Department is well-rounded, with interests in pedagogy, serving students directly, Division services, college initiatives and community outreach (all described in detail in the 2021 Program Review). The addition of new full-time faculty will further improve the Department's service to the college and will improve student learning and achievement.

How will this resource enhance your area or program? Have you considered the College Mission or Strategic Initiatives, physical/organizational restructuring, and or your program's goals for improvement, as stated in your last program review?

A portion of the Department's goals, as stated in the 2021 Program Review, "we aim to provide exceptional classroom and laboratory opportunities for students to achieve success in chemistry courses" can be supported by this request. One strategy to achieve this goal, also stated in the 2021 Program Review, "provide an environment where students develop skills using safe laboratory practices" has been difficult to achieve without additional full-time faculty. With the high turnover and untimely adjunct faculty resignations, emergency hires have been made to avoid canceling full classes with full waitlists, yielding instructors who have little or no teaching experience teaching these courses. The challenge in finding an adequate pool of qualified adjunct faculty coupled with the high percentage of adjunct faculty, makes it difficult to manage quality and safety in the classroom and laboratory. The students directly feel this burden and have made a number of serious safety and instruction-related complaints to both the Dean of Natural Sciences Division and the President of Fullerton College. Furthermore, the Chemistry Department struggles to both find and retain qualified adjunct instructors because of competition with local industry-related jobs and higher adjunct salaries at nearby colleges. By securing more full-time faculty, the program will be enhanced and will move closer to the stated program goals.

The Chemistry Department program goals, objectives, and strategies to achieve the objectives support the College Goals through the promotion of student success, efforts to reduce the achievement gap, and the strengthening of its connections with the local community. The opportunities for students both in and out of the classroom and laboratory promote student retention and success, important for the underrepresented and underprepared students. The department is well-aligned with College Goal 1 as the faculty in the program continually identify opportunities to increase student success, retention, and transfer through effective teaching strategies and by adhering to best practices as identified by the American Chemical Society. To continue our alignment with these college goals, it is important for our department to obtain more full-time faculty.

.

Step C: Complete this chart with details of the request:

Type of Resource	**Requested Dollar Amount**	**Potential Funding Source** It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel (3 FT Faculty)	$413,598[1]	
Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
Total Requested Amount:	$413,598	

[1] One FT faculty Class D/Step 8, $101,845 + $16,518 Fringe +19.15% STRS, etc. $19,503; Total = $137,866 x 3 FT faculty requested = $413,598

Briefly summarize your new / modified resource request. Is it imperative that this resource request be processed now rather than during the next comprehensive program review?

The Chemistry Department is requesting funds for instructional equipment and student workers for the Chemistry Stockroom. The Chemical Stockroom is an essential component of the Chemistry Department. The Chemical Stockroom is responsible for the procurement and preparation of chemicals for use in the chemistry laboratories, and the maintenance and purchase of equipment that are commonly used in chemistry experiments and demonstrations. Additionally, every community event in which the Chemistry Department is engaged (e.g., National Chemistry Week, Kindercaminata and Open House celebrations) requires support from the Chemical Stockroom. To ensure that the Chemical Stockroom can provide the Chemistry Department with the support required for the courses that are offered and for participation in community events, the following resources are requested: Nicolet Summit PRO FTIR spectrometer, Mel-Temp Capillary melting point apparatuses, analytical balances, top Bal, hot plates, GC-IR interface, rotary evaporator, ice maker, and lab stools to replace those that have broken.

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

The Chemical Stockroom is responsible for the procurement and preparation of chemicals for use in the chemistry laboratories, and the maintenance and purchase of equipment that are commonly used in chemistry experiments and demonstrations. These are important aspects to the chemistry courses. Having the ability to perform laboratory experiments and view demonstrations improves critical thinking skills and helps attain student equity by giving the students different modes of learning opportunities. This results in an increase in completion of courses, certificate and degree programs, and transfer-readiness. It will ensure that financial, physical, and technological resources are available to maintain necessary services and programs.

How will this resource enhance your area or program? Have you considered the College Mission or Strategic Initiatives, physical/organizational restructuring, and or your program's goals for improvement, as stated in your last program review?

The purchased items will enhance the laboratory experience resulting in increased numbers of students in the Chemistry Program transferring, increased retention, persistence, and success rates of students. Students will learn how to properly use up-to-date advanced scientific equipment that will be an asset for them as they seek employment in chemical/technical fields. It will lead to increased number of Chemistry associate in arts and Associate in Science degrees as well as increased participation in community events. These all promote the college goals of promoting student success for every student and committing to accountability and continuous quality improvement.

Type of Resource	Requested Dollar Amount	Potential Funding Source It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel	$12000/yr for 3 years	
Facilities		
Equipment	$86,800*	
Supplies		
Computer Hardware		

Computer Software		
Training		
Other		
Total Requested Amount:	$122,800	

*See list below for specific equipment.

Equipment	Requested Dollar Amount
Equipment (Nicolet Summit PRO FTIR Spectrometer)	$30,000
Equipment (Mel-Temp Capillary Melting Point Apparatus Cat. # 11-497-7A)	$8000
Equipment (Analytical Balances, A&D Analytical HR-60)	$10800
Equipment (Top BAL 750G X1MG)	$8000
Equipment (Hot Plates)	$14000
Equipment (Thermo Scientific™ GC-IR Interface for Nicolet FTIR Spectrometers)	$11,000
Equipment (Lab stools)	$5000
Total Requested Amount:	$86,800

Briefly summarize your new / modified resource request. Is it imperative that this resource request be processed now rather than during the next comprehensive program review?

The Chemistry Department is requesting funds for the continuation of STEM Boot Camps. We currently have funding for one year but request the continuation of funding until the next Program Review cycle. Prior to the start of the semester, students are invited to attend a free intensive review session for CHEM 107 F, 111AF, 111BF, 201 F, and 211AF courses. Topics covered in these sessions include entry level skills and laboratory techniques essential to success in the course. Each boot camp lasts several days, between 6-12 total hours. Faculty are paid to provide instruction and individualized help with computations and lab skills. The total number of hours requested per semester is 30 hours max per year per instructor for instruction and preparation. And, an additional 15 hour/year for the administrator of the boot camps. Faculty are paid as professional experts at a rate of $55/hour. With the lack of laboratory, learning, writing, and studying skills more apparent post pandemic, it is crucial to keep the Boot Camps going for the students enrolled in most chemistry courses.

If the Resource Request is personnel-related, include support and associated details/data in support of this request.

Prior to the start of the semester, students are invited to attend a free intensive review session for CHEM 107 F, 111AF, 111BF, 201 F, and 211AF courses. Topics covered in these sessions include entry level skills and laboratory techniques essential to success in the course. Each boot camp lasts several days, between 6-12 total hours. Faculty are paid to provide instruction and individualized help with computations and lab skills. The total number of hours requested per semester is between 45-55 hours of instruction, with 10-15 hours of preparation/set up. Faculty are paid as professional experts at a rate of $55/hour. With the lack of laboratory, learning, writing, and studying skills more apparent post pandemic, it is crucial to keep the Boot Camps going for the students enrolled in most chemistry courses.

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

These boot camps not only provide additional training for students, but they also give them a place where they can start to form connections with faculty and other students in their learning community. Giving the students tools to learn chemistry as well as place to belong will address the learning gaps that disproportionately impacted students have coming into our chemistry courses as well as give them a better sense of belonging. In addition, some faculty like to incorporate time-management skills into their boot camps. This will help to increase persistence and success rates for disproportionally impacted students in the Chemistry Program.

How will this resource enhance your area or program? Have you considered the College Mission or Strategic Initiatives, physical/organizational restructuring, and or your program's goals for improvement, as stated in your last program review?

Pre- and post-surveys of student's perspective on the program showed increased retention rate of students in the Chemistry Program, increased success rate of students in the Chemistry Program, increased persistence though the course sequence, and increased number of students transferring. Offering the Boot Camps will improve student critical thinking skills, increase the completion of courses, certificates, and degree programs, and transfer-readiness. It will remove institutional barriers to student equity and success and foster a sense of belonging where all are welcome. This follows the college mission in which Fullerton College strives to promote success for every student and will cultivate a culture of equity.

Type of Resource	Requested Dollar Amount	**Potential Funding Source** It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel	$12,000/year for 3 years	
Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training		
Other		
Total Requested Amount:	$36,000	

Briefly summarize your new / modified resource request. Is it imperative that this resource request be processed now rather than during the next comprehensive program review?

The Chemistry Department is requesting support to improve student success and retention through providing classroom instructional resource of Labster simulations. We currently have licensing until the end of 2023 but would like to continue this resource until the next program review.

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

With the pandemic came a new way of learning. Part of that was laboratory and content simulations. These give a new way for students to learn content in their chemistry courses with the goal of increasing the success and retention rates of students in the Chemistry program. Labster allows a dynamic visualization of chemical reactions, chemical concepts, laboratory techniques, and others so that students can practice and obtain a better understanding of those concepts. In a virtual setting, the students can become familiar with material before they enter the lecture or laboratory class. We would like to use it as a tool to bridge the gap between theory and practice.

How will this resource enhance your area or program? Have you considered the College Mission or Strategic Initiatives, physical/organizational restructuring, and or your program's goals for improvement, as stated in your last program review?

The goal of this resource is to enhance the learning process and increase the retention and success rates of the students in the Chemistry program. This aligns with the College Mission to promote success for every student and commit to continuous quality improvement.

Type of Resource	Requested Dollar Amount	Potential Funding Source It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel		
Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software	500 licenses/year at $8,750/year for 3 years (Based off previous purchase of 900 licenses in 2022 for $15,750)	
Training		
Other		
Total Requested Amount:	$8.750/year 3 year period: $26,250	

Briefly summarize your new / modified resource request. Is it imperative that this resource request be processed now rather than during the next comprehensive program review?

The Chemistry Department is requesting the Laboratory Safety Training Software program for all chemistry faculty through the American Chemical Society.

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

The goal is for all faculty to have current certifications in laboratory safety training. The faculty will participate in the online training once every three years. In addition, any adjunct faculty that is hired will also participate in the training. This will increase the safety awareness of the faculty which will lead to a safer and more productive laboratory experience for the students.

How will this resource enhance your area or program? Have you considered the College Mission or Strategic Initiatives, physical/organizational restructuring, and or your program's goals for improvement, as stated in your last program review?

The goal of this resource is to enhance the learning process and increase the retention and success rates of the students in the Chemistry program. This aligns with the College Mission to promote success for every student and commit to continuous quality improvement.

Type of Resource	Requested Dollar Amount	Potential Funding Source It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel		
Facilities		
Equipment		
Supplies		
Computer Hardware		
Computer Software		
Training	Yearly License $1540 for 3 years	
Other		
Total Requested Amount:	$1540/year 3 year period: $4620	

Briefly summarize your new / modified resource request. Is it imperative that this resource request be processed now rather than during the next comprehensive program review?

The Chemistry Department is requesting Laboratory home kits, laptops and technology

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

Serving a diverse group of non-traditional students calls for offering flexible and innovative teaching practices. For many students who are juggling work, school, and family, hybrid and online courses may be the only choice they can manage. For students who have children and those who are working, learning remotely and spending fewer hours on campus could mean less money spent on childcare and more flexibility in earning a better income while pursuing a degree. With hybrid and online course offerings, the burden on campus facilities will be lessened. In addition, printing and photocopying costs will be reduced since the majority of handouts and assignments will be digitally accessible for viewing and submission. Other benefits of hybrid and online learning include increased student autonomy, better time-management skills, and improved computer and writing skills.

Virtual simulations will be used to teach and reinforce safety and data interpretation while laboratory home-kits will be carefully used to develop laboratory skills. Assessments will be evaluated via online lab reports and student-recorded video demonstrations. Students who do have space at home to do their experiments will be offered a dedicated space under the supervision of a lab instructor in one of the campus laboratory facilities. Laptops and technology resources should be made available to students to borrow.

How will this resource enhance your area or program? Have you considered the College Mission or Strategic Initiatives, physical/organizational restructuring, and or your program's goals for improvement, as stated in your last program review?

The goal of this resource is to enhance the learning process and increase the retention and success rates of the students in the Chemistry program. This aligns with the College Mission to promote success for every student and commit to continuous quality improvement.

Type of Resource	Requested Dollar Amount	Potential Funding Source It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel		
Facilities		
Equipment	Lab Kits: $20,000 yearly for 3 years	
Supplies		
Computer Hardware	$70000 Laptops; Ipads; e-notebook software memberships	
Computer Software		
Training		
Other		
Total Requested Amount:	$130,000	

Briefly summarize your new / modified resource request. Is it imperative that this resource request be processed now rather than during the next comprehensive program review?

The Chemistry Department is requesting funding for outreach programs such as KinderCaminata, National Chemistry Week, and others.

How will this additional resource allocation specifically enhance your program's services, activities, processes, etc. to continue or improve student learning and achievement?

This will provide funding for activities, shirts, swag that will advertise our chemistry program at Fullerton college at several events.

Type of Resource	Requested Dollar Amount	Potential Funding Source It is only necessary to list potential funding forces if you are aware of specific grants/program funds appropriate to the request, such as Strong Workforce.
Personnel		
Facilities		
Equipment		
Supplies	$ 2000	
Computer Hardware		
Computer Software		
Training		
Other		
Total Requested Amount:	$ 2000	