

Department Name: Chemistry

Program Mission Statement:

The Program Learning Outcomes (PLOs) for the Chemistry Department are:

- 1) Demonstrate an understanding of the scientific method and utilize the method in a laboratory situation;
- 2) Demonstrate knowledge of basic chemical concepts as well as mathematical skills as they relate to the study of chemistry;
- 3) Demonstrate basic chemical hygiene and safety in a laboratory environment; and,
- 4) Demonstrate the ability to acquire and analyze data through empirical observation and the use of appropriate instrumentation.

Three of the PLOs (1, 2, and 4) are commensurate with three of the Institutional Core Competencies (ICCs): Communication and Expression, Information Literacy, and Critical Thinking. The ability to conduct experiments in the laboratory, to gather and critically analyze data from a variety of sources, and to lucidly communicate both the results of the experiments and the implications of those results require that students be able to communicate and express ideas, to use and evaluate chemical literature and manipulate concepts, and to apply critical thinking to the methods used and to the interpretation of the results.

The remaining PLO (3) directly relates to the ICC areas of both Physical/Mental Wellness and Personal Responsibility and Civic Capacity for Global, Cultural, Social, and Environmental Justice. A crucial component of conducting chemical experiments is the ability to do so safely, following all applicable protocols for the storage, handling, and disposal of hazardous waste. Beyond the laboratory setting, it is also crucial for our students to understand the role of chemistry in everyday life, both in the way that it positively affects society through the discoveries that chemists have made but also in the way that it has harmed society through the misuse and mishandling of chemicals.

1.A.1 – Primary Focus of Your Program – Transfer

1.A.2 – Choose a Secondary Focus of Your Program – Career/Technical

1.B.1 – # Certificates of Achievement Awarded – 0

1.B.2 – # Certificates of Achievement-Advanced Awarded – 0

1.B.3 – #ADTs (Associates Degrees for Transfer) Awarded – 0

1.B.4 – #AA and/or AS Degrees Awarded – 0

1.B.5 – Strategies to Increase Awards –

The department continues to explore viable ways to offer AS and ADT/AST degrees given local and state requirements. It should be noted that the department has been unable to design a meaningful ADT which does not exceed the unit cap.

1.C.1 – CTE Programs: Review of Perkins Core Indicator and SWP Outcomes Metrics – N/A

1.C.2 – CTE Programs: Labor Market Demand and Industry Trends – N/A

1.D.1 – Academic Services and Learning Resources: # Faculty Served – N/A

1.D.2 – Academic Services and Learning Resources: # Students Served – N/A

1.D.3 – Academic Services and Learning Resources: # Staff Served – N/A

1.E.1 – Full Time Faculty – 15.8

1.E.2 – # Student Employees – 10. These student employees support the operation of the chemistry stockroom. Their primary function is to check out equipment to students during laboratory classes and, when possible, to assist in the creation of chemical sets for use in the instructional labs.

1.E.3 – Full-time to Part-time ratio % of Full-time Faculty Compared to % Part-time Faculty Teaching –

FT% decreased from 29.8% (2016-17) to 25.0% (2017-18). PT% increased from 49.5% to 63.3% in the same period. The difference is due to one faculty member accepting dean's position at Foothill and a concomitant decrease in the number of full-time faculty accepting overload assignments.

1.E.4 – # Staff Employees – 1.75

1.E.5 – Changes in Employees/Resources –

The American Chemical Society's Guidelines for Chemistry in Two-Year College Programs, Fall 2015, states: "One full-time laboratory technician for every four full-time or full time equivalent chemistry faculty members is recommended." The department currently operates at an average FTEF of 15.8. Based on the American Chemical Society's recommendation the department should therefore have 4.0 full-time staff employees for support. The lack of support has a direct effect on the department. We have a difficult time maintaining our sophisticated laboratory equipment, maintaining clean labs, tracking waste management and disposal, and being able to update and expand our course curriculum because faculty have been required to assist with some of these aforementioned duties in order to keep the baseline program running. There are significant structural and safety issues surrounding any move to expand our current program offerings in the absence of increased staff support.

II.A – Enrollment Trends –

Enrollment has seen only incremental growth over 3 years (+2.4%), due to limitations in available material and facility resources and, crucially, staff support.

II.B – Overall Success Rate –

There has been a small decrease in success rate (80% in 2014-15 to 76% in 2017-18) which is matched by an increase in the withdrawal date (9% in 2014-15 to 12% in 2017-18).

II.C – Changes Imposed by Internal/External Regulations –

Regulations regarding chemical safety and hazardous materials management are dictated by various external agencies and are constantly evolving. Naturally, the department must continually update our lab and safety protocols to comply with these new requirements. While the department has been able to accommodate some minor changes, like complying with new fire extinguisher inspection regulations, the department lacks the structural, financial, or staff support to comply with major policy changes. For example, the department has been working with Karen Lauricella, Director of EH&S, to establish a new Chemical Safety Hygiene Plan required by OSHA. The implementation of this plan will require a chemical safety hygiene officer to oversee the newly outlined regulations, which will require additional staff to support such responsibilities.

Providing safety training to faculty is also an important part in maintaining the safety of our lab program. While the district provided faculty safety training in the 2015-16 academic year, no training has otherwise been made available since 2002. The department is currently exploring options to ensure that this important training is regularly available to full and part-time instructors and staff. We strongly believe that annual safety training for our entire faculty should be a standard part of our program; thus, as mentioned in section V.J, we request an annual budget allocation of \$6,000 – 10,000 to be used towards safety training.

III.A.1 – Growth and Decline of Targeted Student Populations: 2017-18 Enrollment –

Chemistry department chemistry enrollments: African American 2.5% (73/2886), Latinx 20.5% (592/2886), Filipinx 6.7% (193/2886), Pacific Islander 0.42% (12/2886)

De Anza College enrollments: African American 4.1% (6708/163346), Latinx 24.9% (40605/163346), Filipinx 6.7% (10940/163346), Pacific Islander 0.74% (1206/163346)

III.A.2 – Targeted Student Populations: Growth and Decline –

The department has seen wide variations in the enrollment of targeted populations over the past five years. For example, enrollment of African American students has decreased 8.8% (80 to 73) over the five-year period, but enrollment was somewhat lower in the 2014-15 academic year and significantly higher during the 2016-17 academic year. Enrollment of Latinx students saw a significant decrease during the 2014-15 academic year, but over the five-year period enrollment has increased substantially by 38.3% (428 to 592). Enrollment of Filipinx students decreased by 5.9% (205 to 193) over the five-year period, with a marked decrease occurring over the 2016-17 and 2017-18 academic years. Finally, enrollment of Pacific Islander students has decreased by 20.0% (15 to 12) over the five-year period.

III.B.1 – Closing the Student Equity Gap: Success Rates –

African American 71%; Latinx 59%; Filipinx 79%; Pacific Islander 67%; Asian 82%; White 78%

III.B.2 – Closing the Student Equity Gap: Withdrawal Rates –

African American 12%; Latinx 22%; Filipinx 12%; Pacific Islander 25%; Asian 9%; White 13%

III.B.3 – Closing the Student Equity Gap: 2017-18 Gap –

All percentages were calculated by weighted averages (sum of grades * percentage per group divided by the total number of grades).

2013-14 : 67.1% targeted groups versus 80.2%

2014-15 : 69.3% targeted groups versus 83.0%

2015-16 : 72.1% targeted groups versus 83.2%

2016-17 : 65.6% targeted groups versus 82.6%

2017-18 : 65.7% targeted groups versus 81.1%

III.C – Action Plan for Targeted Group(s) –

Despite the department's sincerely commitment to addressing the equity gap for targeted populations, we find it extremely challenging to do so given the limited number of full-time faculty relative to the size of the department's course offerings. As noted in section V.C.2, 63.3% of department load is taught by part-time faculty. Additionally, three of the six full-time faculty are currently in the tenure process, with one of the tenured faculty receiving release time due to campus-level commitments. Given the demands of curriculum development, maintenance of the lab program and equipment, mentoring of part-time faculty, and other department-level needs, the department is struggling to adequately address our equity work and the success rates of our students. Moreover, the department is at a loss to explain the variation in all of our success rates observed over the past five years. Although there have been changes to curriculum and staffing, we are unable to establish a correlation between these changes to either our success rates or the results of our SLO assessments. As noted in Section III.E, we therefore request whatever assistance may be available to address our equity gap.

III.D – Departmental Equity Planning and Progress –

As noted in section III.C, the department has been unable to identify the factors that may be responsible for the variations in the equity gap observed over the past five years. The department therefore welcomes any assistance that may be available in terms professional development for identifying areas within the program that can be developed, such as in methods of instruction, to better address the success of targeted populations, and we would also be interested in whatever information is available in terms of best practices.

III.E – Assistance Needed to close Equity Gap – Yes

III.F – Integrated Plan goals: current student equity data and action plan –

- Improve transfer and graduation rates for disproportionately impacted students.
- Identify and update campus services, policies, procedures towards reducing barriers and increasing student success.
 - Engage faculty and staff in professional development activities focused on improving student success and closing the achievement gap.
 - Build on and broaden our existing relationships in the high schools and within the community to improve college readiness of entering new students.

IV.A – PLOAC Summary – 100%

IV.B – SLOAC Summary – 100%

V.A – Budget Trends – Please see section V.J and Dean's comments

V.B – Funding Impact on Enrollment Trends – Please see section V.J and Dean's comments

V.C.1 – Faculty Position(s) Needed – Growth

V.C.2 – Justification for Faculty Position(s) –

Quarter after quarter, virtually all the courses offered by the department fill completely. The majority of students complete chemistry classes as part of their UC/CSU transfer agreements. The inability of the department to offer more sections of classes is directly tied to a profound need for increases in full-time faculty and, as described separately, laboratory staff.

While the department successfully hired two new full-time faculty during the 2017-18 academic year, due to several recent faculty departures, the recent hiring only returns the department to the level of full-time staffing extant in the 1999-2000 academic year. Since that time, the number of sections the department offers has grown nearly 50%, from 65 in the 2000-01 academic year versus 96 sections in the 2018-19 academic year (excluding summer). Concomitantly, in the 2017-18 academic year, 63.3% of load was taught by part-time faculty. This places the department's ratio of full-time faculty to students well below the level prescribed by the American Chemical Society and the State of California, as well as the level at Foothill College. Additionally, as the department has expanded, it has become increasingly difficult to find part-time faculty to staff additional sections given the economic realities in play in the Silicon Valley.

Full-time faculty members are essential for 1) curriculum development, 2) mentoring part-time faculty, 3) representing the department in college level committees, and 4) engaging in district level activities. Since three of the department's faculty are currently in the tenure process and cannot be expected to engage at the level of the other full-time faculty, the department desperately needs a growth position in order to mitigate our low %FT ratio, to expand the program to accommodate high student demand, and to maintain academic excellence within the program.

V.D.1 – Staff Position(s) Needed – Growth position

V.D.2 – Justification for Staff Positions –

All chemistry classes have a lab associated with them. Most classes meet for a lab six hours per week, while others meet for a lab three hours per week. The laboratory curriculum is therefore an essential and integral part of the chemistry curriculum.

While faculty are responsible for the laboratory curriculum, it is the laboratory staff who are primarily responsible for the operation of the labs. There are three distinct functions of the laboratory staff: 1) management of the stockroom and day-to-day operations of all the laboratories, including purchasing and inventory of chemicals and supplies, preparation and management of chemical sets for use in classroom experiments, repair of analytic instrumentations, and managing the activities of student workers in the stockroom; 2) hazardous waste management; and 3) chemical hygiene and lab management. In most academic institutions these functions are distributed among two to three different individuals (the department has conducted a best-practices study and gathered this information and it is available for your analysis on request). This is the situation even within our own district, at the Foothill College chemistry department.

Unfortunately, the staffing situation at De Anza College has been rather bleak. Effectively, we have had one full-time staff person managing the operations of the entire chemistry department, even though the department's offerings have expanded nearly 50% over the past twenty years, as above in section V.C.2. To the credit of the full-time individual, the program has been managing, but this has placed enormous constraints on our program. Although the department has had an additional staff member who worked in the evenings, that person did not have anywhere near the same level of duties, based on the classification of the position, and over the past two years there has been frequent turnover in staffing that evening position. This academic year, another half-time position was created and just within the past few weeks that position has been filled, but this will only partially alleviate the situation.

Any sort of changes to our laboratory curriculum has been greatly limited due to the fact that the person managing the laboratories has been stretched to her limits in terms of her workloads. As a result, while other academic institutions have made great strides in incorporating state of the art chemistry curriculum – such as use of modern instrumentation or project-based laboratory exercises or Process Oriented Guided Inquiry Learning (POGIL which is highly recommended by both NSF and ACS) – we at De Anza College are woefully behind.

At present we offer approximately 110 sections each year (including the summer quarter). In frequent and continuing discussions with administration, our department had previously created a three-phase plan to

expand our course offerings, which would have resulted in a 10% increase in sections within the next three years and an additional 20% in within the next six years. However, this plan has been put on hold due to continuing changes in laboratory staff support.

In order for us to make any advances towards offering more challenging and inspiring laboratory curriculum to our students the department needs one additional full-time staff person to provide us with a total of 2.5 staff positions. If this is not possible, then at the bare minimum we would at least need to expand our half-time position to a full-time position giving us a total of 2 full-time posts.

V.E.1 – Equipment Requests – Over \$1,000

V.E.2 – Equipment Title, Description, and Quantity –

Hot plates – already purchased, but another set needed to replace broken units and expansion 50 @ \$350 each

Centrifuge – 2 more due to expansion – \$500 each

V.E.3 – Equipment Justification –

The assessment data (from almost all our classes) indicates that students learn best when the lab program is strong and in several instances, the deficiencies in the lab program due to equipment that need servicing or are in repair is greatly affecting our lab program. In order to strengthen our lab program, we need to continuously update the equipment and make sure that all the instruments are in good working condition.

V.F.1 – Facility Request –

Quarterly scheduled maintenance of the HVAC, chiller, and vacuum systems of our laboratory building. Installation of shower curtains in all laboratory rooms. Replacement of one flammable/corrosive storage cabinets. Replacement of the locking mechanisms of the all student equipment lockers.

V.F.2 – Facility Justification –

The department has regularly experienced temperature and pressure fluctuations (at times severe) as well as failure of the in-house vacuum system due to a lack of regular scheduled maintenance. We also have requested a number of items such as shower curtains, flammable cabinets, and locking mechanisms that must be provided by facilities since they cannot be purchased by lottery money and must be installed by facilities.

V.G – Equity Planning and Support –

1) Cinzia Muzzi is working with students in the chemistry club to perform chemical demonstrations. These sorts of activities attract interest from a wide range of students, particularly those students who have previously not been exposed to chemistry laboratory curriculum and are unaware of the exciting potential of chemistry. This is one mechanism to reduce the preparedness gap between targeted and non-targeted groups. However, these chemical demonstrations have costs associated with them. If the department were allocated a budget of \$500 per quarter, we would be able to perform this activity in a more structured manner and ensure the participation of many more students.

2) Several instructors involve students in Special Projects classes (CHEM 77). When recruiting students for the CHEM 77 class, they ensure that the students are from diverse backgrounds in terms of race, gender, ethnicity, age, and skill level. Recruiting students from targeted groups enables these students to take advantage of opportunities such as developing leadership skills, working closely with a faculty member, developing laboratory skills, and developing strategies for ensuring lab safety. However, these students do face a financial burden in registering for this class. Ideally, the department would like to be in a position to provide scholarships for students engaged in special projects to cover the cost of the credits for which they will be registering.

3) One of the major advantages our students have (in comparison to those who go to large universities) is that all our students gain hand-on experience with instrumentation. This valuable experience positions our students to work with more sophisticated instruments in the future and also positions them to apply for research assistant positions. Students in targeted populations are often at a disadvantage in large universities because of their lack of experience with such instrumentation. However, here at De Anza, we are conscientiously making an effort to bridge the equity gap for students who are in our program by providing them opportunities that will enable them in the future. However, maintaining instruments and making sure that they are student-ready is a huge task. This often requires obtaining service contracts or bringing an expert on-site for routine servicing of the instruments. This requires a substantial amount of financial resources. We are requesting funds to service and update current instrumentation and, if possible, establish an ongoing fund to ensure that this regularly-required maintenance occurs. We are requesting an initial amount of \$10000, along with a \$5000 annual budget, for maintenance and upgrades to current instrumentation. This will allow us to continue to be in a position to train each one of our students to use these instruments.

V.H.1 Other Needed Resources – None

V.H.2 Other Needed Resources Justification – None

V.J. “B” Budget Augmentation –

The department’s B-budget has remained fairly steady in funding for the last several years. As a result of our expansions (even if modest), we have had greatly increased budgetary needs in this area. In order to cover these expenses, we have fortunately been given increased access to lottery funds. However, due to restrictions in what lottery funds can be used for, we are at limited as to the utilization of these funds. The department is therefore requesting that the B-budget funds be appropriately augmented so that we do not need to tap into funds from the lottery account. The current B-budget alone is markedly insufficient and regularly does not cover the cost of the following:

- Student worker salaries;
- Operating expenses such as equipment maintenance, deionized water service, repair and replacement of equipment, and purchase of chemicals used in instructional labs;
- Faculty and staff safety training; and,
- Replacement of broken glassware (the department is no longer able to charge students for glassware they break).

We estimate that the department needs an augmentation of approximately \$50,000 to meet the current expenses of the department, with an understanding that amount would need to be augmented periodically as the program continues to expand.

V.K.1 – Staff Development Needs –

As mentioned in section II.C, annual safety training is needed for faculty and staff. Additionally, both new and existing faculty need training on new Instrumentation available in labs.

V.K.2 – Staff Development Needs Justification –

The 2015-16 academic year was the only year in recent times that the department was provided safety training, going back roughly 15 years. This was paid for out of special funds obtained by the PSME deans at De Anza and Foothill college. We are technically in OSHA violation every year without having certified safety training. This training needs to be planned and paid for on a regular basis through augmentation of the B-budget. We are currently working on developing safety training materials in-house, but will need a budgetary allocation of \$5,000-10,000 per year to provide for both trainers salaries as well as compensating part-time instructors for attendance.

VI – Closing the Loop –

The department is planning to switch to a comprehensive program level outcome and assessment provided through an outside agency, the American Chemical Society. This is a nationally recognized society within all fields of science. For program level outcomes ACS has the “ACS Assessment Tool for Chemistry in Two-College Programs.” Starting with the next comprehensive program review cycle we will provide the results of this assessment tool.

<http://www.acs.org/content/acs/en/education/policies/twoyearcollege/self-study-tool.html>

The ACS is also developing student level outcomes. When those are published we will also attempt to incorporate those into our assessments.