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Dept - (PSME) Chemistry



2019-20 Annual Program Review Update Submitted By: Erik Woodbury

APRU Complete for: 2018-19

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.


I.A.1 What is the Primary Focus of Your Program?: Transfer

I.A.2 Choose a Secondary Focus of Your Program?: Career/Technical

I.B.1 Number Certificates of Achievement Awarded: 0

I.B.2 Number Certif of Achievement-Advanced Awarded: 0

I.B.3 #ADTs (Associate Degrees for Transfer) Awarded: 0



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I.B.4 # AA and/or AS Degrees Awarded: 0

I.B.5 Trends in # Degrees Awarded: There has been no decrease in our number of degrees over the last several years.

I.B.6 Strategies to Increase Awards: A new transfer degree has been made available to Chemistry and Physics. The Department is currently waiting for more details from the UC system and state before implementing this transfer degree.

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

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

I.D.1 Academic Services & Learning Resources: #Faculty served: N/A

I.D.2 Academic Services & Learning Resources: #Students served: N/A

I.D.3 Academic Services & Learning Resources: #Staff Served: N/A

I.E.1 Full time faculty (FTEF): 16.5

I.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.


I.E.3 Full Time Load as a %: 32.7%








I.E.4 # Staff Employees: 1

I.E.4 #Staff Employees: 1

I.E.5 Changes in Employees/Resources: The Department has had, for many years, 1 full time and 1 part time staff position. In recent years the part time position has been nearly impossible to keep filled, with multiple vacancies plastered over with an ever rotating roster of TEAs or a complete absence of lab coverage. This has directly impacted our ability to safely and successfully complete course objectives with students as lab activities have had to be curtailed due to inadequate support and safety concerns. Last year, the department also had the opportunity to hire an additional half-time lab technician. Unfortunately, the person that entered that position was not up to the task and we are again left without that support. We are currently waiting on the hiring process for a second full time lab tech position that will replace both part time positions that previously existed. Without a stable hire we run a significant risk of alienating students, staff, and faculty as working conditions in the evening become increasingly problematic. This has happened at the same time the department increased offerings with the understanding that additional support was forthcoming.

Notably, the staffing level for our program, even with the new hire, comes no where close to what is recommended by the premier professional group in Chemistry. 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



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chemistry faculty members is recommended.” The department currently operates at an average FTEF of 16.5. Based on the American Chemical Society’s recommendation the department should therefore have 4.0 full-time staff employees for support.


This lack of adequate 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 significant growth over 3 years (+6%), despite limitations in available material and facility resources and, crucially, staff support. Our current lab offerings may be unsustainable long term if additional staff support is not successfully integrated into our program. We have clear demand for additional offerings in our area, but any further expansion is absolutely predicated on additional lab and material support already being in place.

II.B Overall Success Rate: There has been a small decrease in success rate (80% in 2015-16 to 76% in 2018-19) which is matched by an increase in the withdrawal date (9% in 2015-16 to 12% in 2018-19). Given that non-success has remained fairly flat, this may be related to more students enrolling in entry level chem classes with less preparation. It’s also possible that variations in instructors could give rise to the small variance observed. In short, our success rate remains high in comparison to other schools at surrounding institutions and statewide.

II.C Changes Imposed by Internal/External Regulations: We are cautious about the downstream effect of AB705 and what it may mean for the preparation level of our students, particularly as they can no longer be required to take the algebra pre-requisite currently listed on our General Chemistry sequence. This pre-requisite is, of course, still required to be present on our CORs per the UC system in order for the courses to transfer. What this will mean long term is as of yet unknown and we are monitoring the situation as best we can.

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



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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 Program Success: As of last year we made a change in our lab procedures and no longer charge for broken glassware. This means that fewer students will pay additional fees for chemistry courses, creating a more equitable situation within the department.

Additionally, one of our faculty members, Megan Brophy, has been building connections with our Math faculty in order to explore the approach to supporting students in our department with respect to building competency around chemical calculations.

III.B Enrollment Trends - Equity Lens: In comparison to the College overall, we have a higher percentage of women (+7%), Asian students (+15%), and younger students (under 24) (+19%) and a lower representation for men, Latinx (-6%) and White students (-6%). All other differences in enrollment are two percentage points or less plus or minus college averages. Our percentage of enrolled AA students is only two percentage points lower than the College's but given that the college only has about 4% AA students, this is a significant difference.

Looking at the trends, most of our percentages have remained fairly steady over the last 5 years with the following exception: The percentage of enrolled Latinx students has increased from 13 to 18 percent (with a corresponding decrease in our majority group, Asian students) and reached a high of 21% in the 17/18 school year, near parity with college averages. The trend is encouraging, though the cause of the increase is not entirely clear. It may be due to increased course offerings, particularly in the Preparatory and GOB Chem sequences, which see higher enrollment from Latinx students. One route to increasing Latinx enrollment may be to increase our offerings of Chem 30A/B, for which there is high demand in general, and among Latinx students in particular.

In a department with courses that build upon one another in a fairly linear fashion it is unsurprising that success and persistence are tied to enrollment levels. Aside from course offerings, another reason for lower enrollments is tied to our success gaps for Latinx and AA students in



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particular. Students that do not succeed are unable to take subsequent courses, decreasing their participation in later classes. For Latinx students in particular, we see a 28% enrollment during the first course that many students take (Prep Chem/25) which drops to 15% for Gen Chem/1A. This is again cut in half to 8% for OChem/12A. Another way to bolster enrollment would therefore be to bolster success.

Other specific groups either have enrollments in line with the overall college population or have too small an overall number (fewer than 30 students) making meaningful analysis difficult.

III.C Success, Non-Success and Withdraw Rates: Our only areas with notable disproportionate impacts are with AA and Latinx students, as well as with students with disabilities.

African American students: 10-34% gap

Latinx students: 16-24% gap

Students with Disabilities: 5-25% gap - error bar makes this seem less significant and it is impossible to address without knowing what kind of disabilities we are discussing. Accommodations and support would vary greatly based on specific student cases.


The previous two years, the success rate for AA students was around 70%, exhibiting only a 5-7 point gap from department averages. It remains to be seen if this new low is part of a trend, or a blip in the data. We will continue to monitor this in 19/20 and see if any reason for the drop can be determined.

In comparison, the gap for Latinx students has been consistently present for the last few years. It is persistent across all courses in our department. The reason for this gap is not known to us and we are frankly at a loss as to how to address it. A good place to start would be to determine what, if any, additional support could be given to students in foundation courses (25/1A) in order to better prepare them for success later. What is really needed is an understanding of what is causing this success gap in the first place.

General strategies to address some of the preceding points:

- Talk with one of the AA and/or Latinx student groups, like LEAD, and invite them to help us explore how to better connect with and support our student groups that have achievement gaps.
- Discuss course offerings and other program details with counselors that work with these student groups.

III.D Equity Planning and Support: Despite the department's sincere 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



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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.

Given this, we request the following to help address equity issues:

- 1) More FT faculty to help develop and support equity-focused programs and initiatives
- 2) Resources for analysis of equity data in order to identify causes of trends (including staff support and professional development)
- 3) Training on how to address the identified root causes

III.E 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.

As noted above:

Given this, we request the following to help address equity issues:

- 1) More FT faculty to help develop and support equity-focused programs and initiatives
- 2) Resources for analysis of equity data in order to identify causes of trends (including staff support and professional development)
- 3) Training on how to address the identified root causes

III.F Assistance Needed to close Equity Gap: Yes

IV. A. SLOAC Summary: The department has collected a lot of data with regards to our SLOs but has not yet been able to identify any large scale trends or problems that we can address directly.


IV.B Assessment Planning: We plan to asses Chem 25 and 30B this year








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



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classes is directly tied to a profound need for increases in full-time faculty and, as described separately, laboratory staff. Moreover, ongoing support and development of the current program would be significantly improved and assured by additional full time faculty being hired.

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 99 sections in the 2019-20 academic year (excluding summer). Concomitantly, in the 2018-19 academic year, 67.3% 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. This has resulted in several courses this year being filled very close to the start of term which is disadvantageous for new instructors and students.


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. The department desperately needs a growth position in order to mitigate our low %FT ratio, to support the current program from with respect to curriculum, SLO work, and equity, and to maintain academic excellence within the program. Once those factors are addressed we can also consider expanding the program in order to meet the continued demand for more Chemistry courses, especially in 30A/25/1ABC.








In summary, Chemistry courses are in high demand, often with full waitlists. As demand has increased over the last two decades we have been asked to support an increased number of class sections with no increase in faculty resources. In order to sully support our students, adjunct faculty, and program overall, we need additional full time instructors.


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

V.D.2 Justification for Staff Position(s): 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



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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.

It is worth noting that at the time of writing, the Department is in the early stages of hiring a full-time lab technician.

V.E Equipment Requests: Equipment resource requests listed on spreadsheet

V.F Facility Request: See Spreadsheet

V.G Other Needed Resources:

V.H.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.H.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.


V.I 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.

Last Updated: 01/31/2020

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