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**Program Mission Statement:** The Program Learning Outcomes (PLOs) for the Chemistry Department, as existed at the start of the current Program Review cycle, were:

- 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 the ability to effectively express scientific ideas orally and in writing; and, 4) Gather and analyze information from primary and secondary sources.

In reflecting on our PLOs, the department determined that three of the PLOs – numbers 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.

In striving to assess our PLOs, the department felt that the method chosen assessing PLO #4 – analysis of laboratory reports from Chem 12C (third-quarter organic chemistry) – did not properly address the objective, as although Chem 12C is the highest-level course the department offers, the reports generated in the class are, arguably, substantially less complicated than the reports generated in a class such as Chem 1B (second-quarter general chemistry).

Additionally, the department felt that the outcome should be more focused on a key goal of the laboratory program: that students can successfully and correctly collect and interpret data, especially data obtained through the use of analytic instrumentation. Thus, the department has decided to update PLO #4 as follows: Demonstrate the ability to acquire and analyze data through empirical observation and the use of appropriate instrumentation.

Additionally, in further discussion, the department determined the original intent of PLO #3 was already captured largely in the other objectives. Moreover, the department realized an important aspect of the program not captured in any of the PLOs that falls under 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. Thus, the department has decided to replace PLO #3 with the following: Demonstrate basic chemical hygiene and safety in a laboratory environment.

**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:**

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

**I.C.1. CTE Programs: Impact of External Trends:**

**I.C.2 CTE Programs: Advisory Board Input:**

**I.D.1 Academic Services & Learning Resources: #Faculty served:** 0

**I.D.2 Academic Services & Learning Resources: #Students served:** 0

**I.D.3 Academic Services & Learning Resources: #Staff Served:** 0

**I.E.1 Full time faculty (FTEF):** 15.7

**I.E.2 #Student Employees:** 15

**I.E.3 % Full-time :** FT% increased from 27.8% (2014-15) to 37% (2015-16). PT% decreased from 56.9% to 41.3% in the same period. The difference is due to the return of one faculty member who was on PDL during 2014-15.

**I.E.4 #Staff Employees:** 1.5

**I.E.5 Changes in Employees/Resources:** There have been no

increases or decreases in our program in the last three years; however, it should be noted that again we are well below the recommended number of staff members as suggested by the American Chemical Society's Guidelines for Chemistry in Two-Year College Programs, Fall 2015. "One full-time laboratory technician for every four full-time or full time equivalent chemistry faculty members is recommended." We currently operate at an average FTEF of 15.7. Based on the American Chemical Society's recommendation we should have 3.7 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 duties in order to keep the program running.

**II.A Enrollment Trends:** The department's enrollment has remained almost constant in the last three years.

**II.B.1 Overall Success Rate:** The current success rate of 80% has remained steady for the last two years and this is an increase from 73% from three years ago. It is noteworthy that our success in the targeted groups has increased from 68% (2014-15) to 72% (2015-16).

**II.B.2 Plan if Success Rate of Program is Below 60%:** N/A. The program's overall success rate has remained well over 60% in the past 3 years.

**II.C Changes Imposed by Internal/External Regulations:** Rules and regulations regarding chemical safety and chemical hazardous management from various agencies are constantly evolving, and it is crucial for our chemistry lab program to keep updating our lab and safety protocols to comply with these new requirements. This, unfortunately, had been a difficult task since we lack the structural, financial, or staff support to keep up with these policy changes. While we have been able to accommodate some minor changes, like complying with new fire extinguisher inspection regulations, we do not have the staff support to handle any major policy changes. Our department had been working with Karen Lauricella, the Director of EH&S at FHDA, to establish a new Chemical Safety Hygiene Plan that OSHA require chemistry lab programs to follow. The implementation of this plan will require a chemical safety hygiene officer to oversee the newly outlined regulations, and we 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. We are happy to report that, for the first time in years, the full-time and part-time faculty had received safety training in 2015-2016 from the district. We strongly

believe that annual safety training for our entire faculty should be a standard part of our program, and thus we request an annual budget allocation of \$6000 – 10,000 to be used towards safety training.

**III.A Growth and Decline of Targeted Student Populations:**

Compared to the 2013-4 enrollments of targeted student populations, there were slight (1%) declines in 2014-15. But all of these groups of students were back to the 2013-14 levels in 2015-16. In other words, there has been no significant changes to the populations of targeted student groups in the last three years.

**III.B Closing the Student Equity Gap:** The department is proud to report that significant improvements have resulted in the success of two specific targeted student populations. Among African American students, the success rate has increased by about 10% (from around 60% in the previous years to 71% in 2015-16). Among Latino/a students, a similar 10% increase in the success rate was observed (from around 60% in the previous years to 71% in 2015-16).

**III.C Plan if Success Rate of Targeted Group(s) is Below 60%:**

The current success rate of all target populations is above 60%.

**III.D Departmental Equity Planning and Progress:** As noted above, the department has made progress towards increasing the success percentage among two of the targeted student groups, African American and Latino/a students, has increased significantly in the past year by 10% points. And as noted below, the department has embarked upon several equity plans. We are hopeful that these endeavors will further our goals to increase success rates in all student groups, particularly those students who may start from a less advantageous position in terms of their preparedness for chemistry classes.

**IV.A Cycle 2 PLOAC Summary (since June 30, 2014):** 100%

**IV.B Cycle 2 SLOAC Summary (since June 30, 2014):** 77%

**V.A Budget Trends:** Please see section V

**V.B Funding Impact on Enrollment Trends:** Please see section V

**V.C.1 Faculty Position(s) Needed:** Replace due to vacancy

**V.C.2 Justification for Faculty Position(s):** All the courses offered by our department are generally full and they also have a full waiting list. Students have demonstrated a desire for chemistry classes. Most students need these classes as part of heir UC/CSU transfer agreements. Our inability to offer more sections of our classes is a result of challenges in our personnel situation- both staff and faculty.

In discussions with Christina Espinosa-Pieb, the vice president of instruction at De Anza College, our department has come up with a

three-phase plan to expand our course offerings. The summary of the plan is as follows:

Phase 1: 2016-17 add 3 sections, one in each quarter, 2017-18 add 3 sections, one in each quarter, 2018-19 add 3 sections one in each quarter.

Phase 2: Repeat above (2020-23)

Phase 3: Repeat above (2024-27)

Currently (2016-17) our department has FIVE full time faculty members and ONE staff person.

The resignation of one full time faculty member during the last academic year has resulted in our being granted a full time hire currently. The search committee is currently in the process of conducting this search and hire process.

However, this year one other full time faculty member, Homer Tong will retire after over 40 years of service. It is imperative that we hire another full time instructor at the earliest possible opportunity to replace the vacancy that will be created by Homer Tong's retirement.

While the ratio of full time faculty to students is already way below the American Chemical Society's and State of California's and several of our peer institution's (including Foothill College) prescribed levels, it is going to become worse with the loss of a full time faculty member.

At present we offer approximately 100 sections each year (including the summer quarter). As per our expansion plan listed above, this number will increase by 10% in three years and an additional 20% in the next six years. It will be impossible for us to operate successfully with the present number of full time faculty members. Full time faculty members are essential for 1) curriculum development 2) mentoring part time faculty and 3) representing the department in college level committees and 4) engaging in district level activities. We will desperately need all faculty replaced (back to a total of six) for the afore mentioned reasons, and most importantly, we will need a growth position in order to mitigate our low %FT ratio and to accommodate our high student waiting lists.

As a result we are requesting the following positions in order to maintain academic excellence and to expand our program:

2017-18: Authorization for TWO full-time faculty position- 1) a replacement for the faculty member who is retiring and 2) a growth position.

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

**V.D.2 Justification for Staff Position(s):** All the 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 an essential and intricate part of the chemistry curriculum.

While faculty are responsible for the laboratory curriculum, it is the laboratory staff person who is responsible for the operation of the labs.

There are three distinct functions of the laboratory staff person: 1) management of the stockroom and day to day operations of all the laboratories- chemicals, supplies, instrumentations 2) Hazardous waste management and 3) Chemical safety and lab management. In most academic institutions (we have conducted a best-practices study and gathered this information and it is available for your analysis on request) these functions indicated above are distributed among TWO to THREE different individuals. In fact this is the situation even within our own district, at the Foothill College chemistry department.

However, the situation at De Anza College is rather bleak. We have ONE full-time staff person managing the operations of the entire chemistry department and a half-time person who has minimal duties. To the credit of the full-time individual, we have been managing, but this has placed enormous constraints on our program.

First off all, the American Chemical Society guidelines indicate that due to this low number of staff personnel, we are facing a major safety hazard not only for the faculty working conditions, but for our students.

Additionally, 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.

In order for us to make any advances towards offering more challenging and inspiring laboratory curriculum to our students we need one additional full time staff person immediately 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.

On top of curricular innovations, the additional staff person is also essential to the expansion process detailed in the previous section. In fact it must be emphasized that the expansion steps described above are contingent upon the department's ability to work with a second full time staff personnel.

**V.E.1 Equipment Requests:** Over \$1,000

**V.E.2 Equipment Title, Description, and Quantity:** The following is a list of equipment needed in the current cycle.

1. Burettes (10 ml volume) = \$7500
2. Burettes (25 ml volume) = \$7500
3. Pipets (100-1000 microliter volume) = \$10000
4. Pipets (0-100 microliter volume) = \$10000
5. Electrochemistry kit = \$2000
6. IR Laser = \$6000
7. pH electrodes = \$7500
8. NMR USB upgrade = \$11000
9. Atomic absorption flame ionization detector = \$15000

**V.E.3 Equipment Justification:** The equipment is necessary for three purposes:

1. To replace broken, worn, and dysfunctional equipment.
2. To accommodate the planned expansion of the department offerings. For instance, we currently offer approximately seven to eight sections of CHEM 1A during each quarter. In each of those sections, the 30 students work with a certain number of equipment for each of their experiments. When we expand our program, we will perhaps begin to offer eight sections of CHEM 1A, this means, TWO additional set of equipment for each of those 30 students. Likewise this will translate to other classes that we will offer more sections of.
3. When we update our laboratory curriculum to offer more modern experiments, we will still need more modern instruments to perform the data collection and analysis.  
Both the program expansion as well as curriculum revision requires the purchase of additional equipment.

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 and chiller system of our laboratory building. Instillation of shower curtains in all laboratory rooms. Flammable/Corrosive storage cabinets are URGENTLY needed. Replacement of the locking mechanisms of the all the student lockers.

**V.F.2 Facility Justification:** Currently nothing is maintained on a regular basis. Consequently, we spend more money on repairs and this could be prevented by regular maintenance. We also have requested a number of items such as shower curtains, flammable cabinets, locking mechanisms that must 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 and Erik Woodbury are working with students in the chemistry club to do 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 equitize 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) Cinzia Muzzi involves students in Special Projects classes (CHEM 77). When recruiting students for the CHEM 77 class, she ensures that the students are in a diverse background 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- leadership skills, working closely with a faculty member, laboratory skills, lab safety, etc. 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 that they will be registering for.

3) Erik Woodbury has assumed the challenging role of managing the instrumentation currently in possession of the chemistry department. He has been fixing the instruments and ensuring that they are in

working condition. These instruments are used by our students. 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 to avail more opportunities 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 money 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:** Our B-budget has remained fairly steady 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 provide that money, we have been given increased access to the lottery funds. However, this is not always ideal. Due to the restrictions in what the lottery funds can be used for, we are limited in how these funds are utilized and at times this has not been to the benefit of the department. So, we are requesting that the B-budget funds be appropriately augmented so that we do not need to tap into funds from the lottery account. Also- with the expansion proposal, there will need to be a commitment to steadily augment the B-budget periodically as the program continues to expand. The current B-budget is insufficient and does not regularly cover the cost of the following:

- Student worker salaries
- Operating expenses such as equipment maintenance, deionized water service, repair and replacement of equipment.
- Staff safety training

We estimate that to actually run efficiently and effectively we need an

augmentation of at least \$50,000 just to meet the current needs of the department. If we continue to expand we will need a commitment of a sustained increase to the B budget.

**V.K.1 Staff Development Needs:** Annual safety training is required.

**V.K.2 Staff Development Needs Justification:** This past year was the first year that we were provided safety training in the last 10 years. This was paid for out of special funds obtained by the PSME deans at De Anza and Foothill college. We are 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.

**V.L Closing the Loop:** We will 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 program review cycle we will provide you with the results to 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.

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**APRU Complete for 2016-17:** Yes

**#SLO STATEMENTS Archived from ECMS:** 100