2019-20 Chemistry Annual Program Plan

I.A. Program Profile: Purpose

Describe the program(s) to be reviewed. What is the purpose of the program and how does it contribute to the mission of Skyline College?

Narrative

The chemistry program serves students from San Mateo County and surrounding areas by providing lower division transfer programs, which prepare students for continued education in four-year colleges and universities. Most of our students who complete the general and organic chemistry sequences transfer to four-year colleges.

Some of the Department's goals include:

- Provide a high quality and complete lower division chemistry program.
- Enable students to gain experience with laboratory equipment and learn procedures and skills to prepare them for upper division studies in the sciences.
- Enable students to succeed in subsequent classes at Skyline College, transfer institutions, and in employment.
- Provide science majors with a solid foundation in the fundamentals of general and organic chemistry.
- Enable students in the health professions to gain the knowledge and skills in chemistry to succeed in their educational programs.
- Provide general education and transition classes for students with non-science backgrounds or goals.
- Provide students with the knowledge and critical thinking skills needed to evaluate scientific information they encounter in research and in everyday life.

The Department offers:

- Chemistry in Action (CHEM 112) that meets a general education science with laboratory course requirement for non-science majors.
- Elementary Chemistry (CHEM 192) to help prepare students for success in the General Chemistry major's sequence.
- Chemistry for Health Professionals (CHEM 410) to prepare for health professions programs such as Respiratory Therapy and Nursing.
- Chemistry majors-level General Chemistry (CHEM 210-220) and Organic Chemistry (CHEM 234/237-235/238) sequence for students who are majoring in Chemistry, Biology, Physics, some Engineering majors, and those who are preparing for professional schools.
- Survey of Chemistry and Physics (CHEM114) to support the Associate Degree for Transfer in Elementary Teacher Education.

The department contributes to the College mission and goals by preparing students for academic transfer, acceptance to professional programs, entering the workforce, and by supporting an academic and scientific culture in our College. The department works closely with the MESA program and the Learning Center to develop study groups and problem solving sessions to support students across the chemistry curriculum. The relationship with the MESA program and the Learning Center adds much to student learning in Chemistry and has helped us attract and retain underrepresented students, as well as those who may be struggling because of work and family obligations.

The chemistry faculty are contributing to college wide efforts to improve student learning support. The introduction and continued implementation of the Skyline Promise has great promise to have a direct impact on student success. The Chemistry Department is fully committed to work with this program and we are excited to see how we might improve our student's success in achieving their future goals in a timely manner. We're also committed to the expansion of programs that will lead to better integration of student support services and instructional services, which is a direct path to student success (for example, development of integrated review workshops through the Learning Center). The SMT division is currently planning to create a STEM Center, which will greatly benefit the students in our chemistry courses.

I.B. Program Planning Team

Annual program planning is intended to be a collaborative process which promotes dialogue and reflection. Please identify all individuals who contributed to or shaped the narrative. Include names and the title or role of each person.

Narrative

Joaquín J. Rivera, Professor

Alec J. Bates, Professor

Safiyyah Forbes, Associate Professor

II.A. Analysis: Progress on Prior Program Objectives (Goals) and Activities

Describe the progress made on previously established program objectives (goals) including identification of achievements or areas in which further effort is needed. New programs which have not yet established CPR/APP objectives should discuss progress on program implementation or activities.

Narrative

Previous Recommendation: The FTE/PTE ratio is under 50% for the chemistry department. We need an additional full-time faculty member. The hiring of a new full-time faculty member would be of great help to continuing to build and develop the coursework and expand department resources and improve student learning. In addition, having an additional full-time faculty member would help with the continuity of instruction within the chemistry program

Response: We still need an additional position.

Previous Recommendations: Need for an increase in the Chemistry supply budget

Response: We still need an increase in the supply budget.

Previous Recommendation: In the Fall of 2017 the department changed the scheduling pattern for CHEM 210 to allow for discussion/recitation sessions in order to improve student success in the course, to offset the impact of the removal of CHEM 192 as a prerequisite for the course. This has allowed for more structured problem-solving time in class. Embedded tutors have been placed in each sessions to assist the instructor in addressing student needs as related to critical thinking and problem solving strategies.

Response: The recitation sessions have been implemented in CHEM 210 along with embedded tutors during each class sessions. We need to analyze the data to determine if they have had a positive impact in improving student success.

II.B. Analysis: Program Environment

Describe any recent external or internal changes impacting the program or which are expected to impact the program in the next year. Please include when the specified changes occurred or are expected to occur.

Narrative

The department changed the scheduling pattern in CHEM 210 in the Fall 2017 to allow for discussion/recitation sessions in order to improve student success in the course. This allows for more structured problem-solving time in class. Embedded tutors during the sessions assist the instructor in addressing student needs as related to critical thinking and problem solving strategies during these sessions. We need to analyze the data to determine if they have had a positive impact in improving student success.

The department implement Chemistry Jam program a non-credit course in Fall 2018 in an effort to introduce foundational concepts to students entering introduction to chemistry, general chemistry I and chemistry for health sciences.

II.C. Analysis: Student Learning Outcomes (SLOs and PSLOs)

1) Instructional Programs Only: Describe what was learned from the assessment of course SLOs for the current and past year.
2) Student Service Programs Only: If PSLOs are being assessed this year (3-year cycle), describe what was learned. If no assessment was done because this is an off-cycle year, please state that this item is not applicable.

Narrative

Chemistry Department – Spring 2020 – Past-Year SLO Analysis CHEM 220 – General Chemistry 2 Student Learning Outcomes (SLO) Assessment Report Term: Spring 2019 Instructor: A.J. Bates Overview: Criteria met for all Student Learning Outcomes SLO #1 - Kinetics & Thermodynamics: Quantitatively and qualitatively analyze the kinetics and thermodynamics of chemical reactions including gaseous and aqueous equilibria. Assessment Method: Final Exam question requiring the student to determine the rate law for a chemical reaction based on initial rates data. Success Criterion: A minimum of 70% of students will successfully determine the rate law for the chemical reaction. Status: Criterion Met Analysis: On the final exam question, of the 37 students who took the exam, 27 (73%) of the students correctly determined the rate law equation. We are considering switching to an Atoms-First presentation of the General Chemistry 2 material for Spring 2020. This would move Kinetics (often the most challenging topic for students in the course) to later in the semester after the presentation of equilibria. Update: The department adopted the Atoms-First Approach for CHEM 220 - General Chemistry 2 for Spring 2020 SLO #2 - Electrochemical Cells: Quantitatively and qualitatively analyze electrochemical cells. Assessment Method: Laboratory Performance and Laboratory Report for the construction and measurement of cell potentials of Galvanic Cells. Success Criterion: A minimum of 70% of students will successfully construct a galvanic cell with the correct potentials, calculate 1/2-cell potentials, and diagram the constructed cells. Status: Criterion Met Analysis: Of the 36 students who performed the experiment, 35 (97%) successfully performed the Electrochemical Cells experiment. The SLO was achieved. SLO #3 - Quantitative Experimentation: Experiment quantitatively using common laboratory techniques and equipment to investigate concepts including thermodynamics or acid-base systems, and critically analyze and communicate the results. Assessment Method: Laboratory Performance and Laboratory Report for the construction and measurement of cell potentials of Galvanic Cells. Success Criterion: A minimum of 70% of students will successfully perform the experiment, plot the resulting data, and determine the enthalpy ad entropy of the reaction from the graph. Status: Criterion Met Analysis: Of the 37 students who performed the experiment, all 37 (100%) successfully determined performed the experiment and interpreted the results. The SLO was achieved. CHEM/PHYS 114 – Survey of Chemistry & Physics Student Learning Outcomes (SLO) Assessment Report Term: Fall 2019 Instructors: Mousa Ghanma & Kolo Wamba Overview: Criteria met for all Student

Learning Outcomes Student Learning Outcomes: A. Interpret the meaning of the chemical equation and relate it to the physical materials involved in the process. B. Carry out a chemical experiment to test a hypothesis and critically analyze the results. C. Describe energy in forms important to systems in physics and chemistry. D. Describe the fundamental forces that hold an atom together, and its role in chemical bonding. E. Critically evaluate scientific information in the popular press. SLO A (Chem.) SLO B (Chem.) SLO C (Chem. & Phys. Averaged) Student # Meet SLO Some evidence of SLO No evidence of SLO Meet SLO Some evidence of SLO No evidence of SLO Meet SLO Some evidence of SLO No evidence of SLO 1 1 1 1 1 1 1 2 1 1 1 1 0.5 1 3 1 1 1 1 0.5 1 4 1 1 1 1 1 1 5 0 1 0 1 1 1 6 1 1 1 1 1 1 7 0 1 0 1 1 1 8 1 1 1 1 0.5 1 9 1 1 1 1 1 1 10 1 1 1 1 1 1 11 0 1 0 1 1 1 12 1 1 1 1 0.5 1 13 1 1 1 1 1 1 10 13 0 10 13 0 11 13 0 77% 100% 0% 77% 100% 0% 85% 100% 0% SLO D (Chem.) SLO E (Chem. & Phys. Averaged) Student # Meet SLO Some evidence of SLO No evidence of SLO Meet SLO Some evidence of SLO No evidence of SLO 1 1 1 0.5 1 2 1 1 1 1 3 1 1 1 1 4 0 1 0.5 1 5 0 1 1 1 6 1 1 1 1 7 1 1 1 1 8 0 1 1 1 9 1 1 1 1 10 1 1 0.5 1 11 0 1 1 1 12 1 1 1 1 13 1 1 1 1 10 13 0 11.5 13 0 77% 100% 0% 85% 100% 0%

III.A. Reflection: Considering Key Findings

Consider the previous analysis of progress achieved, program environment, and course-level SLOs or PSLOs (if applicable). What are the key findings and/or conclusions drawn? Discuss how what was learned can be used to improve the program's effectiveness.

Narrative

The chemistry program provides a comprehensive lower-division Chemistry program that meets the needs of students for transfer to science major programs, preparation for professional schools, entrance into health profession programs, and general education requirements.

We have seen an increase in success and retention for all groups over the last five years.

Although success and retention rates have increased among all ethnic groups, success for African American, Hispanic/Latino and Pacific Islanders are lower than the departmental average. This shows that additional resources for student support and tutoring outside of the classroom are needed to improve student success in Chemistry courses. This might include hiring tutors, embedded tutors, offering learning skills supplement courses, supplemental instruction sessions, continue the partnership with the Math, Engineering and Science Achievement (MESA) program, the STEM Center, partnering with existing campus learning communities and student support programs such as the Learning Center and re-instituting the CHEM 192 prerequisite for CHEM 210. In the CHEM 210 course we have implemented a recitation session to increase student success.

Our program is very efficient. Our load has increased over the last three years. The faculty and staff of the Chemistry Program are all exceptionally knowledgeable in their area of expertise and share a strong commitment to student success. Faculty members maintain a current and meaningful curriculum in Chemistry. These members have built an excellent and efficient team/family that delivers the highest quality of educational services to our students.

Increases in the number of laboratories and increases in the cost of chemicals and equipment over the last few years should also be met with an increase of a budget to both purchase materials and chemicals. A long-term plan for maintaining, purchasing and replacing laboratory equipment is essential to staying current and being able to teach with modern technology.

A new full-time faculty member is needed. The FTE/PTE ratio is under 50% for the chemistry department. The hiring of a new full-time faculty member would be of great help to continuing to build and develop the coursework and expand department resources and improve student learning. In addition, having an additional full-time faculty member would help with the continuity of instruction within the chemistry program.

III.B. Reflection: ISLOs

If your program participated in assessment of ISLOs this year:
(1) What are the findings and/or conclusions drawn?
(2) Does the program intend to make any changes or investigate further based on the findings? If so, briefly describe what the program intends to do.

Narrative

Students in all chemistry courses improve their critical thinking skills by analyzing complex chemistry problems in both lecture and laboratory settings. In the laboratory in particular, students are required to develop experimental plans and molecular-level models to relay chemical information. Students improve their communication skills by answering questions in both sentence and chemical symbol formats. Students practice scientific communication by keeping a laboratory notebook and writing lab reports.

All courses in the chemistry program help students improve scientific understanding and effective communication. The lab component of chemistry courses is essential for the outcome of drawing conclusions based on the scientific method, computations or experimental and observational evidence. All courses have students construct and analyze statements in a formal symbolic system (chemical symbols). Lab reports help student practice deriving conclusions based on their data and communicating those results through scientific language.

Students are also able to demonstrate skills central to computer literacy. Many of the laboratory experiments in General Chemistry require students to measure data using a variety of equipment and to manipulate and graph data using excel. Most homework is completed through an online homework system, Sapling Learning.

Working in the lab requires students to interact with each other, work in groups, show leadership skills and demonstrate critical thinking. All of these apply to the citizenship ISLO.

IV.A. Strategy for Program Enhancement: Continuation/Modification

Indicate whether the program is continuing implementation of the last CPR strategy or revising the strategy. Please describe the modifications if revisions are intended.

Note: Any new strategies should be linked to Institutional Goals through creation of objectives in the next section. If the program has not yet participated in comprehensive program review, an annual or multi-year strategy can be defined in this item.

Narrative

The program is continuing implementation of the last CPR strategies.

The department has implement Chemistry Jam Program in 2018-19 a non-credit course. Chemistry Jam is a one-week intensive, fun and stimulating program that will remedy some of the challenges our students face with chemistry. This program will aid in providing the foundational knowledge for incoming and existing students to successfully complete their first semester chemistry course thus allowing them to either continue with the chemistry course sequence or fulfill their chemistry requirements on time.

IV.B. Strategy for Program Enhancement: Action Plan and Resource Requests

Based on the most recent CPR and any desired modifications, develop an annual action plan with related resource requests. No narrative response will be entered in this section, but the objectives you create will be printed automatically in the APP report under this item.

(1) To begin, click on PLANNING at the top of the page, then CREATE A NEW OBJECTIVE. To view previously created objectives, click PLANNING at the top of the page, then VIEW MY OBJECTIVE.
(2) IMPORTANT! Make sure to associate each objective to this standard in the APP. Need help? Contact the PRIE Office for further instructions. Institutional Goals. Need help? Contact the PRIE Office for further instructions.

Narrative

Associated Objectives

1140-Chemistry Jam

1141-Hire a new full time faculty

1142-Hire an instructional aid

1143-Increase the chemistry supply budget and buy

Enhanced Budget with Objectives and Task Detail

Chemistry Enhanced Budget with Objectives and Task Detail