PALO VERDE COLLEGE

Program Review

Chemistry

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2007-2012

The Chemistry Department at Palo Verde College believes that an understanding of chemical sciences is an indispensable part of a sound education in the overall development of students in not only the Health and Allied Sciences, but also engineering, pure and applied sciences. The goal is to provide all students with access to supportive, excellent education, where all students learn by direct experience with the methods and processes of inquiry. Our faculty are highly trained, committed to student development, and dedicated to helping students achieve their maximum potential. Our curriculum is structured to encourage students to engage in critical thinking and to help students realize that learning is a life-long endeavor.

EXECUTIVE SUMMARY

Chemistry

1. **Program Strengths**

    a. Faculty utilization of innovative teaching methodologies, such as open resource textbooks and online lab s, to enhance student learning.

    b. Implementation of math and English pre-requisites to increase the chances of student success.

    c. Faculty commitment to continuously evaluate student learning through the use of multiple measures of learning.

2. **Program Weaknesses**

    a. Need for qualified tutors in Chemistry.

    b. Need for sufficient enrollments to justify more frequent face-to-face chemistry lab sections.

3. **Recommendations for Program Improvement:**

    Continue work in open education resources, monitoring student learning achievement, evaluating learning, and making improvements in teaching methods and approaches.

4. **Committee Determination:**

    Report is accepted and may proceed to the next step in the process.

Program Review Committee Approval Date: April 17, 2012

PROGRAM REVIEW:
CHEMISTRY
2007-2012

PART I: SUPPORT OF THE COLLEGE MISSION

A. STATE THE PURPOSE OF THIS PROGRAM.

The Chemistry discipline is comprehensive in that it provides a variety of science courses that address the diverse educational needs of the community. Almost all course offered by the Discipline satisfy general education requirements for associate degrees and transfer to four-year institutions. These courses emphasize the development of student critical thinking skills that contribute to academic and vocational success and impart a basic understanding of the sciences.

B. DESCRIBE HOW THE PROGRAM SUPPORTS THE OVERALL MISSION OF THE COLLEGE AS ADOPTED BY THE BOARD OF TRUSTEES.

The Chemistry discipline provides an excellent learning environment through both face-face and online courses, all designed to give students the tools for success through on the job, practical, hands-on experiences. This discipline promotes scientific inquiry, environmental awareness, synthesis of interrelated disciplines, and lifelong learning through lecture and laboratory courses for those pursuing degrees within and outside of the physical sciences.

C. DESCRIBE THE UNIQUE INSTITUTIONAL GOAL THE PROGRAM SERVES.

The Chemistry discipline provides unique lower division general education transferable and nontransferable courses, as well as preparation for occupational certificate programs. No other discipline at Palo Verde College encompasses and teaches such a wide variety of topics. Upon completion of this coursework, students should be able to use scientific methodologies to understand, describe, explain, and even predict human behavior and natural phenomenon. By knowing how people and social institutions function and relate to their physical surroundings, students can contribute to society.

PART II: ACCOMPLISHMENTS IN ACHIEVING GOALS OUTLINED IN THE PREVIOUS PROGRAM REVIEW

A. DESCRIBE PROGRESS IN ACHIEVING GOALS OUTLINED IN THE PREVIOUS PROGRAM REVIEW, PROVIDING EVIDENCE DOCUMENTING SUCH ACHIEVEMENTS.

By moving the medium of instruction for the CHE 101 – Introduction to General Chemistry to exclusively online medium on the BRIDGE using OER (open educational

resources), we have reached all the underserved populations of the district by making the course material available 24/7 for the duration of the semester. This is also done at a fraction of the earlier cost since the OER materials are free. By incorporating both the theory and lab experience into a unique virtual experience, we have eliminated the lack of attendance issue which is plaguing many of our face-face classroom experiences.

B. EXPLAIN MODIFICATIONS OF GOALS OUTLINED IN THE PREVIOUS PROGRAM REVIEW, PROVIDING EVIDENCE DOCUMENTING SUCH MODIFICATIONS.

By working with the curriculum committee the department has strengthened the pre-requisites required for both entry into the course in terms of the English and math courses. This has strengthened the fundamental basis of reading, writing and arithmetic that is required to succeed in the class.

PART III: POPULATIONS SERVED

A. DESCRIBE THE POPULATION SERVED BY THE PROGRAM, INCLUDING SPECIAL POPULATIONS.

The Chemistry program is open to all Palo Verde College Students and the general public interested in physical sciences. The students served by the Chemistry discipline are diverse with slightly more females (52%) than males (For the academic years of 2004 through 2011). Student ethnic diversity is also mixed, with no single ethnicity forming a majority. This is unusual, as historically under-represented people are less likely to take science courses. Thus this discipline is showing improvement in breaking down the ethnic barriers of education.

The Chemistry discipline serves approximately 20 students per semester. The course offering in the Discipline are currently meeting the needs of transfer students. Initial surveys indicate that almost all of the students enrolled in Chemistry courses indicated transfer as an educational goal.

B. DESCRIBE OTHER POPULATIONS THAT SHOULD BE SERVED BY THE PROGRAM, AND DESCRIBE PLANS TO SERVE THEM IN THE FUTURE.

PVC sometimes has enough students to offer a face-face class. So our labs are kept ready and viable to keep these offerings possible in the future.

PART IV: CURRICULUM HISTORY

A. LIST THE COURSES OFFERED SUPPORTING THE PROGRAM OR CERTIFICATE. GIVE THE DATE OF FIRST OFFERING FOR EACH, AND INDICATE HOW MANY SECTIONS WERE SUCCESSFULLY OFFERED DURING EACH OF THE LAST FOUR REGULAR SEMESTERS (TWO YEARS).

Term	COURSE	SUCCESSFULLY OFFERED
Fall 2009	CHE 101: Introduction to General Chemistry	1 Section
Term	COURSE	SUCCESSFULLY OFFERED
Spring 2010	CHE 101: Introduction to General Chemistry	1 Section
Term	COURSE	SUCCESSFULLY OFFERED
Fall 2010	CHE 101: Introduction to General Chemistry	1 Section
Term	COURSE	SUCCESSFULLY OFFERED
Spring 2011	CHE 101: Introduction to General Chemistry	1 Section

B. LIST THOSE COURSES THAT HAVE NOT BEEN SUCCESSFULLY OFFERED AT LEAST ONCE DURING THE PRECEDING SIX (6) SEMESTERS.

- CHE 108: Organic Chemistry
- CHE 109: General, Organic and Bio-Chemistry
- CHE 210: General Chemistry I
- CHE 211: General Chemistry II

C. EXPLAIN WHY SUCH COURSES WERE NOT SUCCESSFULLY OFFERED.

Currently, courses are undergoing revision to include the ability to deliver them via online methods. It is the desire of the program to have these courses offered in the very near future. Therefore, they have not been placed on "inactive status" in the college catalog.

D. **PROVIDE A STRATEGY FOR IMPROVING THEIR SUCCESS, OR EXPLAIN WHY THEY SHOULD NOT BE REMOVED FROM THE PROGRAM.**

Again, the ability to deliver these courses via online delivery method should and will make these courses strong and viable offerings for student success.

PART V: COURSE SCHEDULING AND AVAILABILITY

A. OPTIMIZES CLASS AVAILABILITY FOR DAY STUDENTS, EVENING STUDENTS AND DISTANCE EDUCATION STUDENTS.

The majority of the Discipline's courses transfer to CSU and UC campuses. Since the Chemistry Department, offers the courses online, it meets the needs of students on campus either during the day or evening, and also those who are located off campus.

Since the CHE 101 – Introduction to General Chemistry is offered completely online, we are able to meet the needs of the students who need this class by making it available continuously on the BRIDGE. Once the students have registered through the PVC-Services, the same login credentials can be used to access the content on the BRIDGE. The OER that are used in the program, currently like MIT – OPENCOURSEWARE and FLATWORLDKNOWLEDGE.COM make their resources available with a very high degree of reliability.

An important factor in offering courses that students need is the decision about when and where they are offered. Studies show that the number of hours students work per week is increasing. In most cases students are working between 15 and 25 hours/week, with 25% working more than 26 hours/week. Clearly, when students work this much, the scheduling of classes will be critical in determining if they can, in fact, take any classes. Palo Verde College instructors report a continuing pattern of large numbers of students attempting to add distance education classes at the beginning of the terms in an attempt to alleviate the restrictions of work schedules not coinciding with course offerings. The courses taught in the Discipline are difficult to learn via traditional distance education methods. Therefore we have developed, and will continue to develop, courses that can be taught on-line in an attempt to make the learning of scientific processes and methods mirror that of face-to-face instruction.

B. OPTIMIZES STUDENT LEARNING.

Quality of student learning may be reflected by student grades, student retention and student satisfaction. Student learning will be evaluated using retention rates (% of students that remain in the class until the end of the term), successful completion rates (% of students that receive A, B, or C grades in the class) and Survey data, beginning with the Fall 2002 term. The retention rate for Discipline courses is 58% and is an indication of our student's belief they can complete the course. This is especially remarkable given the nature of the Discipline's courses and their diversity. The transfer courses for science majors and non-science majors are rigorous and demand a commitment of time and energy from our students. The successful completion rates for the Discipline need to be improved, and towards this goal, some of the attributes of the student success have been identified. Over the last six semesters, 44% of the students have completed Discipline courses successfully. Many factors can contribute to a student's ability to successfully complete a course. Quality of instruction, preparedness of students, course content, support services for specific courses and student workload are a few of the factors that affect student success.

PART VI: STUDENT LEARNING OUTCOMES

A. DESCRIBE THE PROCESS BY WHICH THE PROGRAM IDENTIFIES, MEASURES AND EVALUATES STUDENT LEARNING OUTCOMES AT THE COURSE, PROGRAM AND DEGREE LEVELS, AND PROVIDE EVIDENCE THAT THIS PROCESS IS BEING FOLLOWED.

The Division of Mathematics and Sciences at Palo Verde College believes that an understanding of mathematics and the sciences is an indispensable part of a sound education. Our goal is to provide all students with access to supportive, excellent education, where all students learn by direct experience with the methods and processes of inquiry. Our faculty are highly trained, committed to student development, and dedicated to helping students achieve their maximum potential. Our curriculum is structured to encourage students to engage in critical thinking and to help students realize that learning is a life-long endeavor.

The Chemistry discipline strives to maintain the currency of course content and laboratory exercises (where applicable). All course outlines have been reviewed and updated within the last two years. Each course outline defines course-specific learning outcomes. However, on a program-wide basis, the Math and Science Division has recently developed Student Learning Outcomes (SLO) applicable for all courses taught with the spectrum of Math and Science and has implemented assessment procedures and analysis of the SLOs.

- ***Demonstrate research, analytical reasoning, applied science and technological skills for real life expectations.***

Pre and Post tests are continually being administered in face-to-face classes as stated in the most recent program review. Traditional tests, quizzes, and homework are being assigned and graded with appropriate corrections and comments.

The quality of lab reports that were being submitted by the CHE 101 – Introduction to General Chemistry students after viewing the video labs online was inadequate. To help them better model the report, a sample of a good report is being provided in the course syllabus along with suggested topic headings to help structure the written presentation.

The Chemistry Discipline have utilized pre- and post-tests, progressive quizzes, and rubrics since Spring 2007 term as an instrument for assessing learning outcomes. With the recent addition of our online learning system, this task has been simplified, both in terms of delivery and analysis. The tests/quizzes are designed to involve students solving specific problems using several sets of particular data relevant to the Discipline. A rubric has been developed for scoring the various attributes of the project.

All assessment findings for the division will be compiled and cataloged giving each faculty the ability to evaluate outcomes at the course and division level. Following the

time necessary for sufficient data collection, the Math and Science Division will compile the assessment findings and make the necessary recommendations for remediation, if necessary.

B. DESCRIBE THE PROCESS BY WHICH THE PROGRAM IMPROVEMENTS ARE MADE, AND PROVIDE EVIDENCE THAT THIS PROCESS IS BEING FOLLOWED.

Learning assessment is in its proficiency stages at Palo Verde College. The access to DATATEL, necessary for compiling the necessary reports and thus furthering the program can be improved. The Chemistry Department will work closely to provide the students with any necessary program improvements as identified.

PART VII: PROGRAM AND COURSE COVERAGE

A. DESCRIBE HOW EFFECTIVELY COURSES IN THE PROGRAM ARE COVERED BY FULL-TIME AND PART-TIME FACULTY.

The Chemistry faculty meets the minimum qualifications to be an instructor at Palo Verde College and is adequate to support the program at the Main Campus, as well as all distance education courses.

B. DESCRIBE ONGOING OR PROJECTED DEFICIENCIES IN FACULTY COVERAGE OF COURSES IN THE PROGRAM.

There is no need for additional support staff for the Chemistry program at this time. However, due to the nature and expertise necessary, it will be likely that an adjunct faculty member will be utilized to cover the course taught at Needles Campus.

PART VIII: PROFESSIONAL DEVELOPMENT

A. DESCRIBE SPECIFIC PROFESSIONAL DEVELOPMENT ACTIVITIES IN WHICH FACULTY MEMBERS IN THE PROGRAM PARTICIPATE, AND EXPLAIN HOW SUCH ACTIVITIES BENEFIT OR ENHANCE THE PROGRAM AND SUPPORT AND FACILITATE STUDENT LEARNING.

The Chemistry faculty is involved in campus activities and is active in the community and professional organizations, continuing their education and participating in activities that utilize or increase their expertise. Instructors routinely participate in professional development in terms of continuing professional education and seminars. Instructors attend professional workshops available through the various discipline-related organizations and federal, state and regional organizations. Faculty also enrolls in university courses to keep current in their field. Faculty of the Chemistry program regularly participate in in-service activities, including College Flex Day trainings, college seminars, and other professional growth opportunities offered on campus. Currently,

there is much interest in open educational resources and service learning. The faculty is heavily involved in providing students access to free educational materials to lessen the financial burden students face, and has placed many students in seasonal, temporary or career oriented places of employment.

The chemistry department is part of the Kaleidoscope Project which is in the running to obtain the Gates Foundation Scholarship to further the development of use of OER's to improve student accessibility and success to the Chemistry courses.

B. DESCRIBE AREAS OF UNMET PROFESSIONAL DEVELOPMENT NEEDS AMONG FACULTY IN THE PROGRAM.

At this time, all professional development is currently being met, thus there are no plans to address the needs to rectify any deficiency.

PART IX: STUDENT PERFORMANCE AND COMPLETION.

A. DISPLAY AND COMMENT ON SEMESTER-BY-SEMESTER COURSE COMPLETIONS IN THE PROGRAM OVER THE PRECEDING SIX (6) SEMESTERS.

Academic Year	Success Rate	Retention Rate
Fall 2008	10%	20%
Spring 2009	70%	90%
Fall 2009	21%	28%
Spring 2010	22%	55%
Fall 2010	70%	80%
Spring 2011	70%	75%

The retention rate for chemistry discipline courses over the last six semesters is 58% and is an indication of our student's belief they can complete the course. This is especially remarkable given the nature of the Discipline's courses and their diversity. The successful completion rates for the Discipline are respectable. Over the last six semesters, 44% of the students have completed Discipline courses successfully.

PART X: ENROLLMENT AND FINANCIAL TRENDS.

A. DISPLAY AND COMMENT ON SEMESTER-BY-SEMESTER ENROLLMENT IN THE PROGRAM OVER THE PRECEDING SIX (6) SEMESTERS.

Semester	Student Enrollment
Fall 2008	14
Spring 2009	9
Fall 2009	21
Spring 2010	13
Fall 2010	21
Spring 2011	16

Enrollment over the past six semesters has shown a familiar trend when a campus is in the development phase of a discipline program. Historically, enrollment numbers are

predictably varied during the phase in period of a program. Recent enrollment has decreased and is constant with the overall college unduplicated headcounts for the last six semesters

B. DISPLAY AND COMMENT ON SEMESTER-BY-SEMESTER EXPENSES INCURRED BY THE PROGRAM OVER THE PRECEDING SIX (6) SEMESTERS.

Academic Year	Supplies	Operating Exp.	Capital	Total	Change
2006-2007	0	0	0	0	
2007-2008	0	0	0	0	0
2008-2009	0	0	0	0	0
2009-2010	0	0	0	0	0
2010-2011	0	0	0	0	0
Average	0	0	0	0	0

The expenses incurred by the Chemistry discipline are appropriate for current enrollment and program activities. For the past years, the chemistry department has kept the expenses to zero in all categories of supplies, operating expenses and capital because we switched to a virtual format there is no expense of the resupply of the chemicals towards the wet lab experience. Also, by switching over to the OER's and making the resources on the BRIDGE from these sources, we have kept the cost of development to a minimum.

PART XI: FACILITIES AND EQUIPMENT

A. ARE CURRENT FACILITIES, SUCH AS CLASSROOMS, OFFICES AND EQUIPMENT, ADEQUATE TO SUPPORT THE PROGRAM?

The Chemistry discipline is housed within the Classroom Building and has a dedicated lecture/laboratory classroom. The facilities utilized by the Discipline were constructed within the last eleven years and are in excellent condition. Adjoining the dedicated classroom is the faculty office, allowing for ease of and simultaneous access to the teaching forum and faculty office.

B. IS AVAILABLE DEDICATED SPACE ADEQUATE TO SUPPORT THE PROGRAM?

All of the facilities are adequate for the support of this program.

C. IS AVAILABLE EQUIPMENT ADEQUATE TO SUPPORT THE PROGRAM?

Both the classroom and faculty office have a dedicated computer station each. In addition, the classroom has media playing devices and a digital projection and sound system. Laboratory equipment is limited, but adequate to support the program.

D. DESCRIBE PLANS FOR FUTURE CHANGES IN SUPPORT FACILITIES OR EQUIPMENT.

If we make CHE 109 an online hybrid class by making the theory online and labs face-face, we will need to replenish our stock of the chemistry experiments that make up that class. Apart from the restocking of the chemicals needed for specific courses, there is no major need for capital outlay in the support facilities or equipment.

PART XII: STRENGTHS AND WEAKNESSES

A. LIST AND COMMENT ON THE MAJOR STRENGTHS OF THE PROGRAM.

- The Chemistry Discipline provides our students with a wide variety of courses designed to meet their varied needs and requirements.
- Our primary goal is to facilitate student growth and success and at the same time maintain academic standards appropriate to our courses.
- Continue to coordinate course offerings with changes in requirements of the various CSU and UC campuses, as well as, the changing vocational needs of students.
- Chemistry faculty brings years of education, practical work experience, and training to every class.
- Chemistry maintains a steady student enrollment in classes.
- The ability to provide adequate online laboratory instruction.

B. LIST AND COMMENT ON THE MAJOR WEAKNESSES OF THE PROGRAM.

- Lack of qualified tutoring services that have the knowledge base to tutor students in the Chemistry. A consistent question received from students is directed at where they can obtain help outside of the classroom. Currently there are no tutors in the Learning Skills Center qualified to tutor chemistry students. As a result, the faculty assumes the role of tutor, allowing students in need to receive extra learning opportunities.
- The course content delivery currently depends on the ready availability of the OER's which are third party resources for maintaining the structure and integrity of the program. If these were for any reason to be not made available then we would have to develop our proprietary resources on the BRIDGE so that the department would be self-sufficient.

PART XIII: PLANS TO REMEDY WEAKNESSES.

IDENTIFY SPECIFIC STEPS TO CORRECT IDENTIFIED WEAKNESSES AND PROVIDE THE TIMELINE BY WHICH THEY ARE TO BE CORRECTED.

In order to have a qualified tutor that is able to tutor students in Chemistry, that student must have already successfully completed core courses within the Chemistry discipline. An incentive of monetary compensation (employment) might improve the chances that a former Chemistry student would consider occupying such a position. Currently there are no monies dedicated that would allow this to occur; however, recent budget requests are being considered.

PART XIV: PLANS TO ADVANCE THE PROGRAM.

DESCRIBE OTHER PLANS THAT WILL ADVANCE THE PROGRAM.

The Chemistry Discipline is committed to providing out students with the best possible education. To that end we need to continue to establish procedures for evaluating our successes and failures and employ them on a regular basis. We need to monitor all of our courses' retention and success rates and develop plans to address any problem areas that are identified. We need to develop the use of different teaching methods that reach across a broad spectrum of student intellectualism. We need to continue to develop evaluation methods that monitor the effectiveness of our teaching techniques.

Over the next couple of semesters, the chemistry faculty will be working at identifying alternate OER's and also developing proprietary resources on the BRIDGE.