

Skyline College

Chemistry

Program Review

Executive Summary



Short Summary of Findings

The Chemistry program at Skyline College provides students with a full spectrum of courses, ranging from a non-major general education class to a full two-year general and organic chemistry sequence. Courses are taught with the content and standards to ensure transferring students the necessary preparation to succeed in upper division science classes. The overall efficiency of our program is high despite the challenges of aging equipment and facilities.

Three Strengths of the Program

- Provides a comprehensive lower-division Chemistry program that meets needs of students for transfer to science major programs, preparation for professional schools, entrance into health profession programs, and general education requirements.
- Faculty members maintain a current and meaningful curriculum in Chemistry.
- The department works closely with the MESA (Math, Engineering, and Science Achievement) program to help students succeed in our courses.

Three Suggestions for Improvement

- New state-of-the-art chemistry laboratories are under construction; the program needs sufficient funds for equipment and technology to outfit the new laboratories and maintain the equipment for long-term use.
- A new full-time faculty member is needed.
- Better direct students to appropriate chemistry courses based on their program goals and their background in math and chemistry in order to achieve higher student success.

Faculty members participating in the self-study:

Joaquin Rivera
A.J. Bates

Mousa Ghanma
Janice McOmer

Nancy Ruis
Heather Yaros-Ramos

Full-Time Faculty Signatures

Joaquin Rivera, Professor of Chemistry

A.J. Bates, Associate Professor of Chemistry

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SKYLINE COLLEGE
CHEMISTRY
PROGRAM REVIEW SELF STUDY

PART A: Overview of Program

1. State the goals/ focus of this program and how the program contributes to the mission and priorities of the College and District.

Goals and Focus:

- Provide a high quality and complete lower division chemistry program.
- Enable students to gain experience with laboratory equipment comparable to other California community colleges and four-year institutions.
- 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 student 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 everyday life.

Contribution to the Mission and Priorities of the College:

- 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.
- The chemistry program provides a general education course that fulfills transfer requirements for a laboratory science course for non-science majors.
- The chemistry program provides a course intended for students in the health care professions including nursing and respiratory therapy.

2. *Discuss how this program coordinates, impacts, and/or interacts with other programs in the College.*

The primary departments/disciplines that the chemistry department has worked with are physics, biology, and mathematics. Our focus with these departments has been to organize curricular patterns to provide students with an easy progression through the science and math courses offered at Skyline. We also strive to minimize conflicts in scheduling for both lecture and lab courses.

The chemistry faculty coordinates the course content in our Chemistry for Health Professionals with our allied health programs. The department strives to include topics and skills needed by a variety of programs.

The chemistry department has a close relationship to the Skyline College Biotechnology training program. Chemistry faculty members teach the chemistry segments of this highly interdisciplinary program. Facilities and laboratory equipment and resources are shared extensively between the two programs.

3. *If the program utilizes advisory boards and/or professional organizations, describe their roles.*

The chemistry program has no advisory boards.

4. *Explain how this program meets the needs of our diverse community.*

The chemistry program provides the graduation and transfer courses needed by those students who are preparing for science majors at four-year institutions.

The department has revisited the need to help prepare students for success in the general chemistry sequence. As a result, we are offering the Introductory Chemistry course (CHEM 192) in the Fall, Spring, and Summer semesters to provide a transition for students who have no previous courses in chemistry, or who need additional preparation to be successful in the general chemistry sequence.

To meet the increased enrollment in allied health programs we have expanded the number of sections of CHEM 410 (Chemistry for Health Professionals) offered in the regular academic year, and we are consistently offering the course in the summer.

The department works closely with the MESA (Math, Engineering, and Science Achievement) Program to develop study groups and problem solving sessions to support students in the introductory and general chemistry sequence. The relationship with the MESA program adds much to student learning in Chemistry and has helped us attract and retain “non-traditional” and underrepresented students.

The introduction of the Biotechnology program has reached out to the community to help retrain displaced workers who are interested in pursuing a new career in an industry thriving in our community. Chemistry faculty involved in the program tailor the course to meet the needs of a student cohort that is even more diverse than most chemistry classes.

5. *If the program has completed a previous self-study, evaluate the progress made toward previous goals.*

Since the last self-study the District passed a bond and new laboratory facilities are under construction. The completion of new laboratories and the accompanying procurement of equipment, if appropriate funds are made available, should alleviate the problems of aging facilities and equipment and allow us to modernize the program.

PART B: Curriculum

1. *Describe how the courses offered in the program meet the needs of the discipline(s) and the students. (This may be answered through descriptive narrative evaluation or quantitative research).*

Chemistry classes are a typical part of the freshman and sophomore level curriculum in university offerings. We teach introductory chemistry for students who did not take chemistry in high school. This course is necessary to prepare students for subsequent college-level chemistry courses.

In addition, we offer the typical two-year sequence of general chemistry and organic chemistry. This sequence is equivalent to the first two years of chemistry taken by science majors at liberal arts colleges and universities and is necessary for some science majors who wish to transfer to university at the junior year level. The general chemistry – organic chemistry sequence is also required for entry into many professional schools (including medical, pharmacy, dental, and veterinary) and serves students who have already completed bachelor's degrees without these courses.

A semester of chemistry is required of most students entering the allied health fields. Our Chemistry for Health Professionals fulfills this requirement for our students entering many programs including nursing, respiratory therapy, and radiology programs.

We also provide a course for non-science majors (CHEM 112 – Chemistry in Action) who require a laboratory science class to fulfill their general education requirements.

All of our courses provide students with the opportunity to learn common laboratory techniques and to gain experience using standard laboratory equipment.

Many students take the full general chemistry sequence (CHEM 210 – CHEM 220) in the fall and spring semesters of a single academic year. We analyzed data relating to the success of students who followed this pattern in three academic years (*see Table 1 on the following page*). These data represent a very high success rate (84.1%) for students in the second semester of general chemistry after successful completion of CHEM 210 at Skyline College.

Table 1: CHEM 210-220 Subsequent Success

Academic Year	Students in Spring CHEM 220 who had successfully completed Fall CHEM 210	Students Earning A	Students Earning B	Students Earning C	Students Earning D	Students Earning F	Students Withdrawn W
02 – 03	21	5	5	7	0	0	4
03 – 04	25	7	6	8	3	0	1
04 – 05	30	11	7	8	0	1	3
Summary (%)	100%	30.2 %	23.7 %	30.3 %	3.9 %	1.3 %	10.5 %

2. State how the program has remained current in the discipline(s).

- Instructional methods have changed over the last five-year period to incorporate advances in technology. Several faculty members have incorporated Power Point presentations into their lectures and some have a web site. We have incorporated the use of spreadsheet software (Microsoft Excel) in the laboratory portions of some of our courses. Internet sources are used for research by faculty and students.
- The laboratory manuals in the general chemistry sequence and in the chemistry for non-science majors course have been extensively revised to make the experiments more relevant to current topics and teaching methods.
- Across the discipline, faculty members are attending workshops and courses to improve the incorporation of technology in the curriculum. Faculty members study periodicals and online sources to find material that will enhance content and instruction in courses.
- Faculty has attended the IMPAC conference which focuses on aligning transfer curricula between the CSU, UC, and community college systems. Of particular interest at these conferences has been aligning the CHEM 410 curriculum with the needs of nursing programs across the state.
- Faculty attended a conference at San Francisco State University to discuss state legislative mandates for priority transfer for students fulfilling a prescribed curriculum and to discuss how the department can help students to meet these demands.

3. *If the student population has changed, state how the program is addressing these changes.*

Our program continues to attract new students. Our student population has grown substantially over the past few years. To meet these needs, we have increased the number of sections we offer for many of our classes. Unfortunately, this has come at the expense of increasing class size in lectures without providing faculty, in most cases, with additional compensation.

We have recently developed a new biotechnology program. The program trains students who are interested in working for local biotechnology businesses and laboratories. The research and business contacts that were a necessary part of the program creation helped forge new links between the business community and Skyline College and also provided current information regarding the skills that the local science community requires of its new employees.

4. *All courses in this program should be reviewed and, if appropriate, modified every six years. If this has not occurred, please list the courses and explain.*

All the courses in the chemistry program have been reviewed and modified appropriately in a regular and timely manner. The core of the chemistry curriculum has remained fairly constant, because these courses meet needs for transfer degree articulation, vocational/occupational certificates, and degree requirements for Skyline College and other institutions.

5. *If external accreditation or certification is required, please state the certifying agency and status of the program.*

There are no external regulations with which the chemistry program must comply.

6. *Discuss plans for future review and program modification.*

New state-of-the-art laboratory facilities are under construction. These new facilities will need to be appropriately equipped with state-of-the-art equipment and provide a wireless internet network in the lab. This will allow us to use computer interfaced devices in some laboratory experiments so that students can collect and analyze their data immediately. Computer-assisted data acquisition is common in the college chemistry curriculum as well as in research and industry.

Discussion among department faculty members indicates that students need substantial support in problem solving skills to improve their success. This indicates that further work with the mathematics department will be needed to provide means for students to improve their problem solving skills and be more successful in our classes.

At this point in time, the discipline faculty feels that the course offerings adequately meet the needs of our students. However, to provide extra challenge to some of our most motivated chemistry students in the general chemistry sequence, development of an honors section for CHEM 220 (General Chemistry 2) is underway for incorporation into the curriculum in Spring 2006.

PART C: Faculty and Staff

3. List major development activities completed by faculty and staff in this program in the last six years and state what development is needed or proposed by faculty in this program.

Members of the department have worked together to update the General Chemistry laboratory manuals (CHEM 210 and CHEM 220), and the Chemistry in Action (CHEM 112) laboratory manuals). All three manuals included the development of new laboratory experiments.

Faculty met extensively to discuss adoption of appropriate texts to serve the needs of students in our courses, to update and develop curriculum, and to review content and revise outlines for all courses. Special focus in meetings, discussions, and developments included providing easier access to CHEM 192 (Introductory Chemistry) for students not prepared for general chemistry, and providing appropriate topics for students in CHEM 410 to prepare them for a variety of health professions programs. Course descriptions were added to the Skyline Webpage Chemistry links to help students who unfortunately choose not to see a counselor when scheduling classes to better determine the appropriate chemistry course for their current chemistry background and program goals.

2. Describe the orientation process for new faculty and staff (include student workers such as tutors and aides).

- New faculty members attend the district and college-wide orientation process.
- New faculty meet regularly with the dean and senior faculty to ease the transition to working in a new setting.
- Informal mentoring of new full time and part time faculty members is provided by senior faculty.
- Students workers in the Chemistry Stockroom receive extensive on-the-job training in chemical safety and laboratory materials preparation from the laboratory manager.

3. If recruitment of new and/or diverse faculty is needed, suggest recruitment techniques.

One half-time member of the Chemistry faculty (George Goth – Physics and Chemistry) has retired from his Chemistry teaching duties. The Chemistry department now has just two full-time faculty members. In the past few years, enrollments have continued to increase in our sections, and many additional sections offered. Adjunct chemistry faculty also teach the chemistry component of the Biotechnology program. Over half of the chemistry sections offered are taught by part-time faculty. While our adjuncts are excellent instructors, we believe that having an additional full-time faculty member would allow for additional focus on curriculum development, modernization of our laboratory program as we move into new facilities, and to serve the needs of the Biotechnology program – all of which strongly influence our ability to meet the needs of our students.

Local chemistry graduate programs are a good place to look for new faculty members, full and part-time. Tenure track faculty can be attracted through advertisements in professional journals, as well as on internet mailing lists of university and high school chemistry teachers. Chemists in industry who are looking to return to the academic world are another source of possible new staff members. In conjunction with the usual district hiring procedures, these steps should suffice in locating new faculty members.

PART D: Facilities, Equipment, Materials and Maintenance

1. *Discuss the effectiveness of the facilities, equipment, equipment maintenance, and materials for the program to meet its goals and focus. Include if they impact success and if they are accessible to all students.*

- In our labs, we receive outstanding support from our laboratory manager.
- The department's facilities are badly in need of general renovation and are currently inadequate for the department in terms of total space and usability. The ventilation in the labs is inadequate. Reagents are kept on reagent carts located in the front of the lab or in the fume hoods. This practice results in crowds of students congregating at very few locations and moving the reagents to the balances – also a hazard. All of these issues should improve when we move into the new laboratory facilities.
- Another major concern is that sufficient funds are not available for acquiring and maintaining critical pieces of instrumentation and equipment. The repair budget is inadequate. When repairs are needed, the administration has had to supplement with necessary funds. In recent years, funds for replacement and updating of instrumentation have been sporadic and it has not been possible to make specific plans.

2. *List projected needs.*

- State-of-the-art laboratories.
- Laboratories having computers along side normal utilities (gas, water, etc.) and computer-interfaced probes and measuring devices are needed.
- The new facilities will need to be appropriately equipped. Sufficient funds must be allocated by the college for acquiring and maintaining critical pieces of instrumentation and equipment.
- Enough access to computers so that molecular modeling and problem solving software can be used in some courses.

3. *Describe the use of technology in the program and discuss if technology is current and comparable to other college and business or industry.*

The current use of technology includes:

- Use of Power Point presentations in lectures.
- Faculty web sites.
- Use of Excel in some laboratory exercises.

The use of technology in our laboratories is very limited as the current facilities do not have the infrastructure to support it. This will hopefully change in the coming years when the new facilities open. We will need to outfit these labs with computers, instruments, and probes to bring our laboratory program in line with the laboratory experience students receive at other community colleges and universities.

4. *If appropriate, describe the support the program receives from industry. If the support is not adequate, what is necessary to improve that support?*

The Chemistry Department does not depend on industry for support.

PART E: Budget Request

1. *What resources (staff, facilities, equipment and/or supplies) will be needed in the next six years?*

- One additional full-time faculty member.
- Laboratories having computers alongside normal utilities and computer interfaced devices are needed.
- The new facilities will need to be appropriately equipped. Sufficient funds must be allocated by the college for acquiring and maintaining critical pieces of instrumentation and equipment.
- Adequate access to computers so that molecular modeling and problem solving software can be used in some courses.

2. *If appropriate, discuss methods the program could share resources with other programs in the College and District.*

- The physics program and chemistry program often share measuring equipment and power supplies.
- The Chemistry and Biotechnology programs share facilities and significant amounts of equipment and expendable resources (chemicals and other supplies).

Skyline College Program Review
Chemistry - 2005
Worksheet for Enrollment, Performance and WSCH/FTE

Weekly Student Contact Hours – WSCH

Report the 3 previous **Fall** semesters with the most recent on the right.

Year	2002	2003	2004
WSCH	2101	2374	2616

Please comment on program enrollment and expected trends.

A significant increase in enrollment has taken place over the last three years. This is mostly due to the increase in the number of science, nursing and allied health students. It is expected that this growth will be sustained in the coming years.

FTE and WSCH/FTE (LOAD)

Report the previous 3 Fall semesters with the most recent on the right

	2002	2003	2004
FTE	3.60	3.40	3.92
WSCH/FTE	583	698	667

Please comment on the comparison of this program to College trends.

The Chemistry program is very efficient, more so than the College as a whole. In addition, the increase in LOAD has mirrored that of the College. There is a limit to the efficiency of the Chemistry program at which time the quality of instruction will suffer. If labs are too large students do not obtain the individual attention necessary for that environment.

Retention and Success

Report data on program retention and success rate with the most recent on the right.

	2001	2002	2003
Retention	82%	81%	71%
Success	70%	70%	66%

Please comment on the programs success and retention rate. Include factors that affect the rates and how college services are used to provide multiple avenues for student success.

Retention and success is very similar to that of other science and math disciplines. Only one section of chemistry is offered for non-science majors and this may influence the success rate. The beginning majors class (Chem. 210) is the most difficult for students to succeed in and has driven down the success rate. The department has worked with counseling to encourage students to prepare for this class with Chem. 192. Many of the students have taken an equivalent course in high school, but typically not prepared for the level of the science or math in a majors course. The program also offers significant tutoring and assistance to students through the MESA in all levels of the chemistry program.

Looking at specific populations of students the following cumulative success patterns can be seen (1997-2003):

Success Rate	
Filipino	65%
African-American	55%
White	73%
Hispanic	59%
Asian	64%
Male	65%
Female	65%

Taken as a whole these numbers are not statistically significant, but when comparing the highest success found in whites to the lowest found in African-American students it is now significant. The success rate for African American students has improved to 59% over the last three years, which might be accountable to MESA, but the gap between the two groups has not changed. The College may wish to use these figures in development of additional programs or support services.