Skyline College
Chemistry
Program Review
Executive Summary

Short Summary of Findings

The Chemistry program at Skyline College provides students with a full spectrum of chemistry courses, ranging from a non-major general education class to a full two-year General and Organic Chemistry sequence. Courses are taught with content and standards to ensure transferring students the necessary preparation to succeed in upper division science classes. The overall efficiency (faculty load) of our program is high. The program and faculty work closely with the MESA program to help students succeed; however, additional resources and methods to improve student success need to be identified and implemented.

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

- Identify additional resources for student support and tutoring outside of the classroom to improve student success in Chemistry courses. This might include hiring graduate student tutors, offering learning skills supplement courses, and partnering with existing campus learning communities and student support programs.
- Assessment plans need to be developed and implemented for program courses.
- A new full-time faculty member is needed.

Full-Time Faculty Signatures

Alec J. Bates
Professor of Chemistry

Melissa Michelitsch
Associate Professor of Biology & Chemistry

Joaquin Rivera
Professor of Chemistry

Submitted on: March 30, 2011

SKYLINE COLLEGE
PROGRAM REVIEW SELF STUDY

DEPARTMENT of CHEMISTRY

PART A: Mission Effectiveness

Overview

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 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.

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

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

The chemistry program provides courses needed by those students who are preparing for science majors at four-year institutions, careers in allied health fields, and professional schools including medicine, pharmacy, and dentistry.

The department offers Chemistry in Action (CHEM 112) that meets a general education science with laboratory course requirement for non-science majors.

The department offers Introductory Chemistry (CHEM 192) to help prepare students for success in the General Chemistry major's sequence.

The department offers Chemistry for Health Professionals (CHEM 410) to prepare for health professions programs such as Respiratory Therapy and Nursing.

The department offers the 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.

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 across the chemistry curriculum. The relationship with the MESA program 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.

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

Previously, we identified the need for a new full-time faculty member in Chemistry. A hiring committee is currently assembled, and a job announcement posted. Interviews are planned to be held in late April and early May, with the new faculty member starting in the Fall of 2011.

During our previous Program Review, we were greatly in need of new laboratory facilities. Since that time, with significant input of faculty, the design of new laboratories was completed and the Building 7A – housing a new General Chemistry Laboratory, an Organic Chemistry Laboratory and a shared Chemistry / Geology lab has opened. These labs are fully accessible and meet modern laboratory design and safety standards.

We also indicated that it was important to find ways to direct students to the appropriate chemistry classes for their goals and preparation, so that they may complete their sequence of science courses successfully. A variety of methods have been employed, and some progress made; however, further work is still needed. This will be addressed further in subsequent sections of the report.

PART B: Student Learning Programs and Services

Overview

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

   The chemistry program has no advisory boards.

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 (CHEM 410) 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.

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

   - The laboratory manuals in the General Chemistry sequence are edited by faculty and kept up-to date with new revisions approximately every two years. Professors A.J. Bates and Janice McOmber are responsible for the CHEM 210 Laboratory Manual, sold at the Skyline bookstore, and A.J Bates edits and revises the online CHEM 220 manual.

   - Faculty members have incorporated electronic presentations into their lectures and most have a web site to communicate information and practice problems to students. We have incorporated the use of spreadsheet software into the laboratory portions of many our courses for the purpose of data analysis. More faculty are using this option now that computers are available for use in the laboratory.

   - Faculty members attend workshops and conferences to stay current with the latest advances in educational technology, teaching practices and in chemical sciences and education.

- Faculty members employ periodicals and online sources to find resources that will enhance content and instruction in courses.

- Faculty attended a series of meetings at San Francisco State University to determine reasonable pathways for students interested in science education to complete general education and science courses that fulfill the specific requirements of teacher education programs in the sciences.

- Faculty attended a conference for Community College Chemistry instructors hosted by the two-year college branch of the American Chemical Society.

- Faculty attended a district wide Chemistry meeting to discuss curriculum and the use of technology in the chemistry laboratory.

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

   Our program has grown significantly over the last few years, resulting in many more sections of some laboratory courses. Our faculty load has increased which has resulted in a higher student-to-instructor ratio. While efficient for the college, it may not be allowing students as much interaction with their instructors in these courses with a significant focus on problem-solving require.

   Because many courses have multiple laboratory sections, significant coordination among the sections is required. Many members of the faculty work closely to ensure that students receive consistent and quality instruction in their courses.

   Many faculty have reported that a higher proportion of students that are entering the early levels of the majors sequence lack requisite skills in math and basic problem-solving. A variety of methods have been employed to address this issue, including a Learning Skills course as a supplement to General Chemistry 1 (CHEM 210) and a Saturday Math Refresher workshop for CHEM 210 and Chemistry for Health Professions students (CHEM 410).

4. *All courses in this program should be reviewed for currency and 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.*

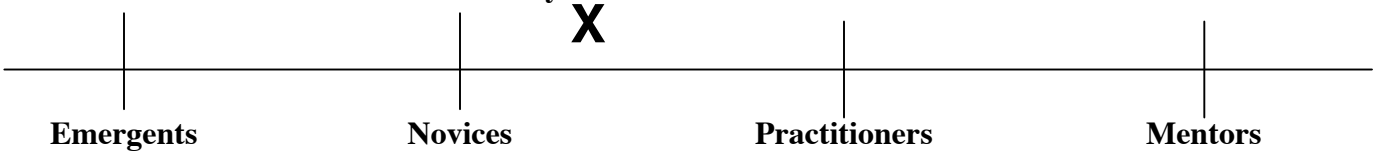
   There are no external regulations with which the chemistry program must comply.

Student Learning Outcomes & Assessment

1. Where on the continuum do you believe your department is on the SLOAC Initiative?

Emergents	Novices	Practitioners	Mentors
• Learning and discovering • Gathering information • Attending workshops	• Beginning a dialogue • Drafting SLOs • Drafting assessment plans • Taking inventory of assessments • Creating instruments for assessment	• Engaging in widespread dialogue • Implementing assessment plans • Refining SLOs • Reviewing outcome data and discussing implications	• Facilitating discussions and generating new dialogue • Conducting workshops • Lending assistance

Mark an X on the continuum and briefly comment.



The work of drafting SLO's and refining them has been completed. This task was coordinated and by A.J. Bates. Significant and ongoing assessment has begun in only one course – CHEM 210.

Assessment plans have not been drafted for other courses.

2. Highlight any major findings and resulting course or program modifications.

Since the last program review, the department has identified various courses and program needs, and has undertaken significant initiatives to improve instruction, better counsel students on the appropriate courses for their educational goals, and prepare students for transfer.

Science Lecture Series

In 2006, A.J. Bates and Tiffany Reardon received a Trustee's grant to begin an Introduction to Research program that would afford our community college students the same opportunity that students at 4-year research institutions have to hear researchers at the forefront of science discuss their experiments, and to become involved in undergraduate research projects. The program began as a 1-unit course in the Fall of 2006, and included lectures by scientists, students, and some laboratory experiences.

The ***Science Lecture Series*** is an ongoing project that grew out of that grant and is an ongoing event at Skyline. In cooperation with the Bridges to Baccalaureate Program at San Francisco State University, and the Skyline MESA Program, the Chemistry Department hosts a lecture series on the Skyline Campus each academic year that brings in speakers from academia, government, and industry to discuss their research and their education. Many of the speakers are women and minorities, and many have followed non-traditional educational paths to get where they are. Undergraduate research opportunities are presented in some talks and in other seminars, and Skyline students who have participated in research projects present their findings and discuss their experiences. Students are encouraged to apply for research internships through the Bridges program and other undergraduate research programs. Chemistry and other science faculty encourage students to attend the lectures, and the MESA director and faculty assist students with their applications to the research internships. Consistently, 50-90 students attend the weekly lectures or presentations.

Discussion Sessions, Learning Skills Course & Math Refresher Workshops

Students entering General Chemistry 1 (CHEM 210) often do not possess the requisite skills for the course. To address this issue, the faculty teaching CHEM 210 do significant review and problem-solving workshops early in the course during lab sessions and outside of class time in order to help struggling students succeed in the course. The goal is to help underprepared students to succeed in the course by helping them learn the basic problem-solving skills needed, while completing the course content of General Chemistry 1 that is required to articulate these courses to the CSU and UC systems and to meet the standards of the American Chemical Society.

A Learning Skills supplement course was developed and implemented by A.J. Bates in Fall 2007 to accompany CHEM 210. While students who actively participated in the course were successful, enrollment was low in the section, and it was not incorporated into the schedule again. It would likely be a worthwhile avenue to explore again, and could help to address the declining success rate. A method for counseling students to enroll in the supplement would need to be explored.

Chemistry for Health Professionals (CHEM 410) is a gateway course to many Allied Health Programs and can be a struggle for many students again due to lack of required math skills. To address this issue in CHEM 210 and CHEM 410, Melissa Michelitsch, along with adjunct faculty and student tutors developed and implemented a one-day math refresher workshop this Spring to address deficiencies in math skills of students entering CHEM 210 and 410. We hope that funding can be identified to make this an ongoing part of the program.

Prerequisites and Course Placement

Prerequisite checking for Chemistry courses is needed to ensure that students have the required Math Skills to succeed in the first-level courses and that students have completed earlier courses in the chemistry courses before signing up for subsequent courses. The Skyline College and Cañada College Chemistry Departments have aligned their prerequisites, and are awaiting action by the College of San Mateo Chemistry Department to allow for electronic prerequisite checking district wide.

In the science majors Chemistry sequence, students are faced with a choice between CHEM 192 – Introductory Chemistry (a preparation course that is highly recommended) and CHEM 210 – General Chemistry 1. In the hope of completing the sequence in less time, many students sign up for CHEM 210, even when their science or math background is not strong. Despite the efforts of faculty to help underprepared students to succeed (as described above), many are still unsuccessful in CHEM 210. The faculty believes a mechanism to better counsel students into the appropriate course is needed. To this end, A.J. Bates, with the assistance of adjunct faculty, piloted an American Chemical Society Placement Exam in CHEM 210 – administered the first week of classes. Student performance on this exam was compared to student success and retention in the course. While their was a correlation between the placement exam score and course success, it was not significant enough to meet the standards the faculty believe would be necessary for a good placement tool. This is still a possibility that the faculty believe might be useful to explore, but with a test developed by our faculty, for use with our students and addressing the skill needs of our courses. Discussions with faculty at other community colleges (including CCSF) indicate that they have had success in using placement exams to counsel students into the course in which they can be most successful.

3. *What additional resources are needed to implement the plan?*

   For the assessment plans, a faculty member need to be identified to coordinate the activities.

   Budgetary resources will be required to continue the learning skills and workshop programs, and the assistance of the Placement Testing Office and Counseling Department may be required to develop an appropriate instrument to counsel students to the best course choice.

PART C: Resources

Faculty and Staff

1. *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.*

   Please see the response above under SLO and Assessment #2.

   Additionally, as also discussed previously in the report, there are ongoing modifications and updates to the General Chemistry Laboratory Manuals to provide a current and meaningful lab experiments to students.

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

   - The new full-time faculty member will attend the district and college orientation meetings.
   - New adjunct faculty meet regularly with A.J. Bates or a senior adjunct faculty member for mentoring in the teaching of course in the Skyline College curriculum. Curriculum materials and resources are provided to assistant in the development of assignments and assessments consistent with the standards of the Chemistry Department. The new full-time faculty member to be hired for Fall 2011 will be oriented in a similar semi-formal mentoring process.
   - Students workers in the Chemistry Stockroom receive extensive on-the-job training in chemical safety and laboratory materials preparation from the laboratory manager, Mousa Ghanma.

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

   The current full-time, tenure track faculty job description and announcement has been posted widely in California by Debbie Carrington in the District Human Resources Department.

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.*

   The Chemistry Department has new, fully accessible laboratory facilities with modern safety features and data acquisition tools and equipment.

   More regular facilities maintenance of leaking fume hood sinks and correction of reduced airflow in the fume hoods is needed for safe operation of the laboratory.

2. *List projected needs.*

   Computer will need to be updated in 1-2 years to be able to run the latest in chemical modeling and data analysis software.

   Up-to-date chemical modeling software is needed.

   For the introduction of Honors or Research components to the Chemistry Program, research equipment such as HPLC, GC-MS, and NMR devices would be required.

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

   The current use of technology includes:

   - Use of Microsoft Powerpoint (or similar) presentations in lectures.
   - Faculty web sites.
   - Use of Microsoft Excel (or similar software) in many laboratory exercises.
   - Use of molecular drawing and modeling software.
   - Computers available for individual student use in the labs (carts with laptops). These are used for data analysis, structure drawing, etc.
   - Infrared Spectrometer (FTIR) is used in the Organic Chemistry Laboratory Courses.
   - Electronic pH meters, modern spectrophotometers, and gas chromatographs are used in the laboratory for data acquisition and analysis of samples.

   The use of technology in the classroom, for out-of-class study, and in the laboratory is comparable to other educational institutions teaching Chemistry.

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. However, partnership with Genentech has resulted in scholarship opportunities for students of science, equipment donations, and program development.

Budget Request

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

   A new full-time faculty member is a strong need for the following reasons:
   - To provide a more consistent, cross-semester experience for students in the chemistry program.
   - To work on program revisions and development.
   - To assist in the administration of department duties, including (but not limited to) coordination of multiple-section courses, assessment of the SLO's, coordinating district Chemistry curriculum, orienting and mentoring adjunct faculty.
   - Assist in the development of research opportunities for students on campus.

   Graduate student (or other post-baccalaureate) tutors assigned to proved tutoring to students in workshops and study groups in coordination with faculty in specific Chemistry courses, particularly General Chemistry 1.

   Updated computer equipment and software will be needed in 1-2 years.

   Analytical research equipment will be needed to develop research opportunities for students.

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

   The three campuses could share some chemistry research instruments. However, this would be a challenge to coordinate for both students and faculty traveling to multiple locations. Some equipment can be shared between biology and chemistry and chemistry and physics.

PART D: Leadership and Governance

1. *What leadership roles do the faculty and staff of your program hold in the college?*

   A.J. Bates is the faculty sponsor for the Gay-Straight Alliance and coordinates the Science Lecture Series on the Skyline campus.

2. *How do the faculty and staff in your program participate in the governance processes of the college/district?*

   Joaquin Rivera is the Chief Negotiaor and member of the Executive Committee of the San Mateo Community College Federation of Teachers, AFT Local 1493, AFL-CIO.

3. *How do the faculty and staff in your program exercise initiative/leadership in improving practices and services related to the program?*

   Please see the response above under SLO and Assessment #2.

PART E: Action Plan

1. *Describe the program's plan for addressing areas of improvement.*

- Hire a new full-time faculty member.
- Develop an SLO assessment plan.
- Develop or reinstate tutoring and assistance options for students in the Chemistry Program.
- Identify methods for better counseling students into the appropriate Chemistry courses for their educational goals.
- Better coordinate courses with multiple sections.
- Achieve a higher level of faculty engagement in departmental activities and responsibilities.

Skyline College Program Review – CHEMISTRY Department
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	2007	2008	2009
WSCH	2,827	3,112	4,302

Please comment on program enrollment and expected trends.

The number of course sections offered in our department and the corresponding enrollment in our department classes has been increasing since the opening of our new laboratory annex in the Spring of 2007. We still have room for a small amount of growth, but will be limited eventually be limited by lab availability.

FTE and WSCH/FTE (LOAD)

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

Year	2007	2008	2009
FTE	4.15	4.76	6.12
WSCH/FTE	682	654	703

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

The Chemistry Department is very efficient. For the three semesters reported above, our average load was 680 vs. 595 for the college (14% above the college wide value). Though there was a dip in the Fall of 2008 for chemistry load, looking over more semesters (back to Fall 2005), there is an overall upward trend.

Retention and Success

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

Year	2007	2008	2009
Retention	77	73	69
Success	66	63	57

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.

There is a decline in both the retention and success rates in Chemistry. A specific cause has not been identified, but this does correspond to two additional trends seen above. The overall enrollment has increased and the faculty load has increased. There are more students taking chemistry, and faculty to student ratio has decreased (based on load), meaning that faculty have less per-student time in lecture and lab.

Additionally, there are only two full-time faculty members in the Chemistry Department, and a Biotechnology faculty member who teaches part-time in chemistry. With release time for one of the full-time faculty members for union activities, approximately 2 FTE are covered by full-time faculty in a semster. In the Fall of 2009, this would have accounted for only ~ 1/3 of the FTE for the department. While we have many excellent adjunct faculty, additional consistency in the courses could be achieved with an additional full-time faculty member.

The chemistry faculty are dedicated to improving success rates in chemistry. The department has a close relationship with MESA (Math, Engineering, Science Achievement), and has helped to develop workshops and tutoring with the program. Additionally, we have tried learning skills courses to accompany General Chemistry 1 (taught by Prof. A.J. Bates) and more recently, a one-day Saturday workshop as a Math Refresher for General Chemistry 1 & Chemistry for Health Professions students.

This topic is further addressed in the self-study document.

Chemistry Program Review – Data Analysis

Addendum 1: Analysis of student enrollment and success by ethnicity and gender.

Table 1: Analysis of student success in Chemistry courses (percent).

	2007-2008	2008-2009	2009-2010
African American	57	45	75
Asian	64	64	64
Filipino	51	63	56
Hispanic	60	53	48
White	60	60	60
Female	67	61	60
Male	55	55	59

Table 2: Analysis of student success in the all Skyline College courses (percent).

	2007-2008	2008-2009	2009-2010
African American	51	50	51
Asian	69	71	73
Filipino	62	63	65
Hispanic	59	62	64
White	72	74	73
Female	67	68	69
Male	64	66	68

Table 3: Enrollment – 5 year average: Fall 2005 - Spring 2010.

Ethnicity / Gender	Percent of Enrollment In Chemistry	Percent of Enrollment College wide
African American	2	4
Asian	33	27
Filipino	26	18
Hispanic	12	18
White	16	20
Female	56	52
Male	42	45

DISCUSSION:

In comparing the success rates of students in Chemistry in the Fall of 2007, 2008, and 2009, there is a downward trend in student success rates overall in the Chemistry program. In comparing success rates among ethnicities, the most significant drop in success rates is among Hispanic students in Chemistry (Table 1). However, over the same time period, the success rates in Hispanic students college-wide has improved. The Chemistry program already works closely with the MESA program to engage students in tutoring and workshops to build problem-solving skills and improve course success. It may be necessary to make sure that Hispanic students are fully aware of the opportunities available in MESA and the Learning center, and assist them in getting help early in their courses when it is needed.

(continued)

DISCUSSION *(continued)*:

African American students have a higher success rate in Chemistry than is observed college-wide when averaged over the three semesters. However, this is based on a small sample size. Only 2% of the total chemistry enrollment is African American, while it is 4% college-wide (averaged over 5 academic years – see Table 3). When considering the enrollment of Hispanic students over the same time period, it is also low at 12%, compared to the college average at 18%. Additional recruitment of African American and Hispanic students is needed. Outreach to learning communities already in place could help to increase enrollment of underrepresented groups.

In comparing success rates by gender, in 2007 there was a wide gap between the success rate in female students (67%) to male students (55%). That gap has narrowed significantly with the Fall 2009 success rate at 60% for female students and 59% for male students. While the Chemistry success rate for both group is lower, females and males have similar success rates to one another overall in the college as well. In comparing enrollment by gender, the enrollment ratio of females to males in Chemistry is slightly higher than the college average.

Program Review
Course Outline & Prerequisite Checklist

Discipline: CHEMISTRY Semester: Spring 2011

ALL COURSE OUTLINES MUST BE REVIEWED AND UPDATED DURING PROGRAM REVIEW!

If there are no changes made to the course outline, use the Program Review date to update the course outline***. Please note that all course outlines must now include the title of a representational text with its publication or revision date*** **and follow the current Title V format**. Refer to *Guidelines for Preparing a Course Outlines* for further assistance.

If it is determined that a course outline needs ***substantial modification***, you must complete and submit ***Form D – Course Modification*** to the Curriculum Committee for approval well **in advance** of your Program Review due date. Please check with your Curriculum Committee representative or go to the Curriculum Committee web site for a list of meeting dates, submission deadlines, instructions and curriculum forms to update (or modify) a course outline. (http://www.smccd.net/accounts/skycurr/).

List all the courses in your ***discipline*** on the attached form. Complete the columns on the form for each course in your discipline using the instructions below:

Column 1: What is the course prefix and number?

Column 2: What is the course title?

Column 3: What date was the course outline last reviewed or updated?

Column 4: If this course transfers to either CSU **or** CSU *and* UC, place a check mark in the appropriate column.

Column 5: If this course satisfies a GE (General Education) requirement, place a check mark in the column.

Column 6: Please list all course prerequisites, corequisites, and/or recommendations.

Column 7: Please indicate that the course prerequisites, corequisites, and/or recommendations have been reviewed and validated by faculty by placing a check mark in the column.

Column 8: Does the course have SLOs on the official course outline of record?

Column 9: Does the course have assessment plans?

Column 10: Has the course implemented their assessment plans?

Column 11: When did the department review results from implementation of the assessment plan?

Upon submission of your Program Review materials, all course outlines should have the current date in the upper right corner. Please submit a hard copy of **each** outline from your **discipline** listed on the form with your *Program Review* materials. Additionally, all course outline ***files*** should be e-mailed to the Instruction Office in care of Maria Norris (norris@smccd.net).

Please have the faculty and division dean sign and date the certification on the last page.

COURSE OUTLINE, PREREQUISITE, & STUDENT LEARNING OUTCOMES CHECKLIST

1	2	3	4		5	6	7	8	9	10	11
Prefix & Number	Title	Review Date	Transfer		G.E.	Prerequisites, Corequisites, Recommendations	Validated	SLOs	Assessment Plans	Implementation	Reviewed
			CSU	UC & CSU							
CHEM 112	Chemistry in Action	3/30/11	X	X	X	No Prerequisite	N/A	X	pending	pending	pending
CHEM 192	Elem. Chemistry	3/30/11	X	X		Satisfactory Completion (grade "C" or better) of MATH 110 Rec. Eligibility for ENG 836	X	X	pending	pending	pending
CHEM 210	General Chemistry I	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) of MATH 120 Recommendation: CHEM 192	X	X	Partially Developed	In progress	In progress
CHEM 220	General Chemistry II	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) of CHEM 210	X	X	pending	pending	pending
CHEM 234	Organic Chemistry I	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) of CHEM 220	X	X	pending	pending	pending
CHEM 235	Organic Chemistry II	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) of CHEM 234	X	X	pending	pending	pending
CHEM 237	Organic Chemistry Laboratory I	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) or concurrent enrollment in CHEM 234	X	X	pending	pending	pending
CHEM 238	Organic Chemistry Laboratory II	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) or concurrent enrollment in CHEM 235	X	X	pending	pending	pending
CHEM 410	Chemistry for Health Science	3/30/11	X	X	X	Satisfactory Completion (grade "C" or better) of MATH 110 Rec. Eligibility for ENG 836	X	X	pending	pending	pending

Skyline College Program Review
Certification of Course Outline & Prerequisite Review

Faculty Signatures

Alec J. Bates

Melissa Michelitsch

Joaquin Rivera

Date Submitted: *March 30, 2011*

Division Dean: _____
Raymond Hernandez

Skyline COLLEGE

MAPPING INSTRUCTIONAL COURSE LEVEL SLOS WITH INSTITUTIONAL SLOS (*FRAMEWORK*, 33-34)

An institutional student learning outcome is a knowledge, skill, ability, and/or attitude that students should attain by the end of their college experience. Here at Skyline, students who complete the GE requirements or receive an AA or AS degree should have mastered the following institutional SLOs: critical thinking, effective communication, citizenship, information and computer technology literacy, and lifelong wellness.

Mapping course-level SLOs with institutional SLOs enables you to identify which courses within your program may be contributing to student achievement of these outcomes, even though your program's approach may differ from others'. Conversely, mapping gives us the means to determine whether our institutional SLOs reflect our priorities as instructors.

Now that Skyline has defined its institutional outcomes, input the names of the key courses in your program (i.e., courses in a prerequisite sequence, heavily enrolled courses, GE courses, etc.) and determine whether achieving those institutional outcomes are: (c) central to a course or (s) supported by the course. An SLO is "central" if it is essential to the course's intent and therefore an instructional priority, and it is "supported" if addressed but not quite at the level of importance as a "central" SLO. Leave the space blank if the institutional SLO does not apply.

This same process can be employed for programs, such as Student Services Programs, that don't have courses. But instead, map your program outcomes to the institutional outcomes.

Skyline College Institutional Outcomes **Key: (C) central to a course, (S) supported by a course, (blank) does not apply**		**CHEM 112 Chemistry for Non-science Majors**	**CHEM 192 Introductory Chemistry**	**CHEM 210 / 220 General Chemistry for Science Majors**	**CHEM 234/235/237/238 Organic Chemistry for Science Majors**	**CHEM 410 Chemistry for Health Professions Majors**
Critical Thinking:	Raise vital questions, formulate responses (or solutions) to problems, evaluate the reasonableness of a solution and provide a justification.	S	S	C	C	S
	Analyze and compose arguments; assess the validity or strength or an argument using appropriate deductive and inductive techniques.	S	S	C	C	S
	Think creatively and open mindedly within alternative systems of thought; communicate, either artistically, graphically, symbolically, or verbally, a complete and clear solution to a given problem.	C	C	C	C	C
	Make effective use of evidence in an argument; evaluate the truth or value of the premises using reliable sources of information.	C	C	C	C	C
	Demonstrate understanding of diverse disciplinary perspectives and use appropriate inquiry, including the scientific method.	C	C	C	C	C
	Analyze multiple representations of quantitative information, including graphical, formulaic, numerical, and verbal.	C	C	C	C	C
Effective Communication:	Comprehend, analyze, and respond appropriately to oral, written, and visual information.	S	S	C	C	S
	Effectively express ideas through speaking and writing.	S	C	C	C	C

Citizenship:	Demonstrate scientific literacy concerning a range of global issues;	C	C	C	C	C
	Articulate similarities and contrasts among cultures, demonstrating knowledge of and sensitivity to various cultural values and issues.					
	Develop attitudes central to lifelong learning: openness, flexibility, intellectual curiosity, and a broad perspective that values diversity of thought.	C	S	C	C	S
	Demonstrate appropriate social skills in group settings, listening and being receptive to others' ideas and feelings, effectively contributing ideas, and demonstrating leadership by motivating others.			S	S	
	Demonstrate commitment to active citizenship.	S		S	S	S
Information and Computer Technology Literacy:	Effectively locate and access information in numerous formats using a variety of appropriate search tools.	S	S	C	C	S
	Use computer technology to organize, manage, integrate, synthesize, create, and communicate information and ideas in order to solve problems and function effectively in an information society.	S	S	C	C	S
Information and Computer Technology Literacy:	Evaluate the relevance, quality, and credibility of a wide variety of information sources using critical thinking and problem solving skills.	S	C	C	C	S
Lifelong Wellness:	Demonstrate an understanding of physical fitness and its role in lifelong wellness.					
	Take personal responsibility for identifying academic and psycho-social needs, determining resources, and accessing appropriate services.		S	S	S	

Program Review - Resource Needs Summary Table

Program: CHEMISTRY

	Needs	Notes
Personnel	1. New full-time faculty member 2. Graduate student tutors	
Equipment	1. New laptop computers for data analysis and molecular modeling. 2. Gas Chromatograph / Mass Spectrometer 3. High Performance Liquid Chromaatography 4. Instructional Nuclear Magnetic Resonance Device	Number 1 will be a need in 1-2 years. Numbers 2-3 are a needed for the purposes of offering students in-house research opportunities (CHEM 690)
Facilities	1. Regular fume hood maintenance for proper airflow regulation and to fix leaking water pipes that feed sinks.	Current laboratories are up-to-date.

Appendix D
Skyline College - Evaluation of the Program Review Process

To improve the Program Review process your help and suggestions are instrumental. We ask that all parties responsible for preparation of this review have input into the evaluation. After completion of the Program Review process, please take a few moments to complete and return this evaluation to the chair of the Curriculum Committee.

Estimate the total number of hours to complete your Program Review: 40

This reflects the time required finalizing updates to the course outlines, final communication with members of the department in assembling the final report, interpretation of data, the writing of the review documents, and other associated tasks. Significant additional time has been dedicated to the writing of the course SLO's, revisions and updates to the course outlines to bring in line with the current format, departmental meetings, and any other activities that are related to this process and are ongoing.

1. Was the time frame for completion of Program Review adequate? If not, explain.

Yes

2. Was the instrument clear and understandable? Was it easy to use? If not, explain and offer suggestions for improvement.

Yes

3. Were the questions relevant? If not, please explain and offer suggestions.

Yes

4. Did you find the Program Review process to have value? If not, please explain and offer suggestions.

Yes

5. Was the data you received from administration complete and presented in a clear format? Would you like additional data?

Success rates by course would be useful information to provide and would be helpful in the analysis of changes to be made in a program.

6. Please offer any comments that could improve and/or streamline Program Review.

N/A

Appendix E
Skyline College

Program Review Completion Check off Sheet

Before submitting your self-study report, please make sure that all forms are submitted by using the checklist below:

		Checked if Completed
1.	Executive Summary	
2.	Program Review Self-Study	
3.	Data Report Sheets: Worksheet for Enrollment, Performance, and WSCH/FTE	
4.	Course Outline, Prerequisite and Student Learning Outcomes Checklist	
5.	Mapping Instructional or Course Level SLOs with Institutional SLOs	
6.	Needs Summary Form	
7.	Evaluation of the Program Review Process (Appendix D)	
8.	Response Sheet (Appendix C)	