

CHEMISTRY PROGRAM REVIEW

2014-2015

TABLE OF CONTENTS

Self-Study	1
1.1 Introduction.....	1
1.2 Relationship to College Mission and Strategic Goals.....	3
1.3 Enrollment.....	7
1.4 Population Served	10
1.5 Status of Progress toward Goals and Recommendations.....	14
1.6 Future Outlook	17
Curriculum Development, Assessment, and Outcomes	18
2.1 Program Level Outcomes.....	18
2.2 Course Support of PLO	19
2.3 PLO Assessment Results	19
2.4 Changes from PLO Assessment	22
2.5 Current Status of SLOs	22
2.6 Review of SLOs	22
2.7 Changes from SLO Assessments	23
2.8 Course Offerings	24
2.9 Fill rates/Class size.....	28
2.10 Course sequencing.....	30
2.11 Basic Skills	31
2.12 Student Survey	31
2.13 Four-year articulation.....	32
2.14 High school articulation	32
2.15 Distance Education.....	33
2.16 Advisory Boards/Licensing (CTE).....	34
Student Equity & Success	34
3.1 Course Completion and Retention	34
3.2 Degrees/Certificates Awarded.....	43
3.3 Transfer.....	45
3.4 Career Technical Programs.....	46
Program Resources	47
4.1 Human Resources.....	47
4.2 Current Staffing.....	47
4.3 Equipment	48
4.4 Facilities.....	48
4.5 Budget/Fiscal Profile.....	49
Programmatic Goals & Planning	49
5.1 Program Strengths.....	49
5.2 Program Goals.....	51
Signature page	54

SELF-STUDY

1.1 Introduction. Introduce the program. Include the program’s catalogue description, its mission, the degrees and certificates offered, and a brief history of the program. Include the number and names of full- time faculty, adjunct faculty, and classified staff. Discuss any recent changes to the program or degrees.

As stated in the college catalog: “*This program is designed to foster an understanding of the fundamental principles of Chemistry in a variety of applications. Students will learn how chemical knowledge is derived, theorized, and applied in solving problems in everyday life.*” The Chemistry program continues to serve transfer and allied health students.

The Associate in Science Degree can be obtained by completing 60 units including the major, general education requirements and elective courses.

REQUIRED COURSES	Units
CHEM 001 General Chemistry	5
AND	
CHEM 002 General Chemistry	5
CHEM 003 Organic Chemistry I.....	5
AND	
CHEM 004 Organic Chemistry II.....	5
BIO (any course except 048 or 098).....	3 - 5
PHYS 002 General Physics (Non-calculus).....	5
OR	
PHYS 006 Physics for Science and Engineering.....	5
OR	
PHYS 010 Descriptive Physics	3
Total Units	26 – 30

Currently, there are no certificates nor do we offer an AS-T (Associates in Science for Transfer) for Chemistry although faculty will continue to research and discuss the possibility of offering an AS-T.

The Chemistry Department has been part of the college since its inception. In 1990, there were two full time Chemistry faculty. This has grown to a total of six full time faculty for the academic year 2014-2015. The Chemistry Department full-time faculty are: John Higashi, Maria Santiago, Christine Ducoing (retired May 2015), Charles Spillner, Kiran Kaur, Kathy Conrad and Oanh Lam. The department has 16 adjunct faculty: Victor Asemota, Damian Arnaiz, Sam Balsley, Vasfi Basaran, Daniel Calef, Vahid Eskandari, Patrick Grant, Volodymyr Gelfand, Poupak Khazaeli Parsa, George Kulasingam, Wayne Hawkes, Robert Montanez, Neeta Sharma, Mani Subramanian, and Dmitry Yandulov. The Chemistry department has one full time lab technician, Christy Green, on the Fairfield campus. The centers have full time lab technicians sharing duties with other lab sciences. The Vacaville Campus technician is Chris Kucala and the Vallejo Campus technician is Irene Camins.

The Chemistry Department has several guidelines for its students that it uses when evaluating and making changes to the Chemistry classes and program.

1) We desire our students to complete lower division Chemistry requirements for many majors.

One of the biggest challenges to be faced by the Chemistry Department is meeting the demand for our courses while maintaining a high standard of quality teaching and learning. General Chemistry (CHEM 001 & 002) and Organic Chemistry (CHEM 003 & 004) classes often fill within the first few days of registration with many other students desperate to be added resulting in long waiting lists kept by individual instructors. A great deal of time and effort is invested each semester in revising the schedule of Chemistry classes, trying to maximize our resources – instructors, facilities, equipment and budgets.

Since Fall 2009 the full year course in Organic Chemistry (CHEM 003 & 004) has been offered on a dual track, Fall CHEM 003/Spring CHEM 004 and Spring CHEM 003/Fall CHEM 004. Ultimately, CHEM 003 & 004 will be offered at the centers contingent upon designing and equipping labs suitable for Organic Chemistry experiments. At this time, we have no plans to offer Organic Chemistry in the summer.

In Summer 2013 the second semester of General Chemistry, CHEM 002, was offered for the first time at a satellite campus, the Vacaville Center. The course filled immediately illustrating the need for the course offering. In order to meet the needs of the students that could not enroll the Chemistry faculty opened a second section at the Fairfield campus.

In Spring 2010 the Chemistry Department offered a combined General, Organic and BioChemistry course for pre-nursing majors and other allied health majors (CHEM 051). It articulates to CSU and many private four year colleges and universities. This course is offered for those students seeking a four year (bachelors) degree and enables them to complete their Chemistry requirement in just 1 semester rather than 2 semesters. As the trend in health care turns to requiring more nurses with BSN degrees, this course will increase in demand than the current one semester course, CHEM 010, for the ASN degree and the sequence of CHEM 010 and CHEM 011 for the BSN degree. Presently this course is offered only Fall and Spring semesters, but beginning 2015 it will be also be offered during the Summer session.

2) We desire our students to have experience with laboratory equipment comparable to or better than other California Community Colleges and transfer institutions.

We have been able to offer our students high quality laboratory training. Computer workstations with interface hardware and software (Vernier LabPro/LoggerPro) allow students to collect and analyze data. Simulation programs familiarize students with equipment they will encounter in their upper division courses. In order to maintain this level of training we must continually update and replace computers, equipment and software. This requires expanding the Chemistry budget.

New science buildings have been approved for the Fairfield and Vacaville campuses and the Chemistry faculty members must be involved in the planning, designing and equipping of these facilities.

3) We desire our students to succeed in subsequent classes at Solano Community College, transfer institutions and in employment.

Many Chemistry classes (CHEM 010, CHEM 001 and CHEM 002) serve as prerequisites for courses in other departments (Nursing, Biology, Physics, Engineering, Biotechnology, etc.). Therefore, we play a supporting role for several programs at Solano College. Recently, the one semester course in General, Organic and BioChemistry (CHEM 051) has been approved for transfer to CSU nursing programs. We are continuing to monitor enrollment in this class and increase sections for CHEM 051 as demand dictates.

4) *We desire our students to obtain transfer classes for students with non-science backgrounds and goals.*

Introductory Chemistry (CHEM 160) serves as the entry point for many students into the sciences. Upon completion of this course, students can follow two pathways, one for science majors (CHEM 001, 002, 003, and 004) and one for Allied Health (CHEM 010 & 011 or CHEM 051).

5) *We desire our students to determine the value of the scientific information they encounter in everyday life.*

Members of the Chemistry Department have attended workshops on Chemistry and Art as well as Food Chemistry. We have also hired a new faculty member with a strong background in Food Science. We hope to develop courses that incorporate everyday life experiences with the study of science. To this end, the faculty continually researches the need for Non-Major Chemistry courses such as Food Chemistry, Chemistry and Art, Environmental Chemistry, Forensic Chemistry, and Chemistry for Poets (a Chemistry class specifically designed for liberal arts majors).

To help achieve the above goals and meet the demands for all of our current courses and new courses without sacrificing quality teaching and learning, the number of full time faculty needs to be maintained and expanded as the program grows. The Chemistry faculty was expanded from 5 to 6 members in the Spring of 2014, but we anticipate the retirement of one or two members in the next few years. It is crucial that we replace these members and grow to become a seven member department. The quality of our adjunct pool is always a concern and we are committed to keeping our standards high.

***1.2 Relationship to College Mission and Strategic Goals.* Describe the program's relationship to the overall mission of the college: "Solano Community College educates an ethnically and academically diverse student population drawn from our local communities and beyond. We are committed to help our students to achieve their educational, professional and personal goals centered on thoughtful curricula in basic skills education, workforce development and training, and transfer level education. The College accomplishes this three-fold mission through its dedicated teaching, innovative programs, broad curricula, and services that are responsive to the complex needs of all students."**

The Chemistry Department supports the college's mission by offering a varied and rigorous program of Chemistry courses that are required for many Science, Technology, Engineering, Math (STEM) majors and transfer to most 4-year institutions. In addition, the department offers several courses that are prerequisites for programs that have certificates such as biotech and nursing. To help students succeed, the department offers a basic, high school level Chemistry course (CHEM 160) to prepare students for further study in Chemistry or other STEM major classes.

Using the matrix provided in Table 1, describe which of SCC's Strategic Directions and Goals the program supports. Address only the goals relevant to the program. *Limit evidence to one paragraph per objective.*

Table 1. SCC's Strategic Directions and Goals

Goal 1: Foster Excellence in Learning	Program Evidence
<p>Obj. 1.1 Create an environment that is conducive to student learning.</p>	<p>Chemistry faculty use smart lab rooms and smart lecture rooms.</p> <p>Our Chemistry lab computers have Chemistry tutorials and electronic data gathering software with equipment probes for students' use.</p> <p>Instruments such as UV/Vis and IR spectrometers provide students with real life hands-on experience in data collection.</p> <p>Many of our Chemistry professors assign online homework and/or quizzes; many also have websites for students' access to class materials.</p> <p>Chemical demonstrations and models are regularly used as a teaching tool.</p> <p>Textbooks are placed on reserve in the library on the main campus.</p>
<p>Obj. 1.2 Create an environment that supports quality teaching.</p>	<p>We have expanded the number of full time Chemistry faculty, which enables the department to offer more sections taught by full time faculty.</p> <p>Faculty have worked cooperatively to obtain funding and have been awarded several grants for instructional and lab equipment.</p> <p>Faculty has started to use i-Clickers to improve student interaction and participation during lectures.</p> <p>Faculty continues to strive to improve our lab program by constantly re-evaluating the safety, efficiency and instructional needs of the Chemistry lab program.</p>
<p>Obj. 1.3 Optimize student performance on Institutional Core Competencies</p>	<p>Through the various assessments on exams and in the labs our Chemistry students in CHEM 001, 002, 003 and 004 have demonstrated competence in the following Institutional Core Competencies, ICC (previously Institutional Learning Outcomes). The most common ILO's measured were:</p> <ul style="list-style-type: none">I. CommunicationII. Critical Thinking and Information Competency

Goal 2: Maximize Student Access & Success	Program Evidence
<p>Obj. 2.1 Identify and provide appropriate support for underprepared students</p>	<p>CHEM 160 Introductory Chemistry is offered for students with little or no Chemistry background.</p> <p>Embedded tutors in CHEM 160, open labs and drop-in tutoring are intended to help these underprepared students succeed.</p> <p>Smart lab rooms, student computers with tutorials and electronic data gathering software and equipment probes are used to enhance student learning.</p> <p>In addition to traditional methods of instruction, online homework and links to helpful websites allows students' access to class materials outside the classroom giving them extra interactive practice of concepts and problems. This allows them to work at their own pace.</p>
<p>Obj. 2.2 Update and strengthen career/technical curricula</p>	<p>Chemistry offers courses, such as Chemistry 010, 011 and 051, which prepare students for several health sciences programs and biotechnology. The Chemistry faculty participate on an interdisciplinary faculty committee (biology and nursing) to integrate relevant material into the curriculum.</p>
<p>Obj. 2.3 Identify and provide appropriate support for transfer students</p>	<p>We have identified the need for continuous update of and additions to our instructional laboratory equipment.</p> <p>Our faculty regularly request funding to update our instructional lab equipment and add to the instrumentation used in our labs.</p> <p>Our faculty strongly encourage students to apply for internships.</p> <p>Our faculty write many letters of recommendation in support of our students' admission to university and graduate programs and internships.</p> <p>Many of the Chemistry faculty use online homework and clickers in their courses to improve learning. Faculty will be discussing changes to the AS degree and the ADT degree requirements.</p>

<p>Obj. 2.4 Improve student access to college facilities and services to students</p>	<p>Chemistry courses are offered at both centers in addition to the main campus.</p> <p>We have applied for funding for open labs, which our students use to do computer tutorials and group work.</p> <p>There is drop-in tutoring at the Academic Success Center for all of our Chemistry students.</p> <p>Chemistry plans to have a student learning center in the new science building in Fairfield. This center should include computers and reliable internet access in addition to our computer tutorial programs.</p>
<p>Obj. 2.5 Develop and implement an effective Enrollment Management Plan</p>	<p>Our role as full time Chemistry faculty is to continue to expand our course offerings and schedule courses at times needed by our students, as most of the Chemistry courses are impacted. Careful attention should be paid to maintain the ratio of full time to adjunct faculty teaching courses where the majority of classes are taught by full-time faculty.</p>
<p>Goal 3: Strengthen Community Connections Program Evidence</p>	
<p>Obj. 3.1 Respond to community needs</p>	<p>Our program is geared to support students who desire a career in one of the STEM majors, health sciences, or biotechnology fields. Faculty also participate in career fairs and other outreach programs for Solano Community College.</p>
<p>Obj. 3.2 Expand ties to the community</p>	<p>The Chemistry department supports and attends community events and encourages field trips to local businesses, industries, and local hospitals such as Jelly Belly, Vallejo and Vacaville water treatment plants, North Bay Hospital medical lab and Sacramento Aeronautics Museum. This not only demonstrates our students' applications of their education, but also demonstrates to the community the high quality of our students and our programs.</p>
<p>Goal 4: Optimize Resources Program Evidence</p>	
<p>Obj. 4.1 Develop and manage resources to support institutional effectiveness</p>	<p>The department has a full time Chemistry laboratory technician at the main campus and Chemistry/biology lab technicians in Vacaville and Vallejo. However, with expansion of the Chemistry program, the full-time lab technician at the main campus should be expanded to 1.5. We have also demonstrated the need for an IT support person for maintenance and upgrades of lab computers. However, this position remains unfilled.</p>

Obj. 4.2
Maximize organization
efficiency and effectiveness

Chemistry works with the other science departments in our division, as well as with nursing and biotechnology, to enhance organizational effectiveness. We continuously assess the use of laboratory space to improve the efficiency of the lab program. It is essential that classroom space for lectures be maintained in close proximity to the laboratories to allow faculty easy access to resources and materials stored in the laboratory (models and other demonstration materials), and to provide a quick and efficient transition from lecture to laboratory for both faculty and students.

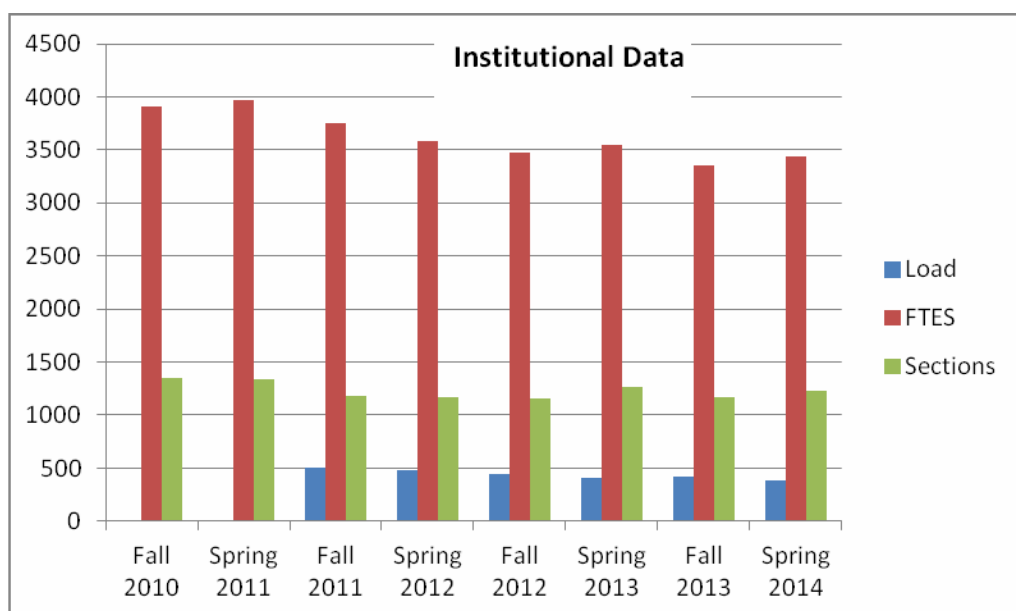
Obj. 4.3
Maintain up-to-date
technology to support the
curriculum and business
functions.

We keep our technology up-to-date in smart classrooms and lab rooms. We also keep our lab technology and instrumentation on our improvement lists, requesting Instructional Equipment funds and Strategic Proposals.

1.3 Enrollment. Utilizing data from Institutional Research and Planning, analyze enrollment data. Include the number of sections offered, the full-time equivalent enrollment (FTES) for each semester since the last program review cycle, and the number of declared degree seekers in the program. Compare the enrollment pattern to that of the college as a whole, and explain some of the possible causal reasons for any identified trends.

Academic year 2013-2014 has the greatest number of sections ever offered by Chemistry, as well as the greatest FTES and WSCH. The lower years were a result of cancelled sections due to budget constraints. Summer 2012 was cancelled by the Administration, again due to budget constraints.

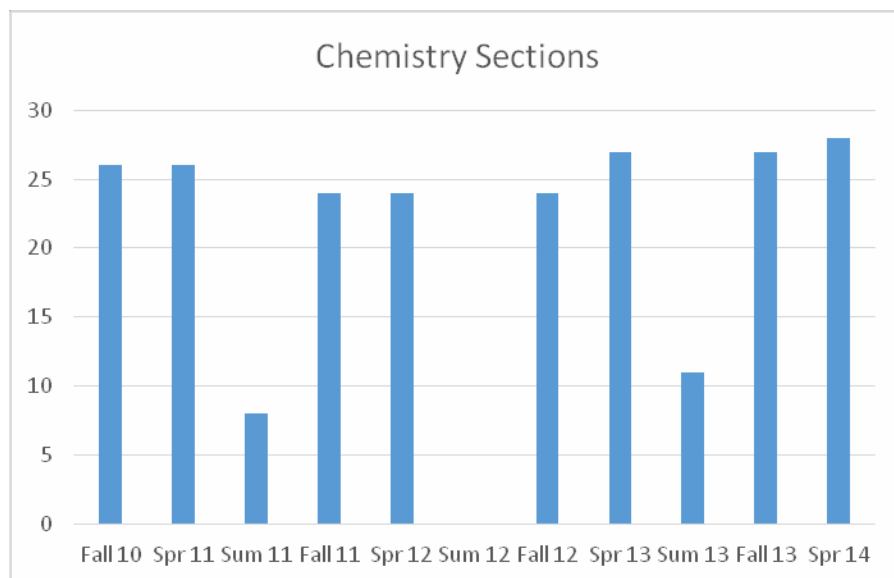
Institutional Data:



From the above graph, the trend is generally a decrease in Load, FTES and Number of Sections for the entire college.

Chemistry – Number of sections offered

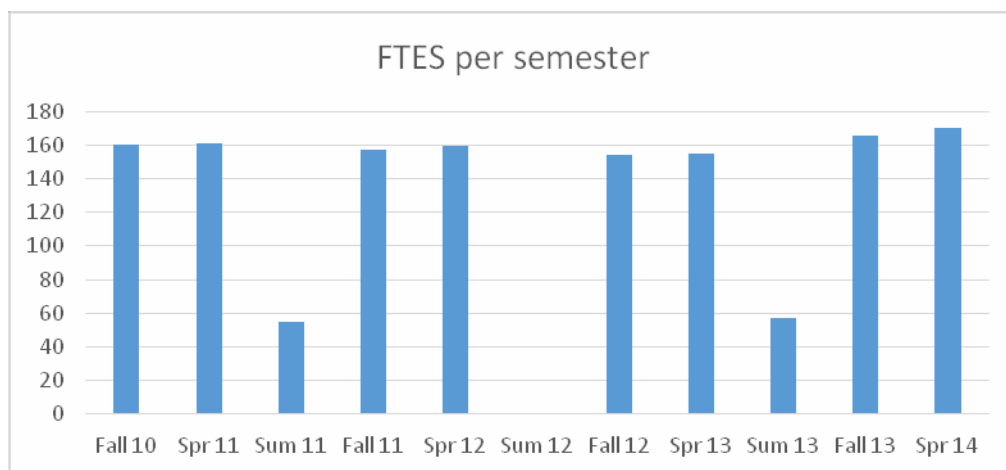
Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
26	26	8	24	24	0**	24	27	11	27	28



The number of Chemistry sections has actually increased since Fall of 2012 as opposed to the college which has generally decreased in number of sections.

Chemistry – FTES per semester

Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
160.0	161.0	55.0	156.9	159.2	0**	154.2	154.7	57.3	165.9	170.2



Comparison to College and Cause: Number of sections and FTES of Chemistry courses offered continue to increase even as other departments within the college have shown a decline in the number of sections offered. Chemistry is a fundamental course for most science and engineering major programs. As the college continues to promote STEM majors and the demand for allied health and biotechnology careers continue to grow, the demand for Chemistry courses will also continue to grow.

Chemistry – Load per semester

The average faculty load for the Chemistry department tends to be lower than that for the college due to the safety constraints which limits the maximum number of students allowed in the laboratory. This is true for any laboratory science class.

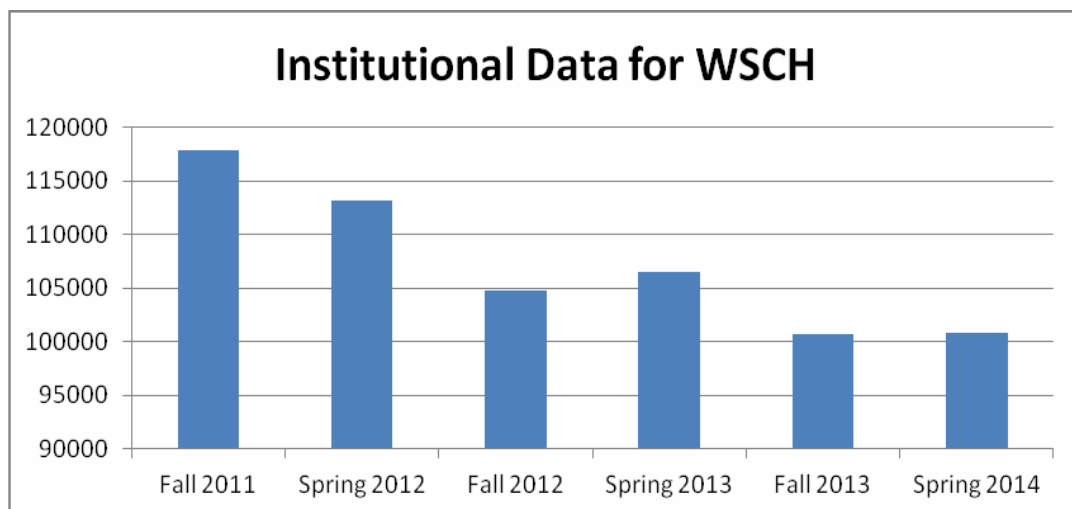
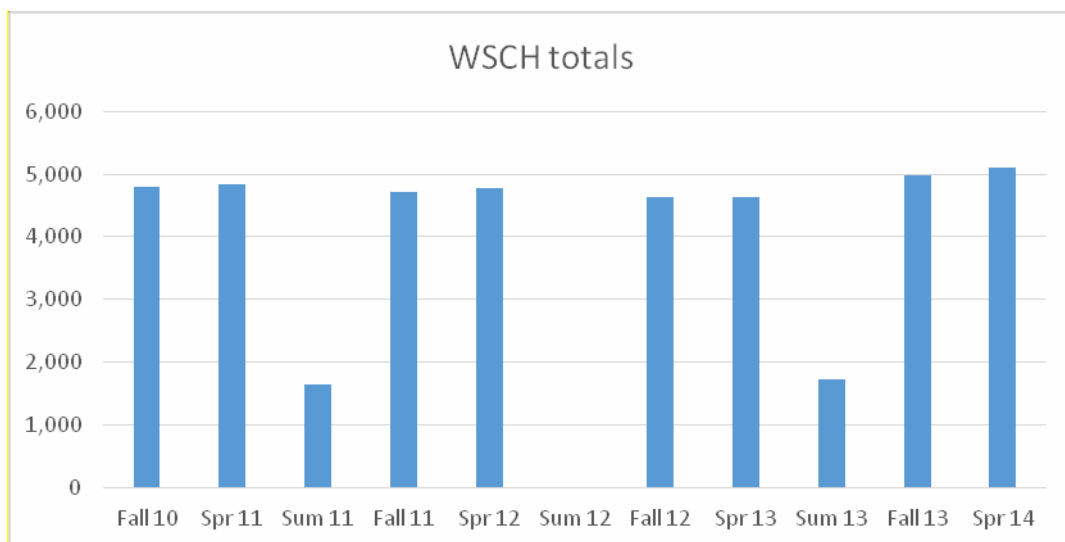
Number of Students Declared Chemistry as Major*

Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
113	126	78	107	111	0	99	104	62	103	118

*Note: These numbers appear exceptionally high compared to what is generally known to the Chemistry instructors. For example, most of the full-time faculty give a survey to their students the first day of class and one of the questions asks them to state their major. Usually, there are only 1 or 2 Chemistry majors (if any) in a course. It is likely that many of these declared Chemistry majors are not very far along in their academic program and will often change their major as they take more courses.

Chemistry – WSCH totals

Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
4,801	4,831	1,650	4,706	4,775	0**	4,626	4,641	1,719	4,978	5,106



Comparison to College and Cause: Again, as the demand for Chemistry courses continues to increase, the number of WSCH will continue to increase. As you can see, the WSCH for the college has decreased since the Fall of 2011, however the WSCH for the Chemistry department has remained fairly constant.

****Summer 2012 was cancelled by the Administration.**

1.4 Population Served. Utilizing data obtained from Institutional Research and Planning, analyze the population served by the program (gender, age, and ethnicity) and discuss any trends in enrollment since the last program review. Explain possible causal reasons for these trends, and discuss any actions taken by the program to recruit underrepresented groups.

Chemistry – % Enrollment by Student Type

	Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
Continuing	78%	83%	78%	81%	89%	0**	78%	88%	70%	80%	68%
First Time Student	10%	1%	1%	9%	0%	0**	8%	1%	2%	11%	11%
First Time Transfer	5%	6%	10%	4%	4%	0**	5%	4%	15%	4%	11%
Returning	5%	9%	9%	5%	5%	0**	8%	6%	10%	5%	9%
Special Admit Student (K-12)	1%	1%	2%	1%	1%	0**	1%	0%	2%	0%	1%
Uncollected Unrecorded	0%	0%	0%	0%	0%	0**	0%	0%	0%	0%	0%

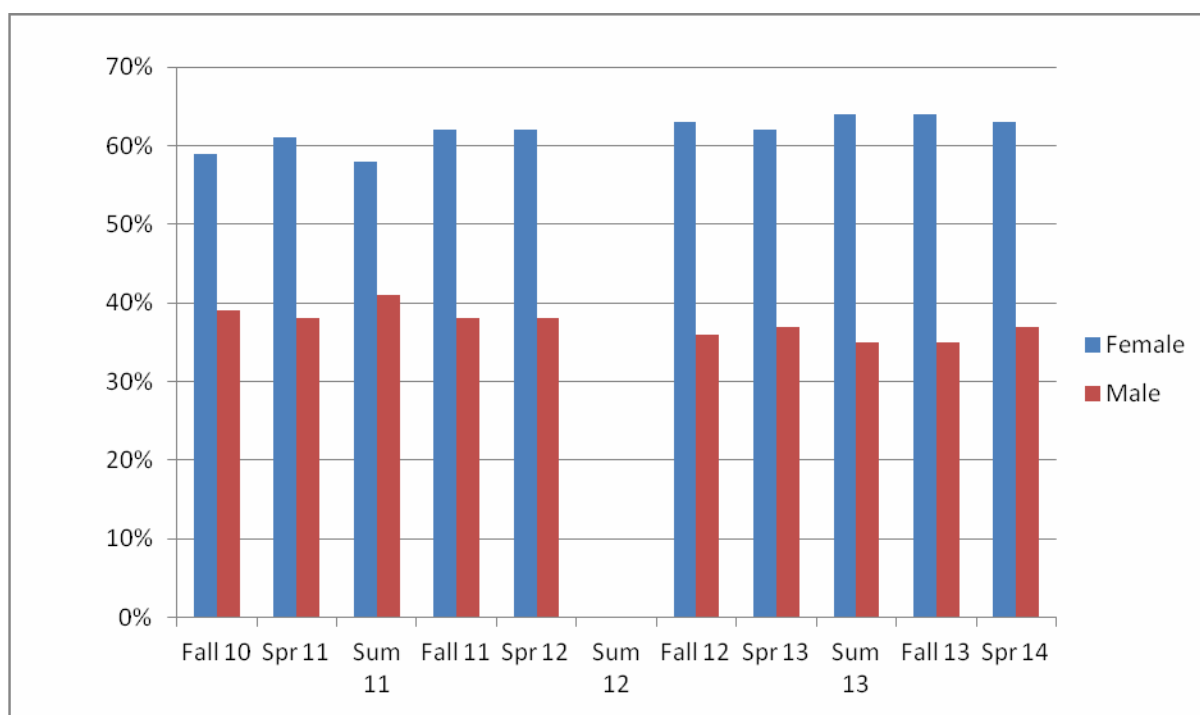
Trend: The enrollment of continuing students is higher in the fall than the spring semesters, and has appeared to decrease recently. Enrollment for first time students and first time transfers had declined but has recently increased to 2010 levels.

Reason: The sanctions imposed by ACCJC had a detrimental effect on enrollment for the whole college and it appears that recent removal of sanctions and public outreach has restored the reputation of the college.

Planned Action: Continue participating as a department with community outreach such as the SCC Solano Mall outreach and other events.

Chemistry - % Enrollment by Gender

	Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
Female	59%	61%	58%	62%	62%	0**	63%	62%	64%	64%	63%
Male	39%	38%	41%	38%	38%	0**	36%	37%	35%	35%	37%
Not Reported	1%	1%	0%	0%	1%	0**	1%	1%	1%	1%	1%
Total	100%	100%	100%	100%	100%	0**	100%	100%	100%	100%	100%



Trend: More females than males are enrolling in our Chemistry courses.

Reason: More four year universities are encouraging female students to attend their STEM courses and increase in the number of our nursing students have contributed to the rise in the percentage of female students as well.

Planned Action: Traditionally Chemistry has been a male dominated field and recent efforts have been made to attract women to the discipline. Perhaps we need to look into ways of attracting males back to the profession.

% Enrollment by Student Age

	Fall 2010	Spring 2011	Summ er	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Summ er	Fall 2013	Spring 2014	Summ er	Fall 2014
0-17	5%	1%	3%	5%	2%	4%	1%	3%	4%	1%	5%	4%
18-25	68%	68%	68%	72%	71%	72%	75%	73%	75%	75%	74%	70%
26-30	12%	15%	14%	10%	14%	13%	12%	12%	11%	12%	11%	12%
31-35	7%	6%	8%	6%	5%	6%	6%	7%	5%	7%	6%	7%
36-40	5%	4%	3%	4%	4%	3%	2%	1%	3%	2%	1%	4%
41-45	1%	3%	2%	1%	2%	2%	1%	2%	1%	1%	1%	1%
46+	1%	2%	2%	2%	2%	1%	2%	2%	1%	1%	2%	2%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

*****Summer 2012 was cancelled by the Administration***

Trend: The majority of our students are “college age” (18-25). The second highest population is “returning adult students” (26-30) followed by students in the “middle adult” range of ages (31-35). Success rates are similar to or better than the rest of the college.

Reason: The higher numbers of students of traditional college age are obvious. Not surprisingly, enrollment of the 26-30 age group are the second highest. Many of these students are often students who had their college education interrupted for a variety of reasons, and have recently decided to return to college to finish their college education. The students in the 31-35 and 36-40 age range are likely students who are desiring to start a second career, or complete their education after raising a family.

Planned Action: Continue to advertise the many careers and opportunities awarded to people in STEM and allied health majors, of which Chemistry is one.

Chemistry - % Enrollment by Ethnicity

	Fall 10	Spr 11	Sum 11	Fall 11	Spr 12	Sum 12	Fall 12	Spr 13	Sum 13	Fall 13	Spr 14
Am. Indian/ Alaskan Native	5%	2%	2%	3%	3%	0**	3%	2%	5%	4%	4%
Asian/Pacific Islander	28%	28%	30%	27%	23%	0**	28%	31%	28%	28%	29%
Black Non- Hispanic	6%	8%	9%	8%	8%	0**	9%	9%	9%	10%	10%
Hispanic	15%	15%	16%	16%	19%	0**	21%	19%	22%	21%	22%
Other	16%	21%	17%	18%	15%	0**	11%	9%	9%	7%	5%
White Non- Hispanic	30%	26%	26%	28%	32%	0**	28%	29%	26%	29%	30%

Trend: Almost 1/3 of our students are White, Non-Hispanic and close to another 1/3 are Asian/Pacific Islander. The next largest population is Hispanic, followed by Black, Non-Hispanic and Am. Indian/Alaskan Native. Success rates are similar to or better than the rest of the college.

Reason: According to the US Census for 2013, the population for Solano County and CA are as follows:

	Solano County	CA
Black or African American alone, percent, 2013 (a)	14.9%	6.6%
American Indian and Alaska Native alone, percent, 2013 (a)	1.3%	1.7%
Asian alone, percent, 2013 (a)	15.4%	14.1%
Native Hawaiian and Other Pacific Islander alone, percent, 2013 (a)	1.0%	0.5%
Two or More Races, percent, 2013	6.7%	3.7%
Hispanic or Latino, percent, 2013 (b)	25.2%	38.4%
White alone, not Hispanic or Latino, percent, 2013	40.0%	39.0%

(<http://quickfacts.census.gov/qfd/states/06/06095.html>)

The trends somewhat mirror the ethnic population of the area we serve. The major difference is that we have a higher percent of Asian/Pacific Islanders enrolled in our Chemistry classes and a slightly lower percent of Hispanics and African Americans than in the general population.

Planned Action: Improving the visibility of the Chemistry department and illustrating the many rewards of taking Chemistry classes to these underserved populations will allow these students to gain valuable knowledge of the Chemistry department and the many advantages to taking Chemistry courses. Creating brochures in Spanish and English that illustrate the employment opportunities for people with college degrees in various fields of Chemistry, especially comparing salaries and benefits of people with and without degrees would likely encourage students to take more classes in Chemistry.

1.5 Status of Progress toward Goals and Recommendations. Report on the status of goals or recommendations identified in the previous educational master plan and program review.

Table 2. Educational Master Plan

Educational Master Plan	Status
1. Increase the number of full-time faculty to seven from five to provide better support for the increased number of sections and professional duties required.	Increased number of full-time faculty to six for the 2014-2015 academic year. Pursue an additional position next year to bring the total to seven.
2. Increase laboratory and classroom lecture space in the new science building for Chemistry growth (three laboratory rooms with one dedicated for organic Chemistry fitted with all the required ventilation and instrumentation; dedicated lecture spaces; Measure Q).	Working with architects on new science building per Measure Q.
3. Increase Chemistry space/footprint in the new science building to accommodate an instrument room and larger preparatory room and greater storage space (Measure Q).	Waiting to work with architects on new science building per Measure Q.
4. Acquire funding for purchasing instruments to support the Inorganic and Organic Chemistry programs, e.g., IR, GLC, HPLC, NMR, etc.	Strategic Proposal Spring 2013 provided for 10 portable data collectors to use with 10 high-temperature thermistors, two polarimeters, three melt stations, and four bench-top GCs. Instructional Equipment Grants Spring 2014 provided three Vernier ultraviolet spectrophotometers, 12 small scale organic Chemistry glassware kits, four centrifuges and tube and replacement of the DI water purification system. Have requested this in the past five years, but it was not granted.
5. Provide funding and technical support for maintenance of all instruments and student laboratory computers.	Associated Students grants in 2013 provided 60 scientific calculators and in 2014, 10 molecular model kits.
6. Install lockable workstations in all three Chemistry laboratories in the new science building (Measure Q).	Waiting to work with architects on new science building per Measure Q.
7. Hire full-time laboratory technicians at both centers and a half-time (20 hours/week) laboratory technician to for additional help at the Main campus.	Full-Time technicians have been hired at all three campus locations as of 2014.

8.	Institute an assessment tool to determine what level of Chemistry a student is prepared for: CHEM 160, CHEM 010 or CHEM 001, in advance of the time when the college's funding is based on who passes these courses.	We are currently developing an assessment tool and will coordinate with counseling, curriculum and the Office of Admissions and Records.
9.	Provide regular training in Chemical safety protocols, proper use of equipment and waste management for all technical staff members, including part-time and student assistants	The required OSHA training was completed October 2012. Faculty are researching the possibilities of an on-going safety program to be offered during each Professional Development day.
10.	Offer open and reliable access to technology such as computers and all Chemistry software outside of the Chemistry laboratories, such as the library computers, libraries or study areas at both centers, etc.	The library student computers used to have some of the Chemistry tutorials, but there have been issues with keeping the tutorials there after IT does the reimaging. (We hope to have a student science study center in the new science building with computers and software for the students to use.)
11.	Add a general education transferable liberal arts Chemistry course for non-majors.	No progress has been made on this goal. The Food Chemistry course was investigated but we would need a laboratory/kitchen set-up in the new science building, or go to an online course with an online lab and kit for doing labs at home. We are considering a Chemistry and Art course also.
12.	In cooperation with the Chemistry lab technician and the Dean, develop lab procedures and protocols to improve the safety and efficiency of the lab program by significantly reducing the chemicals stored in the fume hoods and on the bench tops, and finding more efficient use of storage space for equipment when not currently in use by a particular class for a specific experiment.	Discussions have started taking place amongst faculty and the lab technician concerning the best way to go about implementing this goal.
13.	Develop and implement an instrumental analysis course for science majors once the instrumentation room, instruments, and support staff are acquired	Waiting for building and instrumentation from Measure Q funds.

Table 3. Program Review Recommendations

Program Review Recommendations (Previous Cycle)		Status
1.	Repair and maintenance budgets must be increased to regularly service the UV spectrometers and the Vernier interface. Regular maintenance of these instruments will guarantee the longevity of the equipment.	Partially done. College wide budget constraints.
2.	The purchase of new equipment such as Vernier mini GC, the Vernier Lab Quest interface, and the wide-range temperature probes maintain the current level of excellence in the Chemistry program.	Complete with the grant.
3.	Additional lecture classrooms and laboratories are needed so that it no longer will be necessary to run classes late in the evening.	Maintain two lecture rooms in building 400 reserved for Science in Measure G. Add more labs to new Science buildings in Fairfield and Vacaville.
4.	Hire a Chemical Hygiene officer.	This is a college-wide issue and not just a Chemistry Department issue. Thus Chemistry will no longer have it as part of our Program Review recommendations.
5.	Provide regular training in chemical safety protocols, proper use of equipment, and waste management for all technical staff members, including part-time and student help.	Regular on-going training needed for all faculty and staff, especially new hires.
6.	Hire a part-time (20 hours minimum) assistant to help the Chemistry lab technician in Fairfield.	Completed and then moved to the Vallejo center. Therefore, this is still a need in Fairfield.
7.	Investigate the need for a Chemistry Technician program.	Completed the investigation. Program not needed.
8.	Offer open and reliable access to technology such as computers including all the Chemistry software available outside the Chemistry lab.	We extended the availability of the Chemistry lab computers by offering "Open Lab" time through grants.
9.	Add a GE Liberal Arts Chemistry course for non-majors.	In progress.

1.6 Future Outlook. Describe both internal and external conditions expected to affect the future of the program in the coming years. Include labor market data as relevant for CTE programs (*limit to one page or less*).

The need for a strong, viable Chemistry program is projected to remain consistent over the next 5 years and into the foreseeable future. Chemistry is fundamental to all sciences and as such, courses in Chemistry are required in all health science and STEM (Science, Technology, Engineering and Math) curriculums. Career Vision states “it is very clear that tomorrow’s ‘most in-demand careers’ will require education in science, technology, engineering and math - referred to as STEM careers.”

There are eight STEM disciplines identified on the U.S. Department of Labor's O*NET occupational database website that require a solid educational foundation in science, technology, engineering or mathematics:

1. **Chemistry**
2. **Computer Science**
3. **Engineering**
4. **Environmental Science**
5. **Geosciences [Earth Sciences]**
6. **Life Sciences**
7. **Mathematics**
8. **Physics and Astronomy**

In 2012, the US STEM workforce surpassed 7.4 million workers and it is expected to grow significantly through 2018, to an estimated 8.65 million workers. Currently the manufacturing sector faces a large shortage of employees with STEM skills. Alarming, 600,000 manufacturing jobs are going unfilled in spite of current economic conditions. By 2018, the bulk of STEM jobs will be in Computing (71%) followed by Traditional Engineering (16%), Physical Sciences (7%), Life Sciences (4%) and Mathematics (2%). Here is a link to a recent report on the need for STEM education in the United States in order to keep our global edge in science and technology. <http://www.stemconnector.org/sites/default/files/store/STEM-Students-STEM-Jobs-Executive-Summary.pdf>

Program Level Outcomes

2.1 Program Level Outcomes. Using the chart provided, list the Program Level Outcomes (PLOs) and which of the “core four” institutional learning outcomes (ILOs) they address. In the same chart, specifically state (in measurable terms) how your department assesses each PLO. For example, is there a capstone course (which one), is it completion of a series of courses (list), is it a passing grade on certain assignments that are universally given (list), passing a licensing exam, completing a portfolio, etc.

Table 4. Program Level Outcomes

	Program Level Outcomes	ILO (Core 4)	How PLO is assessed
1.	Students show proficiency in various lab techniques as demonstrated during experimental procedures and/or by their written reports.	I.A,B,C II.A,B,D III.A	Students in CHEM 001, 002, 003 and 004 were assessed by performing specific tasks and experiments in lab for the SLO for lab techniques.
2.	Students can formulate and write names for chemical compounds.	I.A,B II.A	Students in CHEM 001, 002, 003 and 004 were assessed on exams for writing chemical names and formulas.
3.	Students are able to analyze chemical problems as demonstrated by assessments on exams.	I.A II.A,B,D	Students in all the courses are assessed for analyzing chemical problems.
4.	Students can interpret and analyze chemical data in both the laboratory setting and in theoretical problems in their assessments on exams.	I.A,B II.A,B,D	Students in CHEM 001, 002, 003 and 004 were assessed for analyzing chemical data in their lab reports.
5.	Students are able to demonstrate their knowledge of chemical bonding and structural analysis; for example, they are able to relate structure to physical and chemical properties and/or to analyze spectra to identify structures.	I.A II.A	Students in CHEM 001, 002, 003 and 004 were assessed on exams and in lab for knowledge of chemical bonding and structural analysis
6.	Students can construct balanced equations for chemical reactions.	II.A	Students in CHEM 001 and CHEM 002 were assessed on exams for constructing balanced equations.

2.2 Course Support of PLOs. Report on how courses support the Program Level Outcomes at which level (introduced (I), developing (D), or mastered (M))

Table 5. Program Courses and Program Level Outcomes

Course	PL01	PLO2	PL03	PL04	PL05	PL06
CHEM 160	I	I	I	I	I	I
CHEM 010	D	I	I	I	I	I
CHEM 011	D	D	I	I	I	I
CHEM 051	D	I	I	I	I	I
CHEM 001	D	D	D	D	D	D
CHEM 002	M	M	M	D	D	D
CHEM 003	M	M	M	M	M	M
CHEM 004	M	M	M	M	M	M

2.3 PLO Assessment Results. Utilizing table 6, describe the results of the program level assessments and any changes/planned actions made based on the outcomes of program level student learning assessments. Results should be both quantitative and qualitative in nature, describing student strengths and areas of needed improvement. Action plans should be specific and link to any needed resources to achieve desired results.

Table 6. Program Level Assessments

Program Level Outcomes	Date(s) Assessed	Results	Action Plan
1.	Fall 2013/Spring 2014	Students in CHEM 001, CHEM 002, CHEM 003, and CHEM 004 courses were assessed in the use of different lab techniques. Most of the students demonstrated correct use of techniques, as measured by their experimental results on their lab reports. Graduates of CHEM 004 have completed a qualitative analysis (QA) experiment which includes various techniques and reactions from the entire year of Organic Chemistry. All graduates of CHEM 004 have done very well on this QA experiment.	See below

2.	Fall 2013/Spring 2014	This PLO links with CHEM 003 and CHEM 004. Students in both classes were able to formulate and write names for chemical compounds. There was some improvement in CHEM 004 from the previous assessment.	See below
3.	Fall 2013/Spring 2014	This PLO links with CHEM 001, CHEM 002 and CHEM 004. Students met the success criteria for the courses.	See below
4	Fall 2013/Spring 2014	Students have been writing Lab Reports on Titration experiments in CHEM 001, Spectrophotometry experiment in CHEM 002 and “Determining the Boiling Point by Distillation” experiment in CHEM. 004. The students seem to enjoy the hands on activities and the majority of them have written excellent lab reports.	See below
5	Fall 2013/Spring 2014	This PLO links with CHEM 001, CHEM 002, CHEM 003, and CHEM 004. Students met the success criteria for these courses.	See below
6	Fall 2013/Spring 2014	This PLO links with CHEM 001 and CHEM 002. Students in both classes met the success criteria.	See below

Action Plan: The following are our planned actions based on all our PLO results.

1. Chemistry offers Open Lab time for students to use the computer tutorials on the lab computers if funding is available. The Organic Chemistry students took advantage of this time to work on the computer simulated software in the lab. The software tutorial should be purchased, installed and maintained in the Main campus library's student computers and provide access to the students at both Centers. (For PLO 1, PLO 2, PLO 3, PLO 5, and PLO 6)
2. Organic Chemistry, CHEM 003 and CHEM 004, impart unique lab techniques to the students. These techniques require proper ventilation and adequate work space which we do not have. A new “dedicated Organic Chemistry” lab facility is needed for these courses. (For PLO 1 and PLO 4)
3. Organic Chemistry, CHEM 003 and CHEM 004, use instrumentation for the identification of the compounds produced in the lab. Through a strategic proposal submitted in Spring 2013, we acquired some instruments. We will apply again for funding if monies are available. Nonetheless, Organic Chemistry labs are deficient of much needed instrumentation. (For PLO 1 and PLO 4)

4. We need to increase the number of full-time Chemistry faculty from six to seven, to provide continuity and to provide at least one full-time faculty at each center. (for PLO 1, PLO 3 and PLO 6)
5. All of these courses have publisher provided online homework. All of the faculty should be encouraging online homework to the students based on the success we see as a result of the online homework. (for PLO 1, PLO 2, PLO 3 and PLO 6)
6. The Chemistry lab computers at the Main campus and both centers need to be maintained and updated. We have asked for a 0.25 time computer tech to be assigned to Science and this is becoming more imperative as updates become available for the programs used, mostly in drawing in Chemistry. (for PLO 1, PLO2, PLO 3, PLO 4, PLO 5, and PLO 6)
7. As Chemistry software becomes available, the department needs an increase in its budget for purchasing and making it available at all of our facilities. The CCC software we use is quite old and has many software flaws, e.g., computer locks up on a certain question, and evaluation says a correct answer is incorrect. We either need to get the newest available software, or find something else that works better, serving the same purpose. (for PLO 1, PLO 2, PLO 3, and PLO 6)
8. To provide our students with the best hands-on experience we need to continue to fund full-time laboratory technicians at both centers and to replace the half-time (20 hours/week) laboratory technician to assist the current full-time laboratory technician at the main campus. (PLO 4)

Timeline for Action Plan:

1. 2013-2014: inventory and evaluate the Chemistry tutorials available outside of the Chemistry lab rooms. Seek funding to acquire more software and replace the old tutorials as well as monies for installation of it at various campus sites (ongoing).
2. 2013: obtain the data and write the justification to hire one additional full-time Chemistry faculty. (Done). 2014: repeat until the dept. has seven full-time Chemistry faculty.
3. 2013: have a chemistry group meeting about online homework and share the information with our adjunct faculty. (on-going).
4. 2013: request the 0.25 time computer technician yet again.
5. 2013-2014: write a strategic proposal or a grant to purchase some or all of the required instrumentation. (Partially completed)
6. 2014-2015: request full time laboratory technicians at both centers (Done) and a half-time laboratory technician on main campus, a position that was approved and filled, then not filled a couple of years ago for some reason.

The Chemistry curriculum is current and effective. We use current textbooks to ensure our curriculum is up to date and many of our faculty are using online homework and quizzes. These online activities can measure student learning outcomes comparative to other colleges nationwide. Our program courses, CHEM 001, 002, 003, and 004, are articulated and count for credit at both the CSU and the UC level. Student performance on the assessment tools in all of our courses was generally good with scores meeting the success criteria. However, there was room for improvement because not all students met the success criteria for the course. As funding becomes available the Chemistry Department will continue to acquire equipment. The Chemistry Department will continue to work diligently for the success of the students in our program.

After examining our program level student learning assessments we have come across the additional comments below:

From our PLO 1 and PLO 4 assessment results for CHEM 003 and CHEM 004 we can conclude that our students have learned how to perform the lab techniques correctly. Our CHEM 001 and CHEM 002 students are writing very well organized and Lab Reports as evident from PLO 4 assessments.

As a result of our PLO 5 assessments we have determined the following:

Students had difficulty understanding the shapes of molecules and hence identifying their chemical properties. We saw this trend throughout our CHEM 001-004 assessments. As a result, we have introduced open lab times for our students where they can use the model kits and study the shapes of molecules. We applied for and received a grant for holding open labs to help these students which are run by several adjuncts and a few full time faculty. This Fall 2014 semester we are offering approximately nine hours of open lab times for students including the main campus and the centers. We have ordered more model kits through the equipment grant. We have more of those kits available for our students to use. In the past we have also talked about having a few kits available in the library for our students to access. Many faculty use online homework tutorials to help students better understand the concepts taught in class. These tutorials help students understand the complex materials better as well as reinforce important concepts.

2.4 Changes from PLO Assessment. Describe any changes made to the program or courses that were a direct result of program level assessments.

After assessing our program level assessments we noticed that our students needed more time to understand some complex concepts. We have our students do computer tutorials in our lab times. If students need extra help and practice we have started holding Open labs in our Chemistry labs when classes are not in session. We applied for a grant for holding these open labs and many adjunct faculty and a few full time faculty are present during these lab hours to help students complete their tutorials or work on the model kits. From our program assessment results we noted that recognizing, drawing and understanding structures is hard for most of our students. So we ordered more model kits through ASSC grant and now have more of these available for students to use. We have also purchased more centrifuges, centrifuge tubes, drop counters, magnetic stirring stations, remote data loggers (LabQuest), high temperature probes, gas chromatograph sensor, polarimeter, and conductivity meters, etc., for students to have more hands on experience.

Student learning outcomes

2.5 Current Status of SLOs. Describe the current status of SLOs in your program. Are SLOs being updated as necessary, are they being assessed yearly? Are assessment results driving course level planning? If deficiencies are noted, describe planned actions for change. Address how courses with multiple sections have been aligned so that a common tool is utilized to assess student learning outcomes; describe any steps taken to standardize measures.

We have collected a lot of SLO assessment data since 2008. All our SLO's are assessed and updated and recorded regularly as requested by the college and in a timely fashion. For example, as a result of PLO review, we have added the lab technique SLO in most Chemistry classes.

The Chemistry faculty continues to discuss the assessment results and modify SLO's according to the course requirements. We are currently working on aligning our SLO assessments for each course. (See section 2.6 below)

2.6 Review of SLOs. Review the course level SLOs completed by the program in the last year to ensure accuracy of information provided (core four, level of mastery, assessment tool, etc.). Note if any changes are needed.

We are still in the process of discussing exactly what these assessment tools will look like. Possibilities are to have a list of sample questions with grading rubrics, or specific labs and grading rubrics for each SLO for each class that the instructor would choose from to use on a quiz or exam. (For example, for a Lewis structure question, several similar structures that the instructor could choose from would be proposed but the same rubric would be used to grade the question).

Another possibility is to have an "SLO test" developed for each course that is given near the end of the semester, but is only for a small part of the grade (this is done at Contra Costa College Chemistry dept.) This would have the advantage in that we need to only consider students who pass the course when we look at the SLO's, so we could easily pull these students tests out at the end of the semester and evaluate the SLO's separately for them. For the same reason, perhaps a common type of "lab exam" could be developed for each course for the end of the term (this, again, would be an easy way to separate the SLO assessments for the students who pass the course vs. those who do not.)

2.7 Changes from SLO Assessments. Describe any changes made to the program or courses that were a direct result of student learning outcomes assessments.

As a result of our discussions on SLO assessments, the following changes have been made:

1. Maintained the Chemistry lab tutorials that help students with understanding Chemistry.
2. Offered "open lab" times for students to come in to the labs and use the computer tutorials and/or the molecular model kits.
3. Purchased and maintained the supply of molecular models kits, using ASSC funding.
4. Encouraged CHEM 001 faculty to incorporate into their lab schedule one entire lab period doing stoichiometry problems.
5. Encouraged all faculty to start using online homework, especially with areas of Chemistry requiring mathematical problem solving skills.
6. Started project to institute an assessment tool for enrollment in CHEM 001 and CHEM 010. Expected implementation for Fall 2015.
7. Encourage instructors to spend more time on equilibrium in CHEM 002, even though the topic is covered in CHEM 001.
8. Some instructors have implemented a lab practical final exam to assess the students' lab skills.
9. Discussion, creation and eventual implementation of common assessment tool for SLO's.
10. Changed SLO's to support PLO's (lab technique SLO added to all classes).
11. Started assigning usage of flashcards provided by the publisher's textbook online resource for CHEM 003 and CHEM 004. Homework and quizzes are assigned in this format too.
12. A vast majority of the Chemistry faculty is using Web-based platforms for instructional materials, communication and links to other resources available to students.
13. Purchased handheld Logger Pro data collecting device and high temperature probe. Students are now acquiring data safely. High temperature mercury thermometers are no longer used in Organic Chemistry lab for CHEM 003 and CHEM 004.
14. Purchased magnetic stirrer stations and drop counters to facilitate students' learning modern lab techniques.

Curricular Offerings

2.8 Course Offerings. Attach a copy of the course descriptions from the most current catalogue. Describe any changes to the course offering since the last program review cycle (course content, methods of instruction, etc.) and provide rationale for deletion or addition of new course offerings. Also state whether a transfer degree has been established in accordance with SB 1440. Include a discussion of courses offered at Centers (Vacaville, Vallejo, Travis) and any plans for expansions/contraction of offerings at the Centers.

Please see attachment at the end of the document that contains the course descriptions from the catalog.

The most significant change in the Chemistry Department is the addition of CHEM 051. CHEM 051 is a one semester of general, organic and biochemistry course that encompasses the materials covered in CHEM 010 and CHEM 011. The course is mostly for students pursuing a career in nursing or other allied health occupations.

The course enrollment and offerings have increased considerably. Presently we are offering four sections a year: two sections in the Fall semester and two in the Spring semester. In the Fall semester the day section is on the Main campus and the evening section is at the Vacaville campus, but in the spring the Main campus offers the course in the evening and the morning section is at the Vallejo campus. We are proposing a CHEM 051 Summer course for the first time in Summer 2015 semester in an eight week schedule.

The Chemistry Department continues to grow and offer more sections to meet students' demands, as shown on the table below.

Chemistry – Total Number of Sections

	Fall 2010	Spr 2011	Sum 2011	Fall 2011	Spr 2012	Fall 2012	Spr 2013	Sum 2013	Fall 2013	Spr 2014
Total	26	26	8	24	24	24	27	11	27	28

The largest growth is in our General Chemistry CHEM 001 and CHEM 002 courses. CHEM 001 is offered in the fall and in the spring at all of our campuses, as well as in the summer as an 8 week course. CHEM 002 is offered year round in Fairfield and Vacaville centers. If the growth trend continues, a section will be offered at the Vallejo center.

Our student headcount for these courses is also on the rise, as shown on the table below.

Chemistry – Headcount for CHEM 001 and CHEM 002

	Fall 2010	Spr 2011	Sum 2011	Fall 2011	Spr 2012	Fall 2012	Spr 2013	Sum 2013	Fall 2013	Spr 2014
CHEM 001	164	121	61	149	130	169	159	78	168	148
CHEM 002	32*	82	31	51	79	58	72	28	58	85

*One section of CHEM 002 was dropped this semester due to lack of a qualified instructor.

There has not been significant growth in Organic Chemistry, CHEM 003 and CHEM 004 and the section offerings have remained the same in the last four years. Since the Fall 2009 semester, we have offered two sections of CHEM 003 in the fall and one section in the spring while CHEM 004 has one section in the fall and two sections in the spring. All the sections are taught on the Main campus since the Vacaville and Vallejo centers do not have appropriate ventilation for organic Chemistry laboratories. With the passing of Measure Q, SCC is in planning for a new building in Vacaville which will provide adequate lab space and ventilation for offering of organic chemistry courses there in the future. Also, a new Science building is in the planning process at the Main campus which will contain a designated Organic Chemistry lab.

Chemistry – Year Headcount for CHEM 003 and CHEM 004

	Fall 2010	Spr 2011	Sum 2011	Fall 2011	Spr 2012	Fall 2012	Spr 2013	Sum 2013	Fall 2013	Spr 2014
CHEM 003	46	22	0*	44	16	35	19	0*	49	24
CHEM 4	17	41	0*	19	34	NO*	29	0*	14	46

*CHEM 003 and CHEM 004 courses have not been offered in the summer

*** **NO*** = **Not Offered** Fall 12 CHEM 004 was cancelled for low enrollment

CHEM 010, Intermediate Chemistry is offered year round at all three campuses. CHEM 051 is offered at the Centers since the amount of organic experimentation is quite low and does not require fume hoods. However, CHEM 011 requires half a semester of organic experiments which require fume hoods for the students. With the new, well ventilated laboratories to be built at the main campus and at Vacaville, we hope to be able to offer this class at these campuses in the near future.

Chemistry – Year Headcount for CHEM 010, CHEM 011, and CHEM 051

	Fall 2010	Spr 2011	Sum 2011	Fall 2011	Spr 2012	Fall 2012	Spr 2013	Sum 2013	Fall 2013	Spr 2014
CHEM 010	136	116	60	138	135	117	141	48	144	114
CHEM 011	57	37	27	32	46	58	50	21	50	45
CHEM 051	18	19	NO*	22	21	24	14	NO*	28	30

* **NO*** = **Not Offered** -CHEM 051 was not offered during Summer 2011, 2013, or 2014, but has been scheduled for Summer 2015 at the Vacaville Campus

Initially, course enrollment for CHEM 051 was low as expected. Chemistry continued to offer the course expecting the demand to increase. As can be seen from the data, the demand for CHEM 051 has increased while the demand for CHEM 010 and CHEM 011 has stayed at the same level. The Health Care industry is requiring nurses to have an earned BSN degree rather than ASN degrees and CHEM 051 satisfies the requirement for the program.

Chemistry – Year Headcount for CHEM 160

CHEM 160, Introductory Chemistry, is the equivalent of a one year high school Chemistry course, intended for students who have not had any background in Chemistry.

	Fall 2010	Spr 2011	Sum 2011	Fall 2011	Spr 2012	Fall 2012	Spr 2013	Sum 2013	Fall 2013	Spr 2014
CHEM 160	168	189	55	148	164	167	174	69	165	163

The demand for CHEM 160 has remained fairly constant, with slight variation from semester to semester.

In regards to the new Transfer Degree as established by SB 1440, the Chemistry Department has not established it, mostly because the CCCCCO, (California Community Colleges Chancellor's Office) has not developed a TMC, (Transfer Model Curriculum) template for Chemistry. It appears that CHEM 001 and CHEM 002 match the number of units mandated by SB 1440, but CHEM 003 and CHEM 004, and the required physics and calculus courses are not in line with the course units. The Chemistry Department is aware of the disparity and will begin working on it as soon as the TMC is in place.

The State Chancellors Office has approved a template for the ADT (Associate Degree for Transfer) for Chemistry based on the Transfer Model Curriculum (TMC) but has not yet published it. Once the template for the ADT is published, the Chemistry faculty will need to discuss how the Chemistry Department will align the current AS degree with the ADT degree requirements. Currently, the AS degree at Solano does not align with the ADT degree. The current AS degree in Chemistry at Solano has the following requirements:

REQUIRED COURSES	Units
CHEM 001 General Chemistry.....	5
AND	
CHEM 002 General Chemistry.....	5
CHEM 003 Organic Chemistry I	5
AND	
CHEM 004 Organic Chemistry II.....	5
BIO (any course except 048 or 098).....	3 - 5
PHYS 002 General Physics (Non-calculus).....	5
OR	
PHYS 006 Physics for Science and Engineering.....	5
OR	
PHYS 010 Descriptive Physics	3
Total Units	26 - 30

The proposed Transfer Model Curriculum for Chemistry is as follows:

Proposed Transfer Model Curriculum

CCC Major or Area of Emphasis: Chemistry

CSU Major or Majors: Chemistry

Total units 34 (all units are semester units)

Degree Type (indicate one): AS-T X

“Core” Courses:

34 units

Title (units)	C-ID Designation	Rationale/Potential GE applicability
General Chemistry for Science Majors Sequence A (10)	CHEM 120S	Required lower division preparation for major./CSU GE Areas B1 & B3.
Organic Chemistry for Science Majors Sequence A (8)	CHEM 160S	Required for major.
Calculus-Based Physics for Scientists and Engineers: A and B (8)	PHYS 205 and PHYS 210	Required lower division preparation for major.

AND

Single Variable Calculus Sequence (8) Or Single Variable Calculus I – Early Transcendentals (4) And Single Variable Calculus II – Early Transcendentals (4) Or Single Variable Calculus I – Late Transcendentals (4) And Single Variable Calculus II – Late Transcendentals (4)	MATH 900S OR MATH 210 AND MATH 220 OR MATH 211 AND MATH 221	Required lower division preparation for major./CSU GE Area B4. 2 semesters or 3 quarters of calculus, minimum 8 semester units.
---	---	---

In order to align with the TMC, the Chemistry degree would have to implement a requirement for a second semester of calculus-based physics with 8 units instead of 10, 2 semesters of calculus with 8 units instead of 10, and decrease the number of units for the organic Chemistry series of classes to 8 units. These would be major changes to the degree and will have to be discussed and researched at length before any definite changes are made. However, once the TMC is published to the Chancellor’s website, the Chemistry department will have 18 months to either align the AS degree with the TMC or will need to stop offering the AS degree in Chemistry since it will not be a transferrable degree to a 4-year institution.

This, then, essentially leaves three options for the Chemistry Department:

- 1) Offer both the ADT and AS degrees: this would likely be the optimum choice since it will give our students the most options. However, this will require the Chemistry Department to create two more organic Chemistry courses that align with the TMC, which will require more resources and faculty. It will also require the physics and math departments to develop courses that meet the ADT for Chemistry for 8 units instead of 10.
- 2) Offer only the ADT degree and not the current AS degree: It is likely that most students who take the courses required for just the ADT will transfer to a California State University. However, many of our students wish

to transfer to a UC or professional school, most of which require more units in Organic Chemistry than the ADT. This would likely decrease the number of students actually receiving their degrees from Solano.

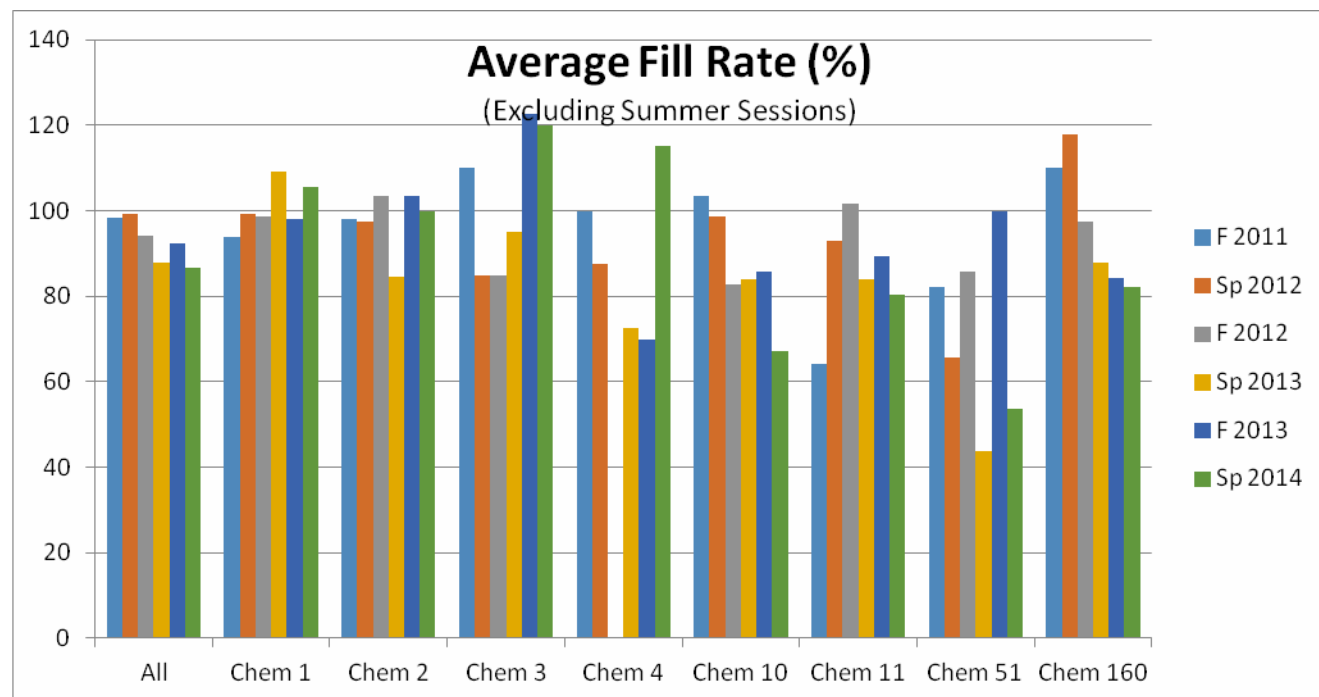
- 3) Cease to offer any degree in Chemistry and continue to offer Chemistry courses to support other courses and to prepare students for transfer to 4-year universities.

2.9 Fill rates/Class size. Based on data from ITRP, discuss the trends in course fill rates and possible causes for these trends (include comparison/analysis of courses by modality if applicable). Address how the size of classes affects courses and if there are any necessary adjustments to course classroom maximums. If there are courses that are historically under-enrolled, discuss strategies that might increase enrollment.

As you can see from the chart below, the average fill rate for chemistry classes over-all has been historically fairly high, with a range of 85-100% fill rate. While CHEM 003 had a low fill rate for the terms Spring 2012 and Fall 2012, the fill rate greatly increased the following terms to well over 100%. Due to a low fill-rate for CHEM 003 in the Spring of 2012, the fill rate for CHEM 004 in the Fall of 2012 was so low that the course was cancelled. As you can see, this pattern has not been repeated, and in fact the fill-rate for CHEM 004 was over 100% for the Spring of 2014.

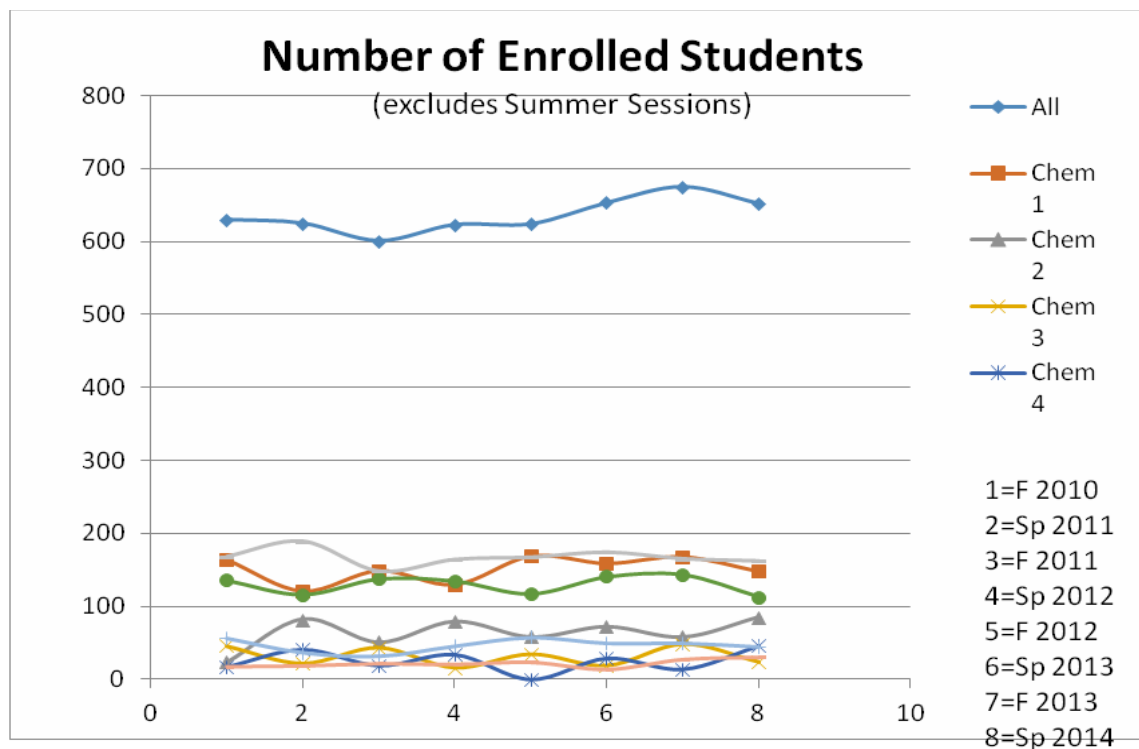
The two courses with the lowest fill rates are CHEM 011 and CHEM 051. CHEM 051 is a relatively new course and as nursing and other health related professions change their prerequisites and course requirements for their programs, the need for students to take CHEM 011 has diminished, and the demand for CHEM 051 has tended to increase. We expect this demand to continue to increase and will be considering replacing sections of CHEM 011 with Sections of CHEM 051.

The maximum class size is usually determined by the number of students that one faculty member can safely and effectively supervise during the laboratory period. Typically, this has been 28 students for all chemistry classes except for the Organic Chemistry classes (CHEM 003 and 004) which have a lower class maximum of 20 students due to the nature of the experiments and the number of operable fume hoods.

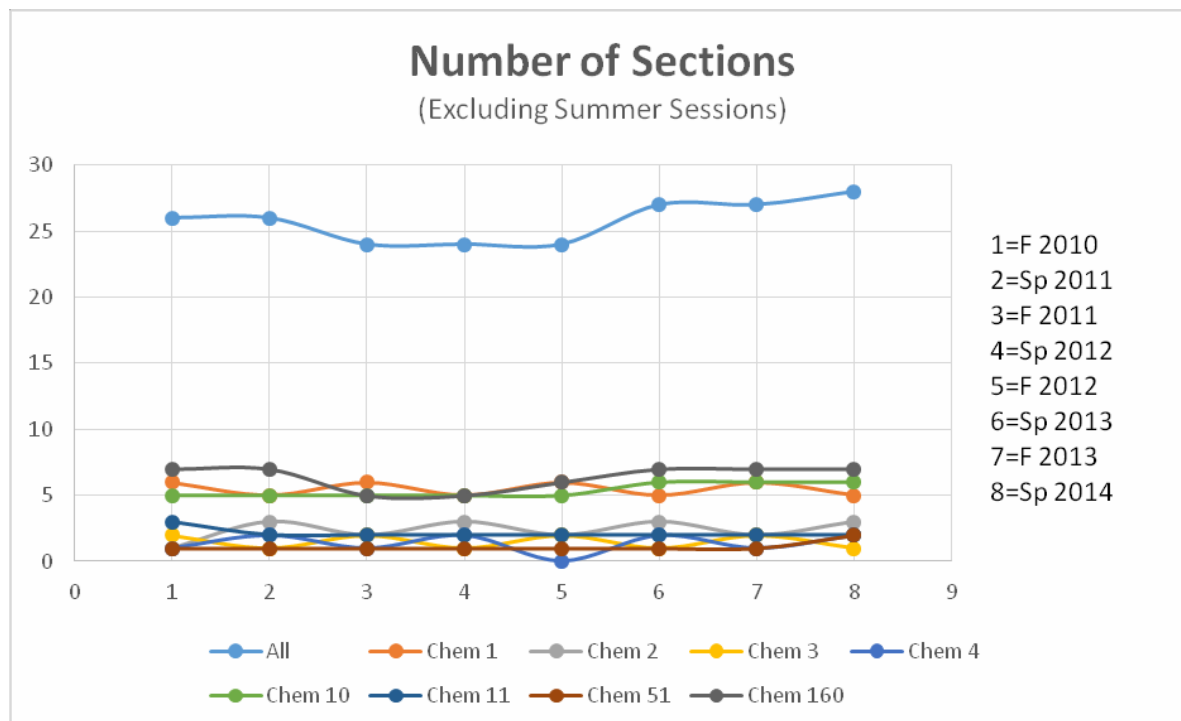


The number of enrolled students in chemistry courses has continued to increase (see below), with a slight dip in Spring 2014. It remains to be seen as to whether this is a trend or an outlier. In general, the courses for Fall of 2014 had a very high fill-rate, which may indicate that this downturn is not a trend. Greatest enrollments are in CHEM 001, CHEM 010 and CHEM 160. This is likely due to the fact that CHEM 160 is an introductory

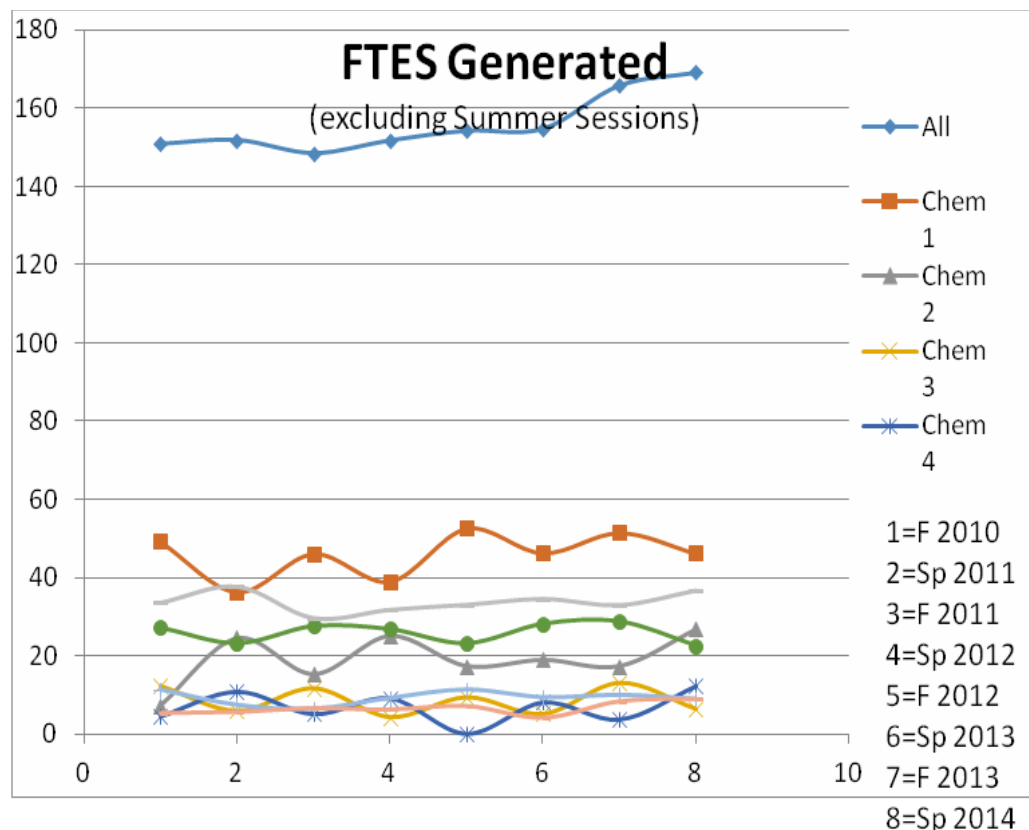
chemistry class that can fulfill a prerequisite for the other chemistry classes, and CHEM 001 and CHEM 010 are both the 1st semester of a 2-semester series.



In fact, as can be seen in the following graph, the number of chemistry course sections offered has increased in the past to accommodate greater student demand. The courses that have seen the greatest demand are CHEM 001, CHEM 010 and CHEM 160. To keep up with this trend, we will be adding additional CHEM 001 and CHEM 002 courses at the Vacaville center, and will be considering adding additional classes as the need arises.



The number of FTES generated by the Chemistry Department has increased significantly since the Fall of 2010. The classes that generate the most FTES are CHEM 001, CHEM 160, CHEM 010 and CHEM 002, respectively.



2.10 Course sequencing. Report on whether courses have been sequenced for student progression through the major, how students are informed of this progression, and the efficacy of this sequencing. Report on whether curriculum is being offered in a reasonable time frame (*limit to one or two paragraphs*).

The usual course sequence for Chemistry students greatly depends on the individual student's academic goals. The course sequence required for the AS degree are described in the catalog and courses required for other majors or transfer are available through the counseling office. Descriptions of prerequisites for each course are clearly stated in the catalog.

Students who have never had a chemistry course usually take CHEM 160: Introductory Chemistry. Students who are science or engineering majors and who have had chemistry before but may need a refresher course usually take CHEM 010: Intermediate Chemistry. Students who major in science, chemistry, biology and other STEM majors who desire to get the Chemistry AS degree or transfer to a four-year institution move through the CHEM 001/002: General Chemistry sequence (2 semester sequence) followed by CHEM 003/004: Organic Chemistry sequence (2 semester sequence).

Students in allied health majors can take the CHEM 010: Intermediate Chemistry course followed by CHEM 011: Organic and Biological Chemistry (2 semester sequence) or CHEM 051: General, Organic and Biological Chemistry (1 semester).

This course sequencing is fairly standard for college chemistry departments and has worked well for our students. Students who follow this sequence are well prepared to transfer to other institutions in most STEM majors.

Other than Summer session, multiple sections of every course are offered each semester so students are usually able to progress through the sequence of courses in 2 years or less.

2.11 Basic Skills (if applicable). Describe the basic skills component of the program, including how the basic skills offerings prepare students for success in transfer-level courses. Analyze courses with prerequisites and co-requisites, and whether this level of preparation supports student success.

Not applicable; however we do offer an introductory, high school level chemistry course to prepare students for success in future chemistry courses or other STEM courses.

2.12 Student Survey. Describe the student survey feedback related to course offerings. In terms of the timing, course offerings, and instructional format, how does what your program currently offer compare to student responses? Attached find a copy of the original survey questions as an appendix.

Overall the survey included a good set of questions, but the sampling of the students was not representative of those enrolled Spring 2014. All sections taught by the full-time faculty, but not all sections taught by the adjunct faculty, were surveyed. Some questions will need to be revised when the survey is repeated for the next Program Review.

Question 1: Revise it to: "If you have completed one or more Chemistry courses, mark the number completed below."

Student responses: Most students enrolled in chemistry courses in the spring had completed one or more courses.

Question 2: The results are not relevant because several of the adjunct faculty did not administer the student surveys. Also some students admitted to completing the survey at the college and again at home.

Question 3: Notice that 86% of students currently enrolled are not Chemistry majors. The majority were allied health or biology.

Question 4: Most students are enrolled in a chemistry course because it is required for their major or for transfer.

Question 5: Most students are enrolled at the Fairfield campus, but 39% are enrolled at the Vacaville Center. The Vallejo Center enrollment is quite low: 13%.

Question 6: As they say in real estate, it is all about location, location, location. That was the primary driving force for our students. Coming in second was the availability of courses, and third at 23% was our good reputation.

Question 7: There was no clear trend in the data for this question. Students chose their course for a variety of reasons and no one reason stood out amongst the others.

Question 8: The students are satisfied with their textbooks and other instructional materials.

Question 9: Most students want the 9 am to noon time, followed by 8 am. Afternoon and evening were rated almost the same for preference.

Question 10: It should be noted that 73% of our students would NOT take a Saturday afternoon class, but 23% said they would take a Saturday morning class. The Chemistry Department used to offer a CHEM 160 course with a Thursday night lecture and a Saturday morning lab in the fall followed by a CHEM 010 course in the spring with the same schedule. Both courses filled for several semesters. When the instructor could no longer teach it, the next adjunct instructor did not have the same fill rate. The Chemistry Department will consider offering the option again, but the quality of the instructor has to be included in the decision. Another future possibility would be to offer an online lecture with Saturday lab.

Question 11: This question needs to be revised to include a 5:30 pm start time for evening classes. Over 70% of our students preferred the 6 pm start time over 6:30 pm.

Question 12: 36% said they would be interested in a hybrid chemistry course. The Chemistry Department is planning to offer hybrid courses again in the near future. CHEM 001 and CHEM 002 were offered online for three years: 11/12, 12/13 and 13/14.

Question 13: Our students said 81% would use a Science Learning Center, therefore the Chemistry department needs to ensure that it is part of the planning process for Measure Q.

Question 14: Not relevant because the adjunct faculty did not survey all of their sections.

Question 15: Students prefer day classes taken during the regular semesters. The question should be split into two parts, with the second part about Summer session being 8-week or 6-week courses. The Chemistry Department could also consider a 7-week session for CHEM 001 and CHEM 002, with the building open on Fridays for instruction. It may have to be lecture only on Fridays, as the staff work a four-day week in the summer.

Question 16: Strengths of the department: over and over again it was the quality of our instructors and their availability outside of class, which is referring to the full-time instructors. All of our full-time instructors are available to students enrolled in any Chemistry course through SCC. Second, but very close to first, was the offering of courses at various times. The Chemistry Department tries very hard to offer sections of the same course at various times, morning, afternoon, evening, etc. Third was the good laboratory environment and the technology available to the students, i.e., the Chemistry laboratory computers and the lab interface tools that are associated with them.

Question 17: Weaknesses of the department: classes fill too quickly, ineffective adjunct instructors, not enough chemistry courses offered in Vacaville, more lab tech support is needed because many times the lab setup and/or chemicals were not available and the instructor had to find them; chemistry lab in disarray, dirty; study center is needed.

Actions for Question 17: add more sections of the filled chemistry courses; strategically assign courses to the ineffective adjunct instructors (this may be more difficult to do now that the adjuncts have a seniority system); have already moved and added sections to Vacaville Center; push for the ½ time lab tech we had filled for Fairfield, but which was moved to Vallejo; keep doing Open Lab Hours grant requests AND make sure a Science Learning Center is in the planning process for Measure Q. Work with the lab technicians and Dean to devise a plan to maximize the storage space, efficiency and safety of the lab classrooms.

2.13 Four-year articulation (if applicable). Utilizing the most current data from the articulation officer, and tools such as ASSIST.org, state which of your courses articulate with the local four year institutions and whether additional courses should be planned for articulation (limit to one or two paragraphs).

The ASSIST.org files indicate that CHEM 001, 002, 003, 004, 010, and 011 are UC transferrable for unit credit at all UC campuses and are also articulated as Area UC-S Physical and Biological Sciences. CHEM 001, 002, 003, 004, 010, and 011 are CSU IGETC courses. CHEM 001, 002, 003, 004, 010, 011, and 051 are transferable as CSU GE certification courses. CHEM 001, 002, 003, 004, 010, 011, 051, and 097 are articulated as transfer courses to CSU.

New courses being discussed and researched are Food Chemistry, Art and Chemistry, Chemistry for Poets (a Chemistry course specifically designed for liberal arts majors), Environmental Chemistry and Instrumental Analysis.

2.14 High school articulation (if applicable). Describe the status of any courses with articulation/Tech Prep agreements at local high schools. What (if any) are your plans for increasing/strengthening ties with area high schools and advertising your program to prospective students? (limit to one or two paragraphs).

Our program is being advertised to area schools through the SSTEM scholars who are reaching out to their former high school teachers and counselors to promote STEM education at Solano.

2.15 Distance Education (if applicable). Describe the distance education courses offered in your program, and any particular successes or challenges with these courses. Include the percentage of courses offered by modality and the rationale for this ratio.

Then:

- 1) Discuss your program's plans to expand or contract distance education offerings;
- 2) State how you ensure your online courses are comparable to in-class offerings

The Chemistry Department offered a distance education (HYBRID) course section for CHEM 001 four times in the last four years and for CHEM 002 three times in the last four years. The hybrid courses had lecture online, but the laboratory portion was face-to-face. Overall, for the semesters when the online hybrid courses were offered, it appears as if students in the online hybrid courses were less successful than in the traditional classroom environment. However, a more accurate assessment of the success of the Chemistry DE classes is when the same instructor teaches both the hybrid course and the traditional course. Three of the four times that CHEM 001 was offered as a hybrid course, the same instructor taught a face-to-face section at the same time as the hybrid section, and completed an SLO assessment for both sections for Fall 2011, Fall 2012, Fall 2013, and then Spring 2014 only the hybrid section was assessed. Two of the three times that CHEM 002 was offered as a hybrid course, the same instructor taught a face-to-face section at the same time as the hybrid section, and completed an SLO assessment for both sections Spring 2012 and Spring 2013. The final semester success rates are shown in the Table below. There were no significant differences in the SLO assessments between hybrid sections and face-to-face sections. Grades were also analyzed and there was no trend in the final grades for the two Chemistry courses when comparing the hybrid course to the face-to-face section, when taught by the same instructor. The department chose to do this for several years, in order to determine if distance education would really work for our students in Chemistry.

Traditional Sections	Total Students*	Number Passed	Percent Passed	Hybrid Sections	Total Students*	Number Passed	Percent Passed
CHEM 001							
Fall 2011	24	19	79.2%	Fall 2011	15	11	73.3%
Fall 2012	29	18	62.1%	Fall 2012	21	15	71.4%
Fall 2013	21	18	85.7%	Fall 2013	13	11	84.6%
				Spring 2014	19	12	63.2%
CHEM 002							
Spring 2012	21	19	90.5%	Spring 2012	17	17	100.0%
Spring 2013	23	21	91.3%	Spring 2013	22	18	81.8%
				Spring 2014	16	14	87.5%

	HEM	raditional			HEM	ybrid			
Term	Census	End of term	Passed	Success Rate	Term	Census	End of term	Passed	Success Rate
Fall 2011	26	24	19	73.1%	Fall 2011	22	15	11	50.0%
Fall 2012		29	18	54.5%	Fall 2012	27	21	15	55.6%
Fall 2013	26	21	18	69.2%	Fall 2013	25	13	11	44.0%
					Spring 2014	27	19	12	44.4%
Average				65.6%					48.5%
	CHEM 002	raditional			CHEM 002	Hybrid			
Spring 2012	31	21	19	61.3%	Spring 2012	24	17	17	70.8%

Spring 2013	27	23	21	77.8%	Spring 2013	26	16	14	53.8%
					Spring 2014	26	16	14	53.8%
Average				69.6%					59.5%

*Number of students enrolled at the end of the course

As stated above and in other sections of this program review, ALL online/hybrid classes have a “lower success rate” based on enrollment at the census date. However, the students who drop EARLY in the semester were usually not motivated or prepared to perform the activities necessary to succeed in an online lecture learning platform.

ACTION NEEDED: When the assessment tool for entry into CHEM 001, CHEM 010 and/or CHEM 051 is in place, then add a survey for students wanting to enroll in any hybrid section of those courses. Example: ask the students about their experience with online classes and computers, etc. The counselor would then also advise the students about the hybrid course. However, even with all the assessment, advice, etc., the students can enroll if the course prerequisites have been met.

The same challenge was seen in teaching Chemistry as a hybrid course that other departments noticed: enrollment dropped off rapidly. However, the student demand exists, especially for our military students and for our employed students.

The Chemistry Department plans to offer one section of the hybrid course for CHEM 001 every fall and one section of the hybrid course for CHEM 002 every spring as faculty assignments allow. As the number of sections increase in the next ten years, more sections could be offered as hybrid courses. Discussions are currently underway concerning the possibility of a CHEM 010 hybrid class.

The Chemistry Department will continue to compare SLO assessments and term grades for the hybrid sections vs. the face-to-face sections, in order to ensure that they continue to be comparable.

2.16 Advisory Boards/Licensing (CTE) (if applicable). Describe how program curriculum has been influenced by advisory board/licensing feedback. How often are advisory board meetings held, provide membership information and what specific actions have been taken. Attach minutes from the past two years.

Not applicable

STUDENT EQUITY & SUCCESS

3.1 Course Completion and Retention. Anecdotally describe how the program works to promote student success. Include teaching innovations, use of student support services (library, counseling, DSP, etc), community partnerships, etc.

The Chemistry Department is committed to promoting student equity and success in a variety of ways. This year, for the first time, Chemistry “drop-in” tutoring by Chemistry faculty was offered through the Basic Skills program for students struggling in any area of Chemistry. In 2012-2013 and 2014-2015, the department was awarded 2 strategic grants for open labs to provide students with access to the Chemistry tutorial programs on the Chemistry computers, access to the molecular model kits, and a place with other online resources for students to form study groups and study. Also, in 2012-2013, the department was awarded a Basic Skills grant to teach Chemistry workshops at the Introductory Chemistry (CHEM 160) level to aid and support students struggling at the introductory Chemistry level.

Teaching innovations include introduction of i>clickers to the classroom as a means of immediately assessing student comprehension during lecture. Chemistry faculty routinely use publisher on-line homework sites for

easier access for students since these sites can be accessed from virtually any technology device (including smart phones and tablets) and assessment of student work, and also for use as tutorials and resources for students. Furthermore, most of the Chemistry faculty have used either MySolano or Canvas to set-up course shells for students to have access to course materials such as files, power points, links to helpful tutoring sites, practice exams, worksheets, etc. In addition, CHEM 001 and CHEM 002 have been offered the past 2 years as online “hybrid” courses (lecture online, lab face-to-face). These online courses were not offered this year due to the switch to Canvas and the retirement of the key faculty person in charge. Other faculty are discussing how to fill this gap and ways to offer these important online courses once again.

In order to help keep the costs of course materials down which will help increase access and success, some faculty are currently considering participating in the UC Davis Chemwiki project (open-source textbooks and materials for Chemistry and other STEM majors). Several faculty already use “open-source” textbooks to help keep the cost of course materials as low as possible for the students. Faculty have also worked with publishers to “bundle” custom textbooks with other course materials as a means of keeping costs down. Faculty are also currently trying out a less expensive non-publisher specific online homework site to help keep student expenses down.

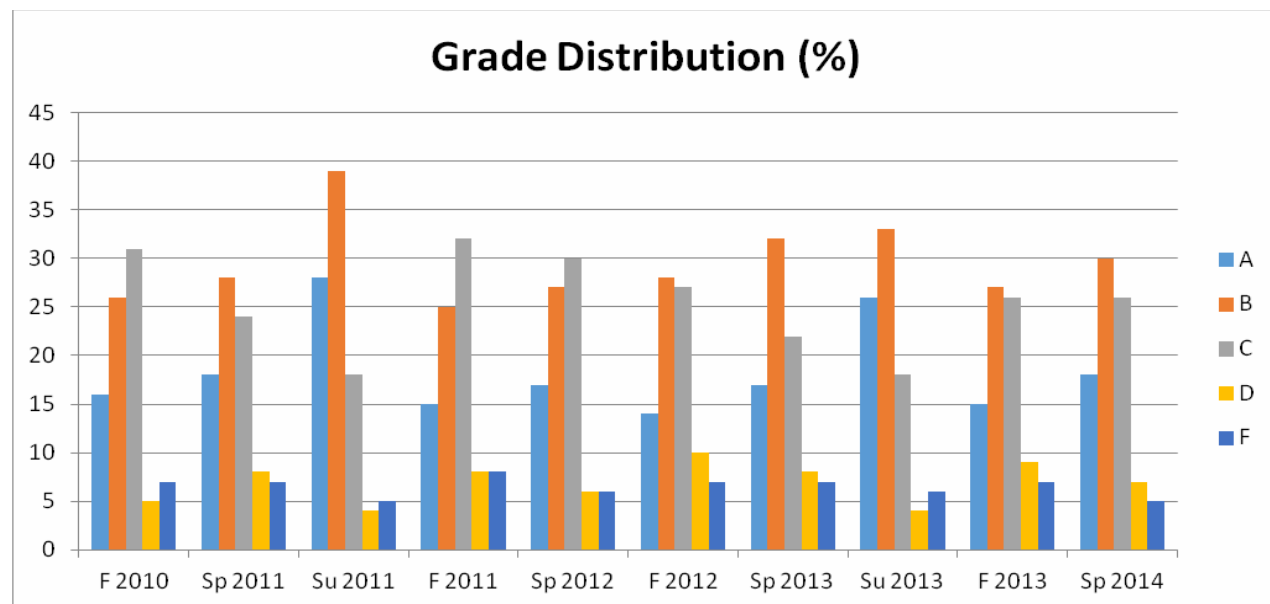
The department has also striven to remain current with technologies, equipment and instrumentation used in the Chemistry laboratories. In Spring 2014, the department was awarded a grant to purchase new Vernier equipment that is used in conjunction with the current data loggers and computers, especially for use in the organic labs.

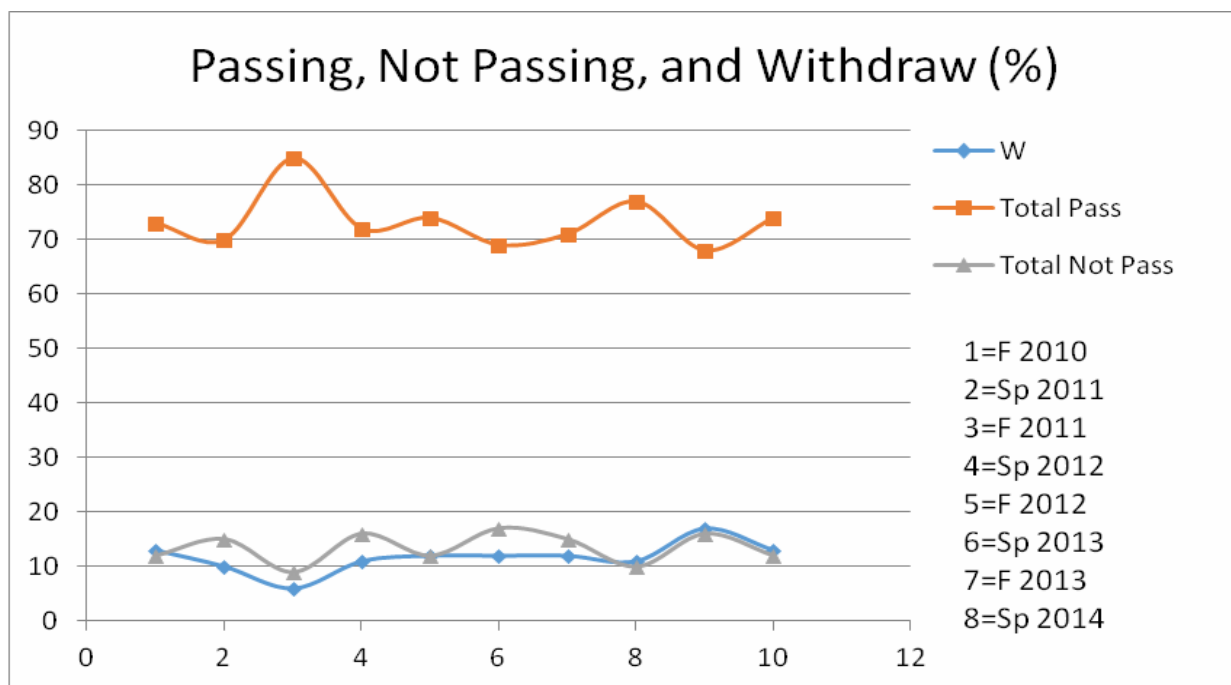
The Chemistry faculty have provided Chemistry textbooks to the library to be placed on reserve for student access. In addition, the faculty fully cooperates with the DSP office to make sure our DSP students receive the full accommodations given them. In the past, the Chemistry faculty have met with the Counseling office to discuss the best methods of placing students in the correct Chemistry class for their skill and level of knowledge, however the faculty recognize that a meeting may need to occur with the counseling office in the near future so that the counselors are aware of changes to the Chemistry program.

Then, utilizing data from the office of Institutional Research and Planning, report on student success through course completion and retention data. Analyze by gender, age, ethnicity, and on-line (may analyze other variables such as disability, English as a second language, day vs. night courses, etc. as appropriate).

Provide possible reasons for these trends AND planned action to equalize student success.

The following graph illustrates the grade distribution by percent for the Chemistry department as a whole:



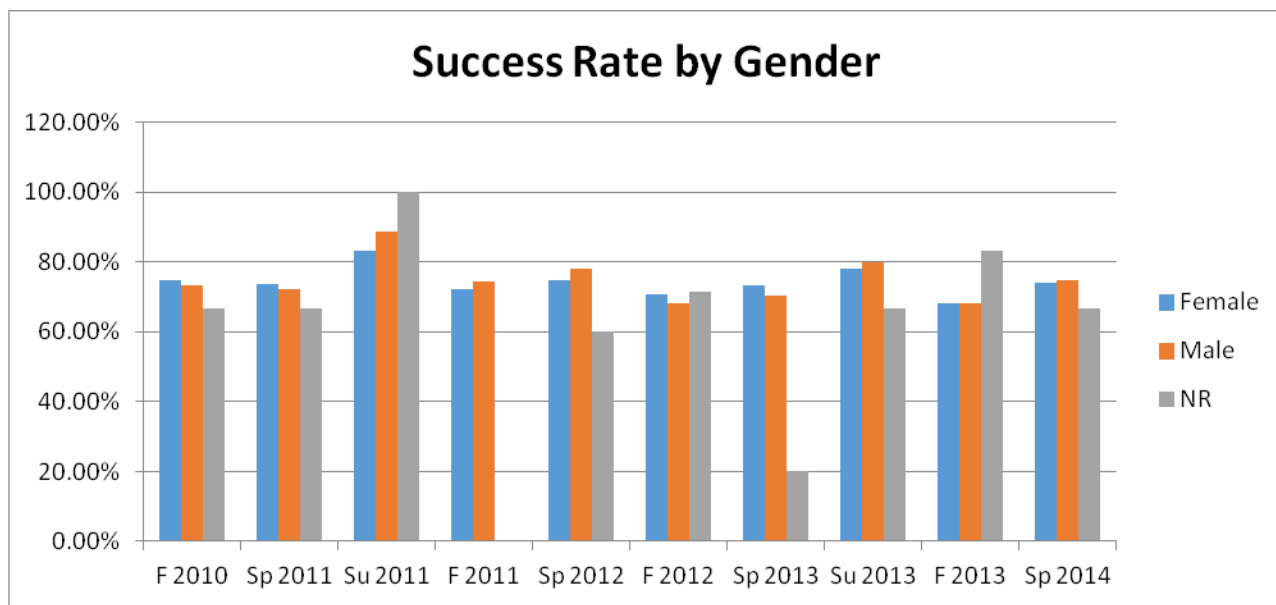


The majority of letter grades awarded are B's and C's, followed by A's. Grades of D and F are much lower. It is also interesting to note that there does not seem to be any "grade inflation" with regard to Chemistry since the number of A's has not increased significantly and the percentage of students passing Chemistry courses has remained relatively flat. There is a slight increase in grades and passing rates during the Summer sessions. This would seem contradictory to what would be expected since the Summer terms have the same amount of material delivered in a much shorter time frame. However, many instructors have noted that the students taking Summer courses tend to be more prepared for their college course as these students are often already enrolled at a 4-year college or are recent high school graduates wanting to "get ahead".

The withdrawal and the total not pass rates can be attributed to the fact that many four-year programs and professional programs require their incoming transfer students to have a "B" or above in the courses in their major they intend to transfer to these programs so students may be passing with a C but choose to either withdraw from the class or purposely fail the class if it is too late to withdraw, so that they can retake the class and try to get a better grade on their transcript.

Planned Action: Offer an 8-week CHEM 160 course followed by an 8-week CHEM 010 course in the Fall semester so that students can prepare for and be more successful in CHEM 001 the subsequent semester. This would also allow students who start in CHEM 001 but withdraw early to enroll in the "late start" CHEM 010 class which would help to keep them on their academic track.

Course Completion:
By Gender:

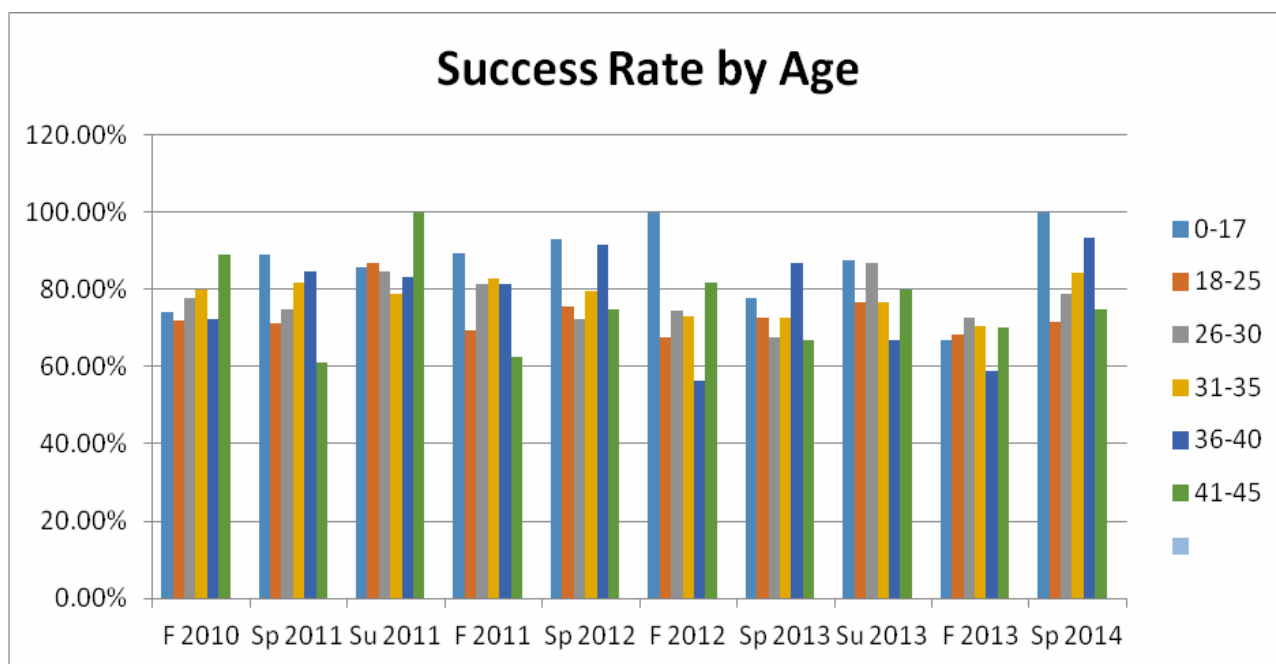


Trend: There does not appear to be a correlation between success rate and gender.

Reason: Gender does not seem to have any influence on success rate.

Planned Action: None.

By Age:

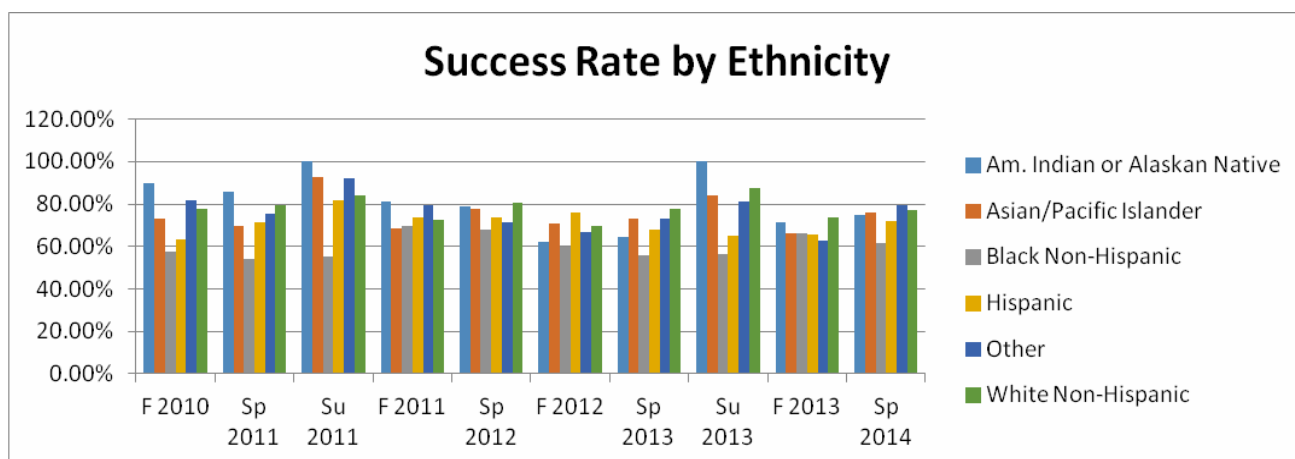


Trend: There does not appear to be a trend when looking at success vs. age of student.

Reason: Age does not appear to have a significant influence on success rate.

Planned Action: None.

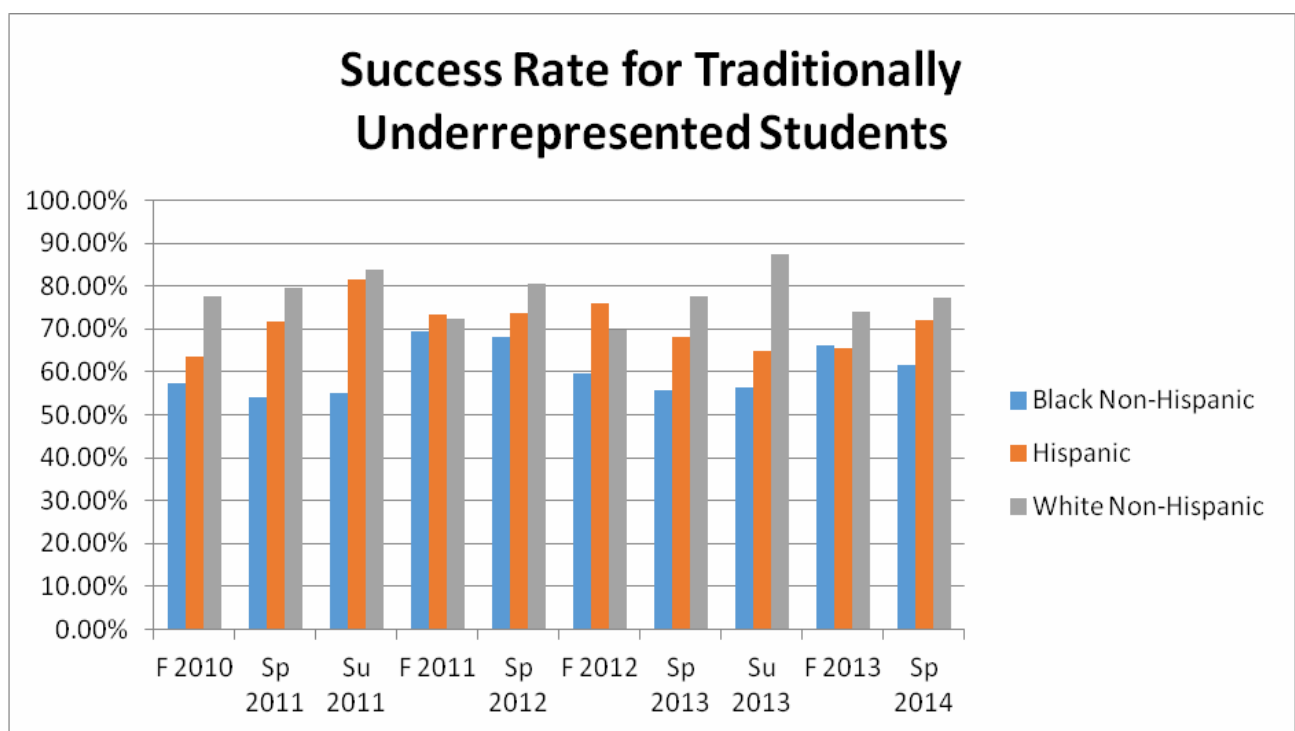
By Ethnicity:



Trend: American Indian/Alaskan Native and Asian/Pacific Islander students tend to do as well as or better than White Non-Hispanic Students.

Reason: No correlation between these ethnicities and success rate.

Planned Action: None.



Trend: Black Non-Hispanic and Hispanic students have a lower success rate than White Non-Hispanic students.

Reason: The reasons why these ethnicities do not do as well as other ethnic populations for chemistry courses are complex and varied. Both of these student populations tend to come from traditionally economically disadvantaged groups which are often also correlated with a lower education level. This may mean that these students are entering their chemistry classes without the previous knowledge and educational/study skills needed to be successful at this level. Another reason may be cultural, since many lower income families desire their children to go to work soon after graduating from High School to help support the family and thus do not

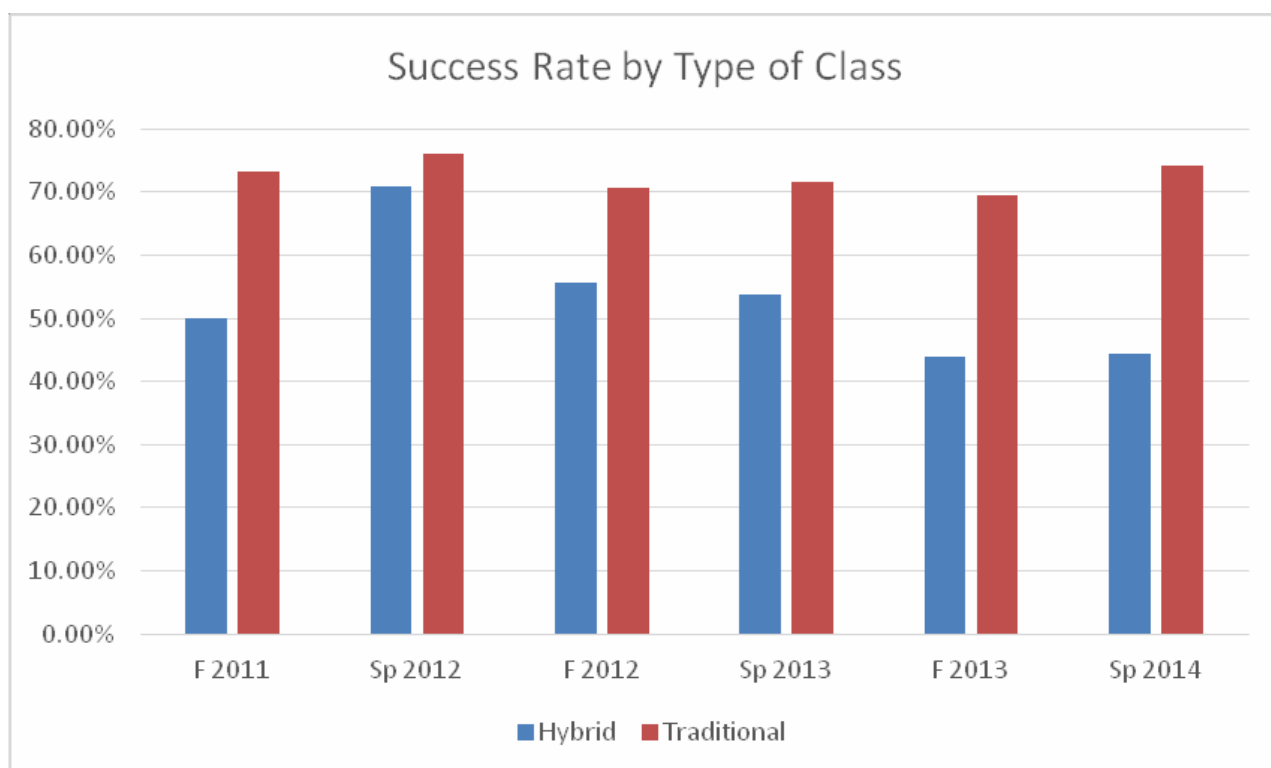
necessarily support their child attending college, especially on a full-time basis. They may not understand the long-term benefits to acquiring a degree in higher education.

For Hispanic students, a language barrier may be one of the reasons they do not do as well since chemistry textbooks are written at a fairly high English reading level and the vocabulary uses words not commonly used in the everyday English language.

Planned Action:

- 1) Create brochures in Spanish and English that illustrate the employment opportunities for people with college degrees in various fields of chemistry, especially comparing salaries and benefits of people with and without degrees.
- 2) Find the Spanish version of chemistry textbooks and keep them on reserve at the library.
- 3) Seek-out bilingual tutors for chemistry.
- 4) Have a "family day" for prospective chemistry students where parents and family members can tour the Chemistry facilities at SCC and interact with the chemistry faculty to help prospective student's families to be more supportive of their chemistry education.
- 5) Encourage black/non-Hispanic students to be involved in programs such as MESA, UMOJA and other college support groups.

By Course Type:



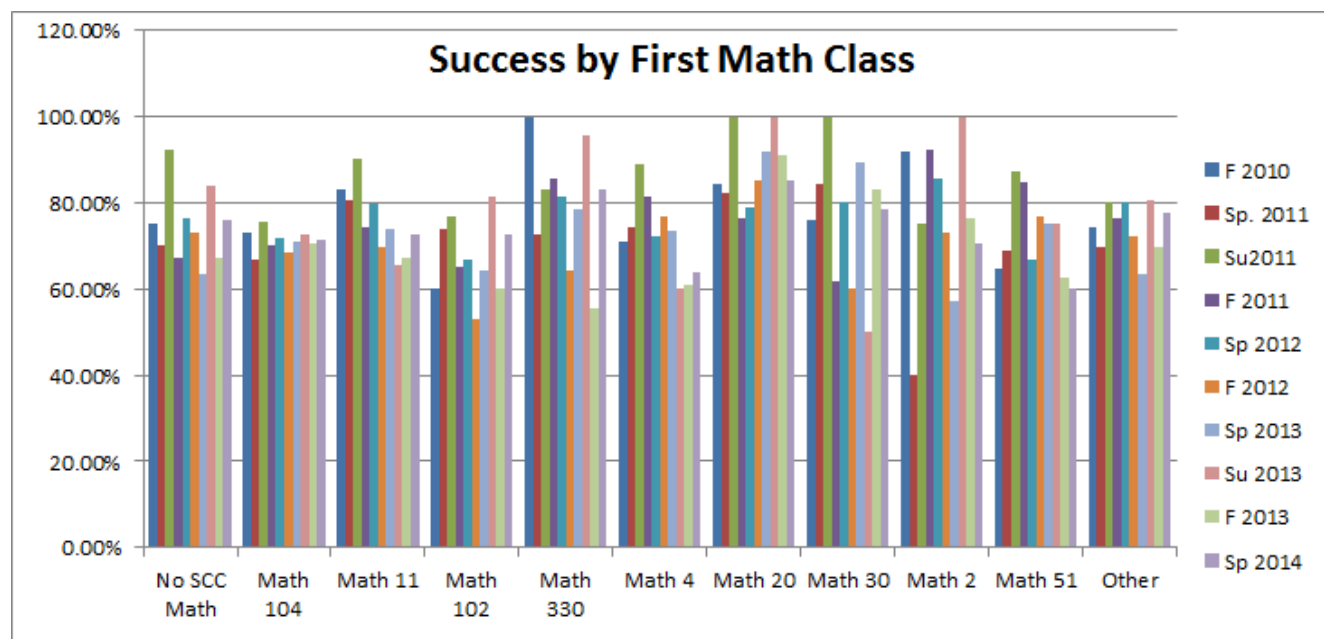
Trend: For the semesters when the online hybrid courses were offered, it appears as if students in the online hybrid courses were less successful than in the traditional classroom environment. Please note that when the success rate for the hybrid class of a particular course is directly compared to the success rate of the same class taught by the same instructor using the traditional lecture/lab mode, the success rates are comparable for each class. (Please see section 2.15 for more information.)

Reason: Chemistry is a difficult subject to learn even when a teacher is present to explain it and offer guidance. It is even more difficult to try to learn without the physical presence of a teacher. Chemistry textbooks are not easy to read and decipher due to the reading level required the previous amount of math knowledge required and the more uncommon vocabulary. There is also a tremendous amount of homework practice needed to be successful. For an online student to be successful, they must be very self-motivated and have good time management skills.

Planned Action:

- 1) Emphasize at the beginning of the class the need for self-motivation, time management, and computer competency in order to be successful in the online classes.
- 2) Implementation of the assessment tool to help place the students in the proper chemistry course.
- 3) Inform the students, especially the online students, of all the academic success resources available to them.
- 4) Include a survey for students wanting to enroll in any hybrid chemistry course. The survey could ask the students about their experience with online classes and computers, time management skills, other time consuming activities, etc. The counselor would then advise the students about the hybrid course.

SUCCESS RATE BY FIRST MATH CLASS



Trend: Students who had Math 20 (calculus) as their first math class at SCC had a higher success rate than students who started in other math classes.

Reason: Chemistry is a math-intensive course. A student needs a good background in mathematics to apply and solve the majority of chemistry problems required in the first chemistry classes a student would take. Students who take Math 20 (calculus) as their first math class already have demonstrated that they have a very extensive math background.

Planned Action:

- 1) Implement the chemistry assessment tool, which includes a math portion, to help students be placed in the correct chemistry course.
- 2) Work with the Math faculty to develop and implement a math review course for science students similar to Math 160 for nursing students, and encourage Counselors to strongly recommend enrollment in such course for students who have not had a math course within the past three years.

MATH 160**0.5 Units**

Math for Nursing School Students

Prerequisite: CONDITION OF ENROLLMENT:*Current acceptance or on the waiting list of an RN*

Program. This course focuses on mathematics topics that are critical to success for students entering an RN program. This course provides a review of select mathematics topics for students entering nursing school. This course is especially designed for students that have had an extended time period between finishing their pre-nursing requirements and entering nursing school. Pass/No Pass only class. *Two hours lecture. (4-week course)*

SUCCESS RATE BY SUCCESS IN PREVIOUS CHEMISTRY COURSE:**Average success (%) in CHEM 001 based on previous enrollment**

Not previously Enrolled	Fall CHEM 001 from Spring CHEM 160	Fall CHEM 001 from Spring 010	Spring CHEM 001 from Fall CHEM 160	Spring CHEM 001 from Fall CHEM 010	Over-all CHEM 001 success from CHEM 160	Over-all CHEM 001 success from CHEM 010
63.9	59.4	68.1	74.1	66.8	66.8	67.4

Trend: In general, students were more successful if they had a previous Chemistry course at SCC than if they had not. Interestingly, whether that course was CHEM 160 or CHEM 010 does not seem to be a good predictor of success in CHEM 001.

Reason: Usually, only the higher achieving CHEM 160 students immediately go into CHEM 001 from CHEM 160.

Planned Action: Investigate the possibility of creating a course to prepare students specifically for CHEM 001.

Average success (%) in CHEM 010 based on previous enrollment in CHEM 160

Not Previously Enrolled	Enrolled in CHEM 160 previous semester
72.83	81.59

Trend: Students who took CHEM 160 were more likely to be successful in CHEM 010 than students who did not.

Reason: CHEM 160 is an introductory chemistry class that prepares students for success in future chemistry classes.

Planned Action: None.

Average success (%) in CHEM 160 based on previous enrollment in Math 104

Not Previously Enrolled	Enrolled in Math 104 previous semester
69.1	70.4

Trend: Enrolling in Math 104 prior to taking CHEM 160 does not appear to improve student success rates in CHEM 160.

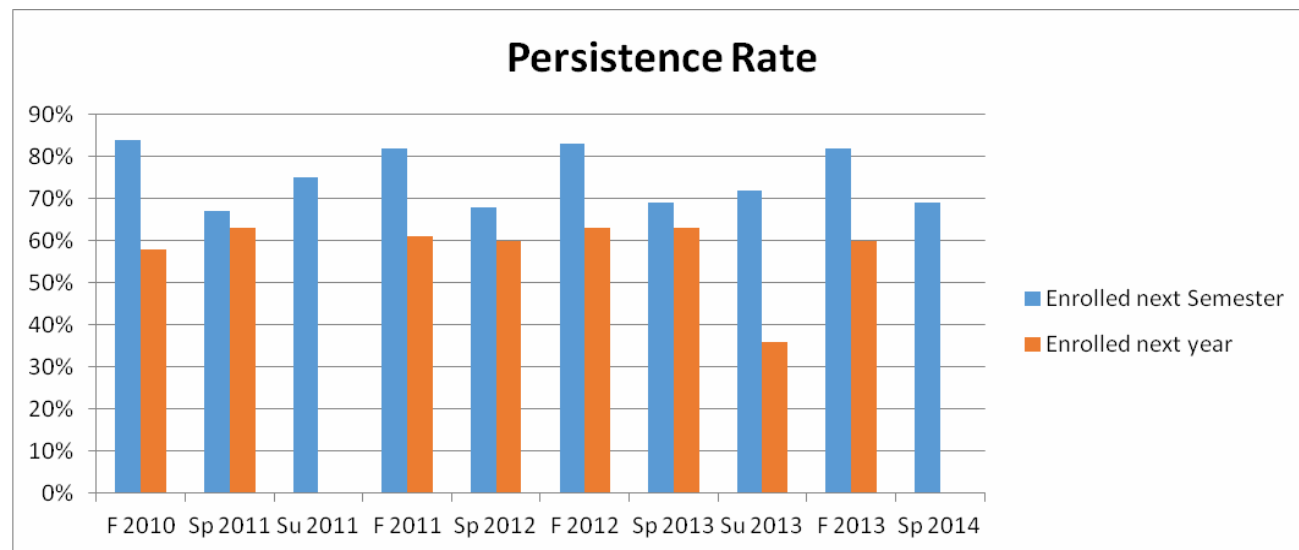
Reason: Many students who take CHEM 160 have previously satisfied the prerequisite of taking a math course equivalent to Math 104 at a prior time to their enrollment at SCC. Students who do not take the equivalent of Math 104 until enrolling at SCC generally have difficulty being successful in math and thus may have difficulty applying the concepts taught in Math 104 to CHEM 160.

Planned Action: Work with the Math faculty to develop and implement a math review course for science students similar to Math 160 for nursing students, and encourage Counselors to strongly recommend enrollment in such course for students who have difficulty applying mathematics to other areas of study (see above).

Other Planned Action to improve the success rate of students in CHEM 010 and CHEM 001:

- 1) Develop a tool that counseling can use to help assess the readiness of a student for suggested placement in either CHEM 010, CHEM 051 or CHEM 001.
- 2) Have “late start” CHEM 160 and CHEM 010 classes so that students who initially enroll in CHEM 001 or CHEM 010 but find they are not prepared for these classes can then enroll in either CHEM 160 or CHEM 010 for the current semester.
- 3) Have an 8-week CHEM 160 class followed by an 8-week CHEM 010 class.
- 4) Have an 8-week Math 104 class followed by an 8-week CHEM 160 class.

Course Retention:



Trend: In general, over 60% of the students who took a chemistry class enrolled in another class at SCC the following semester. A lower percentage of students who took a chemistry class enrolled at SCC the following year.

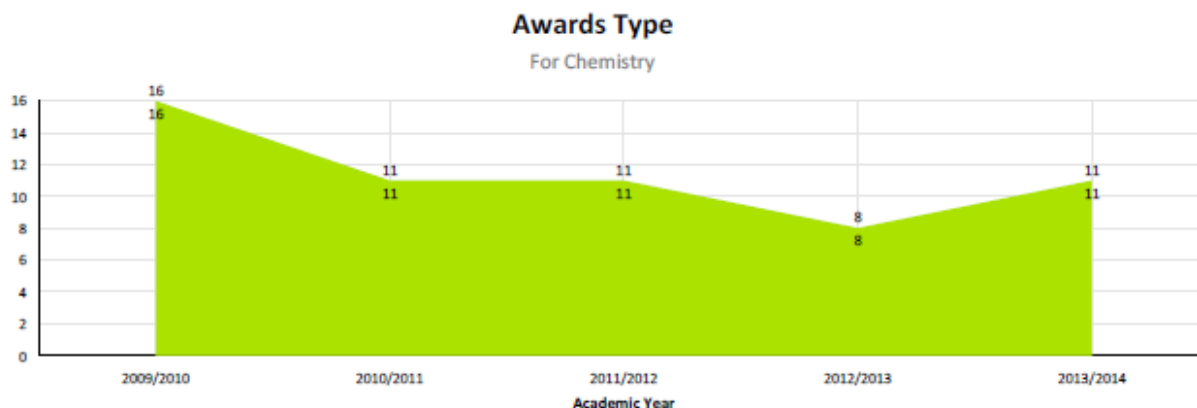
Reason: Since many of our students who take chemistry classes intend to continue their education at a four-year institution, it follows that a number of students who took Chemistry classes would not necessarily enroll again at SCC if they had transferred to another institution.

Planned Action: None.

3.2 Degrees/Certificates Awarded (if applicable). Include the number of degrees and certificates awarded during each semester of the program review cycle. Describe the trends observed and any planned action relevant to the findings.

The number of degrees and certificates awarded during each semester since 2009 is shown below:

2009/2010	2010/2011	2011/2012	2012/2013	2013/2014
16	11	11	8	11
100.00%	100.00%	100.00%	100.00%	100.00%



The general trend is a decline in the number of AS degrees in Chemistry awarded over the past 5 years. This is likely due to the fact that the majority of our Chemistry students transfer to a four-year institution to pursue a 4-year Bachelor's degree rather than get a two-year degree.

The State Chancellors Office has approved a template for the ADT (Associate Degree for Transfer) for Chemistry based on the Transfer Model Curriculum (TMC) but has not yet published it. Once the template for the ADT is published, the Chemistry faculty will need to discuss how the Chemistry department will align its AS degree with the ADT degree requirements. Currently, the AS degree at Solano does not align with the ADT degree. The current AS degree in Chemistry at Solano has the following requirements:

REQUIRED COURSES	Units
CHEM 001 General Chemistry.....	5
AND	
CHEM 002 General Chemistry.....	5
CHEM 003 Organic Chemistry I	5
AND	
CHEM 004 Organic Chemistry II.....	5
BIO (any course except 048 or 098).....	3 - 5
PHYS 002 General Physics (Non-calculus).....	5
OR	
PHYS 006 Physics for Science and Engineering.....	5
OR	
PHYS 010 Descriptive Physics	3
Total Units	26 - 30

The proposed Transfer Model Curriculum for Chemistry is as follows:

Proposed Transfer Model Curriculum

CCC Major or Area of Emphasis: Chemistry

CSU Major or Majors: Chemistry

Total units 34 (all units are semester units)

Degree Type (indicate one): AS-T X

“Core” Courses:

34 units

Title (units)	C-ID Designation	Rationale/Potential GE applicability
General Chemistry for Science Majors Sequence A (10)	CHEM 120S	Required lower division preparation for major./CSU GE Areas B1 & B3.
Organic Chemistry for Science Majors Sequence A (8)	CHEM 160S	Required for major.
Calculus-Based Physics for Scientists and Engineers: A and B (8)	PHYS 205 and PHYS 210	Required lower division preparation for major.

AND

Single Variable Calculus Sequence (8) Or Single Variable Calculus I – Early Transcendentals (4) And Single Variable Calculus II – Early Transcendentals (4) Or Single Variable Calculus I – Late Transcendentals (4) And Single Variable Calculus II – Late Transcendentals (4)	MATH 900S OR MATH 210 AND MATH 220 OR MATH 211 AND MATH 221	Required lower division preparation for major./CSU GE Area B4. 2 semesters or 3 quarters of calculus, minimum 8 semester units.
---	---	---

In order to align with the TMC, the Chemistry degree would have to implement a requirement for a second semester of calculus-based physics with 8 units instead of 10, 2 semesters of calculus with 8 units instead of 10, and decrease the number of units for the organic Chemistry series of classes to 8 units. These would be major changes to the degree and will have to be discussed and researched at length before any definite changes are made. However, once the TMC is published to the Chancellor’s website, the Chemistry Department will have 18 months to either align the AS degree with the TMC or will need to stop offering the AS degree in Chemistry since it will not be a transferrable degree to a 4-year institution.

This, then, essentially leaves three options for the Chemistry department:

- 1) Offer both the ADT and AS degrees: this would likely be the optimum choice since it will give our students the most options. However, this will require the Chemistry department to create two more organic Chemistry courses that align with the TMC, which will require more resources and faculty.
- 2) Offer only the ADT degree and not the current AS degree: It is likely that most students who take the courses required for just the ADT will transfer to a California State University. However, many of our students wish

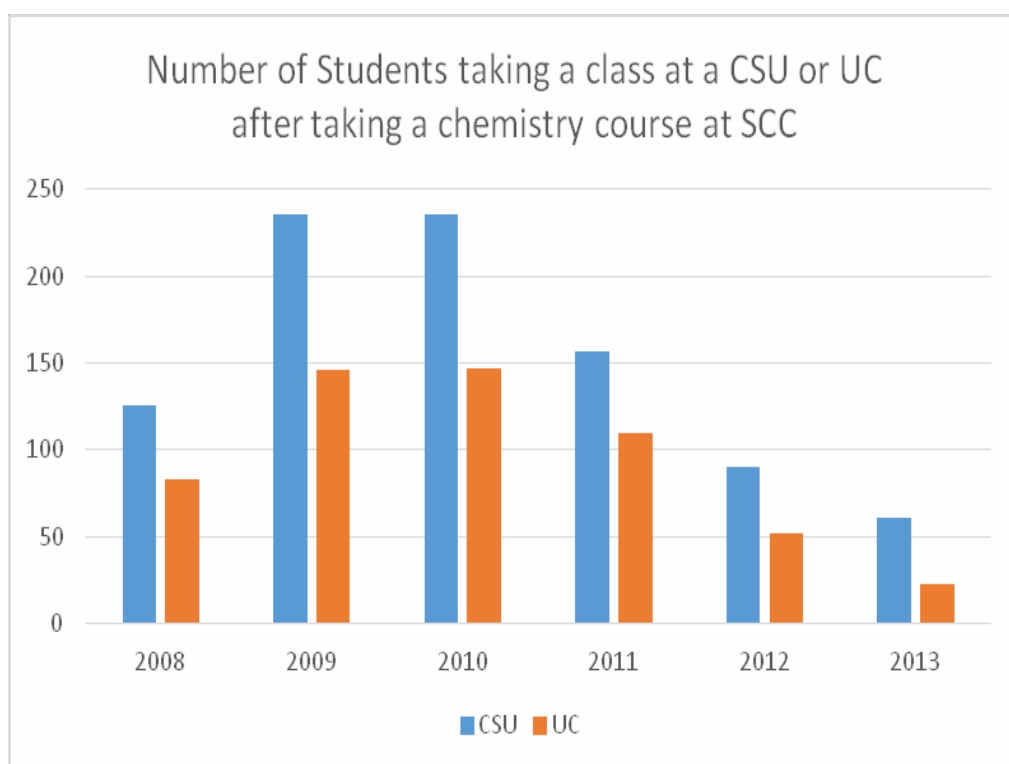
to transfer to a UC or professional school, most of which require more units in organic Chemistry than the ADT. This would likely decrease the number of students actually receiving their degrees from Solano.

- 3) Cease to offer any degree in Chemistry and continue to offer Chemistry courses to support other courses and to prepare students for transfer to 4-year universities.

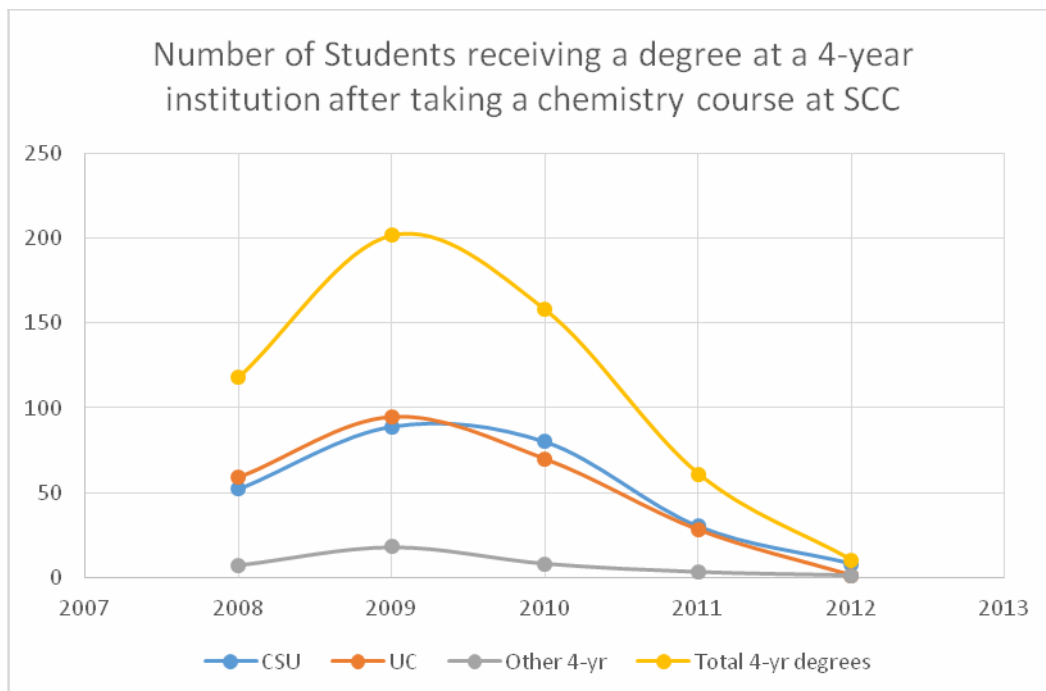
3.3 Transfer (if applicable). Describe any data known about students in your program who are transfer eligible/ready (have 60 transferable units with English and math requirements met). Include how your program helps students become aware of transfer opportunities (limit to one or two paragraphs).

From the chart below, and a comparison with the table in section 3.2, one can see that far more students who take Chemistry courses go on to transfer and take courses at a 4-year institution than are awarded the AS degree in Chemistry, again lending support to the idea that the majority of our Chemistry students intend to achieve a 4-year degree rather than a 2-year degree.

- Original data may be questionable. This trend does not follow with what the Chemistry faculty know to be true from feedback from their students.



This is further supported by the following graph which indicates the number of students who went on to receive a degree from a 4-year institution:



- Original data may be questionable. This trend does not follow with what the Chemistry faculty know to be true from feedback from their students.

Both of these graphs indicate that the number of students transferring to a 4-year institution and receiving their degrees from a 4-year institution after taking a chemistry course at SCC has diminished recently. The reason for this is as yet unclear. The total enrollment in chemistry courses at SCC has slightly increased over the past several years as can be seen in the following table:

Total enrollment of students within the Chemistry Department:

	Fall 2010	Spr 2011	Fall 2011	Spr 2012	Fall 2012	Spr 2013	Fall 2013	Spr 2014
All	630	625	601	623	624	653	675	652

It is possible that the number of degrees reported for the last few years is lower simply due to the fact that SCC has not recently received the correct number of degrees awarded from these institutions since that reporting is voluntary.

Students become aware of transfer opportunities by participation in the transfer and career fairs held on campus. Faculty actively promotes these events during class. The Transfer Center sponsors field trips to the CSU's and UC's and students are encouraged by the Chemistry faculty to attend. Faculty also distributes and post information concerning internships available and other employment opportunities from the college Career center. Faculty also are involved in a lot of counseling of students during office hours concerning the student's future educational and career goals and what type(s) of degree(s) would be needed to achieve those goals.

3.4 Career Technical Programs (if applicable). For career technical programs, describe how graduates are prepared with the professional and technical competencies that meet employment/ licensure standards. State if there are any efforts made to place students in the workforce upon graduation, including any applicable placement data.

Not Applicable

PROGRAM RESOURCES

4.1 Human Resources. Describe the adequacy of current staffing levels and a rationale for any proposed changes in staffing (FTES, retirements, etc.). Address how current staffing levels impact the program and any future goals related to human resources.

Current staffing for chemistry faculty is barely adequate. All Chemistry Department plans include increasing the number of full-time faculty to seven. The department has one retirement coming May 2015, and another May 2016 or 2017. If these faculty are not replaced, the Chemistry Program will suffer greatly. There are at least one or more adjunct Chemistry hiring committees annually, as some of our adjunct faculty move on to full-time jobs elsewhere. The high quality of the Chemistry Department and Chemistry Program depends on a full contingent of highly qualified full-time faculty. This will continue to improve the student enrollment and success rates. In addition, hiring faculty with a broader level of experience, for example in areas of Chemistry and the Arts, or Environmental Chemistry, etc., will attract and encourage more students to enroll in chemistry courses from a variety of backgrounds.

The Chemistry lab technician position was increased to 1.5 full-time equivalent several years ago. At that time, a full-time technician was added to the division and split the work time between biology and Chemistry. However, the Administration moved the employee to Vallejo and never replaced the position at the Fairfield Campus. As the Chemistry sections and faculty are increasing and we consider increasing the number of classes offered in the evenings and week-end, it is essential that a Chemistry technician be on site during these times.

As we acquire advanced and technical instrumentation for Chemistry labs, the need of hiring a specialized lab technician who has expertise in these areas will be essential.

Planned Action: Continue to pursue the hiring of additional faculty, lab technician support and an instrumentation technician.

4.2 Current Staffing. Describe how the members of the department have made significant contributions to the program, the college, and the community. Do not need to list all the faculty members' names and all their specific activities, but highlight the significant contributions since the last program review cycle.

Chemistry was awarded two strategic grants for open labs in 2012-2013 and 2014-2015 to provide students with access to the chemistry tutorial programs on the chemistry computers, access to the molecular model kits, and a place with resources for them to form study groups and do other homework. We were also awarded strategic grants for the purchase of equipment such as high temperature probes, hand-held data loggers, polarimeters, and gas chromatographs. In addition, the Chemistry Department was awarded a Basic Skills grant to teach chemistry workshops at the Introductory Chemistry (CHEM 160) level.

Chemistry faculty have been advisors to student clubs such as MSS, SHPE, SACNAS, AGS, Campus Crusade and the Native Americans Club. Chemistry faculty have also been involved in many committees including the Academic Senate, Curriculum Committee, Accreditation Committees, Academic Calendar, Flex Cal committee, PCA and SCFA, the local faculty union and many of these faculty held executive positions. Faculty have also served on numerous hiring committees, including those for upper level administrators.

Faculty have been involved with a local Boy Scout Troop which visited the lab at the college for their Chemistry Merit Badge and have participated in other boy scout merit badge events around the region where they participated as the Chemistry merit badge counselor. Chemistry participated in the Outreach held at the Solano Mall in October 2014. Faculty are also involved in career fairs at the college. In addition, several faculty participate in helping with Mission Solano several times a year.

Faculty have introduced i>clickers to the classroom as a means of immediately assessing student comprehension during lecture. They are also currently looking at participating with the UC Davis Chemwiki project (open-source textbooks and materials for Chemistry and other STEM majors). Faculty were part of the pilot group that

evaluated the use of CANVAS LMS instead of the Pearson eCollege LMS. Some faculty are currently part of the pilot program to evaluate the efficacy of using the "Prezi" presentation software.

4.3 Equipment. Address the currency of equipment utilized by the program and how it affects student services/success. Make recommendation (if relevant) for technology, equipment, and materials that would improve quality of education for students.

The following equipment needs to be replaced or purchased to support the quality of education of our Chemistry students:

1. Replace damaged balances.
2. Laptop computers and permanent, locking cabinet for storing and charging laptops for each laboratory, especially for the new facility.
3. Upgraded or new Chemistry tutoring software programs.
4. Acid cabinet for concentrated acids for each lab (or one for the middle room - the diluted acids are ok to be kept in the hood)
5. Periodic Table for room 304 (similar to the one in room 303)
6. New pipette pumps or "old-fashioned" pipette filler. These may be better as the pipette pumps seem to keep breaking probably due to using them for solvents.
7. Sufficient rulers
8. Porcelain or clear glass spot plates. The plastic ones get scratched and clouded due to acetone or other solvents so they are difficult to see precipitates and other reactions.
9. Glassware, including 30-ml beakers, 25 and 50 ml Erlenmeyer flasks
10. Bunsen Burners and tubing
11. Tubing for Distillation and Fractional Distillation apparatus and vacuum filtration.
12. Dedicated and practical space for the Organic Chemistry lab glassware and equipment.
13. Weighing boats or weighing paper in the balance rooms.

In the future, we will need to research and purchase more advanced instrumentation including an NMR, FTIR, Gas Chromatograph and likely replace the current spectrophotometers with more current models.

4.4 Facilities. Describe the facilities utilized by your program. Comment on the adequacy of the facilities to meet program's educational objectives.

Planning for expansion of space for science programs is already underway with Measure Q. This planning needs to incorporate all the needs of each science program, such as adequate ventilation for Organic Chemistry, adequate preparatory space, storage, etc.

Current issues:

Vallejo Center: Lack of ventilation for any type of Organic Chemistry experiments, which occur in CHEM 003, CHEM 004, CHEM 002, CHEM 011, and CHEM 051. Lack of natural gas supply at the student workstations.

Vacaville Center: Storage cabinets for oxidizers, acids (additional), bases (corrosives), and poisons are needed. The metal sink drains are leaking and need to be replaced with glass or plastic drains. More fume hoods and a dedicated reverse osmosis or distilled water source for the chemistry labs are needed. Additional burets, better quality pipet pumps, better quality Bunsen burners and crucibles are needed. A minimum of two laboratories, dedicated to chemistry classes must be provided for future growth and expansion of the Chemistry program.

Main Campus: Shortage of ventilation for the majors Organic Chemistry classes, CHEM 003 and CHEM 004. Lack of locking student workstations. Lack of instrument room and instruments. Inadequate preparatory and storage space. Current space not being used efficiently (cabinets not labeled correctly, old or unused equipment being stored, etc.) A minimum of three laboratories (preferably four) dedicated to chemistry classes must be provided for future growth and expansion of the Chemistry program.

4.5 Budget/Fiscal Profile. Provide a five year historical budget outlook including general fund, categorical funding, Perkins, grants, etc. Discuss the adequacy of allocations for programmatic needs. This should be a macro rather than micro level analysis.

Chemistry Supply Budgets

	2010	2011	2012	2013	2014
Vallejo Center	\$2000.00	\$2000.00	\$2000.00	\$2000.00	\$2000.00
Vacaville Center	\$1000.00	\$2000.00	\$2000.00	\$4000.00	\$5000.00
Main Campus	\$14908.00	\$14908.00	\$8850.00	\$10610.00	\$14000.00
Total	>\$17908.00	>\$18908.00	>\$12,850.00	>\$16610.00	>\$21000.00

Fiscal data is NOT completely accurate, but the table shows what could be found for this program review cycle using various sources. Data for the centers was very difficult to find. If budget was available for one year, the same amount was assumed for following years. The Chemistry Department cut back on expenses at the main campus starting with 2012 because the budget for the entire college was significantly reduced in 2012.

PROGRAMMATIC GOALS & PLANNING

5.1 Program Strengths. Summarize what you believe are your program’s strengths and major accomplishments in the last 5 years. Next, state the areas that are most in need of improvement.

Strengths:

1. Faculty are responsive to students’ needs for more sections of particular chemistry courses.
2. Faculty plan and develop new courses as the need arises such as a new course for nursing students.
3. Faculty work well together to meet expectations and accomplish goals in a timely manner.
4. The variety of academic strengths and areas of expertise of the faculty complement each other to provide a well-rounded and balanced Chemistry Program.
5. The faculty inspire each other to try a variety of teaching methods and new technologies in the classroom and laboratory in order to maintain a “cutting-edge” approach to secondary education.
6. The faculty are constantly reviewing new educational materials for incorporation into the Chemistry Program to keep the program up-to-date.
7. The faculty make optimal use of the classrooms and laboratory facilities for educational purposes such as open lab times for students to use chemistry tutorials and molecular model kits.
8. The faculty strive to make themselves, the facilities and other educational resources available and accessible to students via course companion websites, email, etc.

Major accomplishments are as follows:

1. Distance Education courses offered and evaluated.
2. Expanded FT faculty to six members.
3. CHEM 051 developed and sections expanded to meet student need.
4. Organic Chemistry equipment updated and expanded.
5. Student learning outcomes assessments completed on time.

Needs Improvement (In order of priority):

1. The department would benefit from additional experts in the field of Organic Chemistry to expand its offerings at the new Biotechnology building at the Vacaville campus. Currently we have one member whose specialty is Organic Chemistry. As we increase the number of organic classes taught to include the Vacaville facility, we will need another faculty person who is able to teach those classes.
2. The Chemistry Department will need a member who has expertise in instrumentation as soon as the new building and instrument room is built at the Fairfield campus.
3. Laboratory rooms and the prep room at the Fairfield Campus: The two laboratories in the 300 building are currently being used to full capacity. In order to offer more Chemistry classes, a minimum of three (preferably four) Chemistry laboratories must be provided to accommodate more laboratory classes. The current laboratories, including some of the equipment, are in disrepair and somewhat disorganized. The labs could use a thorough “spring cleaning”, including removing old, outdated or broken pieces of equipment and re-organizing the current equipment to give prime storage space to that equipment that is used most often.
4. Chemicals are stored in the laboratories when they are not currently being used, often for prolonged periods. This “clutters-up” the lab benches and confuses students. Chemicals should be placed in the laboratory at the beginning of a specific experiment and then removed from the laboratory once the specific experiment for which they are intended is finished.
5. Lab technical help is often not available for the evening lab classes, and would likely not be available for week-end classes.
6. Faculty are not provided the funds to attend professional meetings and workshops. Chemistry is a dynamic discipline that changes rapidly due to new discoveries and methods used in areas of research and industry. As such, the faculty need to attend professional meetings to be kept abreast of these changes.
7. Faculty are not provided the funds to become members of professional organizations such as the American Chemical Society, Institute of Food Technologists, etc.

5.2 Program Goals. Based on the self-study analysis, prioritize the program's short (1-2 years) and long term goals (3+ years). Check whether the goal requires fiscal resources to achieve.

Table 8. Short-Term and Long-Term Goals

Short-Term Goals	Planned Action	Target Date	Person Responsible	Source
1.	Replace the retirement position from Spring 2015	Spring 2015	Dean and F.T. Faculty	DB
2.	Hire a seventh FT faculty member	Spring 2016	Dean and F.T. Faculty	
3.	Expand number of sections of courses offered as laboratory space permits.	Every semester as needed	F.T. Faculty	DB
4.	Ensure that lecture rooms are maintained for use by the Chemistry program in close proximity to the laboratories	Each Semester	Dean	NR
5.	Offer a DE Hybrid CHEM 001 in the fall and a DE Hybrid CHEM 002 in the spring every academic year.	Each Fall and Spring Semester	Dean and F.T. Faculty	NR
6.	Re-arrange lab storage spaces to improve the storage and efficiency of the lab spaces	Spring 2015	Dean, F.T. faculty and lab technician	DB
7.	Develop a Chemistry Department packet that would contain Division and Department policies, procedures and safety protocols for new faculty and adjuncts; include instructions for Banner, Companion websites, photocopying, etc.	Fall 2015	Dean, F.T. faculty, lab technician and administrative assistants	DB SP
8.	Align Chemistry courses with CID designation.	Fall 2015	Dean, F.T. faculty	NR
9.	Implement the assessment tool for entry into CHEM 010, CHEM 051 and CHEM 001.	Fall 2015	Dean; F.T. Faculty	DB
10.	Implement a survey and counseling for entry into hybrid Chemistry courses.	Fall 2015	Dean, F.T. Faculty	DB

11.	Research Spanish versions of current Chemistry textbooks	Spring 2016	F.T. Faculty	DB
12.	Obtain funding for new instrumentation	Each year	Dean; F.T. Faculty	SPDB
13.	Make open lab time a fully-funded Chemistry study area for our students in Fairfield and at the Centers	Fall 2015	Dean	DB
14.	Research audio textbooks for Chemistry courses.	Each Semester	F.T. Faculty	DB
15.	Ensure that chemistry tutorials, Model Chem Lab computer program, etc. are available at the Centers and the library.	Spring 2015	F.T. Faculty	NR

Long-Term Goals	Planned Action	Target Date	Person Responsible	Source
1.	Measure Q planning Chem labs in Fairfield and both centers. A minimum of two chemistry labs at the Vacaville Center and a minimum of three chemistry labs at the Fairfield Campus (preferably four.)	Fall 2014 continuous	Dean and F.T. Faculty	Q Funds
2.	Research the possibilities of offering an ADT (Transfer) Degree in Chemistry	Fall 2015	Dean and F.T. Faculty	NR
3.	Research the possibilities of offering Chemistry for non-majors courses such as Food Chemistry, Environmental Chemistry, Art in Chemistry, Chemistry for Poets, etc.	Fall 2016	F.T. Faculty	NR
4.	Research and purchase instrumentation such as FTIR, NMR, GC-Mass Spec, HPLC, etc.	Fall 2018	Dean and F.T. Faculty	DB SP
5.	Hire a full-time faculty member whose focus is in instrumentation	Fall 2017	Dean and F.T. Faculty	College Funds
6.	Research and institute a new course in instrumentation	Fall 2018	Dean and F.T. Faculty	NR
7.	Hire a full-time technician whose focus is in instrumentation	Fall 2017	Dean and F.T. Faculty	College Funds
8.	Continue to search and apply for funding for Chemistry computer programs that are laboratory simulations or tutorials.	Each year	Dean and F.T. Faculty	SP DB
9.	Create and offer an 8-week CHEM 160 course followed by an 8-week CHEM 010 course in the Fall semester so that students can prepare for and be more successful in subsequent chemistry classes.	Fall 2016	Dean and F.T. Faculty	DB

In the source column denote “SP” for Strategic Proposals, “DB” for Department Budget, “P” for Perkins or “NR” for No Additional Resources Needed.

SIGNATURE PAGE

6.1 Please include a signature page with all full-time faculty and as many part-time faculty as you are able. The signature page should include lines with the signatures and then typed names of the faculty members.

The undersigned faculty in the Chemistry program, have read and concur with the finding and recommendations in the attached program review self-study, dated _____.

Maria Santiago

Charles Spillner

John Higashi

Kiran Kaur

Kathleen Conrad

Oanh Lam

Sam Balsley

Note: Professor Christine Ducoing, retired as of 5/15, was a significant contributor to this report.

Chemistry

Program Description

This program is designed to foster an understanding of the fundamental principles of chemistry in a variety of applications. Students will learn how chemical knowledge is derived, theorized, and applied in solving problems in everyday life.

CHEM 001 General Chemistry <i>Prerequisite: A minimum grade of C in any of the following: MATH 104 or two years of high school algebra AND a minimum grade of C in one of the following: CHEM 160 OR one year of high school chemistry. Course Advisory: Eligibility for English 001 and CHEM 010 is strongly recommended for students who need additional preparation in problem solving.</i> Presents principles of general chemistry for students in science, engineering, medical and related professions. Topics include atomic structure and theory, the periodic table, bonding, gas laws, stoichiometry, solutions, ionization, thermochemistry and equilibrium. Field trips may be required. Some online work may be required. <i>Three hours lecture, six hours lab.</i>	5.0 Units	CHEM 002 General Chemistry <i>Prerequisite: CHEM 001 with a minimum grade of C. Course Advisory: Eligibility for English 001.</i> A continuation of chemical principles and theory covered in CHEM 001 with emphasis on electrochemistry, chemical equilibrium, and quantitative and qualitative analysis. Field trips may be required. Online work may be required. <i>Three hours lecture, six hours lab.</i>	5.0 Units
CHEM 003 Organic Chemistry I <i>Prerequisite: CHEM 002.0 with a minimum grade of C. Course Advisory: English 001 is strongly recommended.</i> First half of a two semester course (CHEM 003 and CHEM 004) that begins a survey of organic chemistry for students in chemical, biological, health science, and related professions. Topics include analysis of structure and nomenclature, bonding, isomerism, and basic reaction mechanisms of organic chemicals. Functional groups considered include alkanes, alkenes, alkynes, alcohols, and alkyl halides. Basic organic laboratory procedures are introduced along with spectral analysis, simple syntheses, and reactions described in lecture. Field trip may be required. Online homework may be required. <i>Four hours lecture, four hours lab.</i>	5.0 Units	CHEM 011 Basic Organic Chemistry and Biochemistry <i>Prerequisite: CHEM 010 or CHEM 001 with a minimum grade of C. Course Advisory: Eligibility for English 001.</i> Presents an overview of organic chemistry and biochemistry for majors in nursing, home economics, liberal arts and technical fields. Field trip may be required. Online work may be required. <i>Three hours lecture, three hours lab.</i>	4.0 Units
CHEM 004 Organic Chemistry II <i>Prerequisite: CHEM 003 with a minimum grade of C. Course Advisory: Eligibility for English 001.</i> A continuation of CHEM 003, topics include analysis of structure, nomenclature, and reaction mechanisms of conjugated systems, aromatics, organometallics, various functional groups, carbohydrates, lipids, amino acids, proteins, and nucleic acids. The laboratory will emphasize more advanced work and the application of instrumentation in organic chemistry. Field trip may be required. Online homework may be required. <i>Four hours lecture, four hours lab.</i>	5.0 Units	CHEM 051 Chemistry for the Health Sciences <i>Prerequisite: Chem 160 with a minimum grade of C, or two semesters of high school chemistry, and a minimum grade of C in MATH 104 or MATH 114 or the equivalent or two years of high school algebra. Course Advisory: Eligibility for English 001.</i> This course presents an overview of general, organic chemistry, and biochemistry for majors in nursing and other allied health occupations. Topics covered include chemical bonding, chemical equations, gas laws, solutions, acid-base theory, oxidation-reduction, functional groups and properties of organic compounds, and the structure and function of carbohydrates, lipids, proteins, and nucleic acids. These topics are discussed in the context of cellular metabolism and human health. <i>NOTE: Not open for credit to students who have completed CHEM 011. This course is not a prerequisite for any chemistry course.</i> Field trip may be required. Online homework may be required. <i>Three hours lecture, three hours lab.</i>	5.0 Units

CHEM 010**4.0 Units****Intermediate Chemistry**

Prerequisite: CHEM 160 with a minimum grade of C, or two semesters of high school chemistry, and a minimum grade of C in MATH 104 or MATH 114 or two years of high school algebra. Course Advisory: Eligibility for English 001. A general chemistry course often required for nursing students and for students majoring in physical therapy, occupational therapy, industrial technology and home economics, it emphasizes the chemistry of inorganic compounds and covers selected topics such as atomic theory, bonding, equations, gas laws, solutions, acid-base theory, and oxidation-reduction. Field trip may be required. Online homework may be required.

NOTE: Not open for credit to students who have completed CHEM 001. Three hours lecture, three hours lab.

CHEM 098**Special Topics**

These courses, numbered 048, 098, or 148 depending upon their transferability, are courses of contemporary interest centered on changing knowledge and important issues in the field. Announcement of Special Topics courses appears in the Schedule of Classes.

CHEM 160**4.0 Units****Introductory Chemistry**

Prerequisite: A minimum grade of C in any of the following: MATH 104 or MATH 114 or two years of high school algebra. Course Advisory: SCC minimum English standard. An introductory course covering the fundamental principles of inorganic chemistry. Field trips may be required. Online work may be required.

NOTE: Not open to students who have completed CHEM 001, CHEM 010, or equivalent. Three hours lecture, three hours lab.