

## INSTRUCTION PROGRAM REVIEW: SPRING 2013 SUBMISSION CYCLE

Program Name: Chemistry  
Faculty Contact: Jeff Flowers

Academic Year: 2013-2014  
Program Review Submission Date: March 23 2013

### I. Description of Program

Provide a brief description of the program and how it supports the college's [College Mission and Diversity Statements](#), [Institutional Priorities, 2008-2013](#), [5 in 5 College Strategies, Spring 2011](#), and other [institutional planning documents](#) as appropriate.

The Chemistry program offers the first two years of chemistry courses to serve two major tracks:

- 1) The first two years of chemistry required for a baccalaureate in various majors such as biology, chemistry, and engineering.
- 2) Various chemical courses required for certificate or two year programs such as nursing, dental assisting, and lab technologist.

Courses offered in chemistry include:

**Chem 192 Elementary Chemistry** – a first introductory course in chemistry for non-science majors, remedial preparation or some certificate programs. Prereq: Math 110 or one semester algebra. Recommended: enroll concurrently in MATH 115 or MATH 120 or 122.

**Chem 210 General Chemistry I** – first semester general chemistry for science majors. Prereq: MATH 120 with a grade of C or higher. Recommended: CHEM 192 with a grade of C or better or equivalent; eligibility for ENGL 838/848 and one course in physics.

**Chem 220 General Chemistry II** – second semester general chemistry for science majors. Prereq: Chem 210 with a grade of C or higher.

**Chem 231 Organic Chemistry I** – first semester organic chemistry for science majors. Prereq: Chem 220 or 225.

**Chem 232 Organic Chemistry II** – second semester organic chemistry for science majors. Prereq: Chem 231

**Chem 250 Analytical Chemistry Quantitative Analysis** – Introduction to chemical analytical procedures. Prereq: Chem 220 with a grade of C or higher.

**Chem 410 Health Science Chemistry I** – a first introductory course in general chemistry for some health professions. Prereq: None Recommended: MATH 110 or one semester course of algebra, eligibility for ENGL 848.

**Chem 420 Health Science Chemistry II** – a first introductory course in organic/biochem for some health professionals. Prereq: Chem 410 with a grade of C or higher.

## II. Summary of Student and Program Data

### A. Student Learning Outcomes Assessment

Summarize recent SLO assessments, identify trends, and discuss areas in need of improvement.

SLO assessment has been carried out on all chemistry courses at least once and in most cases twice. We feel that at this time, there is not enough data to make any meaningful comments about trends. Early data does suggest that our goal of increasing student knowledge has been effectively captured in the attitude and perceptions instruments used to assess each course's learning objectives. We believe that this type of a device is best suited for understanding this type of information.

### B. Student Success Indicators

1. Review [Student Success and Core Program Indicators](#) and discuss any differences in student success indicators across demographic variables. Also refer to the [College Index](#) and other relevant sections of the [Educational Master Plan: Update, 2012](#), e.g., Student Outcomes and Student Outcomes: Transfer. Basic Skills programs should also refer to [ARCC](#) data.

The student success indicators for the 2011-2012 academic year were 73.8% success and retention of 86.6%. These numbers were consistent with the previous year values for the chemistry department.

The success value of 73.8% was higher than the division value at 67.4% and in line with the overall college value of 70.9%. The retention values for the chemistry department showed a slight upward trend progressing from 84% in 2010-2011 to 86.6% in 2011-2012. The retention value of 86.6% is in line with the retention value for the division at 82.7% and the overall college retention rate of 84.8%.

Overall our retention rates for our all demographics either increased or remained stable. Across all of the demographics there was a marked increase in the success indicators.

For the demographic identifying as black where the success in 2011-2012 for the chemistry department was 93.8%. This value appears to be on an upward trend from a value of 54.6% in 2010-2011 for the chemistry department. The success rate was significantly higher than the division success rate at 52.3% and the college success rate of 61.8%. The retention rate in the chemistry department for the black demographic was 100% for the 2011-2012 academic year and is an increase from the 2010-2011 year that had a retention rate of 72.7%.

No individuals identifying as Native American enrolled in the Chemistry course in the year 2011-2012.

The retention rate of the demographic identifying as Hispanic remained stable with a retention rate of 78.3% for 2011-2012 which is in line with the division retention rate of 79.6% and the

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overall college retention rate of 82%. For the demographic identifying as Hispanic the percent success in 2011-2012 for the chemistry department was 64.4%. This value appears to be stable from a value of 65% in 2010-2011 for the chemistry department. The success rate was in line with the division success rate at 62.4% and the college success rate of 66.1%. The retention rate of the demographic identifying as Pacific Islanders remained stable with a retention rate of 90.9% for 2011-2012, which is higher than the division retention rate of 79.9% and the overall college retention rate of 82.9%. For the demographic identifying as Pacific Islander the percent success in 2011-2012 for the chemistry department was 81.8% . This value appears to be on stable from a value of 80% in 2010-2011 for the chemistry department. The success rate was higher than the division success rate at 58.3% and the college success rate of 65.8%.

2. Discuss any differences in student success indicators across modes of delivery (on-campus versus distance education). Refer to [Delivery Mode Course Comparison](#).

CSM Chemistry programs are offered mostly in on-campus mode with some CHEM231 and CHEM232 being offered as web-assisted courses occasionally starting in Fall 2012. We anticipate having enough annual data for CHEM231/CHEM232 to perform meaningful descriptive statistics by 2016. In addition, most chemistry courses – CHEM 192, 210, 220, 250, 410 and 420 have begun to use some web-assisted technologies.

### *C. Program Efficiency Indicators. Do we deliver programs efficiently given our resources?*

Summarize trends in program efficiency as indicated in the [Student Success and Core Program Indicators](#) (LOAD, Full-time and Part-Time FTEF, etc.).

The three-year average LOAD has been 571 (WSCH/FTEF) with the latest year available showing a slight dip of about 6% from this average value. Full-time FTEF which has been 8.9 spiked in the latest year on record to 9.7, while Adjunct FTEF has maintained around its three-year average of 4.4. Other metrics of classroom teaching FTEF have remained relatively stable with no major deviations from prior years. Overall, these measures of program efficiency suggests that the CSM Chemistry department has been able to maintain overall efficiencies in an consistent manner.

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### D. Course Outline Updates

Review the [course outline update record](#). List the courses that will be updated in the next academic year. For each course that will be updated, provide a faculty contact and the planned submission month. See the [Committee on Instruction website](#) for [course submission instructions](#). Contact your division's [COI representatives](#) if you have questions about submission deadlines. Career and Technical Education courses must be updated every two years.

Courses to be updated	Faculty contact	Submission month
CHEM 250	Kate Deline	April
		Tab to add rows

### E. Website Review

Review the program's website(s) annually and update as needed.

Faculty contact(s)	Date of next review/update
Jeff Flowers	December 2013
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### F. Additional Career Technical Education Data – CTE programs only. (This information is required by California Ed. Code 78016.)

- Review the program's [Gainful Employment Disclosure Data](#), [External Community](#), and other institutional research or labor market data as applicable. Explain how the program meets a documented labor market demand without unnecessary duplication of other training programs in the area. Summarize student outcomes in terms of degrees, certificates, and employment. Identify areas of accomplishment and areas of concern.

N/A

- Review and update the program's Advisory Committee information. Provide the date of most recent advisory committee meeting.

N/A

**III. Student Learning Outcomes Scheduling and Alignment**

*A. Course SLO Assessment*

Explain any recent or projected modifications to the course SLO assessment process or schedule.

The course SLO process and schedules are do not require modifications at this time as they have proven successful.

*B. Program SLO Assessment*

Explain any recent or projected modifications to the program SLO assessment process or schedule.

When a student requests their Chemistry Degree from CSM, they are automatically asked to participate in an online instrument measuring Program SLOs. This system, data, and analysis is currently being performed by CSM PRIE.

*C. SLO Alignment*

Discuss how Course SLOs support Program SLOs. Discuss how Course and/or Program SLOs support Institutional/GE SLOs. Refer to [TracDat](#) related Program and Institutional SLO reports.

Course level SLOs contain language developed specifically to support Program level SLOs. In addition, chemistry faculty has implied program level support in the course level SLOs.

#### IV. Additional Factors

Discuss additional factors as applicable that impact the program, including changes in student populations, state-wide initiatives, transfer requirements, advisory committee recommendations, legal mandates, workforce development and employment opportunities, community needs. See [Institutional Research](#) as needed.

It has come to the attention of the faculty of the CSM Chemistry department that the requirements of our Chemistry 250 have changed under the authority of the American Chemical Society (ACS). These changes will require a modification to the number of units this course holds in order to maintain our accreditation with this standards setting body. The course outline will reflect these needs, and will impact the cost of this course to the college. This will impact the cost to the students and college as the total number of units will need to be increased from 4 to 5. We will be working on these modifications and submit a revised course outline Fall 2013.

Furthermore, we plan to introduce supplemental instruction (SI) to some of our chemistry courses, resources permitting. This program has been empirically proven by the department of education to yield higher grades for participants for the past forty years. More recently, SI has been piloted at CSM and shown to provide these same benefits to our college's students. We hope to replicate these same stories in our students.

In recognition of the changing demographics of CSM students, we are planning on introducing key concepts, such as reading apprenticeship (RA), in support of the basic skills initiative (BSI) into some of our chemistry classes. This integration hopefully will provide CSM chemistry students with the tools necessary to be successful and increase retention.

**V. Institutional Planning**

*A. Results of Plans and Actions*

Describe results, including measurable outcomes, from plans and actions in recent program reviews.

In response to an action from the previous program review, a full time faculty member was hired.

*B. Program Vision*

What is the program's vision for sustaining and improving student learning and success during the *next six years*? Make connections to the [College Mission and Diversity Statements](#), [Institutional Priorities, 2008-2013](#), and other [institutional planning documents](#) as appropriate. Address trends in the SLO assessment results and student success indicators and data noted in Section II. Summary of Student and Program Data.

[*Note*: CTE programs must address changes in the context of completion and employment rates, anticipated labor demand, and any overlap with similar programs in the area as noted in Sections II.F.1 and II.F.2.]

[*Note*: Specific plans to be implemented in the *next year* should be entered in Section V.C.]

As a department we have looked at available on-line resources. This has included faculty training in STOT I and II and faculty reviewing commercially available learning tools ranging from laboratory demonstration videos to online homework tutorial systems from a variety of educational publishers. resources.

Another vision is to pilot, resources permitting, supplemental instruction to general chemistry and allied health chemistry programs.

In 2013, we plan on attempting a measured and exploratory overhaul of some chemistry laboratory courses, resources permitting, as to allow for a focusing on up-to-dating experimental skills and technique development. This would significantly aid both our four-year transfer and workforce development students, by providing these students with the skills to be competitive in the ever-evolving jobs market.

1. To guide future faculty and staff development initiatives, describe the professional enrichment activities that would be most effective in carrying out the program's vision to improve student learning and success.

CSM Chemistry has historically been unable to participate in a meaningful manner, any and all professional enrichment. This has been due to the need for faculty to have schedules

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and loads that have precluded us from these needed activities. Chemistry as a department has determined the need to address this and make all necessary corrections, in order to permit these undertakings.

Chemistry faculty has begun to understand necessary protocols and the forms of enrichment activities that will make the most sense for our students and us. We intend to become more engaged with the American Chemical Society's Committee on Professional Training. This committee develops and guides the creation of chemical curriculum. This will ensure that all of our courses articulate to four-year institutions.

Additionally, to support the statewide initiative for common transfer pathways, chemistry faculty will continue and enlarge their participation with the C-ID program. Currently one member of the chemistry faculty has been officially nominated by the college to be a representative for these activities. This person has been unable to participate in a meaningful manner due to pre-existing obligations.

2. To guide future collaboration across student services, learning support centers, and instructional programs, describe the interactions that would help the program to improve student success.

Chemistry faculty actively support the Math/Science Division integrated science center (ISC) and the campus learning center (in building 10). This support includes some faculty having their office hours in these two centers, ensuring that both textbooks and other educational materials for student use are present, and working with learning center staff on evaluating online learning resources. These centers give the students the opportunity to have a place to meet and work on assignments from their classes together. It is very beneficial for the students to have a place where they can gather and discuss how to approach problems they are stuck on with their peers.

3. To guide the [Institutional Planning Committee](#) (IPC) in long-range planning, discuss any major changes in resource needs anticipated in the *next six years*. Examples: faculty retirements, equipment obsolescence, space allocation. Leave sections blank if no major changes are anticipated. Specific resource requests for the next academic year should be itemized in Section VI.A below.

Faculty: We will be having a full time faculty member retire immediately - Spring 2013. Currently, full-time overload is running at a three-year average of nearly 1 FTEF. This overload is even with three adjunct professors presently working in the department. The loss of this individual will be felt in the loads of the remaining faculty, many of whom are already having difficulty maintaining these intense working conditions along with their professional obligations. Chemistry must hire at least two more adjunct professors.

In addition to this immediate loss of a full time professor, Chemistry anticipates that another faculty member will be retiring within the next six years.



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### Equipment and Technology:

Instrumentation, Computers, , The CSM Chemistry department depends upon an array of computers for controlling scientific experiences and learning moments. These computers are the better part of a decade old and have begun to fail just as we are moving large amounts of the teaching experience online. These will need to be addressed in a meaningful manner.

Science education, and chemistry in particular, is a hands-on experience – equipment heavy. Those starting their scientific education must be exposed to a working laboratory in order to have the skills and talents that industry seeks. These environments are increasingly rich in technology, and we do not serve CSM students well to not have laboratories that mirror these realities. As a department, CSM Chemistry feels that we need to invest more in technology and instrumentation as to provide a learning environment as similar to those that our students are likely to see during their professional careers. Instrumentation does cost money, both upfront and continuing.

Below is a sample of both the cost of maintenance or replacement of **course critical** equipment and instrumentation. We would be unable to fulfill our education objectives should we lose the use of these items

Item	Est Cost <i>(Replacement Cost per Unit unless otherwise Noted)</i>
FTIR Service Package	\$5,000 (annually)
AA Service package	
Mass Spec Service package	\$9,000 (annually)
Melting point Apparatus	\$1,750
Spectrophotometer Model 20	\$3,350
Hot Plates	\$350
Chemical Balance	\$3,000

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Instructional Materials: Molecular models, Safety training videos

In order to aide in our lecture discussions, we need to have a set of atomic orbital models and at least two molecular model kits. It really helps the students to see a three dimensional representation of these when we are discussing these topics in lecture and in lab.

The department is investigating the possibility of expanding upon training videos for faculty and students covering lab safety, lab techniques, and operating expensive instrumentation the chemistry department has been able to acquire over these past few years. These videos will be extremely useful for students, present faculty, and any new adjunct faculty.

Chemistry faculty would also like to investigate online homework alternatives, as we are not pleased with the current services we have in our general chemistry and health chemistry courses.

Chemistry would like, resources permitting, to look into textbook choices to combat the rising costs of printed textbooks. In some cases the costs of the textbooks have become prohibitively expensive, preventing CSM students from being able to purchase the textbook. Online texts and the potential of developing readers have been discussed.

Classified Staff: [Click here to enter long-range planning: Classified Staff narrative](#)

We are very fortunate to have an outstanding chemistry stockroom person at the present time. However, he is presently working on his master's degree in chemistry with the goal of going into teaching. Therefore, we anticipate that we will need to hire a new stockroom person within the next 5 years.

Facilities: The chemistry portion of the building is nearly seven (7) years old currently and will be nearly 13 years old in six years. Presently, these physical assets are already in need of major refurbishment such as laboratory bench-top and fume hood modifications. Chemistry students at CSM work with real chemicals, like the ones found in the workplace, as such these do result in the deterioration of all surfaces that are exposed. Failure to make these modification and replacements poses as a long term safety hazard to our students and instructional staff.

Building 36, when first opened, was lauded as having "new state of the art digital controls [...] to maximize occupant comfort and indoor air quality." This has not been the case observed by those working, teaching, and learning. Classes have been cut short due to equipment failure as extreme heat and cold negatively affects the abilities of our instruments to properly work. Also the temperature can fluctuate wildly between rooms and

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is highly dependent upon external factors that are not controlled by the current setup. Also, the nature of the present system results in the aggravation of allergies. The heating/cooling system of building 36 will need a major overhaul in order to assuage the damages currently being inflicted on people and equipment.

The noise level in the many of the chemistry laboratories can fluctuate to the point that it is not possible for our students to effectively hear materials.

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### C. Plans and Actions to Improve Student Success

Prioritize the plans to be carried out next year to sustain and improve student success. Briefly describe each plan and how it supports the [Institutional Priorities, 2008-2013](#). For each plan, list actions and measurable outcomes.

#### Plan 1

Title:

Instructor Telepresence Between Lab Rooms

#### Description

Chemistry has laboratory rooms that may require students (that have been put into discrete groups) not be in line-of-sight of their instructor during normal lab hours. This occurs when students are working on complex instrumentation that are located in different physical rooms. One challenge that occurs during these moments, instruments may be rendered inoperable due to user inexperience.

Chemistry faculty has known of this concern and struggled to develop a workable solution. We believe that one solution is the installation of a video camera system (one that is not able to record any materials) that will be able to virtually break down these very real walls separating instructors from their students.

Action(s)	Completion Date	Measurable Outcome(s)
Reconfigure organic chemistry laboratory instrument room for greater supervision of instructional staff.	Fall 2013	Permit greater teaching oversight of CSM chemistry students as they use real world instruments.
Install a video camera system	Fall 2013	To virtually eliminate physical barriers that separate faculty to their students. It will permit rapid troubleshooting of student usage of instrumentation.
Click here to enter action	Choose Year or Semester/Year	Click here to enter measurable outcome

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### Plan 2

Title:

Click here to enter title

Description

Click here to enter plan description

Action(s)	Completion Date	Measurable Outcome(s)
Click here to enter action	Choose Year or Semester/Year	Click here to enter measurable outcome
Click here to enter action	Choose Year or Semester/Year	Click here to enter measurable outcome
Click here to enter action	Choose Year or Semester/Year	Click here to enter measurable outcome

For additional plans, cut/paste from above and insert here. Or add an additional page. Number your additional plans accordingly.

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[Note: Itemize in Section VI.A. Any additional resources required to implement plans.]

### VI. Resource Requests

#### A. Itemized Resource Requests

List the resources needed for ongoing program operation and to implement the plans listed above.

Faculty

Full-time faculty requests (identify specialty if applicable)	Number of positions
Chemistry Faculty Member	2

Complete [Full-Time Faculty Position Request Form](#) for each position.

Description of reassigned or hourly time for prioritized plans	Plan #(s)	Cost

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Equipment and Technology

Description (for ongoing program operation)	Cost
20 laptop computers (10 each for lab rooms 306, 321, 329) to replace the communal units used between all chemistry courses for the past seven (7) years.	\$36,200
12 computers (4 each for lab rooms 300, 306, 321 and 329) in order to replace the units currently in service for the past seven (7) years.	\$22,720
3 computers to replace the existing units required to run the MeasureNET chemical data acquisition systems.	\$5,470
1 Projector for a smart classroom to replace an original units that is at the end of its useful lifetime	\$5,000
1 Document camera to replace a failing unit	\$1,750
4 Printers to replace failing units in offices and labs	\$2,100
1 Workgroup printer for use of all chemical faculty to replace the one that has failed and been removed by ITS	\$708
Ice maker to replace original unit, nearly a decade old it is time to replace this unit.	\$1,750
Chemical Dispensing Units	\$6,000
Gases for AA	\$175
Lamp for AA	\$450
Sodium Chloride plates	\$75
Service plans IR	\$3,350
Gases for Mass Spec.	\$250
Service plans Mass Spec.	

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Description (for prioritized plans)	Plan #(s)	Cost
1 Tool box with tools in order to perform routine maintenance on our equipment and instrumentation. Installation will require tools and the associated container to store these tools	1	\$675
Video System – Will use off the shelf systems that have proven robust under extreme conditions.	1	\$325



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### Instructional Materials

Description (for ongoing program operation)	Cost
Text Books to put in ISC, Learning Center, and library – Students would greatly benefit from having these resources available to them.	\$1,000
Copy of ChemDraw program to allow faculty to create Organic Chemistry diagrams and other instructional aides	\$200
ACD/Labs NMR predictor suites x 2	\$1800

Description (for prioritized plans)	Plan #s)	Cost

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Classified Staff

Description (for ongoing program operation)	Cost
Student Assistant	\$15,600

Description (for prioritized plans)	Plan #s)	Cost

Facilities

For immediate or routine facilities requests, submit a [CSM Facility Project Request Form](#).

Description (for prioritized plans)	Plan #s)	Cost
Removing water aspirators in OChem		\$35,000
Vented Cabinets for stockroom		\$6,000
Benchtop modifications in order to make all the labs more effective and safe.		\$120,000
Hoods for the labs to hold chemicals for our students. Hood space is limited and results in these materials being stored in a manner that may be less safe than is possible. Again, it is recommended that a company that specializes in these types of instruments be contacted: such as iSec.		\$27,000
Water filters for the deionizing units. Eight individual filters would allow the chemistry department to refurbish completely 2 stations. These two stations service all labs in the chemistry department.		\$5,600

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### *B. Cost for Prioritized Plans*

Use the resources costs from Section VI.A. above to provide the total cost for each plan.

Plan #	Plan Title	Total Cost
1	Replace Aspirators	\$35, 000
2	Bench replacements for both general and o-chem laboratories	\$120,000
	Vented Cabinets for safe chemical storage	\$6,000
	Chemistry Dispensing Station for chemical control at the student level	\$27, 000