Basic Program Information

Department Name: **Chemistry**

Program Mission(s): **To provide undergraduate education founded on a rigorous, applied treatment of chemistry fundamentals coupled with modern analytical equipment and techniques; as well as to prepare students for transfer to a four-year university or allied-health program.**

Program Review team members:

Name	Department	Position
Kathy Armstrong	Chemistry	Instructor
Richard Daley	Chemistry	Instructor
Mary Holland	Chemistry	Instructor
Londa Larson	Chemistry	Instructor
Amanda Norick	Chemistry	Instructor
Sandhya Rao	Chemistry	Instructor
Victor Tam	Chemistry	Instructor
Peter Murray	PSME	Division Dean
Anna Wu	Chemistry	Laboratory Technician

Total number of Full Time Faculty:	7
Total number of Part Time Faculty:	14

Existing Classified positions: 1 (Laboratory Technician)

Programs* covered by this review

Program Name	Program Type (A.S., C.A., Pathway, etc.)	Units**
Chemistry	AS	90

*If you have a supporting program or pathway in your area for which you will be making resource requests, please analyze it within this program review. For example, ESLL, Math My Way, etc. You will only need to address those data elements that apply.

**Certificates of 27 or more units must be state approved (transcriptable). A Certificate of Achievement is state approved (transcriptable).

Section 1. Data and Trend Analysis

1.1. Program Data:

Data will be posted on http://foothill.edu/staff/irs/programplans/programreviewdata.php for all measures except non-transcriptable completion. Please attach all applicable data sheets to the final Program Review document submitted to your Dean. You may use the boxes below to manually copy data if desired.

SEE ATTACHED DATA FROM IRS.

Transcriptable Programs	2010-2011	2011-2012	% Change
Example: A.S Degree			
Example: Certificate of Achievement			

Please provide any non-transcriptable completion data you have available. Institutional Research does not track this data.

Non-Transcriptable Program	2010-2011	2011-2012	% Change
Example: Career Certificate			

1.2 Department Data

Dimension	2010-2011	2011-2012	% Change
Enrollment			
Productivity (Goal: 546)			
Success			
Full-time FTEF			
Part-time FTEF			

Department Course Data (Attach data provided by IR or manually complete chart below)

	2010-2011			2011-2012		
Course	Enroll.	Prod.	Success	Enroll.	Prod.	Success
Ex. ART 1						
Ex. ART 2						

1.3 Using the data and prompts, provide a short, concise narrative analysis of the following indicators.

1. Enrollment trends over the last two years: Is the enrollment in your program holding steady, or is there a noticeable increase or decline? Please comment on the data and analyze the trends.

   Enrollment in chemistry courses has increased by 9% over the past two years. From academic year 2010-11 to 2011-12, the number of students taking chemistry courses has increased by 260 students, with the number of sections offered increasing by 10%. Taken together, this is a noticeable increase and CONTINUES the growth trend experienced by the department over the past four years. Going back to the 2008-09 academic year, the department supported only 2,154 students. Now that enrollment has exceeded over 3,000 students, additional resources will be required to sustain growth including laboratory instrumentation and more FT faculty members.

   Enrollment rates of targeted groups (under-privileged student groups) have also increased by 31% over the same two-year span while maintaining similar success rates (approx. 63% versus 77% for non-targeted groups).

   Every quarter, nearly all sections are full with extensive wait lists, with no indication of demand subsidizing in the next few years.

2. Completion Rates (Has the number of students completing degrees/certificates held steady, or increased or declined in the last two years? Please comment on the data and analyze the trends.

   Course completion rates (~74%) have held steady over the past two years even with an enrollment increase of 9% over the same time period. The rate of withdraws (13%) and non-passing grades (13%) have also remained steady over the same period.

   Continuing these success levels will be contingent on hiring new FT faculty members, who will provide consistency in teaching as well as personnel to develop new courses and programs.

3. Productivity: Please analyze the productivity trends in your program and explain factors that affect your productivity, i.e. GE students, seat count/facilities/accreditation restrictions. For reference, the college productivity goal is 546.

   Productivity numbers provided by Institutional Research are NOT accurate since they reflect the removal of TBA hours between 2010-11 and 2011-12.
   Regardless, productivity for the Program has substantially increased because many single lecture sections have been eliminated and primarily only double lecture

sections are offered. Productivity growth is seen most in Chem 25 and Chem 30A, which have the largest seat counts. They are also the two courses which have seen the most enrollment growth.

Beyond eliminating single sections, class sizes cannot be changed to increase productivity due to lab safety precautions. Also, the Chemistry 12A/B/C Organic Chemistry sequence and Chem 30B have lower productivity numbers due to a maximum seat limit of 24. This limit is due to the higher risk inherent in the handling of Organic compounds as well as the increased level of complexity the laboratory component of these courses require. Therefore, the college productivity goal of 546 may not be acheivable with these class size constraints.

4. Course Offerings: (Comment on the frequency, variety, demand, pre-requisites.) Review the enrollment trends by course. Are there particular courses that are not getting the enrollment or are regularly cancelled due to low enrollment?)

All Chemistry courses are offered regularly (with the exception of Chem 70) since all are required for either UC/CSU transfer (Chem 1A/B/C and Chem 12A/B/C) or preparation for allied health fields (Chem 30A/B). Demand has remained high for all courses with growth occurring throughout the department.

Chem 1A/B/C. Primarily taken by transfer-oriented science majors or professional school bound students, demand has remained high for the general chemistry series. The number of sections offered each quarter has expanded; we have reached lab room capacity fall quarter for Chemistry 1A offerings.

Chem 12A/B/C. Primarily taken by transfer-oriented students seeking careers in a medical profession or those seeking research careers in Chemistry or Life Science, demand has remained high for the organic chemistry series; one new section has been added to the yearly offerings.

Chem 25/30A/30B. The introductory and allied-health chemistry courses are where the department's growth has been primarily focused. One to two new sections have been added to each quarter's offerings with all sections reaching maximum enrollment.

Chem 70. A new course introduced to improve completion taking Chem 1A. Although enrollment was initially low (this being an optional support course), it has steadily increased over the 2011-2012 academic year.

For almost all courses, sections are enrolled to capacity with an extensive waitlist at the beginning of each term. Cancellation of sections due to low enrollment has been rare in the past two years. It is common to offer new sections of classes when the waitlist shows it will sustain a new class. However, this has proved to be problematic.

Competent part-time faculty hired on short notice to staff the new sections are difficult to find.

5. Curriculum and Student Learning Outcomes (SLOs)
    a. Comment on the currency of your curriculum, i.e. are all Course Outline of Record (CORs) reviewed for Title 5 compliance at least every three years and do all prerequisites, co-requisites and advisories undergo content review at that time? If not, what is your action plan for bringing your curriculum into compliance?
    b. Comment on any recent developments in your discipline that might require modification of existing curriculum and/or the development of new curriculum?
    c. Discuss how the student learning outcomes in your courses relate to the program learning outcomes and to the college mission.
    d. As a division, how do you ensure that all faculty are teaching to the COR and SLOs?

a. All CORs are reviewed for Title 5 compliance on a three-year cycle, and prerequisite, co-requisite and advisories are reviewed annually. At this time, curriculum is current.

b. To address the growing demand for "green jobs" in Silicon Valley, a new environmental/green chemistry course is currently being developed for implementation in Fall 2013. In connection with this new course, a job-training program in analytical instrumentation may soon be developed to address employer demands and economic conditions.

Additionally, the increasing cost of hazardous waste disposal and need for more environmentally conscious experiments may require the Program to modify experiments and curriculum to address these concerns.

Finally, a course centered on the chemistry of cooking is currently being developed to attract non-science majors. This addresses the concern that the Program currently does not offer a chemistry course geared solely for non-science majors seeking general education degrees.

c. All the CL-SLO's in each chemistry course assess competency in a critical concept that students must master in order to be successful in the next course of a sequence. The primary program level outcome (as well as College Mission) is for students to transfer to a four-year institution, professional school or allied health program. In order to do this, the Chemistry Program continually monitors student success in these critical areas.

d. All courses in the program have appropriate CL-SLO's, with data primarily collected through online course management systems. Access is given to all full-time and adjunct faculty members so that data can be obtained, analyzed and assessed on an annual basis. Periodic reviews of syllabi and peer evaluations ensure faculty are teaching the concepts stated in the COR.

6. Basic Skills Programs (if applicable). For more information about the Core Mission of Basic Skills, see the Basic Skills Workgroup website:

   Not applicable.

7. Transfer Programs (if applicable). For more information about the Core Mission of Transfer, see the Transfer Workgroup website: http://foothill.edu/president/transfer.php
   a. Please discuss current outcomes or initiatives related to this core mission.

   The Chemistry Program core courses are designed to articulate to the UC and CSU systems for students transferring in chemistry, the biological sciences, physics, engineering or other physical science majors.

8. Workforce/Career Technical Education Programs (if applicable). For more information about the Core Mission of Workforce, see the Workforce Workgroup website: http://foothill.edu/president/workforce.php
   a. Please discuss current outcomes or initiatives related to this core mission.
   b. Please attach minutes from your advisory board meeting(s).

   Currently, PSE 41, 42 and 43 courses are offered to train students interested in teaching STEM classes for the K-6, middle school and high school levels.

   Chemistry 30A and 30B support programs preparing students to pursue careers in allied health.

9. Student Equity: Foothill-De Anza Community College District Board policy and California state guidelines require that each California community college submit a report on the college's progress in achieving equity in five specific areas: access, course completion, ESLL and basic skills completion, degree and certificate completion, and transfer. For the latest draft of the Student Equity Report, please see the ESMP website: http://foothill.edu/staff/irs/ESMP/index.php
   a. To better inform the Student Equity efforts at Foothill College, please comment on any current outcomes or initiatives related to increasing outreach, retention and student success of underrepresented students in your program.

   The Chemistry Program has been supportive of the PSME STEM Internship Program which pairs science and math majors to research internship opportunities in order to increase retention in STEM Majors. Although open to all interested students, underrepresented students were encouraged to apply.

   Additionally, the Chemistry Program will be a part of the STEM Scholarship Program, which will provide substantial financial assistance for underrepresented students majoring STEM fields.

Section 2. Learning Outcomes Assessment Summary

2.1. Attach 2011-2012 Program Level – Four Column Report for PL-SLO Assessment from TracDat, please contact the Office of Instruction to assist you with this step if needed.

SEE NEXT INSERTED PAGES.

2.2 Attach 2011-2012 Course-Level – Four Column Report for CL-SLO Assessment from TracDat

SEE NEXT INSERTED PAGES.

Section 2 Continued: SLO Assessment and Reflection

2.3 Please provide observations and reflection below.

During this assessment cycle, there has been a move within the Program to include CL-SLOs that are more global along with the CL-SLOs specific to course content. The methods used for assessment utilize online homework/quiz systems or embedded exam questions. High target success rates of 70 % to 90 % were achieved or nearly achieved for most of the assessments. For a few cases where the target was not achieved, we concluded that the assessment question or the method used was flawed. Thus, adjustments will be made in these cases to provide a more accurate assessment of student skills and abilities.

2.3.a Course-Level SLO

1. What findings can be gathered from the Course Level Assessments?

The following provides a summary of findings:

(i) The complexity of the questions used for assessment varied greatly; from simple recall of specific information to in-depth critical/creative thinking and advanced problem solving skills. For all assessments that tested recall of content-based information or simple single-step computations, the target was met. These assessments were generally multiple-choice questions involving specific, single concepts. Not surprising, most assessments where the target was not met involved in depth critical and/or creative thinking, integration of multiple concepts, and/or multi-step calculations. These results suggest that a majority of our student population is successful in memorizing content-based information, but a smaller subset of them are not developing a deeper understanding of the underlying concepts.

(ii) Assessment results for Organic Chemistry indicate that some knowledge/skills taught in General Chemistry are not well assimilated by a portion of the student population in a way that enables them to apply the knowledge/skill in the context of Organic Chemistry.

(iii) Assessment results for Chemistry 1C indicate that some skills taught in Chemistry 1A and 1B that are needed for success in Chemistry 1C are not mastered by a portion of the student population.

(iv) Assessment results for students completing the full year of Organic Chemistry indicate that students successfully gained skills that will carry over into subsequent, upper division courses upon transfer as well as into chemical related jobs in the workforce.

(v) Assessment results for Chemistry 25 (Fundamentals of Chemistry) using online homework/quizzes show a greater success rate for Foothill students compared to the overall database of students using the same online system.

(vi) Assessment results for Chemistry 70 indicate that students who concurrently enroll in this problem solving and study skills course achieve greater competency in quantitative problem solving skills and achieve a higher success rate in Chemistry 1A.

2. What curricular changes or review do the data suggest in order for students to be more successful in completing the program?

Consideration and or a discussion of the following is warranted:

(i) Certain topics/skills taught in General Chemistry should be reinforced where appropriate throughout the sequence to better prepare those students who continue on to Organic Chemistry. Some of these topics/skills are taught in Chemistry 1A, and then not visited again in detail until Organic Chemistry. The list of topics includes, but is not necessarily limited to: Lewis Structures; formal charge; the differences and relationships between kinetics and thermodynamics; acid behavior and pKa.

(ii) Mastery of certain topics/skills taught in Chemistry 1A for success in 1B and 1C should be considered a goal for the successful student. For example, mastery of stoichiometric calculations is a vital skill needed for success in both 1B and 1C. More time spent on this topic may be warranted, but this will come at the expense of time spent on other topics.

(iii) Problem-solving classes for Chemistry 1B, 1C and the Organic Chemistry sequence should be considered.

3. How well do the CL-SLOs reflect the knowledge, skills, and abilities students need in order to succeed in this program?

The CL-SLOs appropriately reflect a broad range of knowledge, skills and abilities students need to succeed. Using assessments of varying complexity has also allowed good differentiation of the level of knowledge, skill and ability achieved.

4. How has assessment of course-level student learning outcomes led to improvement in student learning in the program?

Differentiation of the level of knowledge, skill and ability achieved through the CL-SLOs has allowed faculty to identify areas that will be focused on to achieve more in depth learning. In addition, content that students struggle with is more clearly defined and can thus become areas of greater focus and discussion within the program.

5. If your program has other outcomes assessments at the course level, comment on the findings.

2.3.b Program-Level SLO

The Chemistry Department has two different Program tracks that were assessed: General Studies Science AS and Chemistry AS.

1. What summative findings can be gathered from the Program Level Assessments?

General Studies Science AS:
A survey was administered to students in the major. Response rate was lower than desired, but those who did respond indicate that students who completed the program have an increased understanding of science that will influence their decision-making processes related to economics, politics and social decisions.

Chemistry AS:
Assessment results indicate that students who complete the Organic Chemistry sequence are knowledgeable in current theories and applications of chemistry. They also have a good understanding of the safe handling of chemicals and of common laboratory techniques. We conclude that students completing this program are well prepared for transfer to a 4-year university.

2. How has assessment of program-level student learning outcomes led to certificate/degree program improvements?

At this point, no specific changes are warranted for the General Studies Science AS Program. Future assessments that are more inclusive of students who have completed the program are needed.

While we conclude that the Chemistry AS Program is successful in preparing students for future coursework and careers, there are areas within the program, identified in the CL-SLOs assessments, where student learning can be improved. Ongoing discussions within the department will focus on what skills and knowledge are most useful for students in their future coursework and careers as well as on targeted areas where student learning can be improved.

3. If your program has other outcomes assessments at the program level, comment on the findings.

Not applicable.

Section 3: Program Goals and Rationale

Program goals should be broad issues and concerns that incorporate some sort of measurable action and should connect to Foothill's core missions, Educational & Strategic Master Plan (ESMP), the division plan, and SLOs.

3.1 Previous Program Goals from last academic year

Goal	Original Timeline	Actions Taken	Status/Modifications
1. Expand course offerings to match enrollment growth	On going	Additional sections offered in Organic Chemistry, Allied Health courses and Introductory Chemistry	Lecture class sizes have been doubled in many cases in order to meet increased course offerings. It has been necessary to increase the proportion of adjunct faculty. Hiring of additional full-time faculty is necessary to meet demand.
2. Develop new courses and student research program addressing general education and environmental chemistry	1-3 years	Prof. Holland has written the COR for a new course in Environmental Chemistry. The course maps nicely with an existing C-ID course	This course has been approved by the division curriculum committee and has applied for GE approval in Area III. We expect to offer it in Fall 2013.
3. Develop certificate training program to help meet needs of current employers	1-5 years	None	Support for a new certificate is not currently evident
4. Improve teaching consistency	On going	Actively interviewing new qualified adjunct faculty; Mentoring and Evaluating existing adjuncts	Continued growth supports the need for a new FT faculty member

3.2 New Goals: Goals can be multi-year (in Section 4 you will detail resources needed)

Goal	Timeline (long/short-term)	How will this goal improve student success or respond to other key college initiatives	Action Steps
1. Improve instrumental component to laboratory curriculum	On Going	Training with instrumentation relevant to research laboratories is a critical component of offering students an equivalent lower division education to that offered by transfer institutions. As new instrumentation is added or improved upon, curricula must be changed to offer students as much hands-on experience with the instrumentation as possible.	With the move to the new laboratories this Winter 2013, we have purchased a new multinuclear NMR. In addition we have ordered new Gas Chromatography Instrumentation, and new Vernier Lab Quest systems to replace our outdated/ defective ones. We plan to purchase a new FTIR with features unavailable to our existing FTIR, new UV-Vis spectrometers that offer greater application than our existing Vis spectrometers, and we are proposing the addition of an Atomic Absorption Spectrometer. Work on curriculum to incorporate the new instrumentation and to expand on use of existing instrumentation is ongoing.

2. Maintain Existing Equipment	On Going	Heating mantles, hot/stir plates, clamps, balances, centrifuges etc. have a lifetime and require replacement. Glassware breaks and requires replacement. These items were in serious disrepair.	Chemistry requires a significant amount of equipment, all of which has a lifetime. Much of our broken equipment has been ordered. However, the remaining faulty equipment will need to be either repaired or replaced in the coming year. This line item is a critical ongoing requirement of maintaining a Chemistry laboratory.
3. Develop non-majors GE science course to increase enrollment	Hope to implement new course in Fall 2014	Chemistry currently lacks a GE course for science-phobic non-majors. Such a course would increase enrollment and serve a large community of students seeking to fulfill their laboratory science course with a substantive, broad-scoped course geared to those who most dread this GE requirement.	Prof. Tam has requested a course proposal form and intends to develop this course during the 2013-2014 academic year.

Section 4: Program Resources and Support

4.1 Using the tables below, summarize your program's unfunded resource requests. Refer to the Operations Planning Committee website: http://foothill.edu/president/operations.php for current guiding principles, rubrics and resource allocation information.

Full Time Faculty and/or Staff Positions

Position	$ Amount	Related Goal from Table in section 3.2 and/or rationale
1. New FT Faculty Position	$63,000 + benefits	Related Goals: Strengthen our instruction in general and introductory chemsitry which comprise 60% of the coure offerings. **Develop new courses and student research program addressing general education and environmental chemistry** **Develop non-majors GE science course to increase enrollment** Rationale: An additional full time faculty member is essential to support the continued increase in enrollment in chemistry classes and the introduction of new innovative courses. The current ratio of full time to part-time faculty is low (7:14), with the FTEF load being only at 38%. There are many essential roles that full time faculty members perform which are not covered by part-time staff. These include review, development, distribution and updating of course materials, developing and optimizing laboratory experiments, regular safety inspections of laboratories, developing new courses and laboratory programs, coordination of part-time faculty by course, serving on internal and external committees, as well as all administrative tasks such as program reviews, SLO assessments, budgeting, scheduling, etc.

Unbudgeted Reassigned Time (calculate by % reassign time x salary/benefits of FT)

Position	**$ Amount**	**Related Goal from Table in section 3.2 and/or rationale**
1. Coordinator Position	$15,000	Related goal: **Expand course offerings to match enrollment growth**. Rationale: This position is essential to support a growing program. The logistics of laboratory, course, classroom and instructor scheduling require substantial time and effort. There is increasing demand for administrative data and reports, such as program review, budget development, SLOs, etc. which must be coordinated among multiple full-time faculty members and even more part-time faculty.

One-time B Budget Augmentation

Description	**$ Amount**	**Related Goal from Table in section 3.2 and/or rationale**

Ongoing B Budget Augmentation

B Budget FOAP	**$ Amount**	**Related Goal from Table in section 3.2 and/or rationale**
1. Lab Equipment Maintenance Technician and Service Contracts	$12,000	Related goals: **Improve instrumental component to laboratory curriculum ; Maintain Existing Equipment** Rationale: With the expansion of the program and the opening of the new PSEC center, additional instrumentation has been purchased or proposed and will require routine specialized maintenance. Existing instrumentation must also be maintained professionally in order to prevent down-time and to prolong the life of the instruments. Last year $5K was provided as one time, but need on going support.

2. Laboratory Consumables	$10,000	Related goals: **Improve instrumental component to laboratory curriculum; Maintain Existing Equipment** With the addition of HPLC, UV-Vis and atomic absorption capabilities, and in order to adequately support our existing instrumentation, consumables such as columns, solvents, standards, gases, syringes, specialty reagents, etc will be required.

Facilities and Equipment

Facilities/Equipment Description	**$ Amount**	**Related Goal from Table in section 3.2 and/or rationale**
Atomic Absorption Spectrometer	$55,000	Related Goals: **Develop new courses and student research programs addressing general education and environmental chemistry**; **Improve instrumental component to laboratory curriculum** Rationale: Atomic absorption is one of the standard methods for performing metal analysis in environmental matrices. It is used as a component of UC Berkley's freshman laboratory program and will provide Foothill students with comparable exposure to this technique upon transfer.

Section 5: Program Strengths/Opportunities for Improvement

5.1 Address the concerns or recommendations that were made in prior program review cycles.

In the previous Program Review Cycle (2011-2012), three concerns were discussed about issues being faced in the upcoming years.

1. Limited expansion due to an understaffed and overworked laboratory stockroom technician

This issue has been recognized with the approval of a full time chemistry laboratory job position (Job#13-029) that is currently posted. The hiring committee has been formed and has been working to conduct the interview process. The addition of this staff member will ease the workload of the current technician and will assist in the transition to the new PSEC building.

2. Increased demand for classes

Productivity for the Program has substantially increased because many single lecture sections have been eliminated and primarily only double lecture sections are offered. Productivity growth is seen most in Chem 25 and Chem 30A, which have the largest seat counts. They are also the two courses that have seen the most enrollment growth. From academic year 2010-11 to 2011-12, the number of students taking chemistry courses has increased by 260 students, with the number of sections offered increasing by 10%.

3. Migration to the new PSEC Building.

The move to the PSEC building is currently underway, with faculty offices, laboratories and classrooms transitioning to the new building. Appropriate safety concerns were addressed, along with issues related to hazardous waste and safety.

5.2 What statements of concern have been raised in the course of conducting the program review by faculty, administrators, students, or by any member of the program review team regarding overall program viability?

1. Funding and staffing are the two main reasons why program growth cannot expand much further. The addition of another full time faculty member is essential to support the continued increase in enrollment in chemistry courses and the introduction of new innovative courses. As previously noted, FT faculty perform many duties essential to

growth that PT faculty do not participate in. The current ratio of full time to part-time faculty is low (7:14) and will drop further as the program grows, subsequently lowering the already small FTEF load of 38%. Triple lectures offer a potential opportunity to increase productivity, but laboratory section sizes would need to be decreased slightly to conduct the lectures in an optimal learning environment, such as the innovatively-designed PSEC large lecture rooms.

2. Reassign or release time is necessary to develop new courses or develop curricula that involve more analytical equipment, student research and work force training.

3. The reinstatement of a coordinator position is vital to support a growing program. The logistics of laboratory, course, classroom and instructor scheduling require substantial time and effort and become more complex as enrollment and sections grow.

4. The continued support of equipment maintenance in the new PSEC building, along with staying current in equipment and laboratory techniques is key to staying competitive and strong as a department.

5.3 After reviewing the data, what strengths or positive trends would you like to highlight about your program?

The Chemistry Program has an excellent reputation at transfer institutions. Many four-year universities recognize the strength of our Program and are increasingly accepting our students. These institutions include USC, Cornell, UC Berkeley, UCLA, UCSD and UC Davis. The Chemistry Program at Foothill College is growing at a fast rate, and the transition to the new PSEC building will serve to increase this growth further. Our Program has offered more classes, with enrollment increasing 9% over the past two years. Despite the influx of students, our success rates have remained steady (~77%).

In the area of curriculum, to address the growing demand for "green jobs" in Silicon Valley, a new environmental/green chemistry course is currently being developed for implementation in Fall 2013. In connection with this new course, a job-training program in analytical instrumentation may soon be developed to address employer demands and economic conditions. In addition, a course centered on the chemistry of cooking is currently being developed to attract non-science majors.

Section 6: Feedback and Follow Up

This section is for the Dean to provide feedback.

6.1 Strengths and successes of the program as evidenced by the data and analysis:
The Chemistry Program has had consistent student success rate of 77% and a year-over-year growth rate of 9 %. Some reasons are:

1. The faculty are very collegial within the department and outside.
2. All the FT and some PT Faculty provide time in the PSME Center.
3. The PT Faculty are seasoned faculty and provide adequate level of instruction and testing.
4. The faculty update their course and lab materials on a regular basis.
5. Leading the Stanford Internship program
6. The labs have had exemplary hazmat reports (Mona Voss).

6.2 Areas of concern, if any:

1. The development of new courses and curricula, instrumentation labs, and certificate programs requires FT faculty to redirect time and attention away from standard teaching responsibilities. In 2011-2012, FT faculty only represented 38% of the teaching load. Reassign time is not adequate enough for faculty to develop the components necessary for a growing chemistry program.
2. Chemistry department has been fortunate that the number of sections have been able to expand without any Hazmat issues. The current staff have been stretched in providing lab support.
3. PSEC has an additional lab, going from a total 4 to 5 labs plus an instrumentation lab. Current staff are not trained in the instrumentation and not enough time to service the new lab.
4. Lack of time for faculty to develop new courses or wait for faculty to have PDL.
5. Vendor professionals have not maintained the equipment. This will impact classes and students experiments.
6. The next concern is the professional development for the full-time faculty but more importantly the part-time faculty in the use of technology, common standards for student success in a course as well as the sequence, and new teaching techniques and methodology identified in working with outside programs such as Gates foundation and Carnegie foundation.
7. The continued funding of the PSME Center to include the “Boot Camps” to provide remedial assistance. Integrate into STEMway in latter years.

6.3 Recommendations for improvement:
The recommendations map to areas of concerns above.

1. 6.2.1 New FT Faculty Member: Hire a new FT faculty member in order to maintain Program growth trends. This is the highest priority for chemistry.
2. 6.2.2 Lab Staff: Hire a FT lab coordinator that is responsible for lab scheduling, ordering, instruments, and lab preparation.
3. 6.2.3 Expansion:
    a. Hire a FT lab coordinator; in progress.
    b. Create new labs that are green.
    c. New instrumentation from SLI/Foundation donations.
4. 6.2.4 New courses: Provide reassign time along with additional FT faculty member
    a. Develop new courses based on resource sustainability
    b. Develop new instrumentation lab courses and certificates
        i. Collaborate with Biology & Biotech
        ii. Create a work force pathway
    c. Develop student lab research program
5. 6.2.5 Lab equipment: Increase B-Budget to have equipment maintenance contracts and annual inspections.
    a. Large cost equipment could be provided by donors.
6. 6.2.6 Professional Development:
    a. Invite chem "experts" for lectures or 1 quarter visiting professor
    b. Develop quarterly ½ day seminars for FT & PT
        i. Pay PT $100 stipend
    c. Provide FT faculty reassign time to collaborate with local colleges (Stanford, SJSU, UCSC) and Foundations (Gates, Carnegie, Packard).
        i. Use external funds such as grants and Foundation funds when possible
        ii. Contact colleges Foundations and Colleges.
7. 6.2.7 PSME Center:
    a. The Center requires a FT Faculty to develop new curriculum and provide coordination between Chem Classes with Center support. Coordinate with new FT PSME Center Director.
    b. Additional Graduate Student staff required supporting start of quarter assessments as well as remedial/booster class support.
    c. Identify and fund a publisher independent LMS for centralized course materials, assessments, homework and student tracking from course to course.

6.4 Recommended next steps:
_X_ Proceed as planned on program review schedule
___ Further review/Out of cycle in-depth review

Upon completion of section 6, the Program Review should be returned to department faculty and staff for review, then submitted to Instruction and Institutional Research for public posting. See timeline on page 1.

Unit Course Assessment Report - Four Column

Foothill College

Mission Statement: A well-educated population being essential to sustaining and enhancing a democratic society, Foothill College commits itself to providing access to outstanding educational opportunities for all of our students. Whether through basic skills, career preparation, lifelong learning, or transfer, the members of the Foothill College community are dedicated to the achievement of learning and to the success of our students. We affirm that our unwavering dedication to this mission is critical to the prosperity of our community, our state, our nation, and the global community to which all people are members.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 100 - CHEMISTRY STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100 - CHEMISTRY STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100X - CHEMISTRY STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100X - CHEMISTRY STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Chemistry (CHEM))			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Course-Level SLO Status: Active			
Department - Chemistry (CHEM) - CHEM 100Y - CHEMISTRY STUDENT ASSISTANCE - Numerical Problems - The students will be able to use analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 100Y - CHEMISTRY STUDENT ASSISTANCE - Skill Development - Student will spend the appropriate amount of time in PSME Center working on skills. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active			
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Organic Molecule Structure - Predict the thermodynamic stability of Organic Compounds based on their structure (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Rank the stability of six organic compounds. Assign equal credit for each successive pair of compounds (five relative comparisons for six compounds) **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 78% average class score	01/10/2012 - Average score (38 students): 81% **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** none **GE/IL-SLO Reflection:** The Learning outcome is nicely assessed with these ranking questions. They require students to carefully examine the structure of an organic compound to determine structural attributes that destabilize it.	
	Assessment Method: Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target:**	01/11/2013 - For a class of 52 students, 39 (75%) were able to rank at least four of the five cationic intermediates correctly. For the 13 students that did not achieve this target, many failed to recognize the stabilizing effect of an adjacent oxygen. This is in line with the proportion of	01/11/2013 - Since having a strong understanding in resonance is required to successfully answer this question, further emphasis will be placed on the movement of electrons and resonance hybrids at

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Over 70% of the class can correctly rank at least four out of the five intermediates correctly.	students that have difficulty with the concept of resonance. **Result:** Target Met **Reporting Year:** 2012-2013	the beginning of the course. This topic is a common complaint of students annually.
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Acidity - Utilizing theories that affect product stability, predict the relative acidity/reactivity of organic compounds with similar molecular structure and/or functional groups. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 12/13/2011 **Course-Level SLO Status:** Active	**Assessment Method:** Embedded ranking question on final exam: For a series of five organic compounds, rank their relative acidity in decreasing order. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 50% of student perfectly rank all 5 compounds **Related Documents:** Fall 2011 - Chem 12A SLO 01	01/27/2012 - From a class size of 48 students, 29% ranked all five compounds correctly. Another 27% ranked four out of the five correct. This 27% portion all made the same mistake which is common for this type of question -- all improperly ranked the hydronium ion as not being the most acidic compound. Another 29% ranked less than half of the compounds correctly, and 15% missed the question completely. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** Develop a workbook with a myriad of acid/base practice problems.	01/27/2012 - The results of this CLSLO were expected. After assessing students with this question for multiple years, it is common to have at least 50% of the class either perfectly rank the compounds or just miss one - the hydronium ion. This points out the misconception students hold that an acidic group either bonded to a carbon or a hydrogen will have its acidity affected adversely. In fact, this is not the case and greater emphasis will need to be made of this fact. Deeper analysis of pKa tables found in chemistry and biochemistry may assist in dispelling the misconception.
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Reactivity - Predict the products of reactions involving organic compounds (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 09/24/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Embedded M/C question on Final Exam **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 85%		
	Assessment Method: Embedded question on Final exam: Ask students to rank the reactivity of several organic compounds with reference to a specific reaction (ie acid-base or Nucleophilic Substitution)	01/10/2012 - 67% overall score (38 responses) **Result:** Target Not Met **Reporting Year:** 2011-2012	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Assign equal credit to each successive ranking comparison. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 80% overall score	**Resource Request:** none **GE/IL-SLO Reflection:** This question incorporated a number of structure/reactivity relationships (inductive effects, resonance, charge type). Students were required to recognize which was most important and their poor responses reflects a weak assimilation of the disparate ideas.	
	Assessment Method: Embedded series of open-ended questions on final exam: A series of 7 complex organic reactions where students must predict the product, taking into account stereochemistry and other considerations. Each question is worth 5 points (total of 35 points), with simple mistakes (usually with stereochemistry) results in only 3 points being awarded. Evidence of no understanding of the reaction or mechanism resulted in 0 points being awarded. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 70% overall average (24.5 points out of 35 points). **Related Documents:** Fall 2011 - Chem 12A SLO 02	01/11/2013 - Out of a class of 52 students, an average score of 26.13 points (74.7%) was achieved with a standard deviation of 8.2. Considering the complexity of reactions examined, this result reflects an overall satisfactory understanding of reaction mechanisms, stereochemistry and reactivity **Result:** Target Met **Reporting Year:** 2012-2013	01/11/2013 - Additional exercises and worksheets with increasingly difficult reactions will be developed in order to assist students in exam preparation and better understanding of reaction mechanisms.
		01/27/2012 - For a class of 48 students, the average score was 24.6/35 points (70.3%), with the median score being 27 points. **Result:** Target Met **Reporting Year:** 2011-2012	01/27/2012 - A 70% average on this type of question definitely exhibits that a majority of the students have a better than average understanding of reaction mechanisms, stereochemistry and reactivity. With a median score of 27 points, and many other students scoring in the 30-point range, students are achieving the goal set forth. This concept will be repeated in later quarters of organic chemistry, solidifying most weak students' understanding.
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Stereochemical Reaction - Determine the	**Assessment Method:** Multiple Choice question embedded on Final exam		

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
stereochemical outcome of a chemical reaction based on its mechanism. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	Students must identify products formed in a chemical reaction as 2 enantiomers 2 diastereomers 4 stereoisomers a single stereoisomer a single achiral compound **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 80% of students correctly identify stereochemical outcome of reaction		
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Chemical Reaction Outcome - Effectively write an electronic mechanism accounting for the outcome of a chemical reaction. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Final Exam short answer mechanism question : Question should be closely related to the following: "Use curved-arrow formalism to show the mechanism of the following chemical transformation. Show every step in sequence including all proton transfer steps. Include all non-bonded electrons and formal charges." **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Class average of 77% of question points awarded		
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Themodynamics and Kinetics - Understand the role thermodynamics and kinetics plays in the outcome of a chemical reaction. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Final exam question addressing Kinetic vs Thermodynamic control in 1,2 vs 1,4 addition to conjugated dienes **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 80% of students correctly answer question	05/06/2012 - 88% of students were able to correctly predict the major product of addition to 1,3-diene. Only 74% of students were able to correctly explain why the thermodynamic and Kinetic products were the same in this particular reaction. **Result:** Target Met **Reporting Year:**	05/06/2012 - Students often memorize content-based information without understanding the theoretical scaffolding upon which this information is derived. This deeper understanding must be assessed so that students are encouraged to develop greater analytic reasoning skills.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		2011-2012 **Resource Request:** none **GE/IL-SLO Reflection:** This question reveals that short answer questions are far more revealing of the depth of students' understanding than are multiple choice answers alone. While M/C answer addresses acquisition of content- based knowledge, it does not as effectively measure true understanding or require the the same kind of analytic reasoning. M/C question must contain an 'Explain' or other short-answer follow-up component.	
Department - Chemistry (CHEM) - CHEM 12C - ORGANIC CHEMISTRY - Organic Target Molecules - Design a concise, logical chemical synthesis of an expanded array of organic target molecules from simple precursors. (Created By Department - Chemistry (CHEM)) **Start Date:** 04/04/2011 **End Date:** 06/24/2011 **Course-Level SLO Status:** Active	**Assessment Method:** An open-ended question embedded during the final exam that provides the student a complex target molecule, which must be synthesized from simple starting material. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Out of 20 possible points, and a 3 point deduction for each error in the student's synthetic scheme, students scoring around 17 points would be considered proficient at synthesis. **Related Documents:** Chemistry 12C - Synthesis 01	07/24/2012 - Synthesis required a minimum of five steps. Partial credit was given for strategies that showed knowledge of key transformations and for overall strategy. Points were deducted from sequences which included unnecessary steps. Overall average was 16/20 from 36 students. This represents an 80%average which in turn corresponds to a 'B' letter grade so target may be too high. **Result:** Target Not Met **Reporting Year:** 2011-2012 **Resource Request:** None **GE/IL-SLO Reflection:** students demonstrated good memorization of key transformations and some creative construction. a very few students proposed entirely novel approaches. it may be possible to encourage efficient syntheses through point deduction for inefficient approaches.	09/09/2012 - Additional assessment could include breakdown of strategic missteps, for example, points lost because reagents incomplete (missing) or because of low yielding step(s). In this assessment low yielding steps were most common source of point loss. More examples of common traps may prove useful in class. Average is still most useful since low scores are typically the result of many strategic missteps and can't be characterized further.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		These problems require a strong mastery of the course material as well as strong problem solving/ analytic reasoning skills.This assessment demonstrates critical and creative thinking very well.	
		06/24/2011 - For a class size of 50 students, the average score for the assessed synthesis question (which focused on aromatic and amine chemistry) was 16.54/20.00, while the median score was 20. Over half the students scored 20/20 on this question, with nearly all others scoring above 14 points. Only 4 students scored less than 10 points. **Result:** Target Met **Reporting Year:** 2010-2011	10/14/2011 - Synthesis questions are the most difficult and complex in organic chemistry. A majority of the students' schemes demonstrated proficiency in selecting compatible chemical reagents, foresight in building carbon scaffolds, and analysis in functional reactivity. This data demonstrates students have gained skills in organic synthesis and are able to carry these abilities into the workforce.
Department - Chemistry (CHEM) - CHEM 12C - ORGANIC CHEMISTRY - Organic Molecule Reactivity - Recognize structural features of organic molecules important to their reactivity. (Created By Department - Chemistry (CHEM)) **Start Date:** 04/04/2011 **End Date:** 06/24/2011 **Course-Level SLO Status:** Active	**Assessment Method:** A series of embedded, open-ended question on the final exam where the student must predict the product of multi-step chemical reactions. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Six questions (worth 5 points each, total 30 points) will be assessed. Answer are worth partial credit if slight errors are made (approximate 2 point deduction per error). An average of 21 points would consider the student proficient and knowledgeable of various reactivity theories. **Related Documents:** Chemistry 12C - Reactions 01	09/09/2012 - Of the six questions chosen, three had regio and/or stereo selectivity. Each question was worth 6 points. Points were deducted (3 for regio, 2 for stereo) if selectivity was missing or incorrect. Average was 84% on these questions. **Result:** Target Met **Reporting Year:** 2011-2012 **Resource Request:** none **GE/IL-SLO Reflection:** This assessments demonstrates critical thinking and the acquisition of knowledge in the field of Chemistry and therefore addresses the GE/IL SLO's.	
		06/24/2011 - For a class size of 50 students, the average score was 20.7/30.0, with a median score of 23. Over 32 students scored at least 21 points or higher, with only 8 students scoring less than 15	10/14/2011 - By the end of Chemistry 12C, students have learned 200+ reactions that are continually used during the series.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		points. **Result:** Target Met **Reporting Year:** 2010-2011	Being able to filter through this large database of reactions and reagents is a huge feat. A majority of students were able to answer over half of the multistep reaction questions correctly. Considering the complexity of molecules at this level, the data suggests students are able to successfully identify reactive sites on molecules and predict with moderate consistency the product of the reaction. This data demonstrates students have gained skills in assessing reactivity which can be applied to biomolecular chemistry and biochemistry, as well as chemical-related jobs in the workforce.
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Graphing and Data Analysis - A student who successfully masters the material in Chemistry 1A at Foothill College will be able to read and interpret graphs and data. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 03/30/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format.Three questions were assessed. Two questions involved differentiating between physical and chemical properties/changes using given experimental descriptions/data. One question required students to read and interpret an Enthalpy Diagram. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	05/05/2012 - 97.1% of the students participated in the assessment with an average score 76.9%. **Result:** Target Not Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** Students scored highest on the questions involving experimental descriptions compared to diagrams. Increased class time devoted to developing critical thinking as applied to interpreting and understanding graphs and diagrams will improve skills in these areas.	08/27/2012 - Students had the most difficulty with the question involving the Enthalpy Diagram. The low resulting average score of 62.5% on this question brought the overall average below the target score. Upon reflection, the diagram used for this question was not covered/discussed in detail during class time. More class time will be devoted to developing an understanding of these types of energy related diagrams.
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Applying Scientific Method - A student who	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format.	05/05/2012 - 100% of the students participated in the assessment with an average score of 87.2%.	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
successfully masters the material in Chemistry 1A at Foothill College will apply the scientific method in lab experiences to interpret information and draw conclusions. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 03/30/2012 **Course-Level SLO Status:** Active	Three questions were assessed. Two questions involved differentiating between physical and chemical properties/changes using given experimental descriptions/data. One question required students to determine the amount of liquid contained in two different graduated cylinders to the correct precision of the device. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	**Result:** Target Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** The IL-SLO was met.	08/27/2012 - No action plan at this time.
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Critical Thinking Skills - A student who successfully masters the material in Chemistry 1A at Foothill College will demonstrate the ability to think critically and employ critical thinking skills. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 03/30/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Seven different questions were used. The questions chosen addressed a variety of critical thinking skills. Students were required to correctly record a measurement and access its precision, to complete a multistep dimensional analysis problem, to interpret and draw conclusions from diagrams, to interpret and draw conclusions from videos/animations and to correctly describe/interpret energy transfer. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	05/05/2012 - 93.5% participation was achieved with an average of 75.1%. **Result:** Target Not Met **Reporting Year:** 2010-2011 **GE/IL-SLO Reflection:** The average score of the accessed students is near the target score. There were problems detected in the methods of evaluation. (See reflection/action plan.) Evaluation methods that better differentiate abilities will be explored.	08/27/2012 - Three of the questions used were the primary cause of not meeting the target score. One of these three questions involved an energy diagram (average of 62.5%) that was not covered/discussed in detail during class time. More class time will be devoted to developing an understanding of energy diagrams. A second question was a multistep, complex dimensional analysis problem (average of 54.3 %) with no partial credit. It is likely that many students were able to complete part of this multi-step problem correctly, but received zero credit. It would be preferable to evaluate this type of question using a hand graded exam/quiz where better differentiation of abilities can be accessed. The third question involved a numerical calculation of energy released during a reaction (average score 66.0%) where correct units for the answer were kJ. Students who input kJ/mole lost all credit for their answer, even if it was

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
			numerically correct. Again, this type of question would be better served on a hand graded exam/quiz where better differentiation of abilities can be accessed.
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Quantitative/Critical Thinking Skills in General Chemistry - A student who successfully masters the material in Chemistry 1A at Foothill College will demonstrate the quantitative skills needed to succeed in General Chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 03/30/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Seven different questions were used. The questions chosen addressed a variety of skills. The questions included a multistep dimensional analysis problem, unit conversions between mass/molecules/moles, stoichiometric calculations, calculations involving energy and problems related to quantum chemistry. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	05/05/2012 - 93.9% participation was achieved with an average of 80.9%. **Result:** Target Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** The SLO was met and it does involve a variety of computational and critical thinking skills, some of which also apply to GE. However, this SLO is related more closely to Learning Outcomes related to success in future chemistry classes than to GE.	08/27/2012 - The students that were evaluated successfully demonstrated several basic quantitative skills needed to succeed in subsequent courses.
Department - Chemistry (CHEM) - CHEM 1B - GENERAL CHEMISTRY - Graphing and Data Analysis - Global: Read and interpret graphs and data. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	04/30/2012 - The average score based on three problems was 74% with 94% participation. The low average was the result of assigning problem 11.59 from the 12th edition of Brown and Lemay. The students only scored an average of 57%. The other two questions had results that were more reflective of our target goals. **Result:** Target Not Met **Reporting Year:** 2011-2012	04/30/2012 - Problem 11.59 was reviewed and will not be assigned in the future. This problem required reading a graph to a finer precision then could be expected from a computer image. It is understandable that students answered this question incorrectly.
Department - Chemistry (CHEM) - CHEM 1B - GENERAL CHEMISTRY - Quantitative	**Assessment Method:** All questions were assessed online through	04/30/2012 - The results are based on 11 multiple choice questions covering multiple chapters. On	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Skills in General Chemistry - Global: Demonstrate the quantitative skills needed to succeed in General Chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **Course-Level SLO Status:** Active	Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	average, the results were 86% correct with 95% participation. These questions are targeted at the concepts and skills necessary to progress to the next topic/chapter in chemistry. **Result:** Target Met **Reporting Year:** 2011-2012	04/30/2012 - The results are very satisfactory. As instructors with years of experience we are aware of and continually stress those topics that are necessary to succeed in general chemistry. We will continue to make success with this SLO a top priority in our classes.
Department - Chemistry (CHEM) - CHEM 1B - GENERAL CHEMISTRY - Critical Thinking Skills - Global: Demonstrate the ability to think critically and employ critical thinking skills. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** Average score of 80% with 90% participation.	04/30/2012 - We assessed 31 multiple choice questions sampled randomly from every chapter. The average score was 87% with a participation of 96%. **Result:** Target Met **Reporting Year:** 2011-2012	04/30/2012 - The results are very satisfactory. As instructors with years of experience we are aware of and continually stress critical thinking skills. The logical thinking and problem solving aspect of general chemistry is the core of the discipline. Without these skills, students will soon meet their limitations as there pursue their science degrees and move into the workforce.
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Electrochemistry - Computation - A successful student will demonstrate the ability to think critically and employ computational skills in the analysis of redox reactions and chemistry. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Online course homework. **Assessment Method Type:** Departmental Questions **Target:** An average of 75% for the class.	06/27/2011 - The statistics from Mastering Chemistry are as follows for question 20.100 11th ed. of Brown and Lemay. 73% Correct, 10% Unfinished, 17% Incorrect **Result:** Target Not Met **Reporting Year:** 2010-2011 **Resource Request:** None at this time. **GE/IL-SLO Reflection:** This question requires students to consider	07/11/2011 - These values, although not meeting our target, are reasonable considering the complexity of the assessment. We see no need to take significant action at this time to alter our curriculum.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		several factors when formulating their answers. The students that answer incorrectly usually miss one (or more) critical thinking step when answering.	
	Assessment Method: Chemistry 1C Final Exam - Multiple Choice Question. The standard emf for the cell using the overall cell reaction below is +2.20 V: 2Al(s)+3I2(s) ?> 2Al3+(aq)+6I-(aq) The emf generated by the cell when [Al3+] = 4.5 ! 10-3 M and [I-] = 0.15 M is ? V. A) 2.23 B) 2.39 C) 2.20 D) 2.10 E) 2.30 **Assessment Method Type:** Exam - Course Test/Quiz **Target:** This is a difficult problem. A 70% success rate would be terrific!	06/26/2012 - On the final exam from Spring of 2012, 67% percent of the students answered this correctly, just missing the target of 70%. **Result:** Target Met **Reporting Year:** 2011-2012	08/27/2012 - This question is based on the Nernst equation - a conceptually difficult equation for many students to master. To reach a target of 70% correct, I plan to spend more time in lecture and lab on the use and permutations of this question.
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Solubility of Salts - Critical Thinking - A successful student will demonstrate the ability to make connections between concepts across several areas of General Chemistry as applied to salt solutions. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Online course homework. **Assessment Method Type:** Departmental Questions **Target:** An average of 75% for the class.	06/27/2011 - The statistics from Mastering Chemistry are as follows for question 17.107 11th ed. of Brown and Lemay. 70% Correct, 7% Unfinished, 23% Incorrect **Result:** Target Not Met **Reporting Year:** 2010-2011 **GE/IL-SLO Reflection:** This question requires students to recall concepts from 1st quarter general chemistry. The students that answer incorrectly usually miss the stoichiometry aspect of the question.	07/11/2011 - These values, although not meeting our target, are reasonable considering the complexity of the assessment.We see no need to take significant action at this time to alter our curriculum.
	Assessment Method: Chemistry 1C Final Exam - Multiple Choice	06/26/2012 - This question was given to 61 students during the final exam of Sp 2012.	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Question. The Ksp for Zn(OH)2 is 5.0x10-17. Determine the molar solubility of this salt in a buffer solution with a pH of 11.50. A) 5.0x10-12 B) 5.0x10-17 C) 2.3x10?6 D) 1.6x10-14 E) 1.2x10-13 **Assessment Method Type:** Exam - Course Test/Quiz **Target:** An average of 70% correct for the class.	72% of the students answered this question correctly. Considering the dificulty of this question 72% is acceptable. **Result:** Target Met **Reporting Year:** 2011-2012	08/27/2012 - This question involves recognition that buffer solutions provide a constant pH. This must be factored into the mathematics before the final solution can be determined. The low score of 72% may be careless error by some students in forgetting to square the [OH-] concentration or substituting [H+] fro [OH-] in the mathematics. A review/reminder to carefully step through the problem solving algorithm is in order.
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Colligative Properties - Critical Thinking - A successful student must be able to recognize the types of salts presented as strong or non-electrolytes. Secondly, perform the required critical thinking/mathematical analysis of the experimental data to select the one salt that satisfies the conditions given. (Created By Department - Chemistry (CHEM)) **Start Date:** 06/26/2012 **Course-Level SLO Status:** Active	**Assessment Method:** Chemistry 1C Final Exam - Multiple Choice Question. A 1.35 m aqueous solution of compound X had a boiling point of 101.4°C. Which one of the following could be compound X? The boiling point elevation constant for water is 0.52°C/m. A) C6H12O6 B) CH3CH2OH C) KCl D) CaCl2 E) Na3PO4 **Assessment Method Type:** Exam - Course Test/Quiz **Target:** 75% correct would be considered acceptable given the difficulty of the problem.	06/26/2012 - On the final exam from Spring of 2012, 87% of the students answered this question correctly. Far exceeding the target of 75%. **Result:** Target Met **Reporting Year:** 2011-2012	08/27/2012 - The results are very good indicating students can recognize and solve a single step math problem with a high degree of certainty. The 13% that gave an incorrect answer may have carelessly missed the square function in the math. No action seems to be required at this time.
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Nuclear Chemistry - A successful student will demonstrate an understanding of the impact of science on	**Assessment Method:** Online homework. **Assessment Method Type:** Departmental Questions **Target:**	06/27/2011 - The statistics from Mastering Chemistry are as follows for question Nuclear Generation of Electric Power, 11th ed. of Brown and Lemay. 99% Correct, 1% Unfinished, 0% Incorrect	07/11/2011 - In class we emphasize the use of nuclear power as a source of energy. The students can take this information and see how electrical energy production can be

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
society in the area of nuclear chemsitry. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	An average of 75% for the class.	**Result:** Target Met **Reporting Year:** 2010-2011 **Resource Request:** Noe at this time. **GE/IL-SLO Reflection:** This question was conceptual in nature, looking at how nuclear power is used to generate electricity. The students did extremely well on this question indicating their ability to read and apply there understanding of nuclear decay to the global problem of energy production.	solved using nuclear power.
Department - Chemistry (CHEM) - CHEM 20 - I MATTER: AN INTRODUCTION TO GREEN CHEMISTRY - The chemistry of water and the environment - Students will be able to describe the key chemical properties of water and critically discuss environmental issues related to humanity's use of water (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/23/2013 **End Date:** 06/27/2014 **Course-Level SLO Status:** Inactive	**Assessment Method:** Data from selected homework or exam questions will be analyzed **Assessment Method Type:** Departmental Questions **Target:** 80% achievement of satisfactory scores.		
Department - Chemistry (CHEM) - CHEM 20 - I MATTER: AN INTRODUCTION TO GREEN CHEMISTRY - Principles of Green Chemistry - Students will be able to describe the principles of sustainability as they relate to green chemistry and assess their application in environmentally significant chemical processes. (Created By			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/23/2013 **End Date:** 06/27/2014 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Dimensional Analysis - The students will be able to use dimensional analysis to set up and solve numerical problems. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Results from selected assignments in the online homework system will be compiled and reviewed. **Assessment Method Type:** Departmental Questions **Target:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.	04/29/2011 - Two exercises were chosen to evaluate SLO #1 and were administered by all Chemistry 25 faculty in Winter 2011 through the required online homework component of the course. The first exercise was: (Exercise 2.110: Cumulative Problems) A backpacker carries 2.5 L of white gas as fuel for her stove. How many pounds does the fuel add to her load if the density of white gas is 0.79 g/cm3? The second exercise (Exercise 6.102: Cumulative Problems) was: Fingernail-polish remover is primarily acetone (C3H6O). How many acetone molecules are in a bottle of acetone with a volume of 415 mL? (density of acetone = 0.788 g/cm3) The first exercise was completed in the first two weeks of the term. Only 75% of the 114 students who completed the exercise answered correctly. This reflects the different levels of preparedness by students entering the course. By the end of the first month, when the second exercise was completed, 92% of the students answered this similar problem correctly, indicating an improvement in the critical analytical thinking skills required for solving dimensional analysis exercises. **Result:** Target Met **Reporting Year:**	05/30/2011 - No change recommended. The implementation of graded online homework will continue to be a vital component in ensuring students are learning the importance of dimensional analysis.

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		2010-2011 **GE/IL-SLO Reflection:** No change recommended. The results were compared with results from the entire database of students who completed these exercises (over 5000 students). The Foothill students performed better on both exercises with 75 and 92% answering the first and second exercises correctly compared with correct response rates of 67 and 71% for the overall database.	
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Physical and Chemical Properties and Change - The students will be able to identify physical and chemical properties and change (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Results from selected assignments in the online homework system will be compiled and reviewed. **Assessment Method Type:** Departmental Questions **Target:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.	04/29/2011 - The exercise that follows was chosen to evaluate SLO #2 and was administered by all Chemistry 25 faculty in Winter 2011 through the required online homework component of the course: (Exercise 3.38: Problems ? Physical and Chemical Properties and Physical and Chemical Changes) The following list contains several properties of ozone (a pollutant in the lower atmosphere but part of a protective shield against UV light in the upper atmosphere). Which are physical properties and which are chemical properties? (a) bluish color (b) pungent odor (c) very reactive (d) decomposes on exposure to ultraviolet light (e) gas at room temperature The 114 students who completed this exercise all earned 100% on their first attempt. The question does ask about odor being a physical or chemical property, which can be confusing for some students who think that the chemistry that occurs in the nose in order for a person to process is a smell is not to be considered when classifying a substance as having an odor (a physical property). **Result:** Target Met	04/29/2011 - Target met; no change recommended

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		Reporting Year: 2010-2011	
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Mole and Avogadro's Number - The students will understand the meaning and uses of the mole and of Avogadro's number. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Results from selected assignments in the online homework system will be compiled and reviewed. **Assessment Method Type:** Departmental Questions **Target:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.	04/27/2012 - A question designed to assess the student's understanding of the concept of the law of conservation of mass and the mole to mass conversions necessary to use this law was selected for the assessment. The correct response rate for Foothill Chem 25 students was 99% for this exercise, compared with 93% for the Mastering Chemistry database. This suggests most students have a solid understanding of this concept and are able to perform the simple unit conversions necessary to complete the exercise. **Result:** Target Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** This assessment is very positive, however, the data include only those students who completed this homework exercise. It is possible that the true percentage of students who have mastered these concepts is lower than the very high percentage indicated by the scores, if poorly performing students did not answer this question. This potential limitation of the online homework system will be considered in future assessments	
		04/29/2011 - The exercises that follow were chosen to evaluate SLO #3 and were administered by all Chemistry 25 faculty in Winter 2011 through the required online homework component of the course: (Exercise 6.54: Problems ? The Mole Concept) A salt crystal has a mass of 0.12 mg. How many NaCl formula units does it contain? (Exercise 6.86: Problems ? Calculating an	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		Empirical Formula) Samples of several compounds are decomposed, and the following are the masses of their constituent elements. Calculate the empirical formula for a compound containing 0.672 g Co, 0.569 g As, 0.486 g O There were two separate exercises chosen to more fully assess the scope of mastery regarding the important, yet broad, concept of the mole. Both exercises were quantitative. For (1), the correct response rate of 89% was reassuring that this important objective is being mastered by the majority of students. For (2), the percentage of correct answers dropped to 73%, with many students incorrectly proposing a formula that matches a more common form of the arsenate polyatomic ion but does not match the formula that would have been derived from the data given. This suggests that students may have done an internet search for the compound rather than doing the necessary calculations. **Result:** Target Met **Reporting Year:** 2010-2011 **GE/IL-SLO Reflection:** It is important to do examples that showcase the different pitfalls of assuming, for example, an ionic compound composed of Fe and O is not necessarily assumed to be FeO (iron(II) oxide), because perhaps the data would calculate another stable form: Fe2O3 (iron(III) oxide).	
Department - Chemistry (CHEM) - CHEM 25 - FUNDAMENTALS OF CHEMISTRY - Comprehension of chemical reactivity and quantitative relationships in chemical equations - Students will be able to recognize basic patterns of chemical reactivity, express reactions in terms of balanced equations and be able to	**Assessment Method:** Performance on relevant homework exercises completed using Mastering Chemistry (online homework site) was assessed for all sections of Chem 25 for the Winter 2012 term. Foothill performance was also compared to system data available for students that answered the specific problem	04/27/2012 - Students were required to complete a multi-part exercise on solubility and precipitation reactions. The exercise included writing and balancing an equation, as well as predicting whether the solubility of the products would result in a precipitate as one of the products. The question was answered correctly by 91% of the Foothill students compared with an 89% correct	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
determine quantities of reactants and products in terms of moles, mass and volumes of solutions. (Created By Department - Chemistry (CHEM)) **Start Date:** 01/09/2012 **End Date:** 03/30/2012 **Course-Level SLO Status:** Active	from all institutions using the Mastering Chemistry system. **Assessment Method Type:** Departmental Questions **Target:** At least 80% of students who completed the questions should be able tocomplete the selected exercises correctly. Foothill performance should be at least as good as the system data.	response rate in the system database, indicating the target for success was met. **Result:** Target Met **Reporting Year:** 2011-2012 **GE/IL-SLO Reflection:** This SLO encompasses several key concepts and skills which should be mastered by Chem 25 students. The exercise was of moderate difficulty and the high correct response rate suggests the emphasis on these concepts in the classroom was appropriate.	
Department - Chemistry (CHEM) - CHEM 30A - SURVEY OF INORGANIC & ORGANIC CHEMISTRY - Measurements and Equipment - Students will be able to use common laboratory equipment correctly and report measurements to the correct significant figures with proper units. Equipment includes Bunsen burners, beakers, graduated cylinders, thermometers, top loading balances, rulers and burets. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** The following problem for SLO#2 was used in the online homework grading system (Mastering Chemistry) for students enrolled in Chemistry 30A section 1 in winter 2012. These assignments are used as a pretest in preparation for course exams. 1. Which choice best describes the uncertainty in the measurement 16.30 g? A. cannot be determined B. quantity is exact C. +/- 0.01 g D. +/- 0.10 g E. +/- 1.00 g **Assessment Method Type:** Pre/Post Test **Target:** Students who are able to correctly answer this question have mastered SLO #2. Overall success is indicated by a minimum of 70% of students successfully completing this problem.	03/13/2012 - In winter 2012, 100% of students correctly answered this question. This indicates that our students are able to understand the precision of their measurements made with common lab equipment. **Result:** Target Met **Reporting Year:** 2011-2012	
Department - Chemistry (CHEM) - CHEM			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
30A - SURVEY OF INORGANIC & ORGANIC CHEMISTRY - Matter Classification - Students will be able to classify matter correctly. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** The following problem for SLO#1 will be used in the online homework grading system (Mastering Chemistry) for the students enrolled in Chemistry 30A section 1 in winter 2012. These assignments are used in preparation for course examinations (pretest). 1. Classify the following as an element, compound or mixture: Vitamin D, salt water, oxygen, maple syrup, fruit salad, water, gold **Assessment Method Type:** Pre/Post Test **Target:** Students who are able to correctly classify the substances given in this problem have mastered SLO #1. Overall success is indicated by a minimum of 70% of students successfully completing this problem.	03/13/2012 - In the winter of 2012, 93.3% of students assessed were able to correctly answer this question. This indicates that our students are able to successfully classify matter. **Result:** Target Met **Reporting Year:** 2011-2012	
Department - Chemistry (CHEM) - CHEM 30A - SURVEY OF INORGANIC & ORGANIC CHEMISTRY - Chemical Equations and Formulas - Students will be able to represent chemical changes correctly through balanced chemical equations with proper formulas for elements and compounds. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** The following problem for SLO#3 was used in the online homework grading system (Mastering Chemistry) for students in Chemistry 30A section 1 during winter 2012. These problems are used in preparation for course examinations (pretesting). 1. Which is the correct equation for the reaction of magnesium with hydrochloric acid to produce hydrogen and magnesium chloride? A. 2 Mg + 6 HCl → 3 H2 + 2 MgCl2 B. Mg + HCl ->H + MgCl C. Mg + 3 HCl ->3 H + MgCl2 D. Mg + 2 HCl -> 2 H + MgCl2 E. Mg + 2 HCl -> H2 + MgCl2 *Note: formatting for subscripts and arrows did not copy over to TracDat **Assessment Method Type:** Pre/Post Test **Target:**	03/13/2012 - 100% of students assessed in winter 2012 were able to correctly answer this question. This shows that students are mastering SLO#3. **Result:** Target Met **Reporting Year:** 2011-2012	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Students who are able to successfully answer this problem have mastered SLO #3. Overall success is indicated by a minimum of 70% of students successfully completing this problem.		
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Organic Compounds - Students will be able to name simple organic compounds and recognize and name functional groups in an organic compound. By recognizing a functional group, students will be able to determine general reactivity and write reactions to show that reactivity. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** The following question will be used in all Chem 30B courses as part of the assigned chapter homework in preparation for course examinations: The name of the hydrocarbon with three carbon atoms and having only single bonds between carbon atoms is A. decane. B. ethane. C. propane. D. butane. E. methane. **Assessment Method Type:** Pre/Post Test **Target:** Average student score higher than 75%.	06/13/2012 - The average student score for this problem was 98.7% in spring 2012, suggesting student mastery of basic hydrocarbon nomenclature. **Result:** Target Met **Reporting Year:** 2011-2012	
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Bio-molecules - Students will be able to describe the general structure of carbohydrates, fatty acids, amino acids and proteins, nucleotides and nucleic acids. Students will know the roles of these bio-molecules in the body. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All students will be assigned the following problem in homework in preparation for course exams. The backbone of a nucleic acid molecule consists of A. alternating sugar and nitrogen base groups linked by amide bonds. B. alternating sugar and phosphate groups linked by phosphate ester bonds. C. complementary bases joined by hydrogen bonds. D. sugar molecules bonded from the #3 carbon of one molecule to the #5 carbon of the other by glycosidic linkages.	06/13/2012 - The average student score was 89% in spring 2012. This shows that students understanding the structure of bio-molecules, in this case nucleic acid structure. **Result:** Target Met **Reporting Year:** 2011-2012	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	E. alternating nitrogen bases and phosphate groups linked by amide bonds and strengthened by hydrogen bonds. **Assessment Method Type:** Pre/Post Test **Target:** A student average of 75% for this problem.		
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - DNA - Students will be able to describe DNA replication, transcription and translation. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All students will be assigned the following homework problem in preparation for course exam: The process in which information from DNA is used to manufacture RNA is called A. replication. B. mutation. C. translocation. D. translation. E. transcription. **Assessment Method Type:** Pre/Post Test **Target:** Average student score of 75%.	06/13/2012 - The average student score was 98% for this problem in spring 2012. **Result:** Target Met **Reporting Year:** 2011-2012	
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Common Metabolic Processes - Students will understand the chemistry of common metabolic processes. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All students will be assigned the following homework problem in preparation for course exam: The common molecule produced from all foods at the second stage of catabolism is A. ADP. B. glucose. C. acetyl-SCoA. D. carbon dioxide. E. citric acid. **Assessment Method Type:** Pre/Post Test **Target:** 75% student average	06/13/2012 - Average student score for this problem was 90% in spring 2012. **Result:** Target Met **Reporting Year:** 2011-2012	

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 36 - SPECIAL PROJECTS IN CHEMISTRY - Analytic Instrumentation - Proficiently and independently operate analytical equipment found in both organic and inorganic chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36 - SPECIAL PROJECTS IN CHEMISTRY - Data Analysis - Become proficient in analyzing data from instruments in lab, and be able to adjust experimental variables to positively affect data. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36 - SPECIAL PROJECTS IN CHEMISTRY - Scientific Literature Search - Effectively utilize online journal databases and search engines to find scientific data that supports and compliments current research activities. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 36X - SPECIAL PROJECTS IN CHEMISTRY - Analytic Instrumentation - Proficiently and independently operate analytical equipment found in both organic and inorganic chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36X - SPECIAL PROJECTS IN CHEMISTRY - Data Analysis - Become proficient in analyzing data from instruments in lab, and be able to adjust experimental variables to positively affect data. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36X - SPECIAL PROJECTS IN CHEMISTRY - Scientific Literature Search - Effectively utilize online journal databases and search engines to find scientific data that supports and compliments current research activities. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36Y - SPECIAL PROJECTS IN CHEMISTRY			

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
- Analytic Instrumentation - Proficiently and independently operate analytical equipment found in both organic and inorganic chemistry. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36Y - SPECIAL PROJECTS IN CHEMISTRY - Data Analysis - Become proficient in analyzing data from instruments in lab, and be able to adjust experimental variables to positively affect data. (Created By Department - Chemistry (CHEM)) **Start Date:** 06/29/2011 **End Date:** 09/26/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 36Y - SPECIAL PROJECTS IN CHEMISTRY - Scientific Literature Search - Effectively utilize online journal databases and search engines to find scientific data that supports and compliments current research activities. (Created By Department - Chemistry (CHEM)) **Start Date:** 09/26/2011 **End Date:** 06/29/2012 **Course-Level SLO Status:** Inactive			
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Problem Solving Skills for Chemistry 1A - The student	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Average scores for each question were	06/29/2012 - The results were as follows: Question 1: Chemistry 1A students at large achieved an average score of 82.9%. Students	09/06/2012 - The problem solving sessions utilized in Chemistry 70 were found to be successful in

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
will demonstrate competency in quantitative problem solving skills related to Chemistry 1A. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	compared for the Chemistry 1A students at large and for for students who were also concurrently enrolled in Chemistry 70. The following questions were assessed. The questions included unit conversions and stoichiometric calculations. 1) A sample of the male sex hormone testosterone, C19H28O2, contains 3.68×10^21 atoms of hydrogen. a. How many atoms of carbon does it contain? b. How many molecules of testosterone does it contain? c. How many moles of testosterone does it contain? d. What is the mass of this sample in grams? 2) The complete combustion of octane, a component of gasoline, proceeds as follows: (Reaction given) a. How many moles of are needed to burn 1.35 mole octaneof ? b. How many grams of oxygen are needed to burn 12.0 g of octane? c. Octane has a density of 0.692 g/mL at 20°C. How many grams of oxygen are required to burn 19.0 gallons of octane? 3) Tartaric acid, has two acidic hydrogens. The acid is often present in wines and precipitates from solution as the wine ages. A solution containing an unknown concentration of the acid is titrated with. It requires 22.65 mL of 0.1500 M solution to titrate both acidic protons in 60.00 of the tartaric acid solution. Calculate the molarity of the tartaric acid solution. **Assessment Method Type:** Exam - Course Test/Quiz **Target:** A higher average score for those students enrolled in Chemistry 70 compared to the Chemistry 1A students at large.	who were also enrolled in Chemistry 70 achieved an average score of 91.7%. Question 2: Chemistry 1A students at large achieved an average score of 77.2%. Students who were also enrolled in Chemistry 70 achieved an average score of 77.8%. Question 3: Chemistry 1A students at large achieved an average score of 73.2%. Students who were also enrolled in Chemistry 70 achieved an average score of 75.0%. **Result:** Target Met **Reporting Year:** 2011-2012	improving quantitative skills. However, improvement was slight for question (2). More focus on questions of this type will be given in the Chemistry 70 problem sets.

Course-Level SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Study Strategies for College Level Science - The student will develop and apply effective study strategies and skills for the study of college level science. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Study strategies and skills discussed and applied in Chemistry 70 are designed to increase the success rate, defined as a grade of C or better, of students in college level science courses. To access the effectiveness of the Chemistry 70 curriculum, success rates in Chemistry 1A for the class at large were compared with success rates for students who were also concurrently enrolled in Chemistry 70. **Assessment Method Type:** Data **Target:** A Chemistry 1A success rate for students enrolled in Chemistry 70 that exceeds the success rate of those not enrolled in Chemistry 70.	06/29/2012 - The success rate for Chemistry 1A students at large in the group studied was 75.0 %. That is 75.0% of the students enrolled in the course at the end of the second week of classes passed with a grade of C or better. For students in the same course who were concurrently enrolled in Chemistry 70, the success rate was 77.8 %. **Result:** Target Met **Reporting Year:** 2011-2012	09/04/2012 - Tracking success of students who completed Chemistry 70 in subsequent courses would provide further information about the success of the course.