BASIC PROGRAM INFORMATION

Program Review is about documenting the discussions and plans you have for improving student success in your program and sharing that information with the college community. It is also about linking your plans to decisions about resource allocations. With that in mind, please answer the following questions.

Program/Department Name: Chemistry Department

Division Name: PSME

Please list all team members who participated in this Program Review:

Name	Department	Position
Kathy Armstrong	Chemistry	Instructor
Richard Daley	Chemistry	Instructor
Mary Holland	Chemistry	Instructor
Londa Larson	Chemistry	Instructor
Rosa Nguyen	Chemistry	Instructor
Sandhya Rao	Chemistry	Instructor
Amanda Pitts	Chemistry	Instructor

Number of Full Time Faculty: 7 **Number of Part Time Faculty:** 16

Please list all existing Classified positions: *Example: Administrative Assistant I*

Anna Wu	Laboratory Technician
Sherman Lee	Laboratory Technician

SECTION 1: PROGRAM REFLECTION

1A. Program Update: Based on the program review data, please tell us how your program did last year. We are particularly interested in your proudest moments or achievements related to student success and outcomes.

Please see accompanying WORD document - Text box does not allow graphs to be inserted

1B. Program Improvement: What areas or activities are you working on this year to improve your program? Please respond to any feedback from the supervising administrator from last year's program review.

A number of activities are ongoing or under discussion to improve student success rates in the introductory and general chemistry programs, to address the lower success rates of underserved populations and potentially increase enrollment of high achieving students:

1. Development of Chemistry Honors Courses for Science Majors
Currently, as part of a professional development leave project, honors courses are being developed for the first two quarters of the general chemistry sequence, 1A and 1B. Once implemented, this will serve to attract honors students into the Chemistry program. Honors level courses are also being developed for organic chemistry, including a novel integrated research methods laboratory.

2. Adaptive Learning Homework systems in general and introductory chemistry

In the general chemistry sequence, beginning in the 2014-2015 year, the department transitioned to a new textbook and online learning platform (McGraw-Hill Connect and LearnSmart). One motivation for the change was the adaptive capabilities of the LearnSmart system that assesses student understanding of chemistry concepts and directly ties their learning experience to the reading material for the course. Students are given the opportunity to "recharge" or revisist concepts from previous sections that they struggled with and learn from their mistakes in a mastery system.

In introductory chemistry courses, the newer adaptive learning capabilities in online homework systems are being utilized to improve student success rates on exams. These systems assess student performance on an assignment and provide targeted practice on concepts and calculations which were not completed correctly in the initial assignment.

3. Embedded tutors in Chemistry 1A
Beginning with the Winter or Spring 2016 quarters in Chemistry 1A, implementation of embedded tutors with accompanying student led study groups or workshops is being explored. Having more peer student support in the classroom will aid in student comprehension of the material.

4. Atoms-First approach in General Chemistry
In the general chemistry course sequence, a modified approach to teaching the core concepts of atomic structure is being piloted. Selected sections of Chem1A are being taught using an "atoms first" approach, which focuses on developing an initial thorough understanding of atomic structure before learning about chemical reactivity and solution properties. Discussions are ongoing on how student success rates will be measured and compared for each approach.

5. Study of Chemistry Placement Exam effectiveness and possible improvements
The department is working with Institutional Reseach (IR) and Testing and Assessment Center at Foothil College to assess the validity of the current Chemistry 1A placement exam in ensuring adequate preparation for Chemistry 1A. The initial ranking of the match between the placement exam questions to Chem 25 course content has been completed by all full-time faculty members. Currently, the Chemistry 1A faculty have also been working with the IR and testing center team to complete surveys on perception of student readiness in the Fall 2015 quarter. The placement exam validity study is ongoing, and faculty continue to collaborate with the the Placement Exam team as needed.

6. Student Equity Discussions and Development of programs
To specifically address the lower success rates observed in targeted populations noted in previous program reviews, the department has initiated discussions regarding the development of special lower class size sections of Chem 25 and Chem 1A to assist struggling students. More details on this is provided in Section 1D (EMP Goal)

6. Improve safety in the laboratory
We would like to improve student compliance, safety and access to protective eyewear by stocking appropriate eye protection in the student drawers and adding sanitation capabilities (Cabinets which sanitize the goggles with intense ultraviolet light).

7. We are looking to grow our allied health program by offering Chem 30A during Saturdays. This course is targeted towards working individuals in the community looking to complete an allied health or general education requirement.

1C. Measures of Success: What data or information will you use to measure your success (e.g. student success rates, changes in student or program learning outcomes)?

The overall success of many of the activities outlined in Section 1B are largely focused on improving student success rates and can be monitored on a yearly basis via the program review data. In some cases, such as the adaptive homework assignments (Activity 2), the use of embedded tutors (Activity 3) and the "atoms first" approach (Activity 4), the success may be monitored within academic years by comparing historical scores on major exams and interactive discussions among the faculty.

Assessing the success of our new honors classes (Activity 1) will include tracking enrollment, student transfer to UC instiitutions (especially those offering preferred enrollment for honors students), surveying student participants, and assessing Student Learning Outcomes. These metrics will require time for the programs to be implemented, but will be addressed in future program reviews.

Assuming the entrance exam passing score is raised (Activity 5), the expectation is that students entering Chem1A will be better prepared and higher Chem1A success rates will be observed for students would meet the pre-requisite via the entrance exam.

1D. EMP Goal: The 2015-2020 Educational Master Plan (EMP) includes the following goal:
"Create a culture of equity that promotes student success, particularly for underserved students."

Based on the program review data, tell us some of the things your program will be doing this year to support this goal. You will be asked to report on any accomplishments on your next comprehensive program review.

Introductory Chemistry and General Chemistry (Chem 1A) Supplemental Study or "Booster" sections
To address the lower success rates observed in targeted populations noted in previous program reviews, the faculty have initiated discussions within the department regarding the development of special lower class size sections of Chem 25 and Chem 1A. These sections would be limited to targeted groups or students with very weak science/math preparation. The overall goals of these smaller enrollment sections would be to reduce the number of students repeating the courses and raise the overall success rates.

For Chem 25, special sections which require mandatory co-enrollment in a supplementary problem solving and remedial skills course (envisioned as P/NP grading and taught by the section instructor) are being explored. In addition to improving overall success rates for targeted populations, this approach should reduce the number of times a student has to repeat Chem 25 or Chem 1A and allow them to complete their educational goals more quickly. Relevant student populations for these courses would include the targeted ethnic groups as well as students with especially poor preparation based on high school experience in math and chemistry courses. The supplemental course will need to be developed and approved through the curriculum process, which will require substantial faculty time.

For General Chemistry (starting with Chemistry 1A), lower enrollment "Chem Booster" sections are being explored as an option within the department. Struggling students in the General chemistry frequently need more individualized attention as they may be possessing critical gaps in their current chemistry knowledge or math skills, and these learning difficulties may vary from student to student. The Chemistry Booster sections would follow the existing format and assessments as for the main course, but with substantially smaller lab section sizes. This will allow the instructor to spend more time

with individual students to better address their individual skill deficiencies, and would allow students to form a small cohort and make connections with other chemistry students facing similar issues. For exmple, one section of the course could be designated a "booster" section with a lower enrollment cap. For chemistry 1A, priority registration can be offered based on recommendations from the student's chemistry 25 instructor or based on performance on the chemistry placement test

The Chemistry Department wants to create a culture of equity that will promote student success, particularly for the targeted groups that are forming a larger percentage of our chemistry enrolment. These students often come in with deficient math and science preparation and have numerous family or work responsibilities that may limit their study time. Because of this constraint on their time, we would like to provide special support for these students within the structure of our courses in order to make a definitive impact and tie student support structures directly to the faculty teaching the course. In the short term, this means accepting a slightly lower productivity for these sections as well as offering faculty release time to develop the supplemental courses and reference materials. The benefit for these short term costs would be a greater retention of struggling students and perhaps higher enrollment of students in later chemistry classes if students are encouraged to remain in the chemistry pipeline.

SECTION 2: PROGRAM OBJECTIVES & RESOURCE REQUESTS

2A. New Program Objectives: Please list any new objectives (do not list your resource requests).

Program Objective	Implementation Timeline	Progress Measures
Example: Offer 2 New Courses to Meet Demand	*Winter 2016 Term*	*Course Enrollment*
1. Use of embedded tutors in Chem 1A	Winter 2016	Student performance
2. Develop CORs for Honors Courses: Chem 1A and Chem1B courses Honors courses for Organic Series	2015-2016 academic year	COR submited for curriculum review
3. Develop path for approval of Chem25 and Chem 1A supplemental support courses	2015-2016 academic year	CORs developed in for submission Fall 2016
4. Bring % Full-time faculty closer to compliance (currently at 38%)	Fall 2016	Hire 1 full time faculty
5. Update spectroscopic capabilities in general chemistry and organic chemistry labs	Spring 2016	New equipment in house
6. Improve thermodynamic experiment capabilities	Fall 2016	New equipment in house
7. Improve lab safety by stocking drawers with appropriate eye protection and providing santitation capability	Spring 2016	New equipment in house
8. Develop Research Methods Integrative Laboratory Course	Fall 2016	COR submited for curriculum review

2B. Resource Requests: Using the table below, summarize your program's unfunded resource requests. Refer to the Operations Planning Committee (OPC) website for current guiding principles, rubrics and resource allocation information.

Resource Request	$	Program Objective (Section 2A)	Type of Resource Request			
			Full-Time Faculty/Staff Position	One-Time B-Budget Augmentation	Ongoing B-Budget Augmentation	Facilities and Equipment
1 full time faculty		#4 above	☒	☐	☐	☐
Supplemental stipend/grant or release time		#3 above	☐	☒	☐	☐
6 simple UV-Vis spectrophotometers	10,000	#5 above	☐	☐	☐	☒
Vernier High Resolution Spectrometer	1650	#5 above	☐	☐	☐	☒
15 high precision dual digital thermometers	1800	#6 above	☐	☐	☐	☒
bomb calorimeter	10,000	#6 above	☐	☐	☐	☒
protective eyewear and sanitizing stations	5000	#7 above	☐	☐	☐	☒
UV Spectrometer	7,500	#5,#8 above	☐	☐	☐	☒
Rotary Evaporator	2,500	#8 above	☐	☐	☐	☒
Online Scientific Journal Access	1.5K	#7 and #8 above	☐	☐	☒	☐

2C. Unbudgeted Reassigned Time: Please list and provide rationale for requested reassign time.

Developing the COR and course materials for the Chem 25 supplement course as part of our EMP goals will take significant faculty time, but the result will be a path for underserved students and targeted populations to succeed in Chem 25 the first time the course is taken. It will also provide improved readiness for Chem 1A, enabling the future success for students who want to pursue a career in STEM areas, but have poor high school preparation. The COR and materials will be developed for a Fall 2016 submission to the curriculum review committee, with anticipated launch of the course in Fall 2017. To accomplish this, the department is requesting 4 hours per week release time for 1 full-time faculty for Spring quarter 2016.

We would also like to request a one hour overload assignment for one of the Chem1A faculty during Winter and Spring quarter of 2016. The time in Winter Quarter 2016 will be used to develop an outline of the goals for the special section, defining the essential skills to be taught and the strategy for covering the material. This will involve re-organizing the conduct of laboratory sessions and possibly developing novel background materials. The instructor would also serve as a coordinator within the department for consensus on the overall strategy and materials for this new approach to teaching Chem 1A. The overload time in Spring Quarter would be used in conjunction with piloting one of the special sections, modifying materials, developing and performing assessments of its success with modifications of

material as needed.

SECTION 3: LEARNING OUTCOMES ASSESSMENT SUMMARY

3A. Attach 2014-2015 Course-Level Outcomes: Four Column Report for CL-SLO Assessment from TracDat. Please contact the Office of Instruction to assist you with this step if needed.

3B. Attach 2014-2015 Program-Level Outcomes: Four Column Report for PL-SLO Assessment from TracDat. Please contact the Office of Instruction to assist you with this step if needed.

SECTION 4: FEEDBACK AND FOLLOW-UP

This section is for the Dean/Supervising Administrator to provide feedback.

4A. Strengths and successes of the program as evidenced by the data and analysis:

The Chemistry Department has maintained course success rates (68% 3-year average) above the greater PSME Division (65%) and institutional goal (55%), and has increased the percentage of Latino students taking chemistry courses over a three-year period (13% to 18%). This increase is noteworthy considering enrollment for the Chemistry Department has remained relatively consistent over the past three years. The Department's enrollment trend should also be commended since the closely tied Biology Department has seen enrollment drop over 19%, 12%, and 25% in Biology 1A, 1B and 1C, respectively, and 11% in WSCH overall. Growth in enrollment has been seen primarily in introductory chemistry courses (CHEM 25 & 30A), which have greater percentages of students in historically disadvantaged groups.

To help attract additional students, the Department is beginning to offer CHEM 30A on Saturdays (starting Winter 2016) to accommodate working individuals. Additional efforts include the development of multiple honors courses (CHEM 1AH, 1BH, 12AH) as well as a unique research based organic chemistry course (CHEM 12D).

To address the lower success rates of historically disadvantaged student populations, the Chemistry Department is developing new booster class curriculum, working with institutional research to validate the placement exam (with early indications that the cut score is correct), as well as implement embedded tutoring.

The faculty members of the department should be lauded for their commitment to multiple activities outside of the classroom, including the College Curriculum Committee, tenure review committees, hiring committees, as well as efforts to establish the Chemistry AD-T (which required developing new curriculum). Of major importance is meeting and training part-time faculty on lab instrumentation and experimentation issues.

4B. Areas of concern, if any:

An area of slight concern is the enrollment trend overall. The College saw a recent 2.2% increase in WSCH over the past year (and a similar increase the year prior), while the Chemistry Department has remained flat. One potential cause is the strong local economy, with enrollment normally behaving inversely in the chemical sciences. Enrollment in the Biology Department has dropped which is usually coupled to chemistry, but being the enrollment trend is flat rather than negative, makes enrollment

overall a minimal concern.

Another concerning area is the decrease in enrollment for transfer level courses, while introductory courses continue to see enrollment growth. Upcoming honors courses will hopefully attract students to take transfer-level courses at Foothill, since the honors work may make students more competitive when applying to 4-year institutions; however, honors courses have historically generated little enrollment increase in the past in the other PSME disciplines.

One other area of concern is the lack of a permanently funded coordinator for the department to help train new part-time faculty on instrumentation. In addition to helping new members of the department prepare and implement lecture material, faculty in the chemistry department must also be adept at all lab experiments in a course each quarter. This orientation normally requires an extensive amount of time from multiple full-time faculty to help train.

4C. Recommendations for improvement:

To address enrollment concerns, one suggestion in the near-term is to offer courses outside the normal Monday through Thursday block schedule. Saturday classes are being offered for CHEM 30A starting in Winter 2016 (with enrollment at approximately 55 students for two sections which is very high). This suggests strong demand for both CHEM 30A, 30B and possibly CHEM 25 on Saturdays in the Spring 2016 Quarter. For transfer-level courses, potentially a Friday/Saturday schedule could be offered to accommodate two labs a week. Additionally, hybrid courses of CHEM 25 and CHEM 1A/B/C could be offered based on the success of the online Adaptive Learning Homework system recently implemented.

Enrollment may also be increased by marketing the chemistry major and potential career pathways to new/local students. The development of a brochure detailing the multiple careers chemists can enter into (e.g., patent law, materials, environmental chemistry), may help recruit students from local high schools. A Chemistry Show (similar to the Physics Show) may potentially attract students to Foothill College and introduce chemistry to a younger audience, but would require an enormous amount of time investment.

In addition to the development of booster classes for CHEM 25 and 1A, as well as embedded tutoring in CHEM 1A, I would suggest implementing embedded tutoring in CHEM 25 and 30A in the near-term. This quick addition may help to increase course success rates in historically disadvantaged populations while the booster-section curriculum is pending approval.

With regards to funding requests, permanent B-Budget augmentation for a department coordinator to help train and mentor new part-time faculty will assist in maintaining and enhancing the strong course success rates and educational quality of the department. Funding of new spectrometers for both the general and organic chemistry series will help the department implement new experiments that are more aligned to duties seen in industry and four-year research institutions. (NOTE: The request for fine chemicals of approximately $1000 was removed as it can be funded now by current lottery money).

4D. Recommended Next Steps:

- ☒ Proceed as Planned on Program Review Schedule
- ☐ Further Review / Out-of-Cycle In-Depth Review

Upon completion of Section 4, the Program Review document should be returned to department faculty/staff for review, then submitted to the Office of Instruction and Institutional Research for public posting. Please refer to the Program Review timeline.

Unit Course Assessment Report - Four Column

Foothill College

Department - Chemistry (CHEM)

Mission Statement: The mission of the Chemistry Department is to provide undergraduate education founded on a rigorous, applied treatment of chemistry fundamentals coupled with application of modern analytical equipment and techniques to prepare students for transfer to a four-year university or allied-health program.

Course-Level SLOs	Means of Assessment & Targets for Success / 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 SLO Status:**			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 11A - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - Organic Molecule Structure - Identify structural features of an organic compound that influence its reactivity (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 07/10/2016 **End Date:** 07/10/2017 **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 for Success:** 78% average class score **Assessment Method:** Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Over 70% of the class can correctly rank at least four out of the five intermediates correctly. **Assessment Method:** Embedded question on Final exam:		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Ask students to rank the reactivity of several organic compounds with reference to a specific reaction (ie acid-base or Nucleophilic Substitution) Assign equal credit to each successive ranking comparison. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% overall score		
Department - Chemistry (CHEM) - CHEM 11A - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - Reactivity - Predict the products of reactions involving organic compounds (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/26/2016 **End Date:** 09/24/2017 **Course-Level SLO Status:** Active	**Assessment Method:** Embedded M/C question on Final Exam in which a product is shown and the student is asked to CIRCLE ALL reactions or reaction sequences that would produce that product in high yield. If the question is worth 5 points, then the correct circled response is worth 5 points with 1 point deduction for any incorrect answers. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% correct		
	Assessment Method: Embedded series of open-ended questions on final exam: A series of complex organic reactions where students must predict the product, taking into account stereochemistry and other considerations. Each question is worth 5 points with 3 points for answers with incorrect stereochemistry and 2 points for answers with incorrect regiochemistry **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% (4/5 points)		
Department - Chemistry (CHEM) - CHEM 11A - ORGANIC CHEMISTRY FOR LIFE	**Assessment Method:** Embedded ranking question on final exam:		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
SCIENCE MAJORS - Equilibrium - Utilizing theories that affect product stability, predict the relative acidity and/or relative reactivity of organic compounds with similar molecular structure and/or functional groups. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/26/2016 **End Date:** 12/13/2017 **Course-Level SLO Status:** Active	For a series of five organic compounds, rank their relative acidity in decreasing order. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% correct		
	Assessment Method: On the Final exam, rank the Heats of combustion of 2-5 different structural isomers **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** If question is to compare just 2 isomers: 100%; If question is to compare 5 isomers: 80%		
Department - Chemistry (CHEM) - CHEM 11B - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - 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 series of open-ended questions on final exam: A series of complex organic reactions where students must predict the product, taking into account stereochemistry and other considerations. Each question is worth 5 points with 3 points for answers with incorrect stereochemistry and 2 points for answers with incorrect regiochemistry **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80%		
	Assessment Method: Embedded M/C question on Final Exam in which a product is shown and the student is asked to CIRCLE ALL reactions or reaction sequences that would produce that product in high yield. If the question is worth 5 points, then the correct circled response is worth 5 points with 1 point deduction for any incorrect answers. **Assessment Method Type:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Exam - Course Test/Quiz **Target for Success:** 80%		
Department - Chemistry (CHEM) - CHEM 11B - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - Equilibrium and Reactivity - 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 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) Assign equal credit to each successive ranking comparison. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% overall score		
	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 for Success:** 80%		
Department - Chemistry (CHEM) - CHEM 11B - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - Organic Molecule Structure_1 - Identify structural features of an organic compound that influence its reactivity (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 07/10/2016 **End Date:** 07/10/2017 **Course-Level SLO Status:** Active	**Assessment Method:** On the Final exam, circle the reaction that is faster (based on the stability of the carbocationic intermediate). (2-3 points) Explain why (4-5 points) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 75% of points accrued (eg 3/3 points for correct answer and another 3/5 points for explanation)		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 11C - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - 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 in which a product is shown and the student is asked to CIRCLE ALL reactions or reaction sequences that would produce that product in high yield. If the question is worth 5 points, then the correct circled response is worth 5 points with 1 point deduction for any incorrect answers. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80%		
	Assessment Method: Embedded series of open-ended questions on final exam: A series of complex organic reactions where students must predict the product, taking into account stereochemistry and other considerations. Each question is worth 5 points with 3 points for answers with incorrect stereochemistry and 2 points for answers with incorrect regiochemistry **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70%		
Department - Chemistry (CHEM) - CHEM 11C - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - Equilibrium and Reactivity - 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:**	**Assessment Method:** Embedded ranking question on final exam: For a series of five organic compounds, match pKa's to the compound. Each correct assignment is equally weighted. Partial credit (up to 1/2 of points) may be awarded for pKa's that are close but incorrectly assigned) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 50% of student perfectly rank all 5 compounds		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Active			
Department - Chemistry (CHEM) - CHEM 11C - ORGANIC CHEMISTRY FOR LIFE SCIENCE MAJORS - Organic Molecule Structure_1 - Identify structural features of an organic compound that influence its reactivity (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 07/10/2016 **End Date:** 07/10/2017 **Course-Level SLO Status:** Active	**Assessment Method:** On the Final exam, circle the reaction that is faster (based on the stability of the carbocationic, anionic or radical intermediate). (2-3 points) Explain why (4-5 points) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 6/8 points = 75% success		
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 for Success:** 78% average class score		
	Assessment Method: Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Over 70% of the class can correctly rank at least four out of the five intermediates correctly.		
	Assessment Method: Assign the relative stability of successive pairs of cyclic organic compounds **Target for Success:** 80% (4/5) answers correct on average	09/18/2015 - Class average on Final Exam for this question (26 responses) was 76%. The most missed was comparison of cis and trans 1,2-dimethylcyclohexane, which requires an extra layer of analysis (some students correctly drew the	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		diaxial form of trans isomer but didn't recognize that it exists primarily in diequatorial form.) **Result:** Target Not Met **Year This Assessment Occurred:** 2014-2015 **Resource Request:** none **Resource Request:** none **GE/IL-SLO Reflection:** This assessment relates to the institutional learning outcome of creative, critical and analytic reasoning **GE/IL-SLO Reflection:** This assessment relates to the institutional learning outcome of creative, critical and analytic reasoning	
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 for Success:** 50% of student perfectly rank all 5 compounds **Related Documents:** Fall 2011 - Chem 12A SLO 01		
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:**	**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		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
09/24/2012 **Course-Level SLO Status:** Active	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 for Success:** 70% overall average (24.5 points out of 35 points). **Related Documents:** Fall 2011 - Chem 12A SLO 02		
	Assessment Method: Embedded M/C question on Final Exam **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 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) Assign equal credit to each successive ranking comparison. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% overall score		
Department - Chemistry (CHEM) - CHEM 12A - ORGANIC CHEMISTRY - Organic Molecule Structure_1 - Identify structural features of an organic compound that influence its reactivity (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 07/10/2016	**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 for Success:** 78% average class score		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
End Date: 07/10/2017 **Course-Level SLO Status:** Active	**Assessment Method:** Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Over 70% of the class can correctly rank at least four out of the five intermediates correctly.		
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Stereochemical Reaction - Determine the stereochemical outcome of a chemical reaction based on its mechanism. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Multiple Choice question embedded on Final exam 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 for Success:** 80% of students correctly identify stereochemical outcome of reaction		
	Assessment Method: Imbedded multiple choice question on the final exam asking students to determine if an alkene results in a racemic mixture after being subjected to 5 different reagents. Question; Which of the following reactions would result in a racemic mixture when combined with (E)-3-methylpent-2-ene? (Circle ALL that apply). a. catalytic hydrogenation (H2/Pd catalyst) b. epoxidation followed by acid hydrolysis (i. mCPBA; ii. H+, H2O) c. hydroboration (i. BH3, ii. 3 NaOH, 3 H2O2) d. ozonolysis (i. O3, ii. Zn, AcOH)		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	e. dihydroxylation (i. OsO4, ii. NaHSO3, H2O) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 80% of the class scores either a perfect or chooses 4 out of 5 reactions correctly.		
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 for Success:** Class average of 77% of question points awarded		
	Assessment Method: Embedded final exam question; open-ended where the student must provide a detailed, stepwise mechanism to account for the synthesis of BPA from acetone and two equivalents of phenol. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Due to the extreme difficulty of this question, the target for success will be if a student earns at least 50% of the available points (20 points).		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 for Success:** 80% of students correctly answer question		
Department - Chemistry (CHEM) - CHEM 12B - ORGANIC CHEMISTRY - Organic Molecule Structure - Identify structural features of an organic compound that influence its reactivity (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 07/10/2016 **End Date:** 07/10/2017 **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 for Success:** 78% average class score		
	Assessment Method: Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Over 70% of the class can correctly rank at least four out of the five intermediates correctly.		
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:**	**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 for Success:** 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		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Active	synthesis. **Related Documents:** Chemistry 12C - Synthesis 01		
	Assessment Method: Students are given a series of reactants and products and asked to propose a reaction sequence that will result in the transformation shown in high yield. Four such questions were grouped together on S14 final exam for a total of 40 points. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Partial credit is highly subjective and difficult to award given the limited number of strategies available for these particular syntheses. An average of 75% suggests that the class demonstrates a satisfactory proficiency in solving these challenging problems. **Related Documents:** synthesis problems	09/18/2015 - Two synthesis questions grouped together for a total of 24 points on S15 Final; 32 responses gave a class average of 18/24 = 75%. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Resource Request:** none **Resource Request:** none **GE/IL-SLO Reflection:** This assessment relates to the Institutional Learning Outcome of Creative, Critical and Analytic Thinking. This assessment requires a high order of analytic reasoning by requiring application of knowledge to a novel problem. Success provides evidence that this goal is being reached by graduating students. **GE/IL-SLO Reflection:** This assessment relates to the Institutional Learning Outcome of Creative, Critical and Analytic Thinking. This assessment requires a high order of analytic reasoning by requiring application of knowledge to a novel problem. Success provides evidence that this goal is being reached by graduating students.	
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:**	**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		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
04/04/2011 **End Date:** 06/24/2011 **Course-Level SLO Status:** Active	**Target for Success:** 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		
Department - Chemistry (CHEM) - CHEM 12C - ORGANIC CHEMISTRY - Organic Molecule Structure - Identify structural features of an organic compound that influence its reactivity (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 07/10/2016 **End Date:** 07/10/2017 **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 for Success:** 78% average class score **Assessment Method:** Rank the stability of five different cationic intermediates. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Over 70% of the class can correctly rank at least four out of the five intermediates correctly.		
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:**	**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:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
06/30/2014 **Course-Level SLO Status:** Active	Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Two MasteringChemistry online HW questions were used to assess students' ability to interpret data. Question #1 had students reason about a set of experimental data to determine whether a physical or chemical change had taken place. Question #2 had students analyze a set of density data and reason about precision and accuracy of the datasets. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted with a participation rate of 90%.		
	Assessment Method: MasteringChemistry online HW questions were used to assess students' ability to interpret data. Question #1 had students analyze a set of density data and reason about precision and accuracy of the datasets. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted.		
	Assessment Method: Data was collected from student work on a series of questions presented in the third in-class Chem 1A midterm during the Winter 2015 quarter. First, students were asked to reason with a diagram of an atomic spectrum of the Hydrogen atom and identify the spectral lines. This required students to understand the visual representation and reason with the graph and given numbers. In a following question, students were asked	09/25/2015 - Fifty-one students completed this page of this exam, and the average result was a 59.2% **Result:** Target Not Met **Year This Assessment Occurred:** 2014-2015 **Related Documents:** SLO1_Exam question.pdf	09/25/2015 - Students struggled greatly with the concept of atomic spectra and energy levels (this has been seen in past quarters as well). Students also struggle with the concept of absorption spectroscopy. More time should perhaps be devoted to these two subjects because they are integral techniques to understand in the field

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	to look at a set of ionization energy data to determine the electronic structure of an unknown atom. Lastly, students were asked to analyze data from an absorption spectroscopy experiment to identify the mass percent of copper in an unknown compound. All of these questions directly pushed students to reason with data and graphs in ways that linked their chemical understanding to experimental observations. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Since this was an in-class exam, a target rate of 70% was expected.		of analytical chemistry. More time and practice should be given to students to allow them to greater understand these concepts.
Department - Chemistry (CHEM) - CHEM 1A - GENERAL CHEMISTRY - Applying Scientific Method - A student who 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:** 06/30/2014 **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 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 for Success:** Average score of 80% with 90% participation.		
	Assessment Method: In one of the laboratory experiments in Chemistry 1A, the density of 7up and Diet 7up was investigated. Students were asked at the beginning of class to write down their hypothesis as to which had the greater density. During the end of the data analysis period on day 2, a class discussion was held		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	to interpret results. Students were subsequently asked to write down on the report sheet how their resulting data matched with their initial hypothesis. **Assessment Method Type:** Discussion/Participation **Target for Success:** The quality of discussion was assessed to gauge student understanding. The written lab work was assessed to see if students successfully evaluated their hypothesis. A success rate of 90% was targeted for the written lab work.		
	Assessment Method: A question from the MasteringChemistry online HW assignment was used to assess understanding of the scientific method. In the question, a scenario is presented and students are asked to apply the scientific method to arrive at some conclusions about the task. (see notes for scenario). **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted.		
	Assessment Method: In planning for this assessment, four questions from an online pre-laboratory assignment were planned to be used to judge understanding of concepts related to the scientific method. The program used was Connect (http://connect.mheducation.com/). However, in practice, three of the questions had severe bugs (or faulty wording) in the online platform and accurate data was not able to be collected. Only data from one question was used in this current year's **Assessment Method Type:** Exam - Course Test/Quiz	09/25/2015 - Fifty-six student completed the online pre-lab assignment. Out of this group, the average score on this question was a 93.04%. Students overwhelming were able to answer this question correctly. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Related Documents:** SLO2_PreLab question.pdf	09/25/2015 - For next year, the bugs in the remaining three questions need to be worked out, so all 4 questions on the Scientific Method can be used to assess student understanding of the concept for this SLO.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Target for Success: An 85% success rate was set since student had access to their resources and materials.		
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:** 06/30/2014 **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 for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Scores on written questions administered during in-class midterm and final exams were used to assess students' critical thinking skills. Questions were chosen that pushed students' analytical reasoning skills. Question #1 was from the second midterm and asked students to reason and calculate all species present in a final solution. This was a complex problem and involved reasoning skills in a limiting reagent problem. Students had to analyze each of four species, and keep track of quantity reacted and state of matter, performing concentration calculations. Question #2 was from the final exam and students applied their knowledge of thermochemistry to an applied context of a scientist designing a new product, a cold pack. Students had to		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	reason with the experimental design limited by the supplied parameters. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** All students participated in the in-class exams. An average score of 80% was targeted for each item.		
	Assessment Method: Scores on written questions administered during in-class midterm and final exams were used to assess students' critical thinking skills. Questions were chosen that pushed students' analytical reasoning skills. Question #1 was from the second midterm and asked students to reason and calculate all species present in a final solution. This was a complex problem and involved reasoning skills in a limiting reagent problem. Students had to analyze each of four species, and keep track of quantity reacted and state of matter, performing concentration calculations. Question #2 was from the final exam and students applied their knowledge of thermochemistry to an applied context of a scientist designing a new product, a cold pack. Students had to reason with the experimental design limited by the supplied parameters.(See attached for exact questions asked) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted. **Related Documents:** Q3_critical_thinking.pdf Qfinal_critical.pdf		
	Assessment Method: Data was collected for 2 online homework	09/21/2015 - Data was collected from students over 4 different sections of the course. Data was	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	(Mc-Graw Hill Connect system - http://connect.mheducation.com) questions related to quantitative thinking skills across three different sections of Chem 1A in the Winter 2015 quarter. Chapter 4, #3 required students to calculate a final concentration upon mixing two solutions, NaCl and Na2SO4. This question involved more reasoning than a simple dilution calculation. Chapter 4, #8 also asked students to reason with the chemical equation and stoichiometry to determine how much of a compound must be used to neutraliza a spill. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Since this was an online HW setting and students could use the textbook and class resources, a target success rate of 85% was expected.	pooled from two different instructors. Out of the student group, a few students scored a zero on the question. This may be due to an inactive account (students stopped attending the class) or the student may not have even attempted the question at all. When these students were removed from the group, the following results were found Chapter #4, #3 – Out of 89 students (out of 111) who attempted the problem, the average score was 96.1% Chapter #4, #8 – Out of the 92 (out of 111) students who attempted the problem, the average score was 94.3% **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Related Documents:** SLO3_Online HW questions - text.pdf	09/21/2015 - These numbers may be artificially high, because I am only including nonzero answers in the pool. It is possible that some students attempted the question but scored a zero. It is not possible to tease out this information in the online data-reporting tool - so it may be useful to think about collecting this data in a slightly different way, perhaps by using an online quiz.
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:** 06/30/2014 **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 for Success:** Average score of 80% with 90% participation.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Assessment Method: Scores on written questions administered during in-class midterm and final exams were used to assess students' quantitative and critical thinking skills. These questions were complex and highly mathematical, integrating varied concepts from the course. Question #1 was from the third midterm and dealt with the Bohr model of the Hydrogen atom, electron energy levels, and ionization energy, all parts consisted of varied quantitative calculations. Question #2 was from the final exam and consisted of determining an empirical formula from given combustion data. This involved many conversions and multi-part calculations. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** All students participated in the in-class exams. An average score of 80% was targeted for each item.		
	Assessment Method: A short pop quiz was given in class to test student understanding of conversion factors and dimensional analysis. See attached file for questions asked. The quiz was scored out of a total of 5 points. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** A average score of 80% was targeted with a participation rate of 90%. **Related Documents:** Quiz_011614.pdf		
	Assessment Method: Data was collected for 2 online homework (Mc-Graw Hill Connect system - http://connect.mheducation.com) questions related to quantitative thinking skills across	09/21/2015 - Data was collected from students over 4 different sections of the course. Data was pooled from three different instructors. Out of the student group, a few students scored a zero on the question. This may be due to an inactive	09/21/2015 - These numbers may be artificially high, because I am only including nonzero answers in the pool. It is possible that some students

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	three different sections of Chem 1A in the Winter 2015 quarter (N = 112). The first question (Chapter 1, #11) dealt with a complicated dimensional analysis problem (see attached) and the second question (Chapter 3, #11) dealt with the mass of an excess reactant remaining in a chemical stoichiometry problem. Both questions required higher orders of thinking and pushed students to think critically about concepts involved. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Since this was an online HW setting and students could use the textbook and class resources, a target success rate of 85% was expected.	account (students stopped attending the class) or the student may not have even attempted the question at all. When these students were removed from the group, the following results were found Chapter #1, #11 – Out of 80 students (out of 112) who attempted the problem, the average score was 95.4% Chapter #3, #11 – Out of the 83 (out of 105) students who attempted the problem, the average score was 93.1% **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Related Documents:** SLO4_Online HW questions - text.pdf	attempted the question but scored a zero. It is not possible to tease out this information in the online data reporting tool. Even with this caveat, it seems as if students are being very successful across sections on these types of questions. For future data collection, it may be useful to think about collecting data in a different way (perhaps an online quiz) to get a better picture of student understanding
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:** Quiz given in laboratory based on experiments where graphing interpretation was stressed and required. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 65% or better average on quiz/exam questions.	12/08/2015 - The students did very well analyzing and interpreting a graph of gas density versus pressure. The average and median grade were both 80%. We continually stress the interpretation of graphs throughout chemistry. By the time the students reach 1B, they seem to be very comfortable with graphical analysis. Note: 17% of the students that did not meet the 65% score. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
	Assessment Method: All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Assessment Method: Online homework through Mastering General Chemistry, by Pearson. **Assessment Method Type:** Departmental Questions **Target for Success:** Succes would be B-, 78% percentage score. This reflects the ability of an average 1B student.		
	Assessment Method: All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
Department - Chemistry (CHEM) - CHEM 1B - GENERAL CHEMISTRY - Quantitative 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	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		
Course-Level SLO Status: Active	**Assessment Method:** Online homework through Mastering General Chemistry, by Pearson. **Assessment Method Type:** Departmental Questions **Target for Success:** Succes would be B-, 78% percentage score. This reflects the ability of an average 1B student.		
	Assessment Method: All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Target for Success: Average score of 80% with 90% participation.		
	Assessment Method: Laboratory Quiz stressing mathematical analysis of data and problem solving. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Passing score with 65% or better.	12/08/2015 - The average score was 73% with a median of 75%. These questions primarily were on kinetics, heavy on the quantitative reasoning and mathematical skills. The students did about as expected, the low average is common for kinetics problems. Note: 29% of the students did not meet the target. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
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 for Success:** Average score of 80% with 90% participation.		
	Assessment Method: Online homework through Mastering General Chemistry, by Pearson. **Assessment Method Type:** Departmental Questions **Target for Success:** Succes would be B-, 78% percentage score. This reflects the ability of an average 1B student.		
	Assessment Method: All questions were assessed online through Mastering General Chemistry in Quiz format. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Average score of 80% with 90% participation.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Assessment Method: Laboratory Quiz on Data Analysis **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** Passing grade of 65%.	12/08/2015 - The average and median were both 75%. However, 22% of the students did not meet the target. This is typical, about 20% of students are not successful in chemistry 1B and is reflected consistently in the grades on quizzes and exams. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
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 for Success:** An average of 75% for the class.		
	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 for Success:** This is a difficult problem. A 70% success rate would be terrific!		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Solubility of Salts - Critical Thinking - A successful student will demonstrate the ability to make connections	**Assessment Method:** Online course homework. **Assessment Method Type:** Departmental Questions		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
between concepts across several areas of General Chemistry as applied to salt solutions. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Target for Success:** An average of 75% for the class. **Assessment Method:** Chemistry 1C Final Exam - Multiple Choice 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 for Success:** An average of 70% correct for the class.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Nuclear Chemistry - A successful student will demonstrate an understanding of the impact of science on society in the area of nuclear chemsitry. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** Online homework. **Assessment Method Type:** Departmental Questions **Target for Success:** An average of 75% for the class.		
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:**	**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:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Active	Exam - Course Test/Quiz **Target for Success:** 75% correct would be considered acceptable given the difficulty of the problem.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Laboratory Techniques - Students will demonstrate an understanding of how to execute common laboratory techniques. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Quarter **Course-Level SLO Status:** Active	**Assessment Method:** Students were asked the following question on an open lab notebook lab exam: You need to prepare 100 ±1 mL of a buffer that is 0.15 M acetic acid and 0.40 M sodium acetate. The reagents that you have available are 1.00-M HCl, and solid sodium acetate trihydrate. Write step by step instructions on how to prepare the buffer using appropriate lab equipment. (Note that students calculated the reagent amounts in a previous part of the question. Incorrectly calculated amounts of reagents did not impact grading of this part of the question.) **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** This question was assessed out of 4 points. Individual students were considered successful if they earned at least 3 out of the 4 points, or 75%. Target for success was 80% of the class earning a minimum of 3 out of the 4 points possible.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Identification of ions in solution- Scientific inquiry and lab techniques - Successful students will illustrate separation and identification schemes using flow diagrams and apply principles of aqueous solubility equilibria to separate and identify the ions in a solution. (Created By Department - Chemistry (CHEM))	**Assessment Method:** One of the most demanding requirements in Foothill's Chemistry 1C laboratory program is the qualitative analysis of a small sample of a solution containing six different unknown cations, an individual project that spans the last four weeks of the course. Student results for correct identification of the ions in their sample solution during spring quarter of 2014 were tabulated and		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Assessment Cycles: End of Quarter **Course-Level SLO Status:** Active	summarized. **Assessment Method Type:** Class/Lab Project **Target for Success:** Students who earn a passing grade in Chemistry 1C should have developed the skills needed to identify at least 5 out of the 6 ions correctly. Target for success is set at 90% of passing students achieving this goal.		
Department - Chemistry (CHEM) - CHEM 1C - GENERAL CHEMISTRY & QUALITATIVE ANALYSIS - Global Learning Outcome-Impact on Society - The successful student will demonstrate an understanding of the impact of science on society. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Course-Level SLO Status:** Active	**Assessment Method:** The students were asked to determine the validity of the following question: In nuclear power plants energy is generated from a critical mass of radioactive fuel, therefore a nuclear explosion is possible. **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** At least 80% of the class should be able to correctly answer this question.	11/03/2015 - Only 60% of the students could correctly answer the question. **Result:** Target Not Met **Year This Assessment Occurred:** 2014-2015 **Resource Request:** None **GE/IL-SLO Reflection:** The concept that nuclear power plants do not use a critical mass of radioactive fuel was discussed in lecture. However, this was not reinforced with related homework questions. Reinforcing the concept with work assigned outside of class is recommended to increase the success rate.	11/03/2015 - Although this concept was discussed during lecture, it was not reinforced with related homework questions. Reinforcing the concept with work/research assigned outside of class is recommended to increase the success rate.
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:**	**Assessment Method:** Data from selected homework or exam questions will be analyzed **Assessment Method Type:** Departmental Questions **Target for Success:** 80% achievement of satisfactory scores.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
09/23/2013 **End Date:** 06/27/2014 **Course-Level SLO Status:** Inactive			
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 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:** Student progress will be assessed using an online adaptive learning homework system or selected exam questions. **Assessment Method Type:** Data **Target for Success:** Overall class scores of 75 to 80% on relevant learning modules.		
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 for Success:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.	10/29/2015 - The exercise that follows was chosen to evaluate SLO #2 and was administered by in Winter and Spring quarters 2015 through the required online homework component of the course. The exercise asks students to categorize several properties of a compound as chemical or physical. This topic is covered in the first two weeks of the course. The students were comfortable with the exercise, with an average score of 74.8% and 76.4% for the W15 and S15 quarters, respectively. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Resource Request:** None	10/29/2015 - No action plan needed 04/29/2011 - Target met; no change recommended

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		GE/IL-SLO Reflection: This is a straightforward topic which is presented very early in the quarter and the majority of students should be able to complete the exercise successfully. The success rate in the mid-to high seventies is acceptable, but may be slightly lower than reality since some students are slower to master the online homework system.	
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 for Success:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.	10/29/2015 - An assessment of the overall success of the students in solving problems requiring quantitative skills was made through the online homework system. Average percent success rates were examined for assignments early and late in the course for triple sections taught during WQ15 and SQ15. Early in the quarter, when math skills and new quantitative concepts are being introduced, the average success rates ranged from 66-88% (WQ15) and 80 - 94% (SQ15) over a series of problems. These early problems focused on unit conversion skills, significant figures and dimension analysis problems. Later in the quarter, the success rates improved, with success rates of 86-95% (WQ15) and 82-97% (SQ15). **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Resource Request:** none **GE/IL-SLO Reflection:** No change recommended. In a homework setting, where multiple attempts (with a small penalty) are permitted, high success rates are expected. The improvement that was noted in the average success rates for quantitative skills based questions is encouraging, although withdrawal of less	10/29/2015 - 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. The online homework system used has recently added an adaptive follow-up component which will be used to supplement SLO assessments in future years.

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		successful students from the course may skew the results slightly. Comparison of online homework scores with in-class test results is generally good. The online homework system used has recently added an adaptive follow-up component which will be used to supplement SLO assessments in future years.	
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 for Success:** Correct response rates from 70 to >90% will be targeted depending on the timing (within the term) and the difficulty of the selected assignment.		
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 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	**Assessment Method:** Performance on relevant homework exercises completed using Mastering Chemistry (online homework site) was assessed for all or selected sections of Chem 25 for the relevant term. Foothill performance was also compared to system data available for students that answered the specific problem from all institutions using the Mastering Chemistry system. **Assessment Method Type:** Departmental Questions **Target for Success:** 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.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 is used in the online homework grading system (Mastering Chemistry) for students enrolled in Chemistry 30A. These homework assignments are used as a pretest in preparation for course exams. Problem #90 from Chapter 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 for Success:** 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.	09/21/2015 - Data from the online homework for Chemistry 30A section 03 from Spring 2015 was used to assess this SLO. 100% of the 35 students enrolled in the course were able to correctly answer this homework problem in the online homework assignment. This shows that the target was met for this SLO. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
Department - Chemistry (CHEM) - CHEM 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 is used in the online homework grading system (Mastering Chemistry) for all students enrolled in Chemistry 30A. These homework assignments are used in preparation for course examinations (pretest). Prelab #2, Classifying Matter: 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		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Target for Success: 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.		
	Assessment Method: The following problem for SLO#1 is used in the online homework grading system (Mastering Chemistry) for all students enrolled in Chemistry 30A. These homework assignments are used in preparation for course examinations (pretest). Prelab #2, Classifying Matter: Classify each of the pure substances as an element or a compound. silicon, gold, gaseous ammonia **Assessment Method Type:** Pre/Post Test **Target for Success:** 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.	09/21/2015 - Data from the online homework for Chemistry 30A section 03 from Spring 2015 was used to assess this SLO. 88.2% of the 34 students enrolled in the course were able to correctly answer this homework problem in the online homework assignment. This shows that the target was met for this SLO. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
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 is used in the online homework grading system (Mastering Chemistry) for students in all sections of Chemistry 30A. Mastering Chemistry homework problems are used in preparation for course examinations (pretesting). Chapter 5, Problem #7: 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	09/21/2015 - Data from the online homework for Chemistry 30A section 03 from Spring 2015 was used to assess this SLO. 100% of the 34 students enrolled in the course were able to correctly answer this homework problem in the online homework assignment. This indicates that students are learning how to write chemical formulas and chemical equations correctly. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	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 for Success:** 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: Chapter 12, Problem #39: 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 for Success:** Average student score 70% or higher.	09/21/2015 - For the 25 students enrolled in Chemistry 30B Section 01 at the start of Spring 2015, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
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-	**Assessment Method:** All students will be assigned the following problem in homework in preparation for course exams. Chapter 25, Problem #22: The backbone of a nucleic acid molecule consists of	09/21/2015 - For the 15 students that remained enrolled in Chemistry 30B Section 01 in the middle of Spring 2015, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:**	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
molecules in the body. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	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. E. alternating nitrogen bases and phosphate groups linked by amide bonds and strengthened by hydrogen bonds. **Assessment Method Type:** Pre/Post Test **Target for Success:** A student average of 70% or higher for this problem.	2014-2015	
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: Chapter 25, Problem #45: 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 for Success:** Average student score of 70% or higher.	09/21/2015 - For the 15 students that remained enrolled in Chemistry 30B Section 01 in the middle of Spring 2015, the average score for this problem was 100%. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015	
Department - Chemistry (CHEM) - CHEM 30B - SURVEY OF ORGANIC & BIOCHEMISTRY - Common Metabolic Processes - Students will understand the chemistry of common metabolic processes.	**Assessment Method:** All students will be assigned the following homework problem in preparation for course exam: Chapter 20, Problem #22:	09/21/2015 - For the 16 students that remained enrolled in Chemistry 30B Section 01 in the middle of Spring 2015, the average score for this problem was 100%. **Result:**	

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
(Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	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 for Success:** 70% or higher student average	Target Met **Year This Assessment Occurred:** 2014-2015	
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 -			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 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			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 - 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			

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
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 - Student Success - Students will master specific problem solving skills needed to succeed in Chemistry 1B and 1C. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 09/20/2013 **End Date:** 10/04/2013 **Course-Level SLO Status:** Active	**Assessment Method:** Students who completed Chemistry 70 during the WInter 2011, Spring 2011, Fall 2011, WInter 2012 and Fall 2012 quarter were asked to complete a survey. One of the questions asked was: Please choose the highest level of Chemistry you have successfully completed. Choices included Chemistry 1A, Chemistry 1B, Chemistry 1C **Assessment Method Type:** Survey **Target for Success:** A target of 75% for 1A and 56% for 1B. This was based upon a success rate of 75% in each course. Chemistry 1C is difficult to set a target for since a portion of students do not need Chemistry beyond 1B.		
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:**		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	Data **Target for Success:** A Chemistry 1A success rate for students enrolled in Chemistry 70 that exceeds the success rate of those not enrolled in Chemistry 70.		
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Problem Solving Skills for Chemistry 1A - The student will demonstrate competency in quantitative problem solving skills related to Chemistry 1A. (Created By Department - Chemistry (CHEM)) **Course-Level SLO Status:** Active	**Assessment Method:** All questions were assessed online through Mastering General Chemistry in Quiz format. Average scores for each question were 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		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
	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 for Success:** A higher average score for those students enrolled in Chemistry 70 compared to the Chemistry 1A students at large.		
Department - Chemistry (CHEM) - CHEM 70 - STUDY SKILLS & PROBLEM SOLVING STRATEGIES FOR CHEM 1A - Student Success_1 - Students will master specific problem solving skills needed to succeed in Chemistry 1B and 1C. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year **Start Date:** 10/09/2014 **End Date:** 10/09/2014 **Course-Level SLO Status:** Active	**Assessment Method:** Students who completed Chemistry 70 during the Fall 2013 quarter were tracked through the Chemistry 1A, 1B, 1C sequence to monitor their success in completion of the sequence. **Assessment Method Type:** Case Study/Analysis **Target for Success:** A target of 75% for 1A and 56% for 1B. This was based upon a success rate of 75% in each course. Chemistry 1C is difficult to set a target for since a portion of students do not need Chemistry beyond 1B.		
Department - Chemistry (CHEM) - CHEM 9 - CHEMISTRY OF COOKING - Molecular Forces - Recognize the different intermolecular and intramolecular forces present in fatty acids, carbohydrates and proteins. (Created By Department - Chemistry (CHEM)) **Assessment Cycles:** End of Academic Year	**Assessment Method:** A question similar to the following will be embedded in an exam: "Based on the structure of the following amino acids, determine which will mostly be found on the outside of a protein in aqueous solution. Of those, which will form the strongest bond with water?" **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70% is a reasonable benchmark for students to successfully identify the correct amino acids with polar side groups.		

Course-Level SLOs	Means of Assessment & Targets for Success / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Department - Chemistry (CHEM) - CHEM 9 - CHEMISTRY OF COOKING - Stoichiometry - Using the concept of the mole and molar ratio, calculate the amount of product formed for a given chemical reaction. (Created By Department - Chemistry (CHEM))	**Assessment Method:** A question similar to the following will be embedded in an exam: "The reaction between 1.0 g of baking soda and 10.0 mL of vinegar will yield how many moles of carbon dioxide?" **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70% is a reasonable benchmark for students to successfully answer this question. Stepwise analysis of students' calculations may give insight into comprehension is the solution is not completely correct.		
Department - Chemistry (CHEM) - CHEM 9 - CHEMISTRY OF COOKING - Calorimetry - Be able to understand the relationship between temperature and heat transfer as well as calculate energy change using heat capacity. (Created By Department - Chemistry (CHEM))	**Assessment Method:** A question similar to the following will be embedded in an exam: "For a 10-quart pot of water, how much energy is required to heat the water to 50 degrees Celsius from room temperature (25 degrees Celsius)?" **Assessment Method Type:** Exam - Course Test/Quiz **Target for Success:** 70% of students calculating the answer correctly is a reasonable benchmark for success. This question involves multiple unit conversions and allows for stepwise analysis of calculations.		

Unit Assessment Report - Four Column

Foothill College

Program (PSME - CHEM) - Chemistry AS

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Program (PSME - CHEM) - Chemistry AS - 1 - Knowledge of current theories and applications in the field of chemistry **SLO Status:** Active	**Assessment Method:** Standardized Achievement and Self-Report Tests: Students will be tested on six core topics in chemistry that correlate to topics used in later assessments (for example, the American Chemistry Society (ACS) General Chemistry Exam, or equivalent, and the ACS Organic Chemistry Chemistry Exam, or equivalent.) **Assessment Method Type:** Exam - Standardized **Target:** Students scoring in the 70 percentile compared to the nation.	09/18/2015 - 32 students took ACS standardized exam in Organic Chemistry(year sequence) Average score was 50.5/70 which is 87th percentile according to published national norms. This exam requires students to draw and interpret chemical structures, to understand how structure relates to reactivity and to understand the connection between molecular rearrangement and both thermodynamics and kinetics. This is an excellent performance relative to National averages (4230 students and 71 colleges reporting) and reflects achievement in this key learning outcome. **Result:** Target Met **Year This Assessment Occurred:** 2014-2015 **Resource Request:** none **Resource Request:** none **Resource Request:** none **Resource Request:** none **GE/IL-SLO Reflection:** This assessment relates to the Institutional learning outcome of Critical, Creative and Analytic thinking. The exam requires a good deal of high level reasoning and so this result reflects high achievement in this category. **GE/IL-SLO Reflection:** This assessment relates to the Institutional learning outcome of Critical, Creative and Analytic thinking. The exam requires a good deal of high level reasoning and so this	09/18/2015 - ACS is working to address potential for cell phone security risks that would compromise this exam. It is of utmost importance to maintain no cell phone policy and to administer test only when the use of cell phones may be easily detected

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
		result reflects high achievement in this category. **GE/IL-SLO Reflection:** This assessment relates to the Institutional learning outcome of Critical, Creative and Analytic thinking. The exam requires a good deal of high level reasoning and so this result reflects high achievement in this category. **GE/IL-SLO Reflection:** This assessment relates to the Institutional learning outcome of Critical, Creative and Analytic thinking. The exam requires a good deal of high level reasoning and so this result reflects high achievement in this category.	
Program (PSME - CHEM) - Chemistry AS - 2 - An enhanced ability to research, assess and evaluate topics of interest. **SLO Status:** Active	**Assessment Method:** Students will be tested on six core topics in chemistry that correlate to topics used in later assessments (specifically Chem 1C or Chem 12A/B/C). Special end-of-quarter projects involving presentations on how current events relate to chemistry theory may also be utilized. **Assessment Method Type:** Exam - Standardized		
Program (PSME - CHEM) - Chemistry AS - 3 - An enhanced ability to communicate effectively, both orally and in writing. **SLO Status:** Active	**Assessment Method:** Evaluation of student's laboratory notebook that will contain safety information, step-by-step procedures and clear presentation of data. Additionally, lab reports will be assessed for clear, concise presentation of experimental findings. Group presentations of lab data may also be utilized. **Assessment Method Type:** Essay/Journal		

PL-SLOs	Means of Assessment & Target / Tasks	Assessment Findings/Reflections	Action Plan & Follow-Up
Program (PSME - CHEM) - Chemistry AS - 4 - Facility in the safe handling of chemicals and the execution of common laboratory techniques **SLO Status:** Active	**Assessment Method:** Laboratory safety quizzes will be administered at the beginning of the quarter; or a checklist of laboratory skills demonstrating successful completion of key experiments will also be recorded. **Assessment Method Type:** Observation/Critique **Target:** 80% success rate in passing both safety quiz and satisfying experiment checklist.		