

## Ohlone College Program Review Report

• **Program Description and Scope:**

1. *Program Review Title:* Chemistry Technology and Preparatory
2. *Academic year:* 2012/2013
3. *Review Type:* Instructional Disciplines
4. *Program/Departments:* Chemistry (19001)
5. *Authority Code:* 44-Dean, Science, Engineering, and Mathematics
6. *External Regulations:* Yes\_\_ No X
7. *Provide a brief narrative that describes the instructional program/discipline.*

The Chemistry Technology and Preparatory Program consists of nine courses: seven in chemical technology, two of them are relatively new courses,; a semester-long "Biochemistry for Health Science and Biotechnology", CHEM 109 and a semester-long "Preparation for General Chemistry" CHEM 102. These courses are designed to prepare allied health students and biotechnology students; they also meet the GE requirement. The Chem Tech courses prepare the students for hands-on training so that the student is prepared to enter the chemical industry as technicians. Only one of these courses is currently being offered, due to limits on equipment, staffing, and demand.

Traditionally students preparing for the allied health majors took a one year sequence called Principles of Chemistry 106A and 106B, one semester of lower division inorganic chemistry and one semester of lower division organic/biochemistry respectively. There is a growing trend among the 2-year and 4-year nursing programs to limit the number of prerequisite units that students are required to complete towards their nursing degree. The 2-year nursing programs only required the first semester, i.e. inorganic chemistry. Hence the majority of our allied health students at Ohlone College only completed Chem 106A but not Chem 106B. This was a great disservice to pre-nursing students. The 106A course was filled with mathematical minutia, such as lengthy limiting reagent calculations and lacked relevance to nursing. Students in CHEM 106A often questioned "why do we have to learn this?" -- this was their reaction to the long laborious calculations -- skills that were important to students pursuing a chemistry major but not to students preparing for nursing.

It is for the reasons mentioned above that, CHEM 109 "Biochemistry for Health Science and Biotechnology" was developed to provide both the allied health students and the biotechnology students appropriate training in chemistry with heavy emphasis on relevant topics in human biology and health. By condensing the needed chemistry into one semester -- i.e. the creation of CHEM 109, this reduces the total units students are required to take in order to qualify for nursing programs. It increases students' level of skill and knowledge in crucial topics related to their future professions.

Thanks to heavy emphasis on practical applications in CHEM 109, the students are now much more interested and motivated -- they appreciate the relevance of what is being taught. For example, students are more interested in the metabolism of beer by the liver than they ever were in the endless inorganic substitution reactions from CHEM 106A. Students come to appreciate how chemistry forms the basis of enzymes, sugars, protein folding, genetics, maintaining balance among components of the blood, and drug discovery. CHEM 109 has expanded the student hands-on lab experience. Upon completion of CHEM 109, students will have confidence mixing and diluting solutions, using spectrometry to determine concentrations of proteins, creating their own calibration curves, titrations, and performing dosage calculations.

Starting in Summer 2007, CHEM 109 replaced CHEM 106A as the prerequisite for BIOL 103A "Anatomy and Physiology" and BIOL 106 "Microbiology". Likewise CHEM 106A was replaced by a new course CHEM 102 "Preparation for General Chemistry" as a prerequisite for General Chemistry. Therefore, CHEM 106A is no longer offered at Ohlone College.

It must be noted that we have articulated CHEM 109 as a replacement for CHEM 106A and B for CSU East Bay and SFSU's nursing programs. There are other private schools and CSU's and UC's that still require the year long CHEM 106A and B and no articulation agreements have been made with these schools to accept CHEM 109 in the curriculum instead.

8. *Describe how the program specifically serves students, faculty and staff.*

The Chem Tech program teaches current skills needed for the chemical industry. The hands-on exercises are designed so that the student is constantly kept in touch with current trends.

For the Allied Health branch, there have been improvements made to the program at Ohlone (see above). CHEM 109 "Biochemistry for Health Science and Biotechnology" provides both the allied health students and the biotechnology students appropriate training in chemistry with heavy emphasis on relevant topics in human biology and health. By condensing the needed chemistry into one semester -- i.e. the creation of CHEM 109, this reduces the total units students are required to take in order to qualify for nursing programs. It increases students' level of skill and knowledge in crucial topics related to their future professions. Thanks to heavy emphasis on practical applications in CHEM 109, the students are much more interested and motivated -- they appreciate the relevance of what is being taught. Students come to appreciate how chemistry forms the basis of enzymes, sugars, protein folding, genetics, maintaining balance among components of the blood, and drug discovery. CHEM 109 has expanded the student hands-on lab experience.

9. *Describe how the program addresses current needs and applies current technologies.*

The CHMT Program is designed to address current needs but only one of the courses is being offered at this time. Ohlone College would need to acquire updated instrumentation, additional technician support and more full-time faculty involvement to offer the full palette of courses. The course being offered currently CHMT 104A "HPLC" is very popular.

CHEM 109 serves as the prerequisite to BIOL 103A "Anatomy and Physiology" or BIOL 106 "Microbiology".

CHEM 109, students will have confidence mixing and diluting solutions, using spectrometry to determine concentrations of proteins, creating their own calibration curves, titrations, and performing dosage calculations.

CHEM 102 serves as the prerequisite for CHEM 101A General Chemistry. It prepares students for majors in chemistry, biology, engineering, and other sciences.

10. *Discuss the impact of the program on the college and/or other programs.*

The Chem Tech branch of our program compliments BIOT (Biotechnology). Only the course CHMT 104A is currently offered. It teaches HPLC skills which greatly enhance the students' training for a position in Biotech.

Both CHEM 102 and CHEM 109 satisfy GE requirements for graduation for Ohlone and/or transferring to UC or CSU. They provide students with better awareness of careers in science, nursing, and biotechnology so that students attain greater self-awareness and direction in their career path. They are in a better position to determine which Ohlone program is best suited to their own goals and abilities.

11. *Discuss the impact of the program on the community and the impact of the community on the program.*

The instructor who currently teaches the Chem Tech course CHMT 104A "HPLC" has extensive industry experience and contacts.

It must be noted that we have articulated CHEM 109 as a replacement for CHEM 106A and B for CSU East Bay and SFSU's nursing programs. There are other private schools and CSU's and UC's that still require the year long CHEM 106A and B and no articulation agreements have been made with these schools to accept CHEM 109 in the curriculum instead.

In addition, starting Fall of 2007, CHEM 109 is offered at several local high schools including Kennedy High School and James Logan High School. This is an initiative of the Science, Engineering, and Technology Division's LAB project "Learning Alliance for Bioscience at Ohlone College. The LAB

program aims at promoting career pathways starting at the middle and high schools. Currently there are over 400 students enrolled in high school courses affiliated with the LAB program at Ohlone College. High school teachers are provided support in terms of teacher training, equipment and books, tutoring programs, etc., through the LAB program at Ohlone College. The program provides a pipeline to attract students from underrepresented minorities into the sciences. One a student has taken a biotech course, he/she may realize the excitement and benefit of this career path. This will lead many of them to gain confidence to attempt higher level courses, and ultimately pursue 4 year degrees.

• **College Mission**

1. *Mission Statement*

The mission of Ohlone College is to serve the community by offering instruction for basic skills, career entry, university transfer, economic development, and personal enrichment for all who can benefit from our instruction in an environment where student learning success is highly valued, supported and continually assessed.

2. *Vision Statement*

Ohlone College will be known throughout California for our inclusiveness, innovation and superior rates of student success.

3. *Core Values, Goals & Objectives:*

**College Core Values**

- We provide life-long learning opportunities for students, college personnel and the community.
- We open access to higher education and actively reach out to under-served populations.
- We promote diversity and inclusiveness.
- We maintain high standards in our constant pursuit of excellence.
- We value trust, respect and integrity.
- We promote team work and open communication.
- We practice innovation and actively encourage risk-taking and entrepreneurship.
- We demonstrate stewardship for our human, financial, physical and environmental resources.

**College Goals/Objectives**

**1. Through innovative programs and services, improve student learning and achievement.**

1. By 2013, have in place an ongoing system for identifying and assessing student learning outcomes at the program and course levels, which includes faculty dialogue and appropriate improvement plans.

**2. Support the economic vitality of the community through educational programs and services that respond to identified employment needs.**

2. Within the context of the CTE Strategic Plan, by 2012, identify needs of local employers and create responses through our existing programs, contract education, and new program development.

3. By 2013 create a curriculum which enhances the availability of programs

that focus on emerging industries including green technologies and those identified by the Alameda County Workforce Investment Board and Department of Labor's high growth, high demand job training initiative.

4. By 2013 provide opportunities across the curriculum for students to acquire key skill sets and concepts that will help them succeed in the workplace.

**4. Use human, fiscal, technological, and physical resources responsibly, effectively, and efficiently to maximize student learning and achievement.**

6. By 2011, create organizational structures and procedures to continually improve efficiency and effectiveness of services to students through technology.

**6. Enhance college-wide interaction with, and acceptance of, diverse peoples, cultures, arts, and perspectives.**

2. By 2015, increase the number of opportunities for study abroad for faculty, staff, and students.

**7. Increase access to higher education of under-served and under-represented demographic groups in the District and local communities.**

2. Annually increase retention and success rates of under-served demographic groups.

*4. Briefly describe how the program supports the college mission, vision selected college values.*

The Ohlone Career Technical program in chemistry, especially Chem Tech courses, provide skills necessary to prepare students in basic skills as well as careers in chemical technology, the health sciences, and biotechnology.

Chem Tech prepares students to work in the chemical and biotech industry and insures student success by following rigorous industry standards.

Chem 109 prepares students for are Nursing, Respiratory Therapy and Dental Hygiene.

*5. Briefly describe how the program supports selected college goals.*

The Chem Tech Program teaches life-long skills and actively seeks participation from a diverse, underserved population. By maintaining high industry standards, teamwork, and activiely encouraging risk-taking and entrepreneurship, we feel that the students are ready for the rigorous demands of the industry environment.

CHEM 109 introduces students to a career track in the health sciences. The students after taking one or more of these courses have the flexibility of choosing several careeer tracks in the health sciences, not limited to nursing alone. Students may then, depending upontheir aptitude and inclination, adapt these courses to any track in the health sciences supported by these courses.

CHEM 109 provides a strong foundation for students from all different backgrounds enabling them to pursue higher education leading to career advancement. In addition, this course facilitates open access to higher education and actively reaches out to underserved populations -- it provides a strong foundation for students from all different backgrounds enabling them to pursue higher education leading to career advancement.

6. *Briefly describe how the program supports selected college objectives.*

In addition to conventional students entering the program, the program also serves a body of students returning for retraining for new career paths.

• **Program SLOs & Assessment**

1. **Program SLO -**

**Demonstrate proficiency in lab protocols related to instrumentation and record keeping.**

a. *Indicate program assessment strategies used.*

i. Skills Assessment

b. *Describe the criteria and standards used to appraise student work.*

Excellent = 90 - 100%

Good = 80 - 89%

Fair = 70 - 79%

Poor = 60 - 69%

Fail = below 60%

c. *Enter assessment results and analyze student success in achieving this program SLO.*

see attached

d. *Describe revisions in curriculum or teaching strategies implemented to promote student success.*

A change was implemented in Fall of 2012 -- now homework is required and graded. This increases the rigor of the class and will hold students more accountable.

e. *Future Action (Improvements)*

Maintain current student learning plan

2. **Program SLO -**

**Apply Federal safety regulations, Industry Best Practices and safety to scenarios which might be encountered in the professional laboratory.**

- a. *Indicate program assessment strategies used.*
- i. Performance Assessment
  - ii. Skills Assessment
- b. *Describe the criteria and standards used to appraise student work.*

Excellent = 90% - 100%

Good = 80% - 89%

Fair = 70 - 79%

Poor = 60 - 69%

Fail = below 60%

- c. *Enter assessment results and analyze student success in achieving this program SLO.*

See attached

- d. *Describe revisions in curriculum or teaching strategies implemented to promote student success.*

A change was implemented in Fall of 2012 -- now homework is required and graded. This increases the rigor of the class and will hold students more accountable.

- e. *Future Action (Improvements)*

Maintain current student learning plan

• **SLO Matrix**

*Key: I-Introduced, P-Practiced with Feedback, M-Demonstrated at the Mastery Level*

Course	SLO-1	SLO-2
CHEM 106A	P	I
CHEM 106B	P	I
CHEM 109	P	P
CHMT 102	I	I
CHMT 103A	P	P
CHMT 103B	I	I
CHMT 104A	P	P
CHMT 104B	P	P
CHMT 104C	P	P
CHMT 104D	P	P

• **SLO Matrix Comments**

• **Course SLO & Assessment**

**CHEM 109 Biochemistry for Health Science and Biotechnology**

1. Perform calculations including unit conversions, density, dosages, concentrations, dilutions, and pH.
2. Use the Periodic Table of Elements to predict physical and chemical properties of elements and compounds.

3. Analyze and apply concepts of biological and/or physical science obtained through the scientific method, such as endothermic (endergonic) and exothermic (exergonic) processes, kinetic and potential energy; polar and nonpolar molecules; soluble and insoluble solutions; osmosis and diffusion; acids, bases, and buffers; DNA replication and transcription, and RNA translation.
4. Demonstrate correct laboratory techniques, including making solutions, performing dilutions, spectrophotometry, chromatography, and filtration; obey safety rules at all times.
5. Identify the following functional groups when they appear in an organic structure: alkene, alkyne, alcohol, ether, aldehyde, ketone, carboxylic acid, ester, amine, amide, and aromatic rings.
6. Identify the structures of carbohydrates, lipids, proteins, enzymes, and nucleic acids and their roles in living cells.
7. Analyze the role of ATP in the energetics of a cell; describe the major catabolic pathways in the production of ATP including calculations of ATP yield.

<b>Indicate planned course assessment strategies</b>
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Department Testing
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<b>Describe the criteria and/or performance standards used to appraise student work.</b>
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> 90% = excellent
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> 80% = good
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> 70% = fair
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> 60% = poor
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< 60% = failing
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<b>Enter assessment results and analyze student success in achieving course SLOs.</b>
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see attachment
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<b>Describe revisions in curriculum or teaching strategies implemented to promote student success.</b>
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see attachment
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<b>Future Action (Improvements)</b>
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Maintain current student learning plan <i>see attachment</i>
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### **CHEM 102 Preparation for General Chemistry**

1. Solve problems using dimensional analysis and applying significant figures rules.
2. Write chemical formulas with proper nomenclature.
3. Write chemical equations, and solve stoichiometric problems.
4. Apply in solving problems the laws governing gases, liquids and solids.
5. Analyse chemical problems mathematically including percentage error and yield and display in graphic form.
6. Recognize the fundamental principles of chemistry, including atomic theory, chemical bonding and molecular structure.

## 7. Perform laboratory experiments in a safe and purposeful manner

<b>Indicate planned course assessment strategies</b>
Department Testing
<b>Describe the criteria and/or performance standards used to appraise student work.</b>
> 90% = excellent > 80% = good > 70% = fair > 60% = poor < 60% = failing
<b>Enter assessment results and analyze student success in achieving course SLOs.</b>
see attached
<b>Describe revisions in curriculum or teaching strategies implemented to promote student success.</b>
see attached
<b>Future Action (Improvements)</b>
Maintain current student learning plan <i>see attached</i>

**CHEM 102 Preparation for General Chemistry**

1. Solve problems using dimensional analysis and applying significant figures rules.
2. Write chemical formulas with proper nomenclature.
3. Write chemical equations, and solve stoichiometric problems.
4. Answer questions and perform calculations involving gases, liquids and solids.
5. Analyze chemical problems mathematically including percentage error and yield and display in graphic form.
6. Apply fundamental principles of chemistry, including atomic theory, chemical bonding and molecular structure, states of matter, nomenclature, thermochemistry, stoichiometry, and Le Chatelier's Principle.
7. Perform laboratory experiments in a safe and purposeful manner

<b>Indicate planned course assessment strategies</b>
Department Testing
<b>Describe the criteria and/or performance standards used to appraise student work.</b>
> 90% = excellent > 80% = good > 70% = fair > 60% = poor < 60% = failing

<b>Enter assessment results and analyze student success in achieving course SLOs.</b>
see attached
<b>Describe revisions in curriculum or teaching strategies implemented to promote student success.</b>
see attached
<b>Future Action (Improvements)</b>
Maintain current student learning plan <i>see attached</i>

● **Student Achievement: A series of measures including course completion, course retention, persistence, program completion, and others.**

1. *List expected student achievement outcomes:*
2. *Analyze changes in data, identify trends, and provide possible contextual explanations for each measure used. (Example measures include: course completion, course retention, persistence, program completion).*

Demand for these career and technical chemistry courses has soared. We have to turn many students away.

3. *Analyze program budget trends and expenditures. Comment on how the program can best use budget resources.*

Modernization of the equipment used in the Chemical Technology program is sorely needed. The computer component has died on the donated HPLC. The donated GC systems have plastic housing. They are so old that they leak hydrogen gas -- this could lead to a fire. We need newer GC systems but also updated facilities with adequate ventilation. Likewise, the IR machine needs to be replaced. Our current machine is so old that we cannot attach it to a modern printer. The old printers are no longer available so it prints extremely slowly (about 10 spectra in 1.5 hours).

4. *Analyze the program's current use of staff, equipment, technology, facilities, and/or other resources. Comment on how the program can best use these resources.*
5. *Describe any additional notable program achievements(optional).*
6. *Additional Program Table Data*
7. *Future Action*

● **Program Analysis**

After assessing student learning outcomes/impacts, student/program achievement, and the status of previous program improvement objectives (PIOs), analyze the data and any identified trends, and summarize you findings. Use these data and trends to prioritize, revise, or develop new PIOs

1. *Describe program achievements and successes.*

The CHMT 102, "Chemical Safety and Hygiene", CHMT 104A "HPLC" and CHEM 109 "Biochemistry for Health Science and Biotechnology" are in heavy demand by students. Courses fill quickly and we often have to turn students away. Students exclaim that the training in these three courses is

immensely valuable.

2. *According to the evidence, what are the areas needing improvement?*

The Chem Tech branch of the program is enormously expensive and the current machines are old and outdated. Therefore it requires a huge financial support which the local chemical industry cannot provide. Therefore, Ohlone College is looking at the possibility of developing a "Green Institute" which would encompass our Chem Tech program along with other technical programs at the college. Under the banner of the "Green Institute" the curriculum of our Chem Tech program would need to be modified so that it adheres to strict compliance with green environmentally conscious practices. It would then be well positioned to receive Federal and State funding as well as funding from local industry.

For Chem 109, general chemistry concepts such as atoms and molecules, bonding, acids and bases and pH need to be covered in greater depth. These concepts are required in BIOL 103A/B, BIOL 106, and BIOL 130. The teaching of these topics must include special emphasis on biological examples and applications.

Study of organic chemistry should be kept at a minimum level and only to the extent required for the understanding of biochemistry in subsequent chapters. Course time must be devoted to concepts pertaining directly to biology, biochemistry, and health.

Biological cycles such as Krebs's cycle and glycolysis should be covered early in CHEM 109. This enables the students to acquire a solid understanding of these vitally important topics, rather than rushing through them at the end, which is the way they are structured in most textbooks. In addition, these biological cycles should be reinforced in BIOL 103A/B and BIOL 130 as these are important topics for the program and need to be addressed multiple times to enable better retention of material.

• **Program Improvement Objectives:**

1. **Objective:**

Develop more streamlined pipeline with local industries for placement of students in jobs; provide students with hands-on technology training consistent with needs of industry with a focus on safety.

a. *Action Plan*

*Year 1:*

Hire additional lab technician so that there is support and safety for evening technology courses.

Assign tenured faculty as an industry liaison to coordinate job placement, internship, curriculum development for all STEM programs.

Equipment needs include

- \* one IR
- \* two GC-MS "Gas Chromatograph-Mass Spectrometer", approx \$75,000 each
- \* Two HPLC "High Performance Liquid Chromatograph", approx \$75,000 each

*Year 2:*

Hire additional lab technician

purchase

- \* one additional GC
- \* one additional HPLC

*Year 3:*

purchase

- \* one additional GC
- \* one additional HPLC

b. *Staffing*

*Year 1:*

Plan for the future hiring of one full-timer instructor to teach Chem Tech and Chem 109

*Year 2:*

We urgently need a full-time faculty who is dedicated to teaching and managing the resources of the Chem Tech program. Currently these courses are being taught by a part-time instructor. A full-time instructor is desperately need because

\* because the full-timer is best able to foster collaboration and involvement of other parts of the Ohlone program, since that full-timer is deeply involved in other courses and branches of chemistry program at Ohlone. There needs to be maximum sharing of equipment, team-teaching among departments, and multi-disciplinary synergy which can only be accomplished by a full-timer.

\* The new "Green Institute" will offer a transfer degree, so a full-timer needs to work closely with transfer institutions to implement course articulations and curriculum development

\* There needs to be a full-timer leading and teaching the Chem 109 "Biochemistry for Health Science and Biotechnology". Currently this

critical class is being taught exclusively by part-time instructors. To strengthen it and improve this course, there needs to be the commitment and involvement that only a full-time instructor can offer.

Also hire an additional lab technician to support evening classes.

c. *Equipment (Include items that fit under department budget codes)*

*Year 1:*

purchase

- \* one IR
- \* one GC
- \* one HPLC
- \* maintenance plans for these machines

*Year 2:*

purchase

- \* one IR
- \* one GC
- \* one HPLC
- \* maintenance plans for these machines

*Year 3:*

purchase

- \* one IR
- \* one GC
- \* one HPLC
- \* maintenance plans for these machines

d. *Facilities (Include items that fit under the Facilities budget codes)*

*Year 1:*

Planning is critical. During the planning the following key points must be central to discussion: The transfer track and the occupational/technical track must be taught together on the same campus. Also all the science courses must be slustered together in one building as this increases collaboration, sharing of equipment, and synergy.

The Science Center must be with big enough rooms to house the instruments and to teach hands-on courses using these instruments.

There needs to be space to accomodate the Green Institute, including reception office, classroom space, and space for instrumentation.

e. *Assessment Plan: List Assessment Strategies*

*Year 1:*

Ongoing tracking of placement of students in jobs, using questionnaires.

*Year 2:*

Ongoing tracking of placement of students in jobs, using questionnaires.

*Year 3:*

Ongoing tracking of placement of students in jobs, using questionnaires.

f. *Which college goal(s) does this program improvement objective work to achieve? Clearly describe how your PIO will help achieve one or more of the college goals and objectives, has impact beyond the particular department, and contributes to student learning/success.*

1. Through innovative programs and services, improve student learning and achievement.

Rationale:

These improvements will prepare students for the upcoming demands to convert industry to green sustainable methods.

2. Support the economic vitality of the community through educational programs and services that respond to identified employment needs.

Rationale:

Training and placement of Ohlone students in technical positions will support the economic vitality of the community.

## **2. PIO Assessment**

a. *Enter assessment results with analysis.*

No progress has been made in development of a streamlined pipeline for placement of students in jobs.

We are understaffed; more faculty would need to be hired. Students are sometimes able to find jobs based on advice for savvy job search strategies provided by faculty.

b. *Describe how PIO achieved one or more of the college goals and objectives, had an impact beyond the particular department, and contributed to student success/learning.*

No success in meeting this goal has been achieved. If the economic situation of silicon valley improves, then there may be impact in the future.

c. *Analyze the impact of reallocation or addition of resources. If money or resource was not used, give rationale.*

No reallocation or addition of resources was received, due to budget shortfall.

d. *Future Action*

● **Outside Review Results**

1. List each team members name and title.

na

2. Discuss key feedback provided by team and how it was incorporated into the report.

na

● **Attached Files**

1. [Chem 102 Data Fall 2011.xls](#)
2. [CHEM 109 Assessment Spring 20121.docx](#)
3. [CHEM 102 Assessment Fall 2011.docx](#)
4. [CHEM 109 Data SPRING 2012.xlsx](#)