

Academic Program  
Plan for Assessment of Student Learning Outcomes  
The University of New Mexico

---

**A. College, Department and Date**

1. College: Arts and Sciences: Main Campus
2. Department: Chemistry and Chemical Biology
3. Date: 1/14/09

**B. Academic Program of Study**

B.S. Chemistry

**C. Contact Person(s) for the Assessment Plan**

Alisha Ray, Lecturer II, [adray@unm.edu](mailto:adray@unm.edu)

**D. Broad Program Goals & Measurable Student Learning Outcomes**

Undergraduate Program Learning Goals and SLOs

Students graduating from this program will:

1. Understand major chemical concepts, theoretical principles and experimental findings in the field of chemistry
  - a. Apply their understanding of atomic theory, molecular structure and bonding, thermodynamics, kinetics, chemical reactions, spectroscopy and synthesis on examinations and laboratory exercises
2. Be able to employ critical thinking and hypothesis-driven methods of scientific inquiry
  - a. Solve problems using multiple layers of data analysis
  - b. Use statistics to evaluate quantitative hypotheses
  - c. Critically evaluate experimental data
  - d. Extract chemical information from available resources
3. Demonstrate the ability to construct and test hypotheses using modern laboratory equipment and appropriate quantitative methods
  - a. Construct and test hypotheses
  - b. Design experiments
  - c. Use instrumentation to collect data
  - d. Process data using a computer and use statistics to evaluate data
  - e. Recognize, generate and analyze alternative explanations and models for experimental data
  - f. Interpret experimental results and draw conclusions
4. Convincingly present scientific data and arguments in an oral and written format
  - a. Organize and represent experimental data using appropriate methods (spreadsheets, etc)

- b. Write coherent scientific reports
  - c. Present scientific ideas and arguments in a professional setting
5. Be prepared for entry into graduate school or professional school (e.g. medical, dental, pharmacy, etc) or the chemical industry or government service.
- a. Apply general knowledge of chemical concepts to solve novel problems
  - b. List and explain some of the opportunities and applications of chemical knowledge to the world
  - c. Have a working knowledge of basic chemical concepts, laboratory skills and safety
  - d. Demonstrate scientific literacy and be familiar with the status of current research in the field of chemistry
  - e. Have general skills to work in small groups to accomplish scientific projects

**E. Assessment of Student Learning Three-Year Plan**

All programs are expected to measure some outcomes annually and to measure all priority program outcomes at least once over two consecutive three-year review cycles. Describe below the plan for the next three years of assessment of program-level student learning outcomes.

**1. Student Learning Outcomes**

Relationship to UNM Student Learning Goals (insert the program SLOs and check all that apply):

<b>University of New Mexico Student Learning Goals</b>				
<b>Program SLOs</b>	<b>Knowledge</b>	<b>Skills</b>	<b>Responsibility</b>	<b>Program SLO is conceptually different from university goals.</b>
1a. Apply their understanding of atomic theory, molecular structure and bonding, thermodynamics, kinetics, chemical reactions, spectroscopy and synthesis on examinations and laboratory exercises.	X	X		
2a. Solve problems using multiple layers of data analysis.	X	X		
3f. Interpret experimental results and draw conclusions	X	X		
5a. Apply general knowledge of chemical concepts to solve novel problems	X	X		

## **2. How will learning outcomes be assessed?**

### **A. What:**

- i. Each SLO will be measured using samples of evidence of learning from courses required by the B.S. program. For the 2008-2009 academic year, samples of evidence of learning will be gathered for program SLO 2a in Dr. Whalen's CHEM 302 course. Dr. Ho will use evidence from CHEM 253 to measure SLO 5a. Each will provide at least one direct measurement using graded material (exams, homework, or quizzes). The same SLOs and samples of learning will be gathered for the following two years unless the feedback obtained for the pilot study suggests major changes. In the 2009-2010 academic year Dr. Ho will test SLO 3f in one of the upper level laboratory courses (CHEM 331L or 411L) required for the B.S. program.
- ii. Each SLO measured in the 2008-2009 academic year will be a direct measure. If no major changes are made to the proposed program assessment plan then all measures over the next three years will be direct.
- iii. The program's assessment target is to have 60% of the students in the B.A. and B.S. program to perform satisfactory or better. Scoring rubrics will be used for some measures, but they are not currently available.

### **B. Who:**

Less than half the students in each undergraduate program will take part in the pilot assessment during the next academic year. Because both B.A. and B.S. programs are undergoing major curriculum changes in the next few years there will be difficulties in efficiently assessing all the students in the program each year. However over the next three years it is expected that 80% of students in the program will be assessed using at least one direct measure. A sample representing more than three quarters of the students in the program will be valid since it reflects the majority of students.

## **3. When will learning outcomes be assessed? When and in what forum will the results of the assessment be discussed?**

Priority SLOs will be measured each fall (2008, 2009 and 2010) semester. The number of priority SLOs measured each year may vary between one and three SLOs. The results of the outcomes measured the previous fall will be discussed each February (2009, 2010 and 2011) by a group of faculty including, but not limited to, Dr. Evans, Dr. Ho, Dr. Whalen, and Ms. Ray. All department faculty will be notified via email and invited to the meeting no less than 3 weeks before the scheduled meeting.

## **4. What is the unit's process to analyze/interpret assessment data and use results to improve student learning?**

1. The faculty collecting evidence during that academic year and the chair of the Assessment Committee will meet each February to analyze and interpret the assessment data. All faculty will be invited to participate in the meeting. For the 2008-2009 academic year each faculty member who collected data will present how they carried out the assessment (the tools/techniques used), how they analyzed the data, and what will be done to improve student learning. Finally, plans will then be made for the following year so that only one or two SLOs are tested using one or more direct measures and the analysis is done by everyone

attending the meeting using a “calibrated” rubric rather than just the faculty member who collected the data.

2. The implications of the assessment will be discussed at a meeting in February each year.
3. Recommendations will be compiled at the February meeting by the assessment committee chair and communicated in writing to the department chair with the signatures of all members of the assessment committee by May 15<sup>th</sup> each year. Copies of the document will be provided and discussed in the annual faculty retreat each August.