Marquette University
Learning Assessment Plan

Chemistry

Program: Chemistry
Degree: B.S. Chemistry, B.S. Chemistry Teaching, B.S. Biochemistry/Molecular Biology (Chemistry Portion)
Date Submitted: 10/14/09

Program Learning Outcomes ***Students will be able to:***	**Performance Indicators**	**Measures**	**Use of Information**
(1) Demonstrate clear understanding of concepts, with ability to solve problems in the major traditional areas of chemistry: Analytical, Inorganic, Organic & Physical. **CORE AREA COURSES:** ***Organic Chemistry:*** 123/23=2213/2111 124/24=2114/2112 ***Inorganic Chemistry:*** 105=5330; 106=3320 Analytical Chemistry: 114=2210; 115=3210 ***Physical Chemistry:*** 132=4433/5433 133=4434/5434 136=3420 ***Biochemistry:*** 125=4530	Core concepts are taught in our core area courses that cover the major branches of chemistry: Analytical (CHEM 114, 115), Inorganic (105, 106), Organic (123, 124), and Physical (132, 133, and 136); and, the American Chemical Society (ACS) requires core competence in Biochemistry (CHEM 125). In each area, ACS also offers a national standardized test, which offers a performance indicator distinct from course grade. We establish correlation of core course grade and ACS score every ≤4 yrs.	***Primary:*** Scores on the ACS test: We currently use the ACS tests in Physical Chemistry and in Organic Chemistry. ***Secondary:*** When ACS test scores are not available, we rely on course grades in courses in each of the core areas – this is based on our previous demonstration of a *correlation between ACS standardized scores and course grade*. ***Additional:*** Visualization of molecules in 3D, and drawing conclusions based on this, is an essential skill. To assess this, and determine if we are teaching for different learning styles, students are given: (a) a quiz to assess stereochemistry visualization and (b) the VARK assessment of learning style.	Identify potential weak areas from the ACS standardized test, and adjust our course content and emphasis in these areas as needed (ex. stereochemistry assignment, for Organic). Regarding learning styles, if we find students with certain learning styles do more poorly in chemical visualization, we will add course content or resources (ex. increased usage of hand-held chemical models) to help those students.

(2) Display proficiency in fundamental Chemistry laboratory skills.	a) Keep legible and complete experimental records b) Perform accurate and quantitative laboratory measurements, with subsequent analysis c) Synthesize and characterize organic and inorganic molecules	Use of rubric for scoring key laboratory skills, assessed by evaluation of laboratory reports, for skills such as: (a) overall quality of report, (b) how students make use of significant figures, (c) yield for a reaction, based on data. Scoring is by the professor, using a rubric. Due to the quantitative nature of this analysis, we typically use labs in Analytical Chemistry for this assessment measure.	As weak lab skill areas are identified, adjust teaching accordingly in those topic areas, and perhaps devise further assessments to better diagnose potential skill deficiencies. For example, are low yields due to poor technique in synthetic procedures, or poor analytical skills in characterizing product, or in faulty interpretation of data.
(3) Responsible handling of scientific data, and proficiency in writing scientific reports, which includes overall quality of writing (clear; logical; scientifically sound), as well as proper / ethical citation of the scientific literature	a) Ability to write a scientific report draft (manuscript, grant proposal, or related document, other than lab report). Should present relevant background to a scientific problem; describe methods; draw conclusions from data. b) Proper use of citation in writing, when summarizing other's work. c) Oral presentation of scientific data/topics.	a) Students in CHEM125 write mock NIH grant proposals, which are scored using a modified NIH rubric by: (i) the course professor, and (ii) an external reviewer. b) Oral presentations are scored in Physical and Analytical Chemistry, using a rubric. c) Reports are submitted to turn-it-in.com (to asses proper citation of literature)	=> If students lack ability in drawing conclusions based on data, we will spend more time teaching that skill. => Poor scores on papers/ presentations will prompt us to provide additional lecture time to building these skills. How and where, will be discussed in faculty meeting. => The expectation is to have no "hits" from turn-it-in analysis. Students will be reminded of procedures for citing/paraphrasing papers.