Course Outcomes Guide (COG)

Directions: Please complete this form to document your progress toward improving student learning. For each item, indicate your progress and your anticipated next steps. Thank you!

Course Title: CHM 104 **Date: May 2014**

Course Team: Veronica Stein, Chris Nelling

Expected Learning Outcomes

1. Apply quantitative thinking processes and reasoning skills to core content of courses.
2. Communicate core course concepts in writing while using appropriate technology.
3. Collect, analyze, and evaluate empirical data to substantiate chemical concepts.
4. Apply course content to environmental issues (e.g., pollution, global warming, and toxicology).
5. Apply quantitative thinking processes and reasoning skills to core content of the second semester of general chemistry.
6. Solve quantitative chemistry problems and demonstrate reasoning clearly and completely. Integrate multiple ideas in the problem solving process. Check results to make sure they are physically reasonable.
7. Relate chemical concepts to real life scenarios.

Assessment (How do or will students demonstrate achievement of each outcome? Please attach a copy of your assessment electronically.)

A Nationalized Final Exam written by the American Chemical Society (ACS) for the second semester of General Chemistry is used as the final exam for CHM 104. MasteringChemistry which is an online homework program is used to assess applying quantitative thinking process and reasoning skills, and solving quantitative chemistry problems and demonstrate reasoning clearly and completely.

Validation (What methods have you used or will you use to validate your assessment?)

We compare our students to the national average of the ACS exam.

Results (What do your assessment data show? If you have not yet assessed student achievement of your learning outcomes, when is assessment planned?)

For the 2002 version of the ACS exam, each year the students improved their scores on the final exam in general. We updated the exam to the latest version offered by the American Chemical Society. The newer version has ten fewer questions and they do not ask questions on the topics of organic chemistry or properties of various elemental groups. This is an improvement, since I have not been able to cover the chapters on elemental groups.

CHM 104			
Semester	n	mean	
06/SP	30	30.8	
06/FA	8	27.6	
07/SP	18	44.5	
07/FA	16	32.3	
08/SP	25	38.92	
08/FA	11	33.18	
09/SP	28	40.04	
09/FA	16	41.3	
10/SP	35	42.8	
10/FA	9	40.3	
11/SP	30	45.2	
11/FA	17	45.8	
National 2002 version	*1321 From 17 colleges*	*39.09*	*out of 80 questions*

CHM 104			
Semester	n	mean	
12/SP	20	41.2	
12/FA	18	36.1	
13/SP	23	42.6	
13/FA	18	33.4	
14/SP	22	41.9	
National 2010 version	*Not provided From ACS*	*36.19*	*out of 70 questions*

Follow-up (How have you used or how will you use the data to improve student learning?)

The ACS is still collecting data on the 2010 version of this exam, so the national mean is currently not available.

In addition to determining the average, we perform an item analysis on the questions. From the item analysis, topic areas which are weak are determined and address in changing lecture material or lab experiments to better cover that concept.

Topics that need to be better address in General Chemistry II based on the ACS exam are

visual representation of a reaction at equilibrium

Arrhenius equation

rate laws based on reaction mechanisms
unit cell diagrams of an ionic compound
freezing point depression
signs on ΔG and ΔG°
Gibb's free energy and kinetics

Budget Justification (What resources are necessary to improve student learning?)

The newest version of the ACS exam for 2nd semester general chemistry was purchased and used for the first time in the Spring 2012 CHM 104 course. We plan to use this version of the ACS exam for the next year.

Course: CHM 104 **SLOA Data** **Faculty Team Veronica Stein**

	SU 2009	FA 2009	SP 2010	SU 2010	FA 2010	SP 2011	SU 2011	FA 2011	SP 2012	SU 2012	FA 2012	SP 2013
# Active students		18	40		13	48		19	22		22	34
%W		11.1%	7.5%		0%	20.8%		0%	4.5%			10%
*% walk-away Fs No final exam/grade = F		0%	5.4%		30.7%	13.2%		0%	0%			11.1%
% Success (A,B,C)		72.2%	72.5%		69.2%	51.1%		88.2%	71.4%		85.0%	69.0%
Mean Common Lab Practical Score												
Common Comprehensive Final Exam Score		41.3	42.8		40.3	45.2		45.8	41.2		36.1	42.6
Mean course grade		2.31	2.24		2.15	1.83		2.82	2.25		2.78	2.19
Gen Ed Assessment Score											5.67/8	8.74/10
Item Analysis **Weakest Content Areas**												

*% Walk-away Fs = Did not take the final exam and received a grade of F.

Content Areas

Course: CHM 104 **SLOA Data** **Faculty Team: V Stein**

	SU 2013	FA 2013	SP 2014	SU 2014	FA 2014	SP 2015	SU 2015	FA 2015	SP 2016	SU 2016	FA 2016	SP 2017
# Active students			27									
%W			12.9									
*% walk-away Fs No final exam/grade = F			18.5									
% Success (A,B,C)			74.1									
Mean Common Lab Practical Score												
Common Comprehensive Final Exam Score		33.4	41.9									
Mean course grade			2.11									
Gen Ed Assessment Score		8.71/10	8.91/10									
Item Analysis **Weakest Content Areas**		*										

*% Walk-away Fs = Did not take the final exam and received a grade of F.

Content Areas

- Fall 2013: Determining equilibrium constant of a weak acid, ionization of a polyprotic acid, galvanic cell diagram, electrolysis reaction, visual representation of a reaction at equilibrium, Arrhenius equation, rate laws based on reaction mechanisms, unit

cell diagrams of an ionic compound, signs on Gibb's free energy, standard Gibb's free energy, and second Law of Thermodynamics

- Spring 2014: Ionization of a polyprotic acid, visual representation of a reaction at equilibrium, Arrhenius equation, rate laws based on reaction mechanisms, unit cell diagrams of an ionic compound, freezing point depression, signs on Gibb's free energy and standard Gibb's free energy.