Example of Annual Assessment Form

SJSU Annual Program Assessment Form
Academic Year 2013-2014

Department: Chemistry
Programs: BS Chemistry
BS Chemistry concentration Biochemistry
BA Chemistry
College: Science
Website: http://www.sjsu.edu/chemistry/
X Check here if your website addresses the University Learning Goals.
(See http://www.sjsu.edu/chemistry/Academic_Programs/index.html, in particular)
Program Accreditation: American Chemical Society (BS Chemistry degree only)
Contact Person and Email: Chair Gilles Muller (Gilles.Muller@sjsu.edu)
Professor Karen A. Singmaster (Karen.Singmaster@sjsu.edu)
Date of Report: May 16, 2014

Part A

1. List of Program Learning Outcomes (PLOs)

PLOs Approved by the Chemistry Department on 11/19/13

PLO #1 - Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in inorganic chemistry.

PLO #2 - Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in organic chemistry.

PLO #3 - Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in analytical chemistry.

PLO #4 - Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in physical chemistry.

PLO #5 - Demonstrate understanding of core concepts, methods and limits of scientific investigation to effectively solve problems in biochemistry.

PLO #6 - Answer questions regarding safe practices in the laboratory and chemical safety.

PLO #7 - Demonstrate safe laboratory skills (including proper handling of materials and chemical waste) for particular laboratory experiments.

PLO #8 - Effectively present a scientific paper that applies the scientific approach to address a chemical problem in a poster session, as at an American Chemical Society symposium.

PLO #9 - Effectively present a scientific paper orally applying the scientific approach, as at an American Chemical Society symposium.

PLO #10 - Write a formal scientific laboratory report which applies the scientific approach to address a chemical problem and follows the format and style of an article in a peer-reviewed American Chemical Society journal.

Comments

1. Note that PLOs 1 through 5 are similar. They address different general areas of chemistry. Originally these were combined into one PLO but the College of Science Assessment Director, Dr. Julie Sliva, indicated that it was best if these were broken into individual PLOs.
2. Requirement for BA and BS degrees are similar except that the BA requires a minor and the BS Chemistry requires more advanced math and physics course work to support PLO 4.

Table 1 – Department of Chemistry PLOs Mapped to Courses, ULGs and Schedule

PLOs	Intro	Advanced	ULG	Faculty	Direct Measures	F12	S13	F13	S14	F14	S15	F15	S16	F16	S17
1	1A/B	145,146	1.1,2.2, 3.1,3.2, 4.1,4.2, 4.3	Cheruzel, Muller, Silber, Singmaster	Chem 1B - ACS standardized test,			C	C						
2	1A/B	112A/B, 113A/B, 114	1.1,3.1, 3.2,4.1, 4.2,4.3	Okuda, Straus, Brook	Chem 112B - ACS standardized test					C	C				
3	1A/B 101	55, 101, 155	1.1,3.1, 3.2,4.1, 4.2,4.3	Pesek, Terrill										C	C
4	1A/B 101	160 161A/B 162L	1.1,3.1, 3.2,4.1, 4.2,4.3	van Wyngarden, Stone, Singmaster	Chem 1B - ACS standardized test; Chem 161B - ACS standardized test	C	ER								
5	1A/B	130 A/B/C 131A/B	1.1,3.1, 3.2,4.1, 4.2,4.3	D'Alarcao, Eggers, Rascon								C	C		
6	1A/B	120S 121S 162L 146, 155	1.1, 4.2	All lab coordinators and instructors	Performance on lab safety quiz	C	ER								
7	1A/B	55, 155, 113A/B, 114, 131A/B, 146, 162L, 180	4.1 4.2	All lab coordinators and instructors	Monitor accident reports									C	C
8	100W	180 162L	1.1,2.1, 3.1,3.2, 4.1,4.2, 4.3	100W instructor, van Wyngarden, Terrill, Stone	Poster presentations evaluated with an appropriate rubric			C	C						
9	100W	131B, 146, 162L, 180	1.1,2.1, 3.1,3.2, 4.1,4.2, 4.3	100W instructor, van Wyngarden, Terrill, 131B and 146 instructors	Oral reports evaluated with an appropriate rubric					C	C				
10	100W	131B, 146, 162L, 180	1.1,2.1, 3.1,3.2, 4.1,4.2, 4.3	100W instructor, van Wyngarden, Terrill, 131B and 146 instructors	Written reports evaluated with an appropriate rubric							C	C		
						C-Collection, E-Evaluated; R-Report submitted to CoS									

2. Map of PLOs to University Learning Goals (ULGs)

See Table 1 above. Note the numbering of ULGs is included below as reference because SJSU did not number the ULGs.

1. Specialized Knowledge
   1.1 Depth of knowledge required for a degree, as identified by its program learning outcomes.
2. Broad Integrative Knowledge
   2.1 Mastery in each step of an investigative, creative or practical project (e.g. brainstorming, planning, formulating hypotheses or complex questions, designing, creating, completing, and communicating).

2.2 An understanding of the implications of results or findings from a particular work in a societal context (e.g. social or economic implications of a scientific finding).
2.3 Students graduating with a baccalaureate degree will have demonstrated an understanding of critical components of broad academic areas, the arts, humanities, social sciences, and sciences and their integration.

3. Intellectual Skills
   3.1 Fluency in the use of specific theories, tools, technology and graphical representation.
   3.2 Skills and abilities necessary for life-long learning: critical and creative thinking, effective communication, conscientious information gathering and processing, mastery of quantitative methodologies, and the ability to engage effectively in collaborative activities.
4. Applied Knowledge
   4.1 The ability to integrate theory, practice, and problem-solving to address practical issues.
   4.2 The ability to apply their knowledge and skills to new settings or in addressing complex problems.
   4.3 The ability to work productively as individuals and in groups
5. Social and Global Responsibilities
   5.1 The ability to act intentionally and ethically to address a global or local problem in an informed manner with a multicultural and historical perspective and a clear understanding of societal and civic responsibilities.
   5.2 Diverse and global perspectives through engagement with the multidimensional SJSU community.

3. Alignment – Matrix of PLOs to Courses

See Table 1 on page 2.

4. Planning – Assessment Schedule

See Table 1 on page 2

5. Student Experience

http://www.sjsu.edu/chemistry/Academic_Programs/index.html - The Chemistry Department's website addresses the relationship between ULGs, PLOs and SLOs in hopes of explaining to students how to utilize this information since it is not clear at this time that SJSU students understand any of this process. The student can select one of the words and find the complete list of ULGs from the university website, PLOs in the Chemistry website and SLOs in the Chemistry website.

Greensheets also list PLOs that are covered by the course (http://www.sjsu.edu/chemistry/Academic_Programs/Greensheets/index.html) or have a url that directs the student to the list in the Chemistry website.

We note that student feedback was not considered in the development of PLOs because we are relatively new at doing this and did not know that student feedback was required, particularly since we are not clear how students are supposed to know what is required for a degree in chemistry. It is noted that consistently students who have graduated from Chemistry have reported back that their preparation for graduate programs in chemistry, and in particular, their preparation for graduate chemistry research was excellent. As such we take that as feedback to continue to provide meaningful chemical research opportunities to our students.

Part B

The documentation requested for Part B was data for Fall 2013 to serve as a baseline for future reports. The Chemistry Department elected to include data for additional semesters because:

a) The Fall 2013 semester has been one of budget cuts with increased admission of students, admission that was skewed towards STEM, and a requirement to increase FTES to 105%, all determined by the upper administration, not the individual departments. As such data for Fall

2013 is not the typical average for the Department of Chemistry. Skewed one semester data is expected to lead to poor analysis.

b) Historical data is needed to detect possible patterns since the typical time to degree for an incoming freshman in STEM is well over four years and over three years for a transfer student.

c) It is also important to note that an understanding of how some of the data is calculated by the SJSU Institutional Effectiveness and Analytics Office is also important to interpret possible patterns, so some comments will be included in each section, as needed, to clarify.

6. Graduation Rates for Total, Non URM and URM students (per program and degree)

Table 2 – Graduation Rates for Total, Non URM and URM Undergraduate Chemistry Students

	First time freshman			Transfer		
Cohort	#	6 year	8 year	#	3 year	5 year
F 2004	39	48.7	69.2	16	12.5	62.5
F 2005	50	48.0	62.0	15	20.0	53.5
F 2006	40	50.0	NA	28	21.4	50.0
F 2007	62	**40.3**	NA	29	31.0	48.3
F 2008	44	NA	NA	18	22.2	61.6
F 2009	38	NA	NA	20	40.0	NA
F 2010	62	NA	NA	24	**16.7**	NA
Average	Chem	46.7	65.6		23.4	55.2
	SJSU	47.0	55.7		47.8	66.2
	Non URM First time freshman			Non URM Transfer		
Cohort	#	6 year	8 year	#	3 year	5 year
F 2004	31	54.8	77.4	11	9.1	63.6
F 2005	42	50.0	64.3	11	27.3	63.6
F 2006	26	57.7	NA	21	14.3	42.9
F 2007	45	**44.4**	NA	20	40.0	60.0
F 2008	33	NA	NA	11	9.1	63.6
F 2009	31	NA	NA	9	22.2	NA
F 2010	48	NA	NA	18	**22.2**	NA
Average	Chem	51.7	70.9		20.6	58.7
	SJSU	51.2	60.0		49.0	67.0
	First time URM freshman			URM Transfer		
Cohort	#	6 year	8 year	#	3 year	5 year
F 2004	7	28.6	28.6	3	0.0	66.7
F 2005	6	33.3	50.0	3	0.0	33.3
F 2006	8	37.5	NA	2	0.0	50.0
F 2007	11	**27.3**	NA	2	0.0	0.0
F 2008	7	NA	NA	2	0.0	0.0
F 2009	4	NA	NA	6	66.7	NA
F 2010	11	NA	NA	2	**0.0**	NA
Average	Chem	31.6	39.3		9.5	30.0
	SJSU	37.4	46.3		43.7	63.7

Note the averages for SJSU and Chem listed above are not weighted by the number of students. That would be a bit more time consuming. It is just an average of the values in each column.

Comments – a) This is an example as to why historical data are needed for this report. The report requested only the six bolded numbers on the table. Without any comparison these bolded numbers would be very disappointing in some cases. b) The data on these tables is for students who were admitted when the majors had over 120 units. Now all Chemistry majors are at 120 units so some changes in the time to graduation are expected but it will be a while before these new cohorts graduate. c) Students change majors so the data for the first time freshman can and will reflect students who might have entered SJSU as chemistry majors and changed their majors prior to even taking a chemistry class maybe as a result of not passing a math class or finding some other course work they were passionate about.

Analysis – A few important clarifications are needed to help in understanding the data. It is not surprising that the difference between 6 and 8 year rates for new freshman and between 3 and 5 year rates for transfer students are larger for Chemistry than for SJSU. First it is important to note that chemistry is a difficult major and not a very large major at SJSU. Thus upper division courses tend to be offered just once a year, not every semester. When this is combined with the prerequisite structure it is not uncommon for a chemistry student to have to stay at SJSU for an additional year. If the student happens to not obtain a C or better in an upper division course and needs to repeat, it could also add another year. Students needing remediation in Math or English would also find it difficult to graduate in a timely manner because Chem 1A will not admit remedial students. For transfer students the difference is larger because some transfer with 60+ units but very few to no chemistry classes, so they would still have as many as four years of chemistry course work left. Finally, Chemistry is a laboratory science. Many students get involved in undergraduate research so as to gain more hands on experience and be better prepared for their careers and to be better applicants for graduate and professional school. Undergraduate research can add time to their degree.

The six year graduation rate average for first time freshman for the Chemistry Department and for SJSU are comparable. The 8 year graduation rates are higher for Chemistry, but again recall that this does not imply that the student graduated with chemistry degree or for that matter even in a STEM degree. Significant discrepancies exist however for transfer students. The department has noted that a subset of transfer students come to SJSU with science and math classes not completed and often, if these classes are completed, the grades are poor. Transfers have a minimum GPA requirement for admission to SJSU of 2.0 but their science/math course work GPA is not evaluated. It is very difficult to excel in chemistry if the student's foundation course work in math, physics and chemistry is poor. A student with a poor CC GPA who then transfers to SJSU to complete tough chemistry course work might not survive SJSU at all. If SJSU were to enact some required minimum GPA for math/science course work prior to granting admission to a STEM major, these transfer student graduation rates might better align with the SJSU values.

The trend for URM students is troublesome but realistically the number of students borders on being statistically too low to reach any significant conclusions. The Chemistry Department has a long tradition of supporting URM students in STEM as documented by multiple UMR STEM federally funded programs being housed in the Chemistry Department and will continue to aim at helping its URM majors excel. Note that for 2011/12 and 2012/13 24% of our degrees went to URM students (Table 3)

Table 3 – BA/BS Degrees Awarded in Chemistry

	AY 2007/08	AY 2008/09	AY 2009/10	AY 2010/11	AY 2011/12	AY2012/13
Total	25	27	39	28	40	46
URM	3	2	0	5	10	11
Female	11	18	12	9	24	19
URM %	12.0	7.4	0.0	17.9	25.0	23.9
Female %	44.0	66.7	30.8	32.1	60.0	41.3

Females are also considered underrepresented in physical sciences. Staring in Fall 2010 the % of majors in chemistry who are female has been above 50%. The average 6 year and 8 year graduation rates for first time female freshman in chemistry are 50.8 and 74.8, respectively. The average 3 year and 5 year graduation rates for female transfer students is 24.2 and 55.9, respectively. These data are averaged over the same cohorts as in Table 2. The rates for females are a little better than males in chemistry.

7. Headcounts of program majors and new students (per program and degree)

Table 4 – Headcount of New Students to the BA/BS Degree Programs in Chemistry

By Type	S 09	F 09	S 10	F 10	S 11	F 11	S 12	F 12	S 13	**F 13**	Fall Average
First- time Freshman	1	38	NA	59	NA	40	NA	9	NA	**63**	42
Transfers	7	20	NA	22	11	15	1	9	2	**27**	18
Total	8	58	NA	81	11	55	1	18	2	**90**	60
By Major	S 09	F 09	S 10	F 10	S 11	F 11	S 12	F 12	S 13	**F 13**	Fall Average
BA/BS Chemistry	5	19	NA	38	8	26	1	9	2	**34**	25
BS Chem conc Biochem	3	39	NA	48	5	28	0	10	0	**56**	36
Total	8	58	NA	86	13	54	1	19	2	**90**	61

Analysis - Clearly the number of new students admitted every Fall is not stable and depends greatly on the administration's decisions regarding the number of students to admit and whether to skew admission towards particular majors. In Fall 2013 the administration increase admissions with a particular emphasis on STEM and the data confirm this.

Table 5 – Headcount of Majors in the BA/BS Degree Programs in Chemistry

By Major	F 06	F 07	F 08	F 09	F 10	F 11	F 12	**F 13**	Average
BS/BA Chemistry	158	148	139	130	140	159	128	**121**	140
BS Chem conc Biochem	130	158	164	173	200	205	168	**169**	171
Total	288	306	303	303	340	364	296	**290**	311
By URM status	F 06	F 07	F 08	F 09	F 10	F 11	F 12	**F 13**	Average
Non URM	260	273	269	257	271	311	257	**253**	269
URM	28	33	34	46	69	53	39	**37**	42
Total	288	306	303	303	340	364	296	**290**	311
% URM	10%	11%	11%	15%	20%	15%	13%	**13%**	14%
URM - American Indian, Black, Pacific Islander, Hispanic									
IEA does not distingusih between BA Chem and BS Chem									
Note terminated majors combined with Chem									

Analysis – Admission of freshman and transfers directly to the Chemistry major vary significantly but the number of majors tends to remain in the range of 300. Historically it is noted that students at SJSU change majors as many as three times as they determine their talents and passions. A decrease in the number of URM students selecting a chemistry major is noted after reaching a historical high of 20% in Fall 2010. An action item already enacted by the department is to make a more concerted effort to attract URM students to the major of chemistry by sending a representative to Admitted Students Day and Frosh Orientations.

8. **SFR and average section size (per program)**

Table 6 – Chemistry Department SFR and Average Section Size

	F08	S09	F09	S10	F10	S11	F11	S12	F12	S13	**F13**	S14	Ave
SFR	23.4	21.0	19.0	17.8	21.1	20.0	22.1	21.5	23.9	22.3	**28.2**	TBD	21.8
Ave. Sect. Size	30.7	27.6	29.2	26.2	29.7	28.3	31.3	31.4	33.0	35.5	**38.4**	39.1	31.7

Table 7 – Comparison of SFR and Average Section Size with Other SJSU Departments

Fall 2013	SJSU	**CHEM**	BIOL	PHYS	ME	EE	ENGL	PSYC
SFR	24.0	**28.2**	28.1	17.9	26.3	22.5	22.7	31.4
Ave. Sect. Size	26.8	**38.4**	25.7	26.7	34.9	34.9	24.1	33.0

Important issue related to how IEA calculates SFR– The SFR calculations requires FTES and FTEF. FTEF calculations do NOT incorporate GSAs. As such departments that use a lot of graduate student assistants will significantly impact their SFR. Although we know how many FTES are being covered by GSAs in Chemistry, data for other departments would take a while to collect, so it is not clear whether the comparison between departments above is even valid. Also note that the SJSU Assessment Director indicated a desire to have SFR comparisons between SJSU Chemistry Department and other CSU Chemistry Departments in this report. Without access to other CSUs data and a clear understanding of how other CSU's calculate their SFR comparison of data would be meaningless.

Analysis - Note that the SFR for Chemistry, a laboratory and undergraduate research intensive program at SJSU, is well above the university value. The administration policy of 105% enrollment for CA residents lead to a higher FTES target for the Chemistry Department. This was combined with a decrease in funding for AY13/14 and a reduction in instructional FTEF (see Table 8 below). The only way Chemistry could reach the FTES target without being over budget was to increase class sizes. In addition the department replaced some temporary faculty with GSAs.

Why is the difference between average section size and SFR so big for chemistry (and often other STEM divisions) as compared to other departments? Laboratory intensive programs and/or programs in which scientific research is strongly encouraged lead to very low SFRs due to the need for faculty supervision and restrictions on room capacity placed by safety requirements. As such to reach the required SFR targets lectures become very large. Chemistry 1A/30A lecture typically have 220 or more students.

9. **Percentage of tenured/tenure-track instructional faculty (per department)**

Table 8 - Instructional FTEF by Tenure Status

	F08	S09	F09	S10	F10	S11	F11	S12	F12	S13	**F13**	Ave
Tenured	7.1	8.0	7.5	8.5	7.8	8.7	8.8	9.2	8.6	9.3	**8.4**	8.4
Probationary	5.0	4.1	6.3	5.8	4.2	4.4	2.0	2.0	2.0	2.0	**1.9**	3.6
Temporary	12.0	13.1	10.6	13.3	10.4	13.5	13.1	14.4	10.8	11.4	**8.1**	11.9
Total	24.1	25.2	24.4	27.6	22.4	26.6	23.9	25.6	21.4	22.7	**18.4**	23.8
% T/TT	50.2%	48.0%	56.6%	51.8%	53.6%	49.2%	45.2%	43.8%	49.5%	49.8%	**56.0%**	50.3%

Important issue related to how IEA calculates FTEF – FTEF calculations do NOT incorporate GSAs as temporary faculty. As such departments that use a lot of graduate student assistants will significantly impact their FTEF. For example, a department with no temporary faculty, 4 T/TT faculty and 4 GSAs, all teaching full time, would have % T/TT of 100%, yet the GSAs are unexperienced instructors with just BS degrees. Also note that GSAs need to be trained and supervised, a responsibility taken on by T/TT faculty.

Analysis - Note that the increase in the % T/TT faculty in Fall 2013 is not due to an increase in T/TT faculty but rather is due to a decrease in the number of temporary faculty, some who were replaced by GSAs. Since GSAs are not incorporated into FTEF it appears as if the %T/TT has increased in Fall 13 to 56.0%. **If we correct the data for Fall 2013 and incorporate the 2.5 FTEF covered by GSAs in Chemistry, the calculated % T/TT would be 49.3%.**

Table 9 – External Funding in Thousands Secured by Chemistry T/TT Faculty per Year

	2008	2009	2010	2011	2012	2013	Total
TOTAL	1983	3395	2413	2259	1230	1193	12473

Comment - This table only includes data from SJSU Research Foundation. Additional funding from private corporations/foundations managed by Tower Foundation is not included here and would increase these values.

Analysis – During the last six years Chemistry faculty have secured well over $12 million in funding. Because SJSU does not take into account funding raised by faculty in decisions regarding the number of faculty positions, departments that consistently generate significant funding will often remain with a low instructional T/TT %. Funding often is used for faculty buy-out so as to complete the stated goals associated with the funding (research, student training, curriculum development, etc.) thus these faculty do not teach 12 unit loads. Action item – SJSU needs to consider a department's consistent and long term funding success when allocating faculty positions.

Table 10 – Ratio of FTES to Instructional T/TT FTES

	Chem							Biol	Phys	Psyc	EE	SJSU
	F 08	F 09	F 10	F 11	F 12	F 13		F 13	F 13	F13	F13	F 13
FTES	577	469	475	539	550	586		734	471.9	991	517.8	25406
T/TT FTEF	12.1	13.8	12.0	10.8	10.6	10.3		14.8	9.7	17.4	12.6	477.4
Ratio	47.7	34.0	39.6	49.9	51.9	56.9		49.6	48.6	57.0	41.1	53.2

Analysis – Tenured faculty in particular carry a significant level of the workload associated with the generation of FTES. This includes advising, training/evaluation of GSAs and temporary faculty, committee work, assessment, curriculum development, etc. Thus an increase in the ratio of FTES to instructional T/TT FTEF is a possible way to document T/TT faculty workload. The headcount of T/TT faculty is not used because, at least in chemistry, the faculty pay for buy out from grants. % T/TT, as was requested for this report, might not be the best way to document or compare between departments because of the GSA issue.

Part C

10. Closing the Loop/Recommended Actions

Action Items from Program Planning (10/11/13 document signed by Dean Parrish and Provost Junn)

1) Resolve safety issues surrounding the organic laboratories – Not directly relevant to assessment but a significant issue that needs to be address with Facilities and the administration.
2) Map PLOs to ULGs – Completed. This can be documented in Table 1 in this report and in the Chemistry Department website
3) FTES has increased while T/TT faculty hires have remained constant – Although the Department agrees with this statement and has requested faculty positions every academic year, the administration has only agreed to one search in 2012/13 and one search in 2013/14. The department now has even less instructional T/TT faculty as was documented during program planning because
    a) The rate of loss of T/TT faculty has been greater than the hiring rate of new faculty
    b) The instructional FTEF has decreased in part because of loss of faculty and in part because of faculty buy-out from grants

   For AY 2014/15 the department again requested two positions but a decision has yet to be made by the administration. Two more tenured, full professors have indicated that they will retire and plan to start the FERP program at the end of Spring 2014.

Feedback from the College of Science on 2012/2013 Assessment Repots (10/15/13 document from Assoc. Dean Elaine Collins)

1) Map PLOs to ULGs – Done as indicated above
2) Agree on explicit criteria for assessing mastery level of each learning outcome – Working on this. In some cases the department can make use of American Chemical Society test but the cost of these tests is expensive and some of the courses do not align exactly with these tests because the courses are more interdisciplinary or because the material is spread out over several courses. The department uses these tests at the end of General Chemistry (Chem 1A/B) and Organic Chemistry (Chem 112A/B) because tests purchased more than 10 years ago are being used.
3) Examining the use of WASC rubric for possible use in assessing capstone experiences - Faculty have been asked to look over the rubric and determine whether they can use it. Part of the issue is that some of the courses don't get taught by the same person every year, and sometimes it is a part-timer who might teach the class. Again, a reason why the university has to commit to hiring TT faculty.
4) Revisit maps to incorporate new assessment data – In progress.
5) Perform assessment and submit a report for AY 2013/14 – This document.
6) Consider incorporating student reflection and self-assessment on program outcomes – Investigating exactly what this means.

This year's activities

As indicated by Table 1, PLOs #1 and #8 were scheduled to be assessed. The responsibility for assessing PLO #1 was assigned to Dr. Lionel Cheruzel who was teaching Chem 145 in Spring 2013. The responsibility of assessing PLO #8 was assigned to Dr. Jospeh Pesek who was teaching Chem 100W in Fall 2013 and Spring 2104. We continue to monitor our student's success in securing positions in graduate degree programs which serves as an indicator of whether top universities consider our students to be well prepared for graduate degree programs. We continue to test all students completing Chem 1B, the second semester of General Chemistry, with an American Chemical Society national exam. In addition the department also monitors average GPA for lower division and upper division courses. It is important that our grading of students throughout time shows some level of consistency.

11. Assessment Data

A – Chem 1B – American Chemical Society Standardized Exam

Selected faculty teaching Chem 1B, the second semester of General Chemistry, continue to administer the American Chemical Society Brief Full Year General Chemistry, Form 2002, as a way to monitor the course. The national mean on this test is 24.77 out of 50. Please note this is an older test.

B – Average GPA in lower and upper division chemistry course work.

In an effort to monitor for grad inflation or significant fluctuations in grading we continue to track the average GPA for lower and upper division courses in Chemistry. This data is available at iea.sjsu.edu.

C- Report on PLO #1 as provided by Dr. Lionel Cheruzel

Last time Dr. Cheruzel taught Chem 145, a class only offered in fall semesters, students seemed to have difficulties visualizing the molecular structures in 3D and determining their respective symmetry elements necessary to identify the point group of the desired molecules (CLO-1). This is one of the core concepts of inorganic chemistry. However, since it is the first time that this course is being formally assessed, no initial evidence of measurable significance was available.

In order to improve students understanding of chemical structures, Dr. Cheruzel brought model kits to class to illustrate the 3D structure of the molecules and the symmetry elements. He often passed the model to the students so they can visualize by themselves the respective structures. He invited the students to consult several websites dedicated to symmetry elements such as http://symmetry.otterbein.edu/gallery/index.html. In class, they also treated multiple examples of the most common structures and symmetry elements in order to familiarize students to the topic.

A question worth 16 pts in the final exam was dedicated to assign point group to several structures.

D – Report on PLO #8 as provided by Dr. Joseph Pesek

The data collected for the assessment of PL#8 was done during the Spring 2014 semester. A standard assignment for Chemistry 100W is to construct and present a poster based on a scientific topic related to chemistry that the student has researched in the chemical literature. The poster is printed as if it were to be presented at a symposium (such as a regional or national meeting of the American Chemical Society). Then two class sessions are devoted to having the posters set-up in the department meeting room. One-half of the posters are presented in each session. The student presenting the poster stands by the poster as if they were making the presentation at a scientific meeting. The other students in the class take the part of being attendees at the meeting and circulate among the posters. The presenter explains the poster to everyone who views it and answers questions about the material in the poster. The poster sessions are advertised on the department website (calendar) so that other faculty and students can attend.

Every student in the spring 2014 class (as well as the fall 2013 class) successfully fulfilled the poster assignment and received a passing grade on their presentation. All of the posters were of sufficient quality to be accepted for presentation at a typical scientific meeting, particularly in sessions that have only undergraduate students. The posters achieving the highest grades would be acceptable in any session of a meeting including those that were open to scientists with many years of experience in some area of chemical research or applications.

The poster session is a highly successful assignment in Chem 100W. Positive feedback has been obtained from many of the students and other members of the department who attend the poster session are always complimentary about the quality of these undergraduate presentations.

E – Tracking of majors who continue to advanced degree programs

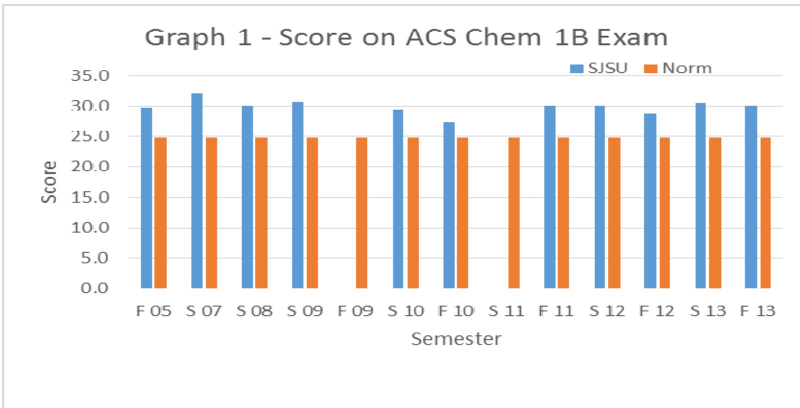
Continue to track student's continuation to PhD degrees in chemistry as a way to document that students are well prepared. It is our opinion that the rigor of our courses and the exposure to research help our top students be very competitive for PhD programs. Students from other majors have also benefitted from these opportunities.

12. Analysis

A – Chem 1B – American Chemical Society Standardized Exam

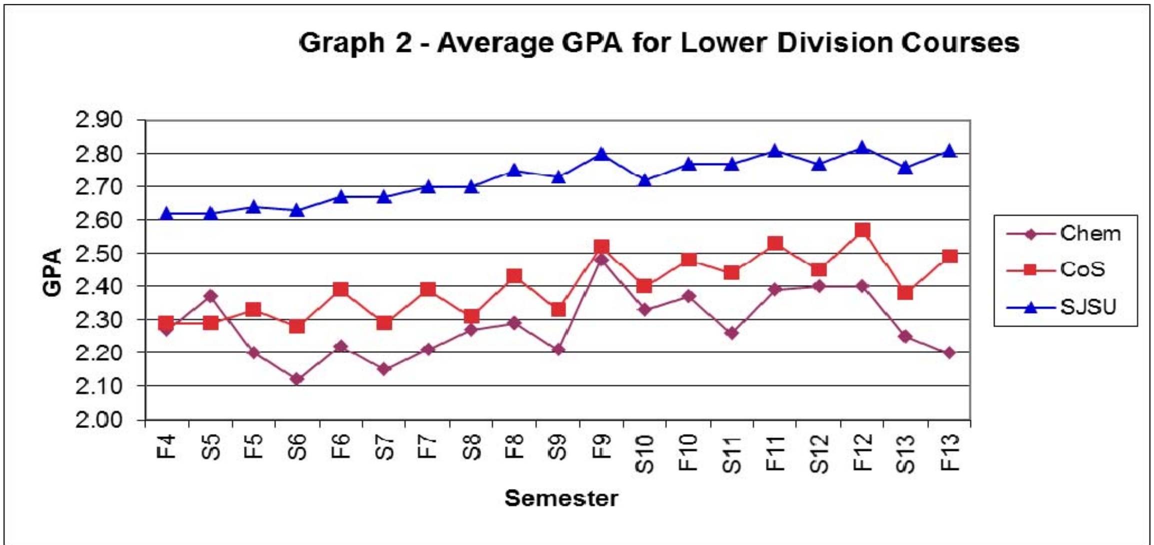
Selected faculty teaching Chem 1B, the second semester of General Chemistry, continue to administer the American Chemical Society Brief Full Year General Chemistry, Form 2002, as a way to monitor the course. The national mean on this test is 24.77 out of 50. Please note this is an older test.

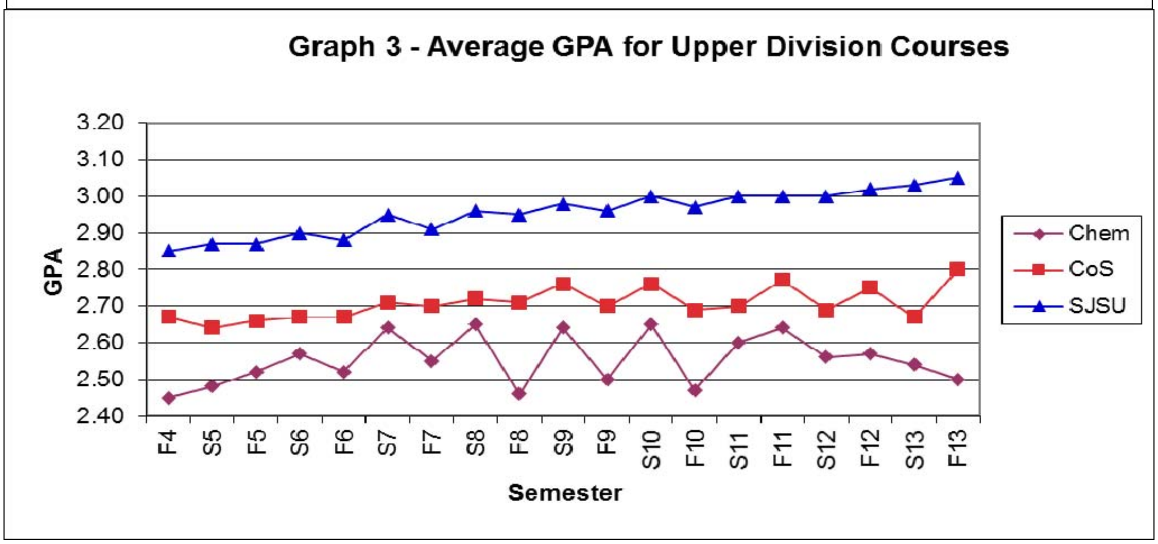
Graph 1 shows data for semesters in which faculty used this test. Note that the national mean for the test is 24.77 out of 50 (ACS Full Year General Chemistry, Form 2002). Note that this table summarizes data for groups ranging from 120 students to 200 and represents data for two different Chem 1B faculty.



B – Average GPA in lower and upper division chemistry course work.

Graphs 2 and 3 plot the average GPA for lower and upper division courses in Chemistry, the College of Science and SJSU. The data indicate that although the average GPAs in LD and UD classes are slowly increasing for SJSU, Chemistry has not experienced any measurable level of grade inflation during this ten year period. It appears that faculty in the College of Science and, in particular, in the Chemistry Department are more likely to use the full set of grades (ABCDF) even in upper division courses, course that are taken by our majors as well as a few other selected STEM majors.





We believe that one reason for the consistency in grading has to do with the fact that the TT/T faculty teach most lectures. This allows for consistency as a function of time with faculty that are not as concerned about their next semester's employment. It also allows faculty to develop and try new ideas. With the decrease in T/TT FTES and increasing FTES we have done our best to still manage to have T/TT teaching lectures by increasing lecture sizes but we are running out of options. Also another factor that we think allows us to retain some consistency in grading is that new tenure track faculty often are mentored by tenured faculty. We now have serious concerns that with the decreasing number of T/TT instructional FTES we might start observing some level of grade inflation if we have to have more part-time faculty teaching lectures or if we lose so many tenured faculty that new TT hires might not be able to be mentored by faculty who taught the course previously. Table 11 shows how Chemistry and CoS compared with others colleges in Fall 2013.

Table 11 – Fall 2013 Average GPA for Lower Division and Upper Division Courses

	LD Courses	UD Courses
SJSU	2.81	3.05
Applied Arts & Sciences	3.20	3.27
Business	2.74	2.85
Education	3.17	3.31
Engineering	2.95	2.90
Hum & Arts	2.96	3.24
Science	2.49	2.80
Social Sciences	2.74	3.04
Chem	**2.20**	**2.50**

C – Report on PLO #1 as provided by Dr. Lionel Cheruzel

A question in the final exam worth 16 pts was dedicated to assign point group to several structures. The class average for this question was 10.5. 60% of the students got C or better (10 and higher) on the point group question. Overall, the performance was somewhat adequate, however there is still room for improvement. It would be of essence to understand the student problems in trying to identify point group or visualizing molecules in 3D. For the next time, class assignments of point groups in order to assess student problems with these specific questions should be included in the course.

D – Report on PLO #8 as provided by Dr. Joseph Pesek

One of the issues we have is the development of a rubric to judge student poster presentations. The faculty teaching classes with poster presentations typically evaluate the multiple drafts of the posters, providing students with feedback, so that their final product typically is of good quality. At that point applying a rubric seems to be meaningless because the work already has been evaluated and improved upon multiple times with faculty assistance. It is not clear that this would then demonstrate that a student has learned how to create a poster, although they will have an example in their work to use for future posters. One would assume that they would use that.

We also have come to realize that we have two types of posters to judge in chemistry courses that use posters. Type I is a poster in which a student presents someone else's research. For example in Chem 100W, the student selects a topic and then is required to put together a poster to represent that work. The student is judged on whether they organized the poster correctly, used the correct sections, etc. and then whether the student can answer questions on the work. The actual scientific content of the poster is not judged because it isn't the student's work. We have developed a very rough draft of a possible rubric to use under these conditions. We are currently asking for input and suggestions from the three faculty members who have taught Chem 100W in the last few years. The draft is attached.

We are also considering whether we could develop and assignment for 100W that provides the student with a poor poster to evaluate. This way we might be able to see what the student has retained.

Type II posters are poster that present scientific work created by the student or group of students. For example, research they performed with a faculty member or data they collected in a lab experiment. In Type II posters you are also typically judging the content. For example, did the student approach the research in a manner that could answer the question(s) being asked, did the student understand the sources of error, are data valid and properly collected. The rubrics for Type II would require more extensive rubric and includes items in the rubric for Type I.

E – Tracking of majors who continue to advanced degree programs

Direct admission into PhD programs in Chemistry, without doing an MS degree, is an accomplishment that requires students to have a strong foundation in chemistry and significant research skills. The Chemistry Department's ability to produce students that secure positions in top PhD programs in Chemistry (Stanford, UC Berkeley Univ. of Illinois, Univ. of Washington, etc.) serves as an external assessment of our students and thus our program. These students are being judged by admission committees at top universities which are composed of top chemistry faculty. Table 12 documents students continuing to top programs since 2008. The table also includes important national level graduate school awards secured by our students.

Table 12 – Chemistry Majors in PhD Programs

Name	Degree	Graduate School	Degree	Research	Comments
				Advisor	
Esfandiari, Nagameh	2008 BS	UC Irvine	PhD	Muller	Degree completed
Payumo, Alex	2008 BS	Stanford	PhD	Eggers	
Wong, Janice	2009 BS	UC Irvine	PhD	Brook	Degree completed
Botorff,Shalina	2010 BS	Washington State	PhD	Muller	
Chemistruck, Victoria	2010 BS	Univ. of Minnesota	PhD	Brook	
Fields, Jorie	2010 BS	UC Davis	PhD	Silber	
Hua, KimNgan	2010 BS	Univ. of Mass.	PhD	Muller	
Le, Thao Nhi (Lily)	2010 BS	UC Santa Cruz	PhD	Collins	
Nguyen, Huan	2010 BS	UC Los Angeles	PhD	Okuda	
Sarina, Evan	2010 BS	UC Davis	PhD	D'Alarcao	
Heredia, Jeremiah	2011 BS	Univ. of Illinois	PhD	Cheruzel	
Ingram, Andrew	2011 BS	Stanford	PhD	Muller	
Sun, Daniel	2011 BS	UC Los Angeles	PhD	Brook	
Fox, Douglas	2011 PBac	UC Berkeley	PhD	D'Alarcao	
Berry, Jeffrey	2012 BS	Washington State	PhD	Van Wyngarden	
Calabretta, Phil	2012 BS	Univ. of Wisconsin	PhD	Eggers	
Crowder, Caitlin	2012 BS	Univ. of Oklahoma	PhD	D'Alarcao	
Roberts, Austin	2012 BS	Univ. of Albany	PhD	Terrill	
Sanchez, Jorge	2012 BS	UC Davis	PhD	D'Alarcao	
Tyson, Katie	2012 BS	Washington State	PhD	Acrivos	
Wright, Heather	2012 BS	UC Irvine	PhD	Collins	
Castellano, Brian	2013 BS	UC Berkeley	PhD	Eggers	
Grist, Jonathan	2013 BS	Univ. of Utah	PhD	Collins	
Nguyen, Brian	2013 BS	Univ. of Illinois	PhD	Muller	
Ponce, Servando	2013 BS	UC Santa Cruz	PhD	Brook	
Dang, Andy	2014 BS	Univ. of Washington	PhD	Pesek	
Deol, Kirandeep	2014 BS	Univ. of Wisconsin	PhD	Muller	
Diniz, John	2014 BS	UC Santa Cruz	PhD	Terrill	
Nguyen, Daniel	2014 BS	John Hopkins	PhD	Cheruzel	
NSF Graduate Fellowships (30K/yr, 3 yrs)					
Chemistruck, Victoria	2010 BS	Univ. of Minnesota	PhD	Brook	
Ingram, Andrew	2012 BS	Stanford	PhD	Muller	
Le, Thao-Nhi	2010 BS	UC Santa Cruz	PhD	Collins	
Calabretta, Phillip	2013 BS	Univ. of Wisconsin	PhD	Eggers	
Gilliam Fellowship (HHMI)					
Castellano, Brian	2013 BS	UC Berkeley	PhD	Eggers	
NSF Honorable Mentions for 2014					
Dang, Andy	2014 BS	Univ. of Washignton	PhD	Pesek	
Deol, Kirandeep	2014 BS	Univ. of Wisconsin	PhD	Muller	
Nguyen, Brian	2013 BS	Univ. of Illinois	PhD	Muller	
Wright, Heather	2012 BS	UC Irvine	PhD	Collins	

13. Proposed changes and goals (if any)

For AY 2014/15 Table 1 indicates that PLO #2 and #9 will be evaluated.

A – Chem 1B – American Chemical Society Standardized Exam

We will continue to encourage Chem 1B instructors to offer this test as a portion of the final so that we can continue to monitor for any appreciable fluctuations.

B – Average GPA in lower and upper division chemistry course work.

We will continue to monitor lower and upper division chemistry course work average GPAs as long as the data is available through iea.sjsu.edu.

C – Report on PLO #1 as provided by Dr. Lionel Cheruzel

The next time Dr. Cheruzel teaches Chem 145 he will consider including a graded class assignment of point groups in order to assess student problems with these specific questions should be included in the course.

D – Report on PLO #8

We have a draft for a possible rubric for judging Type I posters that we hope to improve on once we get feedback from Chem 100W faculty.

E – Tracking of majors that continue to PhD Programs

Continue to track our students' accomplishments.

Rubric for Type I Poster – Draft

	Poster Lay Out	Text	Figures/Photographs	Graphs (if included)	Overall Presentation /Handling of Questions
Excellent	All components are present and well laid out.	Concise, legible	Figures/tables are appropriate ways of summarizing information	Graph(s) helps in summarizing data; improves on understanding	Demonstrates strong knowledge of content
	Easy to follow in the absence of the presenter	Free of spelling/grammar errors	Well and clearly labeled/numbered	Titled and well labeled axis	Speaks clearly, naturally, with enthusiasm; makes eye contact
	Content placed in correct section.	Background assists in legibility	Easy to follow, visually compelling	Data points clearly visible, error bars included or lack of them explained	Uses visual aids to enhance presentation
				Graph covers plot area well	Clear and logical
				Graph type choice and fit are appropriate for the data (best fit vs connect a dot vs bar graph)	Consistently answers questions clearly and logically
Good	All components are present but lay out is untidy or crowded	Concise, mostly legible	Most of the figures/tables are appropriate ways of summarizing information	Graphs helps in summarizing data; improves on understanding	Demonstrates good knowledge of the content
	Somewhat confusing to follow without presenter	One or two spelling/grammar errors	One or two errors in labeling/numbering	One error in title and axis	Speaks clearly and makes eye contact
	Content placed in correct section.	Background assists in legibility	Visuals are acceptable but could be improved upon.	Data points visible, missing error bars or explanation	Uses visual aids to enhance presentation
				Graph covers plot area in an acceptable manner	Presentation, for the most part, was clear and logical, just one or two issues
				Graph type choice and fit are appropriate for the data (best fit vs connect a dot vs bar graph)	Answers most questions clearly and logically
Fair	Missing one or two component, lay out is untidy	Somewhat legible and concise	Figures/photos not related to the text	Graph does not improve understanding; purpose of graph is unclear	Demonstrates some knowledge of the content but clearly there are issues
	Confusing to follow without presenter	Multiple spelling/grammar errors	Poor labeling/numbering	Missing title, poor labeling on axes	Reads from the poster multiple times
	Some content in incorrect section (data in conclusions, statement of problem in methods,…)	Background may be distracting.	Visually difficult to understand without assistance from the presenter	Data points missing, just a trace without an explanation	Does not completely use visual aids or has to read to remember what the visual aid was for.
				Poor choice of graph type and/ or fit	Presentation is unclear, lost of jumping around
					Difficulty answering questions
Poor	Missing several components, untidy and crowded lay out	Difficult to read, messy, illegible	Poorly done or none included even though clearly they would have helped summarize information	Graph was not included when clearly it would have been a useful way of summarizing data	Minimal knowledge of the content
	Confusing to follow even with the presenter	Multiple spelling/grammar errors detracting from content significantly	No labeling/numbering to assist the reader	Graphs are incorrect altogether (axis spaced correctly, not well set-up, etc.)	Reads most of the content from the poster
	Most of the content placed in wrong sections	Background detracts		(This last one is to cover when students use Excel and don't know what they are doing!)	Does not use visual aids to assist in presentation
					Presentation is lacking significantly and is confusing
					Does not understand questions