Program Plan for the Chemistry Department

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**Overview**

The Chemistry Department offers five bachelors’ degrees, two masters’ degree and a minor. The degrees are:

- B.A.-Chemistry
- B.A.-Chemistry, Preparation for Teaching
- B.S.-Chemistry ([American Chemical Society Approved](#))
- B.S.-Chemistry, Concentration in Materials Science
- B.S.-Chemistry, Concentration in Biochemistry
- M.A.-Chemistry
- M.S.-Chemistry

The Chemistry Department provides a strong educational background in chemistry and strives to show all students how chemistry is involved in solving everyday problems such as energy production, pollution control, and disease treatment and prevention. Programs of study can be designed to give broad scientific experience to those interested in a general, liberal education; more specialized training is available to those wishing to pursue any of the health-related disciplines, science teaching, dietetics, engineering or other related sciences. A comprehensive course of study is suggested for career-oriented chemists. The department offers service courses for several departments and offers one lower division GE course (Chem30A) that satisfies two areas in GE (B1 and B3) and one SJSU Studies course, Chem100W.

At the **baccalaureate level**, students may specialize in Biochemistry or Materials Science. Students gain in-depth knowledge of the major field of chemistry, including a broad understanding of the sciences. Students also learn skills in communication, critical inquiry and global perspectives through interactions with people from diverse backgrounds that help them become global citizens. The degree programs strive to cultivate an understanding of ethical choices inherent in human development and scientific endeavors, preparing students for responsible citizenship.

At the **graduate level**, course work and research experience lead to either the M.S. or M.A. Chemistry degree. These degrees permit specialization in analytical chemistry, biochemistry, inorganic, organic, radiochemistry, physical or polymer chemistry. Students interested in conducting or directing chemical research or in graduate work before starting a Ph.D. program consider the M.S. degree. The M.A. degree is intended specifically for teachers who wish to pursue an advanced degree for purposes of promotion or for individuals who have extensive research experience in industry. Graduate courses also support the M.A.-Natural Science.

**Students**

The number of undergraduate majors increased from 256 to 320 between fall 2005 and fall 2010. Twenty three students graduated in 2006/2007 increasing to 39 graduates in 2009/2010. The female:male majors ratio has been approximately 1:1, fall 2006 through fall
2010. The university ratio for the same period was 0.94:1. The students identify themselves as Asian (52%), White (17%), Hispanic (10%), Other (10%), Foreign (6%), Black (4%), American Indian/Alaskan Native (0.3%). (Appendix A, Appendix B)

The number of graduate students has decreased from 32 to 20 from fall 2006 to fall 2010, due partly to admissions constraints. The female:male ratio was 1.6:1 in fall 2006 decreasing to 1:1 in fall 2010. In fall 2010, students identified themselves as Asian (40%), Other (20%), White (15%), Foreign (15%), Black (5%), Hispanic (5%). Three to five graduate students graduate per year. Both M.A. and M.S. degrees require 30 units of graduate level coursework and a thesis. (Appendix A, Appendix B)

**Faculty**

The Chemistry Department consists of 16 tenured/tenure-track faculty as of fall 2010. The T/TT faculty consists of: 75% male, 25% female; two Hispanic, one Asian or Pacific Islander, two Other, and eleven White. All hold Ph.D.s in Chemistry or related field. Of the sixteen faculty members: one is 50% assigned to the Science Education Program, one is in the last year of FERP, and one enters FERP fall 2011. The Department consists of 19 part-time faculty as of fall 2010 for the academic year. The part-time faculty consists of: 53% male, 47% female; 43% White, seven Asian, one Hispanic and two Other, with 81% holding Ph.D. degrees. (Appendix A, Appendix B)

**Strengths**

**Teaching and Research Program**

The Department mandates students receive major advising every semester either at the College of Science Advising Center for lower division undergraduates or with Chemistry faculty advisors for upper division students. The Department purposefully keeps enrollment of the upper division courses low in order to allow students to work more closely and frequently with faculty. The Department provides multiple opportunities for students to actively pursue research with a faculty research advisor, present research at national meetings and coauthor publications. Students from our degree programs consistently secure graduate positions in top Ph.D. granting programs and obtain competitive graduate fellowships such as those awarded by the National Science Foundation. Graduate students are advised by the graduate advisor and the student’s faculty research mentor.

**Distinguished Faculty**

Chemistry faculty secure external grants to fund their research, to improve instrumentation, to develop and refine curriculum, to provide students with "hands-on" chemistry, professional development, to increase the success rate of underrepresented minority students and to fund student scholarships. From 2006 to 2010, Department faculty secured over $11.5 million in external funding. Active grants listed from the SJSU Research Foundation for 11/16/2010, indicate that Chemistry faculty are the Principal Investigator on 32 active projects totaling $7,193,263.27 for budget totals. Since fall 2006, faculty have published 76 articles in peer-review journals (Appendix C) and have presented dozens of conference talks and posters at
regional, national, and international professional conferences. Most of the articles and conference presentations include undergraduate and/or graduate students as coauthors.

Five members of the Chemistry faculty currently hold administration positions at SJSU: Provost, two Academic Vice Presidents, Associate Dean of Undergraduate Studies, Associate Dean of the College of Science. Two full professors in the Department have received the SJSU Outstanding Professor Award. One full professor has received the President’s Scholar Award. For professional/scholarly activities, the SJSU Research Foundation has awarded four Awards of Merit for Undergraduate Research Advising and two Early Career Investigator Awards.

Commitment to Collaborative Learning Opportunities for the Success of STEM Students

Student retention is a main focus of the Department, the College of Science and the University. In support of this, optional extra-curricular learning opportunities are available to interested students through external funding secured by the Department faculty. Opportunities include summer, winter and academic year Academic Excellence Workshops (AEW). All students who request a place in the workshops are admitted, and enrollment ranges from 300 to 400 students per semester. Students participating in Chem1A-Prep Workshop with a 70% attendance rate or above have a 90% passing rate in Chem1A compared to a 69% pass rate for students who do not attend or have poor workshop attendance. Without these workshops, student success rate in the degree program would decrease and student retention and graduation would suffer. All workshops are student-led, creating over 20 paid job opportunities for the Department’s stronger students and cultivating a cooperative learning environment among its students. These student workshop facilitators learn how to facilitate student learning in chemistry. This is a transferable skill that they can use in graduate school.

Table 1. Statistics for Academic Excellence Workshops

The Chem1A-Prep Workshop has served to recruit students into the Chemistry degree program. Many students comment on the positive experience and note that chemistry faculty and students are friendly and available to assist them in learning chemistry. (External evaluations of the workshops/prep courses are done annually. Reports for fall 2009 and spring 2010 can be requested from Prof. Karen Singmaster).

Success with Limited Resources

The Department has 50% T/TT: probationary faculty, an undergraduate program, a graduate program, and provides a significant amount of service to other departments. The full-time equivalent students (FTES) generated by the Department varied from 494.5, fall 2006 to 576.8, fall 2008. FTES fell in 2009 and 2010 to 474.7. This was due to enrollment caps, not due to decreased demand. More T/TT faculty would be required to sustain FTES of 576. (Appendix A).

The Chemistry curriculum includes many laboratory sections linked to lower division courses. In addition to the lab and lecture instructors for the courses, adequate technical staff are required to prepare solutions and maintain equipment. The recent staff cuts impair the Department’s ability to increase enrollment in large lower division Chemistry courses because of inadequate technical support for the laboratory components of these courses. Despite the
reduced faculty number and increased workload, the faculty commitment to undergraduate student research is illustrated in Table 2.

Table 2. Undergraduate Research Opportunities

Challenges

Recruitment Plan

The Department estimates that 20 T/TT faculty are needed to sustain the degree programs (Appendix D), but the current number is only 16 due to a hiring rate insufficient to balance the attrition rate from retirement, loss of faculty to administrative positions, tenure decisions, and other factors. Further, not all T/TT are available for full teaching loads due to sabbaticals, assigned time for major committee service, grant buyout, etc. Relying too heavily on non-T/TT faculty for teaching disrupts the continuity of the progressive learning environment within the degree programs. To effectively achieve the Department’s teaching and research mission requires the hiring of more T/TT faculty. Increasing the number of tenure-track faculty in the Department is expected to increase external grant funding as well as improve continuity in classroom learning.

When hiring T/TT faculty, candidates with scholarly expertise in general focus areas will be sought rather than hiring for a specific course. Three areas of general focus have been identified to help achieve Department objectives: Chemical Biology, Energy Science, and Green Science. This hiring strategy focuses on recruiting candidates who possess the ability to merge a broad area of study with one or more areas of traditional study. For example, a candidate with research interests in Chemical Biology could teach general chemistry courses and also upper division courses in organic chemistry and biochemistry. Staffing the Department with interdisciplinary scientists works to foster interdisciplinary projects, benefits students, and creates flexibility in teaching assignments.

The Department plans to engage more faculty in teaching high enrollment courses by rotating faculty periodically through these identified courses. This arrangement allows every faculty member to continue to teach in his/her specialty, faculty gain a better understanding of the curriculum so that general concepts can be more consciously reinforced in upper-level courses, students are exposed to a broad array of perspectives and teaching styles early in the curriculum, and the faculty are invested in the evolving content of the early curriculum.

Revision of the Undergraduate Chemistry Degree

All three B.S. degrees require over 120 units. The Department Curriculum Committee is currently reviewing these programs to decrease the requirements to 120 units while maintaining the rigor of the degrees. Hidden pre-requisites are being removed from the B.S. Chemistry, Concentration in Materials Science. The B.S. Chemistry, Concentration in Biochemistry, the largest major in the department, is being reworked into a new degree: B.S. Biochemistry and Chemical Biology. The new degree will provide students with more elective choices to tailor the degree to their specific interests and career goals. This also provides curriculum that better aligns with current trends in biochemistry and chemical biology. Providing additional electives will also provide more elective choices for the B.S. and B.A. Chemistry degrees. These changes will allow students to progress through the degree more quickly, aligning with the University and College of Science goals of improving graduation rates. The Science Education Program is
considering creating a minor in Science Education. This change may result in the termination of the B.A. Chemistry, Teaching Preparation, and students interested in teaching would then major in B.A. Chemistry with a minor in Science Education. Together these changes will make the undergraduate curriculum more nimble to better serve students with diverse needs and career goals.

**Synergies**

Chemistry faculty are involved in many interdisciplinary synergies within the Department, the College, the University and beyond the university, particularly involving scholarly and professional activities. Within the Department, many faculty have collaborative research projects. Within the College, faculty are collaborators on grant proposals and research, primarily with the biology department. Within the University, faculty have research collaborations with faculty in several engineering departments and teaching collaborations with Chemical and Materials Engineering, General Engineering and Justice Studies.

Faculty have national and international collaborations. Students benefit from these faculty collaborations. Research helps reinforce the knowledge that science is not static and motivates faculty to continually update course material and pedagogy. Maintaining research-active faculty helps in recruiting top new research faculty. Successful grantsmanship helps provide resources in equipment and facilities to the Department that benefit undergraduate and graduate student researchers and in some cases laboratory courses.

Professional synergies outside of the university include consulting for local business, ArcBio; membership in professional organizations: American Chemical Society (ACS), American Society of Biochemistry and Molecular Biology (ASBMB), American Association for the Advancement of Science (AAAS), Biophysical Society, The Protein Society, and Society for Biomaterials.

**Student Learning**

**Undergraduate Degree Programs(B.A./B.S.)**

The Chemistry Department assesses student learning through a variety of data collection, including but not limited to: exams, quizzes, lab reports, lab notebooks, homework, mid-term and final that are scored and compiled in order to give a grade for coursework. It is the Department’s position that a student has achieved the student learning outcomes (SLOs) with the achievement of a grade of “C-” or better (“C” to continue in Chemistry). Students who do not satisfy the minimum requirements of the course do not obtain a passing grade and have not achieved the SLOs of the Department. Comparing Chemistry course GPAs to University and Colleges course GPAs demonstrates that the Chemistry Department is one of the tougher departments in assigning grades. Nationwide Chemistry degree programs continue to rate among the toughest college majors. Grade inflation is not the norm.

*Table 3. Course GPAs and interesting links to college majors and grade inflation.*

Chemistry emphasizes progressive problem solving ability, so the Department focuses on data collection to assess student learning and values the GPA correlation to student learning. Because of the learning progression in Chemistry, the Department recognizes the importance for
a student to achieve a “C” grade, or better, before continuing to the next Chemistry course. In fact, students who achieve a course grade of “C” in Chem 1A have only a 50% success rate of achieving a “C” grade, or better, in Chem 1B.

The Department’s top chemistry graduates, who have mastered the degree program coursework and have developed strong critical thinking skills, are being admitted into top Ph.D. programs in Chemistry, Medical Schools, and Pharmacy Schools. We believe that our students' acceptance into top Ph.D. programs demonstrate the high quality of our undergraduate programs in chemistry.

Table 4. Students accepted into Ph.D. Programs and Professional Schools

Chemistry B.A./B.S. Learning Objectives

The Department recognizes the importance of Student Learning Objectives (SLO) with measurable assessments that correlate to student grades. Below summarizes the Departmental SLOs with assessment. The Department has met several times spring 2011 to refine and update the SLOs (Appendix E).

SLO1 - To demonstrate a working knowledge of the content and concepts of, and to solve problems in the following areas: inorganic chemistry, organic chemistry, analytical chemistry, physical chemistry and biochemistry.

Assessment: ACS General Chemistry Exam after completing Chem 1A/B, ACS Organic Chemistry exam after Chem112A/B, and DUCK after completing either Chem146 or Chem131B.

The American Chemical Society (ACS) is a national organization that approves Chemistry degree programs. The ACS exams (Http://chemexams.chem.iastate.edu) assess student knowledge and problem solving skills. In the past five years, the Chem1A/B final exam has been the ACS General Chemistry exam, and Chem112A/B has been the ACS Organic Chemistry exam. The results can be compared to the national average. In the academic year, fall 2010, fall and spring 2009 semesters, 461 students took the ACS Brief Version in Chem1A/B: the national average is 24.8 out of 50 multiple choice questions compared to the SJSU student average of 29.3 out of 50. SJSU students on average are performing above the national average.

Developed in 2008, the Diagnostic for Undergraduate Chemistry Knowledge (DUCK) is designed to assess student learning at the end of the undergraduate program degree, and the Department participated in the beta testing of the DUCK. All Chemistry majors are required to enroll in one of the capstone courses, either Chem146 or Chem131B. In the capstone courses, undergraduates are assessed with the DUCK, requiring students to interpret data within a Chemistry scenario and apply the concepts and problem solving skills that they have learned. The Curriculum Committee has determined that the DUCK provides an accurate and acceptable assessment of SLOs and the undergraduate degree program requirements. The national average for the DUCK is 31.49 out of 60 multiple-choice questions. Of the 32 students who have completed the DUCK, the SJSU student average is 33.25. SJSU students are performing slightly above the national level.

SLO2 - To understand and apply the practice of safe laboratory work.
Assessment: Successful completion of Chem120S and safety test or video; instructor observation of student performance in the lab setting.

The Department recognizes the importance of chemical safety and requires that significant accidents be reported to the College of Science Safety Department and to the Department Chair. Chemical safety is a required component of all lab courses in Chemistry, and the Department expects each lab course to emphasize chemical safety as it applies to the course. Prior to being granted lab access, students are required to pass a safety quiz and/or to view a safety video. The Department requires students to complete Chem120S, a one-unit course on chemical safety. At the start of every lab course, chemical safety is discussed, in depth, as it applies to the course. Lab instructors emphasize specific safety issues that apply to each experiment before beginning an experiment. In one capstone course the students are responsible for identifying the safety issues themselves and discussing them with the instructor prior to the experiment.

SLO3 - To communicate science effectively, both orally and in writing.

Assessment: Student achievement of upper division standing, pass WST and Chem100W; professor observation of student during oral and/or poster presentation.

The Department requires students pursuing the Chemistry degree program pass the writing skills test (WST) and achieve upper division standing before enrolling in and completing Chem100W. In order to meet SLO3, students need to demonstrate minimum communication skills, written and verbal, assessed by WST and cultivated by Chem100W. Achievement of a passing grade in Chem100W assesses student proficiency in written and verbal communication skills, preparing the student for upper level division lab course requirements of written reports and oral presentations. The following upper division Chemistry laboratory courses all have Chem 100W as a prerequisite: Chem114 (Advanced Organic Chemistry Lab), Chem127 (Nuclear Science Lab), Chem131B (Biochemistry Lab), Chem146 (Physical-Inorganic Techniques), Chem155 (Instrumental Analysis) and Chem162L (Physical Chemistry Lab). These laboratory classes provide students with additional opportunities to further refine their skills in scientific writing and speaking.

Also, a significant number of the Department’s students also present their work in posters and/or oral presentations at the College of Science Research Day, the Santa Clara Valley ACS Undergraduate Research Conference, CSU Program for Education and Research in Biotechnology (CSUPERB) and at national meetings such as the biannual ACS Society Meetings.

Graduate Degree Programs (M.A./M.S.)

Graduate degrees in Chemistry emphasize research, and the Department is working to create SLOs that focus on the skills required for all aspects of research. Due to under-staffing of faculty, the Department currently offers only one or two graduate level courses per semester. The Department has decided to increase graduate course offerings by pairing graduate courses with Upper Division Undergraduate courses that share relevant topics related to modern chemistry: Chem155/270 in Sp11 and Chem130C/231 in F11. To make this arrangement successful, graduate students share instructor time with undergraduates but must complete extra assignments including a term paper and oral presentation. It is expected that graduate students perform tasks with more in-depth knowledge and understanding of research and analysis as it pertains to their topic of study. The Department graduate program is transitioning and expects to develop more
assessment measures linking student research and research-related activities to the graduate SLOs.

**SLO1–To demonstrate an advanced understanding of selected topics in chemistry.**

**Assessment:** Instructor observation of satisfactory performance of research-related written projects: term paper, oral and poster presentations, Preliminary Seminar, Final Seminar, and Thesis.

The Department is updating SLO wording to reflect the importance of student understanding of research topics and research techniques. Assessment will include research-related projects, such as the Preliminary Seminar, Final Seminar and written thesis, along with course exams.

**SLO2–To demonstrate information literacy skills for acquiring knowledge of chemistry, both as a student and as a life-long learner.**

**Assessment:** Instructor and thesis committee observations of student proficiency of literary skills in writing: term paper with use of rubric, and thesis.

In 2005, the Department developed and implemented a term paper rubric, assessing student proficiency in the use of in-text citations and bibliography. This data is used to assess student literacy skills from each term paper required at the graduate level. Accurately citing text in a term paper is an important topic of discussion in lecture courses.

**SLO3–To demonstrate an understanding of experimentation, observation and data analysis, and their application to defined questions in chemistry.**

**Assessment:** Instructor and thesis committee observations of student performance during oral exams and presentations using the guidelines to determine proficiency.

New guidelines for the Preliminary Oral Exam have been approved and implemented in Spring 2011. Creating a rubric from these guidelines is next. Assessment for SLO3 includes: the Preliminary Seminar, Final Seminar, and/or Final Oral Exam (thesis defense).

**SLO4–To demonstrate a familiarity with available instrumentation for conducting specific scientific research.**

**Assessment:** Faculty research mentor and thesis committee observations of student research-related activities and thesis.

The Department assesses student ability to use instrumentation in scientific research by a student’s success level in obtaining the experimental goals of their specific research project. Supplementary data may be obtained at the thesis-writing stage by students listing instruments used during their thesis project, including computer software packages.

**SLO5–To communicate effectively, verbally and written, for the purposes of conveying chemical information to both professional scientists and to the public.**

**Assessment:** Student proficient performance on WST, GRE verbal score, and satisfactory completion of Chem100W; instructor and student observation of oral presentations using the guidelines and term paper rubric to determine proficiency.

In 2005, the Department implemented the term paper rubric to assess effective communication while conveying chemistry information in written form. The Department expects
the Preliminary Seminar Rubric to be used in assessment. Students entering the graduate program must exhibit proficient writing skills by passing the WST. The Department needs to emphasize the verbal GRE scores when making admission decisions and needs to advise graduate students to complete Chem100W before enrolling in graduate lecture courses.

WASC Program Outcomes Rubric

Comprehensive Program Rubric

The Department’s Comprehensive List is Developed with some characteristics of the Highly Developed category.

The Comprehensive List includes reasonable outcomes and specifies expectations for the program in the categories of communication, critical thinking, and information literacy. The Department has considered national disciplinary standards in the use of the ACS and DUCK exams at a Highly Developed level. Faculty agree explicitly on the criterion that students achieve a “C” grade or better, before advancing in the curriculum, and the Department has created rubrics to assess student writing at the upper division and graduate levels to help distinguish learning outcomes between upper division and graduate levels of writing competency.

Both undergraduate and graduate SLO1 speak to student ability to understand concepts and content of chemistry topics; distinguishing between the undergraduate’s working knowledge of selected chemistry topics and the graduate’s advanced understanding of chemistry topics. The undergraduate SLO2 assesses the undergraduate’s ability to be safe in the lab; the graduate SLO4 addresses the graduate’s ability to use lab instrumentation, but not lab safety. The undergraduate SLO3 assesses the undergraduate’s ability to effectively communicate, and higher levels of sophistication are distinguished by graduate SLO2, 3, and 5. Graduate SLO2 distinguishes the graduate’s ability to specifically include literacy skills in writing, and graduate SLO3 develops the graduate’s ability to demonstrate effective communication of experimentation, analysis, and application. Graduate SLO5 applies the graduate’s ability to communicate to a specific audience: professional scientists or the public. This distinction in sophistication could be made clearer if the undergraduate SLO3 defined its audience. While outcomes are appropriate for each level and there are distinctions between undergraduate SLOs and graduate SLOs, some of the distinctions are implied or vague and could be revised to be more explicit and clear. The Department plans to revise and align each SLO to assess student level of mastery at each outcome, thus creating a clearer distinction between undergraduate and graduate levels.

Assessable Outcomes

The Department’s Assessable Outcomes are Emerging with some characteristics of the Highly Developed category.

Department criterion marks SLO assessment as a student’s ability to reach a “C” grade, or better, in coursework before continuing to the next Chemistry course. Students demonstrate their learning through their performance on the ACS and DUCK exams, and faculty have explicitly agreed on criteria statements in the form of rubrics for the upper division term paper and graduate term paper, and of guidelines for graduate Preliminary Seminar (working toward rubric). The rubrics do have explicit criteria for “does not meet,” “meets,” and “exceeds expectations.” The Department plans to create departmental rubrics for upper division oral presentations and lab reports for lower and upper division levels. The Department acknowledges
that developing departmental rubrics for the outcomes that do not possess a rubric would be beneficial to the standardization of student assessment.

In order to develop student examples that represent the different levels of mastery, the faculty turned in student samples that reflect grades of “A”, “B”, “C”, and “does not meet” student work related to specific teaching assignments. The Department plans to review and analyze student samples collected by to further assess expected Department-wide learning results and explicit assessment criteria.

Alignment

The Department’s Alignment is Emerging with some characteristics of the Developed category.

The Department has given students opportunities to learn and develop with increasing sophistication, but most of these opportunities have not been explicitly aligned to specific outcomes. The Department has intentionally developed the student-led Academic Excellence Workshops to improve student understanding and performance in Chem1A for undergraduate SLO1. Students are given opportunities to develop increasing sophistication through participation in RISE and MARC programs for the minority student population; in SAACS club; in advising and research mentoring; and in co-authoring of research articles, oral presentations, and poster presentations. The Department plans to deliberately align these learning development opportunities to the specific outcomes just as the Department has done with the distinct connection between AEW and Chem1A. There are aspects of a relationship between outcomes and the curriculum, but more of this relationship is implied rather than explicit. The intentional alignment and curriculum progression summary will make the Department more Highly Developed in this category.

Assessment Planning

The Department’s Assessment Planning is Developed.

The Department has created a reasonable multi-year component to the program which includes multiple levels of progressive assessment: the ACS General Chemistry–Chem1A/B, the ACS Organic Chemistry–Chem112A/B, and the DUCK–Chem146/Chem131B exams given in relationship to course progression. The graduate level has a Preliminary Seminar guideline for oral presentation but not at the upper division level, and there needs to be an oral presentation rubric at both levels. There are separate term paper rubrics at the upper division and graduate levels, and undergraduate SLO2 is assessed after Chem120S. While the Department recognizes undergraduate SLO3 as being assessed after Chem100W, achievement of upper division standing and passing WST, it can also be inferred that SLO3 is assessed throughout the undergraduate program. The Department has a general plan for student assessment in that a student is required to achieve a course grade of “C”, or better, to continue to the next course but does not include specific SLO assessment. The assessment does not include implementation of improvements; however, the Department plans to develop a curriculum map that aligns the curriculum with SLOs and will include the plan for assessment of the aligned outcomes. Once the plan is made more explicit, the Assessment Planning will be Highly Developed.

The Student Experience
The Department’s Student Experience is Emerging with some characteristics of the Developed category.

Students have some knowledge of the expected learning outcomes; however communication has been left to individual faculty in most instances. Faculty give students Green Sheets at the beginning of each course with course expectations of lecture and assignment outlines and includes the learning objectives. Faculty state that students will be assessed through varying forms of assessment; however, it is unclear whether or not faculty have aligned a specific assessment to SLOs that relate to each course. It may not be clear to students how learning outcomes of the degree program are specifically assessed within each course. Some faculty give rubrics to their students, but it is unclear whether all of the faculty do this. Some faculty give graduate students the opportunity to peer review oral presentations and term papers, using the Department rubrics, but it is not an explicit practice.

At the undergraduate level, the stronger students do lead the Academic Excellence Workshops and in this environment, they have complete freedom to incorporate learning material they think will benefit the students taking the workshop. However, the majority of students have not been included as partners with faculty in defining and applying the outcomes and the criteria for levels of sophistication. Faculty do communicate learning outcomes to students in each course, and SLOs are posted on the Undergraduate Studies Assessment web pages. At the end of each course, students are given the opportunity to evaluate the instructor and course, rather than the opportunity to review student learning outcomes. The Department recommends that the course evaluation be revised to more explicitly provide the students the opportunity to review the SLOs as they apply to the course, criteria for the course, and the course in relationship to curriculum design.

The Department has determined expectations for successful completion of Chem1A/B, Chem112A/B, for achieving upper division status, and for successful completion of a capstone course, Chem114, Chem146 or Chem131B. The expectations for the graduate thesis are in the Graduate Student Handbook and on the Graduate Studies and Research web page. The Departmental rubrics and SLOs are available as an on-line link for students to access. The Department recommends that the Thesis Committee develop agreed upon general topics to use for their deliberations, allowing Research Advisors to better mentor their students and giving students general expectations for thesis performance.

Summary

The SJSU Chemistry Department has the potential to be one of the Bay Area’s strongest centers of educational and scholarly excellence in the molecular sciences. With strategic investments in human resources, instrumentation, and facilities, the Department can achieve this ambitious goal. Most students graduating with chemistry degree either work in the Bay Area high technology industry or attend graduate and professional schools. An educational program leading to student success in these arenas provides students with a broad foundation in the sciences and mathematics; a deep understanding of current problems, methodologies, and limitations in their chosen field of specialization; effective communication skills, and advanced problem solving skills. To assure these achievements, the Chemistry Department promotes these learning outcomes in its curriculum by combination of rigorous classroom and laboratory course requirements, challenging writing and capstone coursework and engaging research opportunities. As the chemistry field further expands, forming interdisciplinary connections with
biology, medicine, energy science, and green technologies, the relative importance of the learning outcomes is shifting with breadth of scientific education and advanced problem solving skills becoming more important for an educated chemist. Accordingly, the Department aggressively seeks to strengthen those parts of the program that promote these outcomes. To this end, the Department has identified two priorities: curricular revision to rebalance the learning outcomes and enhancement of research activity.