Transfer Major Core Chemistry Program Review 2006-2007

1. Program Description and Scope.

The transfer major core chemistry program offers lower-division major field courses for science transfer students, general education credit for those transferring to the California State University or University of California systems, required courses to fulfill major requirements in two year terminal programs, and general education credit for AA and AS degrees. The transfer major program in chemistry serves students seeking professions in the sciences as well as life-long learning.
The public school system of higher education in California is three-prong:
Community Colleges = first 2 years
CSU = both lower and upper division leading to bachelors or masters degree
UC = full program leading to PhD
Since the Community College system in California was created to provide the first two years of college training, preparing students to transfer to either the SCU or the UC system, it is imperative that Ohlone College courses are equal in quality and rigor to the equivalent lower division classes at CSU or UC

This program enables students to develop a strong foundation in chemistry for successful transfer as described above. Furthermore, the theoretical knowledge and laboratory skills acquired by students in this program also enhances their success with obtaining entry-level jobs that require two years of college-level science.

In this program we have the following courses: Chemistry 101 A and B which is General Chemistry and is the feeder of several other science courses such as, Biology 101A, Engineering 140, and Chemistry 112 A and B which is organic chemistry

The department currently has 3 full time instructors however one of them (Yvette Niccolls) has been assigned as Coordinator of the division and currently has zero teaching load. We have 7 part time instructors and unfortunately they tend to change frequently. The department WSCH/FTEF is consistently over 500 except in summer of 2005 when it fell to 477. The number of adjunct rises steadily. In 2003 it was 1.6 whereas it is 3.0 in 2006. Part time instructors are increasing for two reasons: we are now offering more sections and also Prof. Niccolls' teaching load has been assumed by part time teachers.

During the summer sessions student retention and success are high, probably due to the large number of motivated high school students enrolled in the courses. When Chem 101A or B are offered during the summer, the course last two weeks more than the regular summer session. During the spring and Fall atrition is about 50%. This high number is not surprising due to the rigorous nature of the program transfer chemistry courses. However we expect than once the changes that we are proposing have been implemented student success will be greater

2. Relationship to Ohlone College Mission and Goals

The chemistry transfer program actively supports and implements the goals, objectives and strategies of Ohlone College.

Vision: Ohlone college to be known throughout California for our inclusiveness, innovation and superior rates of student success.

Students taking the transfer major core chemistry courses offered at Ohlone college are receiving a top grade education comparable to one they would receive at any CSU or UC. These are rigorous courses that require time effort and dedication from the student in order to succeed. We are constantly innovating technologically and educationally. Instructors often attend workshops and seminars in order to improve their knowledge and expertise in the area.

Goal 1: Promote appreciation and understanding of diverse races and cultures by expanding the diversity of college personnel, international education offerings and exchanges, cross-cultural curricula, and ethnic/cultural events.

Our college goals state that we strive to reach diverse populations. The chemistry department is striving to develop programs and course curriculum, which attract and retain the underrepresented student population, which is currently missing from our program. For example, even though the local school districts have 40% Latino/Hispanic population, there is only 5% in our chemistry classes. The instructors are developing the Chemistry Tech program as well as assisting with the LAB project, which reaches out to underrepresented high school and junior high students.

Goal 2.: Develop across the curriculum the Learning College Model, utilizing methods and technologies that hold the most promise for improving student course and program completion success rates.

During the review of this program, Maru Grant and Jim Baxter discussed ways to improve success for students in this field. Students traditionally have had much difficulty succeeding in this program. We noted that many of the same students are enrolled in Chem 101B and Biol 101A, by working closely together, we could find ways to help this cohort of students succeed. This collaboration was expanded to include Chem 112A/B as well.
The formation of a Learning Community was proposed in order to increase the success of students enrolled simultaneously in both biology and chemistry, specifically:

			General Chemistry (101A or 101B)
General Biology (101A or 101B)	+	or	
			Organic Chemistry (112A or 112B)

We believe this collaboration will benefit students in the following ways:

- Students will appreciate the pervasive connectedness between biology and chemistry. Fundamental cross-disciplinary themes will be emphasized. If all the instructors stress the same identical principles this will help students see commonalities. Students will better appreciate how the concepts in one are intimately entwined and mutually support the other
- More efficient learning will take place by virtue of the commonalities.
- I would be very helpful to students if there is greater consistency in methods of instruction. . While it is certainly true that no two teachers teach alike and students can often adapt to differences in teaching styles, still the struggling, sleep-deprived student who is barely able to keep up with the torrent of material coming from both biology and chemistry would be greatly helped by collaboration.
- Instructors can strive to align their policies between chemistry and biology. Students would benefit from similar requirements in both disciplines. Students would already be familiar with rules and expectations. They would encounter similar philosophies regarding partial credit, essay questions, tardiness, neatness, punctuality, safety, make-up tests, etc.
- Students will see many of the same students in both their biology and chemistry course, forming friendships and study teams, thus greatly increasing student support and boosting student morale.

Goal 3: Develop strategies to increase the proportion of full-time students including learning communities, cohort groups, enhanced facilities and improved course availability.

All the transfer major core chemistry courses include a Concept Review course. This course provides students with much extra support and practice needed for success in these challenging courses. In addition, Ohlone's Chemistry/Biology Learning Center offers expanded hours this year, – this is increasing student retention. We offer morning and evening sections in order to make our courses accessible to the diverse needs f our community.

Goal 5: Promote the health, environmental, cultural and economic vitality of the communities served by the District through programs of outreach, community service and partnership ventures.

The Math, Science and Engineering Division offers a weekly Brown Bag Science Seminar which features speakers from the science professions who enlighten attendees in current topics of science. The Chemistry department has been an integral part of organizing and promoting this event. Students in the Transfer major courses and the community in general are strongly encouraged to attend the weekly science seminars offered at Ohlone College.

3. **Program Student Learning Outcomes**

Students enrolled in the transfer major core chemistry courses will develop critical thinking skills necessary to:

1. Understand and be able to apply the major chemistry theories
2. Apply scientific principles to specific circumstances or problems.
3. Apply math skills to solve scientific problems and/or situations.
4. Construct program graphs from raw data
5. Analyze graphical representation of scientific data
6. Demonstrate correct laboratory techniques
7. Apply safety rules in the practice of laboratory investigations
8. Demonstrate proper protocols "SOP's" of common scientific equipment such as pHmeter, voltmeter, Spectrophotomer, etc.
9. Analyze data collected during laboratory investigations

4. Assessment of Student Success in Reaching Program Outcomes

Student learning outcomes are assessed with a variety of measurement methods, which are often unique to the instructor and course. In addition to that, we recognize that the American Chemical Society Standardized Exam is accepted nationally as an powerful assessment tool for indicating how a programs compare at different schools across the nation. This is the first year that Ohlone College has administered the ACS exam. Our students' performance on this exam was superior – in the top quartile. Using this assessment tool we will thus be able to track our students' improvement and thus this may reflect the success of changes and improvements that have been implemented in our program.

5. Assessment of Program Through review of the Teaching Learning Process.

For a long time both the biology and chemistry teachers have observed many students commenting "oh, we are going the same thing in biology or chemistry!" In other words, the students have always known that this "learning community" existed, but unfortunately there were no formal efforts to recognize and nurture this cohort of students. By collaborating and maintaining frequent communication, the team will intentionally seek out and highlight shared topics and themes.

Here is one example: a very fundamental principle taught in chemistry is "bonding" and students learn that energy is required to break a bond. In short, bond breaking is always an ENDOthermic process – losing or giving up energy. But students are confused to learn in biology how the breaking of the phosphate bond in ATP appears to release enormous energy (an EXOthermic process) as if somehow this is an exception to what was taught in chemistry. By working in collaboration, both biology and chemistry instructors can be alert to this apparent contradiction. They would show students that in fact breaking the phosphate bond in ATP is endothermic – requires energy – but this is coupled with a second spectacular energy-releasing reaction.
Even the terms used are different:

	in CHEMISTRY	in BIOLOGY
an energy-releasing process	"exothermic"	"exergonic"
an energy-absorbing process	"endothermic"	"endergonic"

Chemistry and biology teachers can alert students to differences of this sort.
Another example, currently the topic of “entropy” is a major concept and driving force in both chemical and biological processes – perhaps instructors could dialogue ahead of time about how it is taught and why it is important to the other. Then it would be taught in a much more recognizable manner reducing student confusion and enhancing retention.

Often the student had great difficulty trying to succeed in both subjects. Too many times a student ended up dropping one in order to succeed in the other, those student who did survive – somehow passing both classes – their grades and understanding took a real toll. In other words students felt that their taking one was actually diminishing their success in the other. By actively seeking out and highlighting commonalities, the biology and chemistry instructors will each teach a bit of the other subject.
The example was already mentioned where the chem. 101 instructor would be sure to teach dephosphorylation of ATP and how two reactions are coupled to produce a net energy release. Likewise the biology instructor might stress organic chemistry processes and principles to compliment the concepts in Organic chemistry. Communicating closely together, instructors will present examples which reinforce the subtleties of the other.

6. Assessment of Program Improvement Since Previous Program Review

During the developing of this program review we realized that the students entering chem. 101A were not adequately prepared for it. We feel that High School preparation is very difficult to verify and led to spot preparation decreasing success rate in Chem 101A, therefore High School Chemistry is no longer accepted as a prerequisite for Chem 101A and student now have to complete the prerequisite chemistry course offered at Ohlone. Students may challenge the Chemistry 102 prerequisite by taking the American Chemical Society Chemistry Placement Test. This test is recommended only for those students whose preparation on High School Chemistry is outstanding or who have completed and introductory chemistry course.
Another reason for Chem 101A low success rate is that the prerequisite course chem106A had a variety of types of students: students for health allied sciences, students that needed the course general education and students majoring in science. It was difficult to set a standard to prepare students adequately for all these purposes. Therefore we created a course that would exclusively prepare students for chem. 101 A. In this course (chem. 102) students will learn the basis of chemistry but also will develop critical thinking in solving chemistry problems using their mathematical knowledge.
This course has already been approved and is also UC, CSU transferable.

The need for this course was already established in the program review of 1999-2000.

Another advantage of doing this report was the creation of a science learning community Many students who successfully complete Chem 101A and 101B will go on to take Bio 101A and Organic Chemistry. The instructors involved are:

- Maru Grant – Chem 101A, 101B
- Jim Baxter – Biol 101A, 101B
- Anu Ganguly – Chem 112A, 112B

These instructors have formed a Biology/Chemistry Learning Community. We already see evidence that this is enhancing students' success in these courses. We have been analyzing the weaknesses and strengths of some students that are currently taking O-Chem and Biology. Careful analysis of the curriculum is being made and the committee is verifying that topics of vital importance for these courses are being taught in a consistent way.

We are also integrating technology in the classroom

The Chem 101A/B classes would be taught using effective visual files and a tablet pc with the software "Camstasia". This technology provides recording of the complete lecture including slides, notes and audio, then it gets downloaded to the internet, either to WebCT or to iTunes University. Students of this learning community will be able to review their classes and the instructors will be able to share opinions on improvements. During lecture we will be using immediate response devices, commonly called "clickers". This technology provides the instructor with instant and frequent assessment of student understanding. It also creates an interactive classroom where all students participate, including the shy ones. This technology also provides a quick way to take attendance.

These courses are web-enhanced. Using WebCT, the students will have access to their courses, homework, notes and assignments. There will be discussion topics so they can interact among them, send messages and receive any updates or changes in the course.

Homework can be assigned on line via WebCT or using the program called OWL (On-line Web-base Learning). OWL helps students improve their problem solving skills and visualize concepts, providing instant analysis and feedback to their responses, they can retry the problems as many times as needed until the concept has been mastered. There is variety of homework problems, including tutors, simulations, and short answer questions. Instructors can view cumulative statistics for each student including assignments attempted, total time spent on assignments, total number of questions submitted and so on. It allows the instructor to easily find students at risk and provide help before it is too late.

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7. Describe Review and dissemination Team involvement

Dr. Ron Quinta
Dean of the Math, Science and Technology Division. Provided constant encouragement and support. He made many helpful suggestions. His experience as a former Biology instructor was abundantly helpful.

Yvette Niccolls
Coordinator of the Math, Science, and Engineering Division, working closely with all teachers involved. Ms. Niccolls has vast experience in the teaching of these transfer major core courses and her valuable input was an important key to the development of this program review and the formation of the learning community.

Dr. Maru Grant
Faculty member in the program, was a crucial member of the team since her students feed into numerous other programs. Therefore she made great improvements: such as adding and updating the technology to get students' excited about chemistry; for example, she uses immediate response devices where all students participate electronically in every lecture; also she introduced an innovative "PC Tablet" whereby her written work during lectures is projected and saved online, so students may view it again and again. Faculty members in the program

Dr. Jim Baxter
Faculty member outside the program, whose input was helpful since he could share with the chemistry instructors exactly what skills the biology students need and which chemistry topics were most important. Currently the Learning Community is planning additional ways to collaborate in their teaching.

Student recommendations are given serious consideration in our ongoing efforts to improve.