

Department of Chemistry
Program Review (2008-2009)

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* The author of each section is given in parentheses. Each author is a member of the full-time chemistry faculty. Robert McLeod was responsible for the overall coordination of the program review and piecing together the document into a unified whole. The Dean of Natural Sciences, Jean Shankweiler, contributed significantly as a resource person and greatly helped with the proofreading.

I. Overview

A. Program Description

The Chemistry Department at El Camino College offers two “tracks” of courses. The longer sequence is essentially university parallel, beginning with a high-level preparatory course, Chemistry 4, continuing with General Chemistry, Chemistry 1A and 1B, and finishing with Organic Chemistry, Chemistry 7A and 7B. The courses are transferable to University of California and California State University campuses and fulfill their comparable requirements; however, at some universities, the transferring student must individually request acceptance of our organic courses for upper division credit and/or take the American Chemical Society exam. We feel that this is a strong program and we aim to keep it strong. Our faculty have sufficient experience at other schools for it to be apparent that our courses are above average in rigor. As compared to the textbooks commercially available for a given course, the textbooks we use are above average in rigor.

The shorter of our two tracks is a choice between “Fundamentals of Chemistry,” Chemistry 20, for students who plan to obtain a R.N. or Allied Health Certificate from El Camino College, and “Inorganic, Organic and Biochemistry,” Chemistry 21A and 21B, designed for those seeking to transfer to a bachelor of science in nursing or other health-oriented bachelors degree program

All of the above courses fulfill general education requirements for physical science with laboratory, but Chemistry 20 is probably the broadest and most suitable for non-science majors.

“Introduction to Research,” Chemistry 99, is another course offering; it is designed to enroll one or two students per semester to explore special problems of interest and often help design laboratory assignments for classes.

The Chemistry Department currently has seven (7) full-time permanent faculty positions. One of these faculty is on a leave of absence teaching at another community college in a tenure track position. For now and the near future, our classes are being taught by the six remaining full-time faculty and fourteen adjunct faculty. This is the fewest number of full-time faculty our Department has had in past thirty five (35) plus years. Just six years ago we had ten full-time faculty members. Four full-time faculty members resigned or retired in the past six years, with only two positions being replaced. We are approved to hire one new full-time position to begin fall 2009. The number of course sections and thus the enrollment in chemistry has actually increased over the last six years.

B. Status of Previous Recommendations

Three of the more important recommendations from our last program review have been completed or partially completed as listed below.

- *Recommendation:* To obtain internet connections and a LAN, more computers, software, one printer and a server for the stockroom.
Status: Completed. All our rooms are now wired for the internet, we now have a new 30-computer Chemistry Computer Lab, a three computer faculty computer lab, a computer in every lecture and lab with accompanying multimedia hardware, Spartan and Odyssey educational software, and a network laser printer.
- *Recommendation:* To establish a plan for the replacement or renovation of infrastructure, the major need being the replacement and addition of hoods and the addition of more electrical circuits.

- *Status:* Completed. The chemistry building has been completely renovated and modernized since our last review. The number of hood stations and electrical circuits were increased resolving earlier safety problems.
- *Recommendation:* To establish a plan for future updating or replacement of computers and other equipment.
Status: Partially Completed. Obtaining new equipment (NMR, GCMS, et cetera) has been funded via grants. The department maintains a list of equipment needs that are to be funded by appropriate sources which varies depending on the equipment. A detailed plan for replacing computers has not been made; at the very least such a plan has not been communicated to the Chemistry Department.

Other recommendations from our last program review and their current status are summarized in the table below.

We need more functioning hoods.	Completed
Tutoring needs to be tied more closely to the department and to individual courses. All of the chemistry tutors on campus need the approval of and coordination with the chemistry department.	Partially Completed*
We need to consider activation of Chem 11/12	In Consideration
We need reliable access to division copy machine or another machine on campus for some of our copying. A card system would be ideal.	Partially Completed
Faculty need to be networked to a local printer and to the internet.	Completed
We recommend pro-rata part-time faculty pay, or at the least, that ECC pay part-time faculty for holding office hours.	Incomplete*
We recommend Math 40 or 41B (elementary algebra) as a prerequisite for Chem 20 and will conduct whatever review process that is required. [Math 40 or 41B is also required by the nursing program.]	Completed
We need a plan for regular review and revision of course outlines and lab manuals.	Completed
We need a department chair to coordinate all the activities of the department and to provide proactive leadership as the department plans for the future.	Incomplete
We need a lead technician who is a chemist and who coordinates with representatives of the faculty and, in the future, the department chair. We recommend a study of the technical support structure.	Incomplete
We will consider the use of common final exams and common problem sets among various sections of Chem 4 and Chem 1A.	Decided Against
We will consider formalized mentoring of both new faculty and part-time faculty, and perhaps orientation in addition to the written instructions.	Incomplete
We need to develop a plan for replacing the faculty who will soon retire.	Incomplete
We will seek better coordination with the counselors and the testing center.	Completed
We will reevaluate the effectiveness of the chemistry placement test. We believe that multiple test forms and perhaps a higher cutoff score are needed.	Incomplete
We recommend a chemistry budget for building replacement or renovation.	Completed
We recommend a chemistry budget item be designated for equipment.	Incomplete
We will investigate what progress has occurred in routinely crediting the chemistry department with the breakage fees collected.	Incomplete
We need to acquire more computers both for multimedia capabilities in lecture rooms and for data acquisition and analysis in labs.	Partially Completed

We have been keeping an ongoing “wish list” since 1996, and recommend acquisition of the items that have not yet been purchased.	Ongoing
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* Partially Completed: moderate to significant progress made.
 Incomplete: little to no progress made.

II. Program Statistics and Analysis

A. Demand: FTES by Course (using first census data)

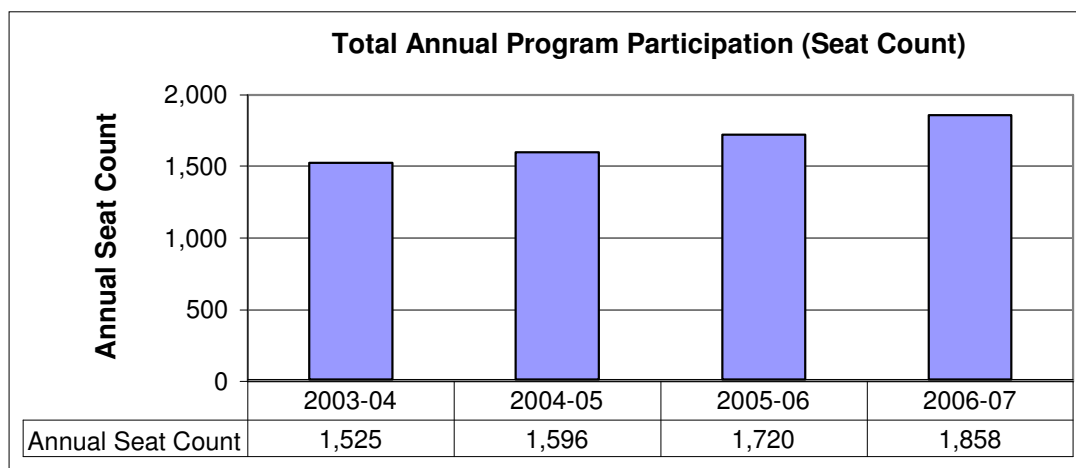
Course	Fall 2004	Fall 2005	Fall 2006	Fall 2007	Fall 2008
Chem 20	24.27	23.02	25.02	31.51	31.52
Chem 21A	26.19	35.24	36.06	34.07	34.72
Chem 21B	0	0	5.99	5.54	6.43
Chem 4	64.12	70.95	72.57	65.53	81.51
Chem 1A	55.43	47.43	53.54	60.35	55.52
Chem 1B	15.66	16.63	16.96	18.26	19.25
Chem 7A	15.62	16.88	14.34	15.30	23.26
All Chem Courses	201.26	210.14	224.45	230.52	252.19

As the data in the above table show, the demand for chemistry courses has been steadily increasing for many years. Over the last five fall semesters the overall demand has increased in each successive year without exception. From fall 2004 to fall 2008, department total FTES has increased by 25% from about 201 to 252. All individual courses show an upward bias in demand; none shows an indication of decreasing demand.

To help meet student demand the Chemistry Department began increasing the number of sections of Chem 20 (in 2007), Chem 21A (in 2005), Chem 21B (in 2006), Chem 4 (in 2008) and Chem 7A (in 2008). The Department has had pent up demand for more sections for many years. The reasons more sections were not offered sooner and additional sections are not currently offered is due to lack of administrative approval to offer more sections, lack of a sufficient number of qualified faculty, and lack of classroom space (at popular scheduling times) appropriate for teaching chemistry.

B. Offerings and Fill Rate

The graph below shows that the number of seats taken by students has increased by significant jumps every year for the past four years. The annual seat count has increased by 22% from 1525 to 1858.



The table below shows that the increasing annual seat count was due to three main factors. First, there has been a steadily increasing number of sections offered. Second, there was a high demand for these

additional sections since the seat count increases exceeded the class sizes of the sections added. The class size for all chemistry classes is 31 except for Chemistry 7A and 7B which are 24. In 2006-07 seven more sections (217 more seats) were offered than in 2006-07, yet the number of students increased by 333. Third, the relatively level value of the “average seats/unduplicated students” indicates that there is a constant steady supply of new students enrolling in chemistry classes.

Academic Year	2003-04	2004-05	2005-06	2006-07	4 Yr Average
Annual Section Count	47	49	51	54	50
Annual Seat Count	1,525	1,596	1,720	1,858	1,675
Unduplicated Students	1,078	1,163	1,250	1,339	1,208
Avg Seats/Unduplicated Students	1.41	1.37	1.38	1.39	1.39

The table below shows that the fill rates for both day and evening chemistry classes is extremely high and holding steady over that past five years.

Fill Rate (seats taken at census vs class size)

Class Times	Fall 2004	Fall 2005	Fall 2006	Fall 2007	Fall 2008
Day Classes	97.4%	100.2%	101.0%	101.5%	103.6%
Evening Classes	98.1%	95.7%	106.5%	99.5%	99.5%
All Chem Classes	97.6%	99.0%	102.4%	101.0%	102.7%

All the data in the above sections IIA and IIB of the program review are consistent with a high level of demand for chemistry class as well as pent up demand for more. When we offer new sections they fill. There is more demand than we are currently able to meet.

C. Retention and Success Rate

Chemistry courses are generally known as demanding courses. Success in a course is dependent on several factors. Students must have adequate preparation from the math and/or chemistry prerequisite for the course. Students must have the discipline to study and learn between classes so that they come to class prepared to use previously discussed material in the learning of new material. Study typically requires repetition of the material as well as a great deal of time.

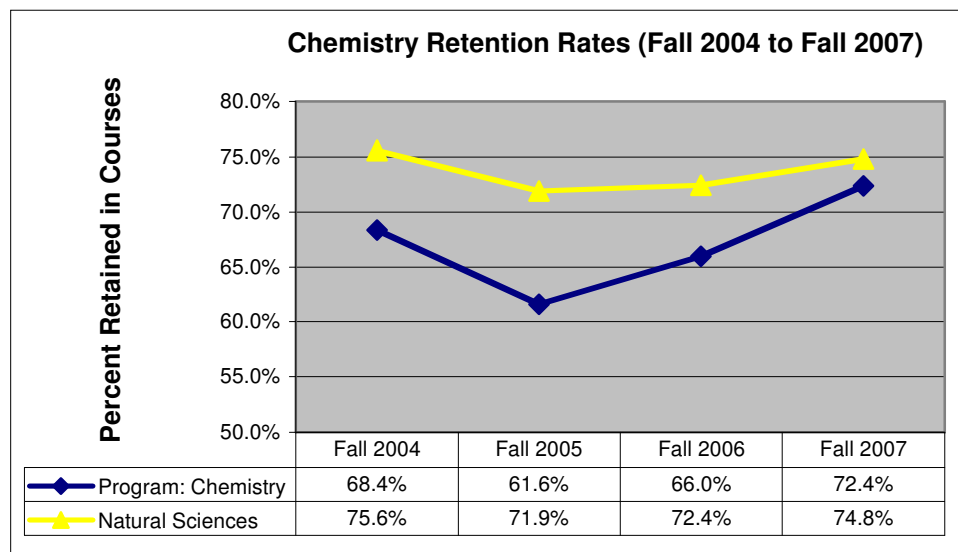
Based on a large amount of anecdotal evidence observed by many faculty over many years in many different courses, chemistry faculty find that the single greatest impediment to retention and success is lack of studying. Although this point is difficult to support with data and anecdotal evidence is normally not acceptable proof, the amount of evidence in this case is so great we feel that it is a valid conclusion. Despite teacher suggestions and the resources available, many students don't even take the time to figure out how to study chemistry effectively. Course material builds on itself, so any gaps in knowledge make later topics more difficult to learn. As a result, catching up is nearly impossible once a student falls behind.

The data in the tables and graphs below indicate that chemistry retention and success rate averages are lower than the Natural Sciences Division whose results are lower than those found campus wide. Faculty feel strongly that maintaining high standards to better prepare students for transfer to universities is paramount to maintaining our excellent reputation with the universities as well as later student success after transfer. Accordingly, slightly lower retention and success rates are expected in highly demanding courses such as chemistry.

Retention Rate (census vs end of course)

Course	Fall 2004	Fall 2005	Fall 2006	Fall 2007
Chem 20	82.8 %	65.9 %	66.0 %	79.8 %
Chem 21A	63.8 %	65.2 %	64.8 %	66.0 %
Chem 21B	—	—	51.9 %	66.7 %
Chem 4	63.6 %	67.1 %	67.8 %	64.2 %
Chem 1A	59.6 %	41.8 %	69.3 %	83.8 %
Chem 1B	77.8 %	64.7 %	59.6 %	63.6 %
Chem 7A	91.8 %	71.7 %	64.4 %	78.7 %
Chemistry Overall	68.4 %	61.6 %	66.0 %	72.4 %
Division Overall	75.6 %	71.9 %	72.4 %	74.8 %
ECC Overall	80.3 %	77.7 %	77.6 %	77.3 %

Since most chemistry courses are part of a sequence, the more demanding courses tend to have better students. As a result and as the table above and graph below show, “easier” and “harder” chemistry courses tend to have similar retention rates. Most individual courses have a great deal of variation in retention rate. The extent to which this variation is due to different faculty, less than a statistical sample size, or other factors is not clear.

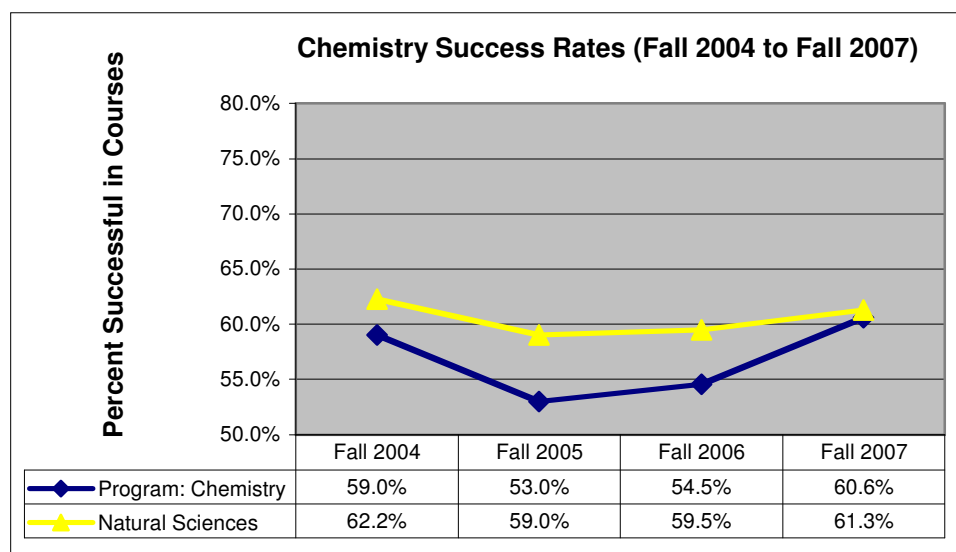


The obvious trend here is the substantial increase in retention rate after bottoming three years ago. From fall 2005 to fall 2007, the overall chemistry retention rate has increased by 18% from 61.6% to 72.4%. The same trend may be found for the Natural Sciences Division except that it is not nearly as pronounced as for chemistry. As a result the chemistry retention rate is now only slightly below that of the division whereas it was substantially below. Meanwhile, the campus wide average has been relatively stable.

The various above comments concerning retention rates also apply to the success rates as may be seen in the table and graph shown below. From fall 2005 to fall 2007, the overall chemistry success rate has increased by 13% from 53.0% to 60.6%.

Success Rate (census vs received C or better)

Course	Fall 2004	Fall 2005	Fall 2006	Fall 2007
Chem 20	81.8 %	51.6 %	54.6 %	67.7 %
Chem 21A	56.0 %	59.0 %	50.0 %	52.6 %
Chem 21B	—	—	51.9 %	62.5 %
Chem 4	51.8 %	55.7 %	55.9 %	50.5 %
Chem 1A	49.4 %	34.9 %	56.0 %	72.6 %
Chem 1B	64.4 %	62.7 %	51.9 %	52.7 %
Chem 7A	79.6 %	66.0 %	62.2 %	72.3 %
Chemistry Overall	59.0 %	53.0 %	54.5 %	60.6 %
Division Overall	62.2 %	59.0 %	59.5 %	61.3 %
ECC Overall	65.4 %	63.3 %	62.8 %	62.8 %



To maintain and possibly continue to improve retention and success, it is important that we continue to have MESA workshops facilitated by well chosen individuals. Campus provided tutors are also important. In beginning level courses particularly (Chem 20, 21A and 4), we should be sure that students are aware of and encouraged to enroll in courses on how to study and how to use their time efficiently. The thorough mentoring of new (full-time and adjunct) faculty is also important to retention and success. Mentoring is always a challenge to do on a consistent basis since there is no one in charge of it (such as a department chair). We get really busy during the semester and we currently have so many new and adjunct faculty that we don't have enough faculty to do the mentoring. Adjunct faculty should be more available to students by requiring them to hold office hours.

III. Curriculum

As the table below shows, five of our eight fully transferable courses have been reviewed and the course outline updated within the last two years. The other three need to be reviewed soon. Of our two courses with limited transferability, one was reviewed five years ago and the other is overdue for review.

Course Number	Course Title	Course Outline Date	Transferability
Chem 20	Fundamentals of Chemistry	Nov 2001	Fully
Chem 21A	Survey of General and Organic Chemistry	Oct 1998	Fully
Chem 21B	Survey of Organic and Biochemistry	Oct 1998	Fully
Chem 4	Beginning Chemistry	Nov 2007	Fully
Chem 1A	General Chemistry I	Fall 2007	Fully
Chem 1B	General Chemistry II	Feb 2008	Fully
Chem 7A	Organic Chemistry I	Fall 2008	Fully
Chem 7B	Organic Chemistry II	Fall 2008	Fully
Chem 50	Special Topics in Chemistry	1996/1997	Limited
Chem 99	Independent Study – Introduction to Research	March 2004	Limited

We are currently too understaffed to have a full-time faculty member teach at least one section of each course. If the number of chemistry faculty increases to a level that will allow growth in the future, there are several exciting chemistry courses we would consider offering.

- El Camino students who are not science majors may find a Consumer Chemistry course as an interesting way to fulfill their general education requirements. Consumer Chemistry would explore the chemistry of products and processes that students encounter every day. We might also consider offering an honors section of this course.
- Engineering students are generally required to take one semester of General Chemistry. They might find that a 1-semester General Chemistry course, tailored specifically to their needs, would be more appealing than taking the first semester of the current 2-semester offering.
- Forensic Chemistry has become popular in movies and on television. As forensics become more important in crime-solving, a Forensic Chemistry course could become quite popular among ECC students.
- One or more hybrid courses would offer students an alternative style for taking a course. Such a course would be taught online except for the laboratory which would be done on campus.

We are confident in the quality and articulation of our courses. The Chemistry Department does have concerns about the large numbers of part-timers we currently engage. Part-time instructors are not required to hold office hours, which is a disservice to our students. Having large numbers of part-timers also affects the continuity of the sequential courses in our program, and the communication between instructors. This may affect our courses negatively over time.

IV. Student Learning Outcomes

The Chemistry Department has been actively writing, assessing, and analyzing Student Learning Outcomes since the spring semester of 2008. We anticipate completing a course-level SLO cycle for every course in the department by spring 2009. In addition, we have written our first program-level SLO. It will be assessed and analyzed for two courses in fall 2008, and for our remaining six courses by fall 2009.

Our course-level SLO is entitled, "Equation Writing." Writing chemical equations is integral to every chemistry course in our department. Given the chemical reactants, students are asked to predict the products, write the complete equation, and balance the reaction. The rubric used to grade the equation varied slightly from course to course depending on the course requirements. Students in higher-level chemistry courses were expected to incorporate more detail (for example, states of matter) than students in lower-level chemistry courses. By modifying the rubric appropriately, we were able to make the topic relevant to all of our courses.

By spring of 2008, one section each of four courses had been assessed and analyzed: Chem 20, Chem 4, Chem 7A, and Chem 7B. The overall results indicated that the assessed chemistry faculty are adequately preparing students in the topics of chemical nomenclature, identifying reaction types, and predicting the products of chemical reactions. It is clear that our passing students are mastering nomenclature and doing well at equation writing. To maintain this level of success, it is our recommendation that El Camino College and the Chemistry Department continue to provide an excellent array of support services for students. College services include the Learning Resources Center tutoring and MESA program workshops and tutoring for appropriate courses. Class-specific services include advertising office hours available for working with students, assigning many practice problems, and providing a wealth of nomenclature practice in the classroom. As the department currently maintains a large number of part-time faculty who are not required to maintain office hours, we fear that students may suffer from the lack of this type of support. We hope that the college will allow us to hire sufficient full-time faculty to better serve our students.

Of the courses not yet assessed for equation writing, the SLO cycle is scheduled to be completed for Chem 1A in fall 2008. The SLO cycle will be completed for Chem 21A and Chem 21B in spring 2009.

Also in fall 2008, our first program-level SLO, "Laboratory Safety," was written. This SLO gauges student compliance with the ECC chemistry goggle policy. We feel that eye protection is of critical importance in the chemistry laboratory, and we are anxious to uncover any deficiencies in communicating the significance of wearing goggles in the lab. In fall 2008, one section each of Chem 20 and Chem 4 were assessed twice during the semester. The dual assessment (one early in the semester and one late in the semester) will help us track changes in goggle compliance over time. Other courses will participate in the Laboratory Safety program-level SLO in spring 2009.

Student Learning Outcomes will be a part of the El Camino College academic landscape for the foreseeable future. The Chemistry Department is serious about meeting our Student Learning Outcomes obligations. We will continue to write relevant SLOs and to assess them appropriately. We hope that the SLO program will have a positive impact on our department for years to come.

V. Facilities and Equipment

We feel that the following list of items will be beneficial for improvement of instruction in the Chemistry Department.

1. Glassware (standard joint 19/22)	Amount	Size	Total Cost
separatory funnel	48	125 mL	\$1,528.32
round bottom flask	48	100 mL	\$402.24
round bottom flask	48	50 mL	\$376.80
round bottom flask	48	25 mL	\$354.72
thermometer adapter	48		\$320.64
3-way adapter (distilling head)	48		\$696.96
end adapter with vacuum line	48		\$717.22
liebig condenser	48	200 mm	\$1,068.48
west condenser	48	201 mm	\$1,105.92
plug	48		\$262.08
2. Delux Demonstration Model Kit	5		\$1290.00
3. Accumet polypropylene body gelfilled electrode	3	std size	\$308.46
4. Brinkmann bottle top dispenser pump	2	5 mL	\$640.00
5. Cart	2	16x30x32	\$350.00
6. Cart	1	24-36-32	\$199.00
7. Balances, Scout, battery or AC	10	±0.01g, 400g cap	\$3,180.00
8. Visible Spectrophotometer, Spec 20	4		\$4,800.00
9. Heavy duty cart	2		\$414.00
10. Atomic Absorption Spectrometer	1		\$20,000.00
		Total	\$38,014.84

Our facility was renovated a few years ago and is largely adequate. The laboratory classrooms have enough hoods and proper ventilation. All the classrooms are “smart”; they are equipped with computers and projectors. Much of this equipment will need replacing in the near future. Also, we do not have enough classrooms in order to grow easily.

One of the problems that we currently have in our facility is the cooling and heating of the building. The temperature control seems to be malfunctioning which causes the laboratory classrooms and some of the offices to be either too cold or too hot. This is an issue for students, especially when they take exams during the lab period. In addition, the air conditioning can be quite loud; this can make it difficult for students to hear the lecture. Another problem is the lack of sufficient board space in all the laboratory classrooms and in lecture room 103. It would be better if we could install sliding boards instead. This would allow the instructors to easily use PowerPoint while presenting a substantial amount of material on the board.

VI. Staffing

A. Faculty

The Chemistry Department currently has seven (7) full-time tenured or tenure-track faculty members, one of whom is on a leave-of-absence, having taken a full-time position at another college. Due to verbal communication, we know that this person will not be returning to ECC, thus actually leaving the department with six (6) rather than seven full-time faculty. The department teaches eight different chemistry courses, usually offering multiple sections of each course; in spring 2008, 29 total sections were offered, while in fall 2008, 28 sections were offered. In each of these semesters 14 sections (48/50%) were taught by full-time faculty, and the remainder were taught by adjunct faculty.

All full-time faculty members are qualified by academic background and experience to carry out their program responsibilities in accord with the purposes of the program. Teaching effectiveness remains the principal criterion for the selection of the teaching faculty, including adjunct faculty; a teaching demonstration during the interviews plays a major role in the selection process. Chemistry faculty are generally quite active in campus-wide organizations and activities, such as Academic Senate, Honors Transfer Program, Curriculum Committee, and other committees. Faculty specialization meets the needs for all courses taught, but is currently somewhat tilted toward organic chemists since the departure/retirement of several inorganic chemists.

The department currently relies too heavily on part-time faculty. There are currently fewer full-time teaching faculty than there are courses taught, so some courses are taught predominantly, or solely, by adjunct faculty. Because each chemistry course includes a laboratory component, individual course loads are such that a part-time faculty member can teach only one class; thus there are currently more than twice as many adjunct faculty (14) as full-time "teaching" faculty. There is a fair amount of turnover and reassignment of part-time faculty, which requires mentoring and evaluation of those new to the college or to a course. It is increasingly difficult to ensure the continued high standards of quality we expect of each of the courses in our program. This comes from experience in teaching and familiarity with course presentation. Over the last ten years the number of sections taught has increased by two full-time equivalent faculty positions, while the number of full-time teaching faculty has decreased by two. Faculty with major released time should be replaced by full-time temporary instructors because it is increasingly difficult to find qualified part-time faculty who are available to teach daytime classes.

In addition to the immediate need for new faculty to replace those that have retired or resigned, if the department continues to grow to meet increasing demand (estimates are that for the past two semesters the equivalent of three sections of students were turned away due to lack of space in the classes), additional staffing will be required. While no current full-time faculty are intending retirement immediately, two teachers will be of retirement age in three years and those positions will also need to be replaced.

The cost of each new full-time faculty we hire is estimated to be about \$90,000. This estimate includes fringe benefits and assumes hiring a PhD at step 4 or 5. We don't view this as a new cost because we have lost five full timers in the last three or four years and only two of them have been replaced. We need three more full-time faculty immediately just to get back to where we were then. We need a minimum of one additional hire to accommodate curriculum expansion and program growth.

Responsibilities of planning, budget, scheduling, and hiring for the department fall primarily to the Dean of the Natural Sciences Division. While faculty usually voluntarily specialize in various aspects of departmental maintenance to aid the Dean, it would be very beneficial to have a department chair to coordinate such activities and have some responsibility for their completion. While democratic,

Division Councils are an inefficient means of disseminating information to, or gathering information from, the several departments within the Division.

B. Technical Staff

The Chemistry Department currently has 2 $\frac{3}{4}$ full-time technical staff (one is $\frac{1}{4}$ time assigned to the Biology department) who prepare materials for lab experiments and demonstrations and check out equipment to students for individual experiments. Each technician is assigned a course or set of courses for which they are responsible, although that person may not be the one on duty at the time of each lab period. There is need for a full-time technical staff member to take care of instruments and lab equipment – or at least to making the $\frac{3}{4}$ -assigned staff member fully assigned to the Chemistry Department to better meet this need. The cost of backfilling the $\frac{1}{4}$ time loss of this technician from Biology would be approximately \$15,000.

There is no “lead” technician, and each technician reports directly to the dean. Faculty and technicians generally work together well, but there is no line of authority through faculty when there are conflicting assignments or responsibilities or specific questions about performance. The chemical technicians should be under direct supervision of one of the chemistry faculty; that is, someone with an expert level understanding of our day to day operations and a great deal of chemical knowledge to guide those who work with equipment and chemicals in a student laboratory setting. There is an increasing number of night lab sections, but only one technician on staff in the evenings. It is at times difficult for that one person to meet the needs of multiple lab sections, and this problem will grow along with the number of lab sections. A department chair would be a good bridge in authority between faculty, technical staff and the dean; part-time student help (to handle checking in and out of equipment) could be beneficial in covering multiple simultaneous lab sections, and in freeing technician time for other duties.

C. Department Chair

The Chemistry Department seriously needs a department chair. We need one clearly responsible person to take a leadership role on a timely and consistent basis. As it is we are all responsible so no one is actually responsible. Maintaining a high quality program and making changes, updates and improvements are not easy; they take a great deal of time, often more time than professional responsibility reasonably requires. It is too easy for even the most professional of us to let problems ride until they become too severe to ignore. We get very busy during the semester and no one of us has the individual responsibility to deal with a given departmental problem.

The dean should provide leadership at the divisional level but at the department level a dean does not have the time to deal with all the issues. A dean may not be aware of all department level issues. A dean cannot be expected to have sufficient expertise in all the disciplines in his/her division to provide the leadership necessary.

To maintain as high a quality of education as possible, we want to have departments running as smoothly as possible and morale to be as high as possible. We want to improve the coordination between faculty and laboratory technicians. Department chairs would provide the missing leadership.

The Chemistry Department has a history where, generally, everyone pulls his/her weight. Nevertheless, we usually are really busy so that problems may languish until they are bad enough that something must be done. We tend to have phases where we respond (or at least partially respond) to problems and other phases where problems are let go far too long. This occurs because no one is in charge except a dean who may not be aware of all the issues and is not in a good position to provide departmental leadership.

We have seen deans who try to help tend to departmental issues. We have also seen deans who pay little or no attention to department problems, at least beyond talking to faculty who come to them. They completely rely on faculty to deal with their own department even though no one within the department is actually responsible. This is a recipe for letting nagging issues fester and only dealing with the major thorns.

The work required to maintain a chemistry program is substantial. The Chemistry Department has special needs that are not being met sufficiently under the current organizational structure. The battle to keep (become) up to date in technology and facilities is never ending. The divisional dean's efforts are necessarily split among many related departments so the attention to each area is diluted. Chemistry needs a great deal of attention from people who understand science and science laboratories. Additional leadership from department chairs is needed.

The department chair would be a leader, a champion, within the department. His/her duties and responsibilities could include:

- schedule and chair department meetings.
- collect and keep department policies, records and wish lists.
- coordinate department projects and intradepartmental communications.
- see that department documents such as course outlines are updated when appropriate.
- oversee laboratory operations and equipment maintenance.
- monitor student learning outcomes (SLOs) development, assessment and recommendations.
- serve as a resource person for adjunct faculty.
- coordinate an effective mentoring program for all new full-time and adjunct faculty.
- serve as a contact person for outside offices, committees, clubs, organizations, and suppliers.
- be a liaison with the laboratory technical support staff.
- respond to student needs and grievances.
- with the division office, coordinate the development and use of the department budget.
- with the division office, coordinate faculty evaluations.
- with the division office, coordinate hiring of faculty and technicians.
- with the division office, coordinate class scheduling and cancellation.

VII. Planning

The mission of the department of chemistry is to prepare students to possess the knowledge and skills to pursue further education and careers in the physical, biological and health sciences; engage in scientific inquiry and problem solving; work effectively in collaborative settings; and communicate scientific information clearly. As a department, our faculty strive to fulfill this departmental mission which provides students with the best education possible. Our future goals and plans are centered on this goal.

To most effectively plan out the future of our department and to ensure that a quality education is being provided our faculty need to know enough about future budgets, deadlines and philosophies of the administration so that we can plan for future equipment, courses, support staff and faculty. Effective planning and coordinating between the administration and our department would be greatly facilitated by having a department chair. Having a department chair would establish a direct line of communication between the administration and our faculty. Additional functions of the department chair would be to organize department meetings, hire part-time instructors, delegate responsibilities and oversee the general functioning of the chemistry department. Currently, many people contribute many hours to the tasks which need to be done for the good of the department. A great deal of good will is exhibited by the faculty toward the maintenance and improvement of the program. Having a department chair to coordinate and assign responsibilities within the department would be very beneficial to us all.

The demand for chemistry classes is currently high and can potentially continue to grow. While this trend is favorable, the lack of classroom space (at popular scheduling times) will hinder or even limit further growth. As a department we are exploring the possibility of developing some hybrid chemistry courses as a possible alternative solution to this problem. The hybrid classes would be a combination of online instruction with on campus lab activities. The labs could be scheduled on weekends to free up some classrooms for other classes. In addition, our department has considered increasing the curriculum by offering a "Chemistry for Engineers" course, which would serve an alternative to the General Chemistry 1A. This class would cover similar topics as those covered in Chemistry 1A, but would be geared toward engineering majors. While we have faculty with the proper backgrounds and/or interests to take on these projects, a severe shortage of full-time faculty cause the future of these projects to be open ended and unknown; we are unable to spare anyone from our regular curriculum.

With regard to our core curriculum, we are continually searching for ways to improve it. We are aware that technology is rapidly evolving and new instruments or new technology which can benefit our students should be purchased and incorporated into our classrooms.

The chemistry department, in general has a good academic reputation. This reputation is something that we in the department take pride in and hope to maintain forever. Over the past years several full-time faculty have retired and have yet to be replaced. This is a cause for concern within our department as the decrease in full-time faculty has made our department too reliant on part-time faculty. Currently, the majority of our courses are being taught by part-time faculty, a huge contrast to the past. The decrease in full-time faculty and increase in part-time faculty has increased the burden on our full-time faculty to mentor them. Currently, our new full-time faculty are being properly guided and mentored.

Unfortunately, the same is not true about our part-time faculty. While we strive to provide mentoring to all our part-time faculty, there are simply are not enough full-time faculty, or a department chair to effectively accomplish this task. In some instances this has resulted in essential topics going uncovered or not covered in sufficient detail, and students find that they are not adequately prepared for the next chemistry class. This inevitably weakens our department curriculum as topics that should have been covered must then be learned by students as part of the sequential chemistry course. Additionally, the high turnover rate of part-timers sometimes makes the hiring and the mentoring process seem overwhelming. The future goals and continued success of our department depends on the replacement of our full-time faculty. With enough full-time faculty and a department chair to coordinate, it will be

possible to adequately support and mentor our part-time faculty. There will need to be some ongoing mechanism established to immediately hire new faculty to replace all retiring or reassigned faculty so that our numbers remain constant. If our faculty numbers are fluctuating on a year-by-year basis then it is virtually impossible to have a healthy department and maintain our program's quality.

VIII. Recommendations and Conclusions

The items below are in priority order as well as can be reasonably decided at this point in time.

- We need a department chair to coordinate all the activities of the department and to provide proactive leadership. Efforts to maintain excellence within the Chemistry Department are fragmented under the current system. History has shown that many of the item listed below will not be done well and on a regular basis without a department chair.
Estimated Cost: \$40,000 for 50% release time
- We need to have at least four more full-time “teaching” faculty just to get back to where we were a few years ago when we offered fewer sections than we do today. It is also imperative that we replace any faculty who retire or resign. In addition, we need a minimum of one additional hire to accommodate curriculum expansion and program growth.
Estimated Cost: $4 \times \$80,000 = \$320,000$
- We need our lab technician position which is assigned three quarters to chemistry to be changed to a full-time assignment in chemistry.
Estimated Cost: \$15,000
- We need to offer more sections for most of our courses as we currently are not meeting student demand. Then we will begin to consider developing other courses such as a one semester general chemistry course for engineering majors, a chemistry for consumers course, a forensics chemistry course and/or a hybrid (lecture online, lab on campus) course.
Estimated Cost: \$11,000 per adjunct instructor (need one per each 5 unit section)
- The air conditioning noise has been a long term problem ever since the chemistry building was remodeled. It needs to be fixed. Attempts to fix the problem have helped. Nevertheless, all the labs (especially room 153) still have too much noise. Lecture room 133 also often has too much noise.
- Temperature control has been a long term problem ever since the chemistry building was remodeled. The temperature runs way too hot sometimes and way to cold at other times. Both of these problems can occur during the same lab period. Attempts to fix the problem have helped. Nevertheless, all the labs (especially room 153) still have problems with temperature control. Lecture room 133 also still has the problem.
- We need a more efficient system of projector replacement, maintenance and repair. Repairs often take too long. The people that are responsible for this should have extra projectors to replace ones that need to be removed for repair. There also needs to be a routine maintenance schedule for projectors.
Estimated Cost: replacement of 5 projectors = $5 \times \$700 = \3500
maintenance plan = \$5000 to \$6000
- The MESA workshops are important asset to the chemistry program and should be continued.
- Tutoring offered by the Learning Resources Center is a valuable option for some students, but it would be better if tied more closely to individual courses and the Chemistry Department. We have space in our chemistry study center to house a chemistry tutoring center.
Estimated Cost: minimal or nothing

- Due to limited board space we recommend sliding white boards be installed in all lab and lecture rooms.
Estimated Cost: \$25,000 for 6 lab and 4 lecture rooms
- Given the proper resources, we will establish a formal mentoring program for all new full-time and adjunct faculty.
- We need to review and update two of our course outlines: Chem 20 and Chem 99 are currently in review during spring 2009. All other course outline are up to date.