CHEMISTRY PROGRAM REVIEW

2008-2009

CHEMISTRY DEPARTMENT

MATH/SCIENCE DIVISION

COMPTON EDUCATION CENTER

EL CAMINO COLLEGE

Program Review (2008-2009)

TABLE OF CONTENTS

1. OVERVIEW

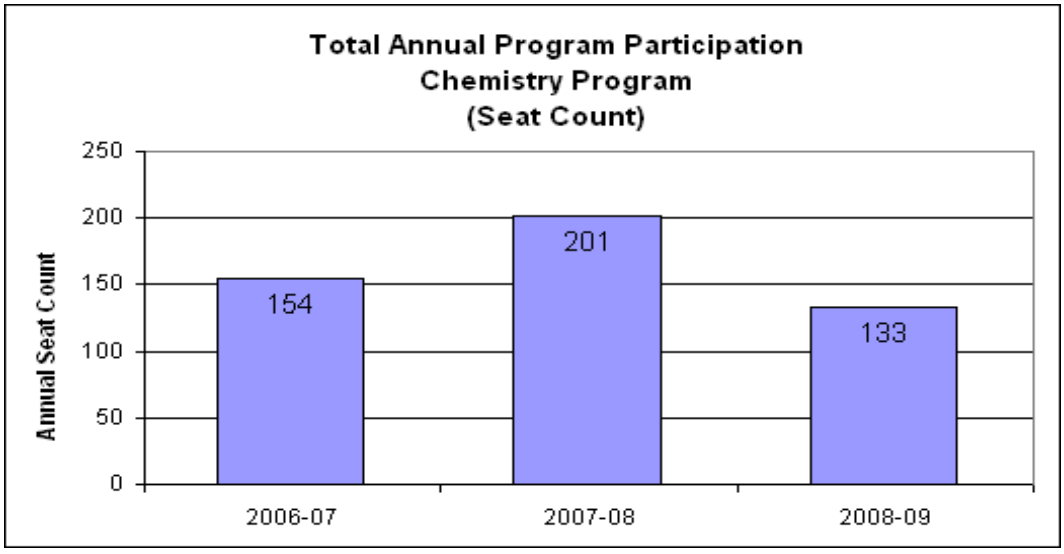
Compton College- the past

During the Compton College years, Chemistry 10 (El Camino Chemistry 20), Chemistry 2 (El Camino Chemistry 4), Chemistry 3 (El Camino Chemistry 1A) and Chemistry 4 (1B) were offered regularly each semester. Chemistry 4 was offered on a yearly basis. The other lower division chemistry courses, including organic chemistry and quantitative analysis had not been offered at all.

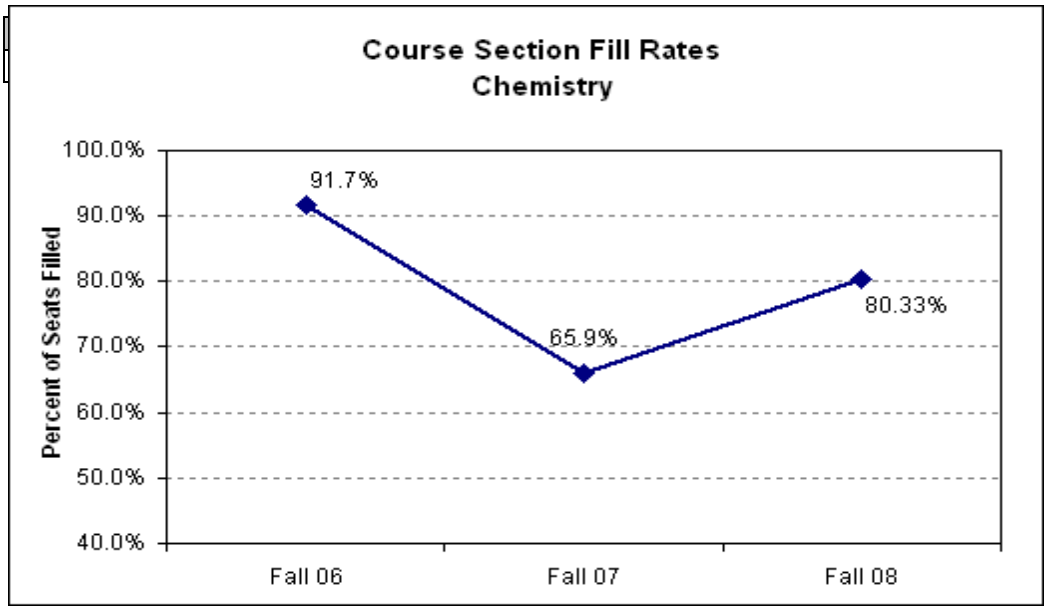
Compton Education Center- the present

After partnership with El Camino College, Compton Education Center has offered only one chemistry course (Chemistry 20), a fundamental chemistry for students who plan to obtain a R.N. or Allied Health Certificate from El Camino College. Chemistry 20 also can fulfill general education requirements for physical science with laboratory for non-science majors (see total annual program participation below). The Center has not had the chance to offer the other lower division chemistry courses that El Camino has offered. El Camino offers sequential college courses, Chemistry 1A and 1B, which are equivalent to the first year general chemistry and are transferable to the University of California and California State University and which can fulfill their comparable requirements. Students who take Chemistry 1A have to finish Chemistry 4 with a minimum grade of C or one year high school chemistry and qualification by testing (El Camino College Chemistry Placement Test). In the past years, Compton Center has tried to offer Chemistry 4 each semester (or each year) to fulfill the requirement for the students to take Chemistry 1A, unfortunately, the classes were cancelled due to low enrollment. Also students who had one year high school chemistry were not willing to take the placement test, and consequently, we have not been able to have students who are qualified to take Chemistry 1A.

Total Annual Program Participation (2-year Trend)
Years: 2006-07 to 2008-09
Program: Chemistry, Compton Center



Course Fill Rates



The enrollment of Chemistry 20 in the past three school years (2006-2008) varied from year to year. As more sections of Chemistry 20 were offered during 2007 and 2008 school year to accommodate the needs of our students, the fill rate dropped. In year 2009 -2010, six (6) sections of Chemistry 20 have been offered, including one weekend section, and the enrollment looks encouraging.

2. RETENTION AND SUCCESS RATE

A. Math Prerequisite Analysis

[ECC Institutional Research]

Fundamentals of Chemistry (Chemistry 20) is a 5-unit, transfer-level course. It carries an advisory placement for Compton Center of Math-40 or Math-41 B. Research shows that a strong math background has a positive impact on success in general chemistry courses. This study examines the academic performance of students enrolled in Fall 2008 sections of Chemistry (N=98).

Of the 98 students enrolled in Chemistry 20, 36% met the prerequisite either with a C or better in Math-40 or higher (19%) or with a satisfactory score on the placement test, i.e., placing higher than Math-40/41 B (16%). Therefore, a total of 64% had not met the prerequisite before enrolling in Chemistry 20. (Table 1)

Table 1: Prerequisite Status of Enrolled Students

Met Prereq?	**Number**	**%**
Course	19	19%
Test	16	16%
All Met	35	36%
Prereq Not Met	63	63%

Table 2 shows the grade distribution, retention and success rates for the Chemistry 20 students by math background. Success rate is the percentage of enrolled students receiving an A, B or C. Retention rate is the percentage of students receiving a grade of any kind, i.e., those who have not dropped (DR) or withdrawn (W). The overall success and retention rates for the course were 41 % successful and 56% retained.

Students who met the course prerequisite were more likely to be successful (46%) and be retained (63%). Students who met the prerequisite with a test were much more likely to be successful (50%) and be retained (69%). Those with lower level math courses only had very low performance with 0% out of 15 students receiving A-C and 40% of students retained.

Interestingly, students with no recorded math background received passing grades at the same rate as those who tested beyond Math-40/41 B. It is not clear from student records if they have any recent math background from other institutions (other than ECC and Compton) since this information is not recorded.

Table 2: Grade Distribution and Success and Retention Rates by Math Background

Group	**A**	**B**	**C**	**D**	**F**	**DR**	**W**	**Total**	**% of Total**	**% Succesful**	**% Retained**
All Students	6	17	17	5	10	6	37	98	100%	40.8%	56.1%
Met w/ course	0	4	4	0	3	1	7	19	19%	42.1%	57.9%
Met w/ test	3	2	3	2	1	0	5	16	16%	50.0%	68.8%
All meeting Prereq	3	6	7	2	4	1	12	35	36%	45.7%	62.9%
Some math	0	0	0	2	4	2	7	15	15%	0.0%	40.0%
No Math/ Other	3	11	10	1	2	3	18	48	49%	50.0%	56.3%

Although a test of significant difference was not performed, results of this small group of students indicate that sufficient math background is associated with better grades and higher retention in Chemistry 20.

B. Retention Rate and Success Rate

Fall 2006 to Fall 2008
Program: Chemistry

Fall 2006

Course	A	B	C	D	F	DR	W	Total Grades	Success Rate		Retention Rate
									Only Completers	All Students	
CHEM-20	4	7	6	0	1	0	37	55			
	18.3%	35.5%	28.0%	1.1%	0.0%	0.0%	17.2%		94.4%	30.9%	32.7%
CHEM Total/Avg.	4	7	6	0	1	0	37	55			
	7.3%	12.7%	10.9%	0.0%	1.8%	0.0%	67.3%		**94.4%**	**30.9%**	**32.7%**
Division Total/Avg	771	1,077	1,118	303	311	0	1,163	4,765			
	16.2%	22.6%	23.5%	6.4%	6.5%	0.0%	24.4%		**82.8%**	**62.2%**	**75.6%**
College Total/Avg	16,165	12,416	9,446	2,995	4,904	0	12,734	64,787			
	25.0%	19.2%	14.6%	4.6%	7.6%	0.0%	19.7%		**82.0%**	**65.4%**	**80.3%**

Fall 2007

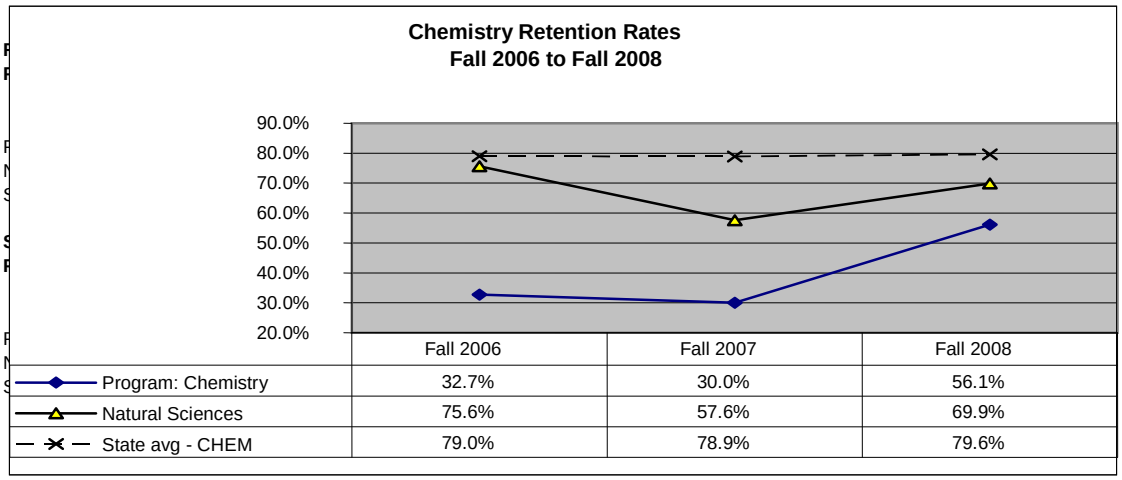
Course	A	B	C	D	F	DR	W	Total Grades	Success Rate		Retention Rate
									Only Completers	All Students	
CHEM-20	3	6	6	0	3	3	39	60			
	7.7%	16.5%	27.5%	11.0%	3.3%	5.0%	34.1%		83.3%	25.0%	30.0%
CHEM Total/Avg.	3	6	6	0	3	3	39	60			
	5.0%	10.0%	10.0%	0.0%	5.0%	5.0%	65.0%		**83.3%**	**25.0%**	**30.0%**
Division Total/Avg	106	146	190	48	59	93	318	970			
	10.9%	15.1%	19.6%	4.9%	6.1%	9.6%	32.8%		**80.5%**	**45.6%**	**57.6%**
College Total/Avg	1,761	1,840	1,586	402	400	645	2,288	9,662			
	18.2%	19.0%	16.4%	4.2%	4.1%	6.7%	23.7%		**84.8%**	**58.7%**	**69.6%**

Fall 2008

Course	A	B	C	D	F	DR	W	Total Grades	Success Rate		Retention Rate
									Only Completers	All Students	
CHEM-20	6	17	17	5	10	6	37	98			
	15.5%	17.5%	21.6%	5.2%	6.2%	6.1%	34.0%		72.7%	40.8%	56.1%
CHEM Total/Avg.	6	17	17	5	10	6	37	98			
	6.1%	17.3%	17.3%	5.1%	10.2%	6.1%	37.8%		**72.7%**	**40.8%**	**56.1%**
Division Total/Avg	155	193	186	59	70	74	212	949			
	16.3%	20.3%	19.6%	6.2%	7.4%	7.8%	22.3%		**80.5%**	**56.3%**	**69.9%**
College Total/Avg	2,303	2,209	1,686	652	843	875	2,766	12,558			
	18.3%	17.6%	13.4%	5.2%	6.7%	7.0%	22.0%		**79.3%**	**56.1%**	**71.0%**

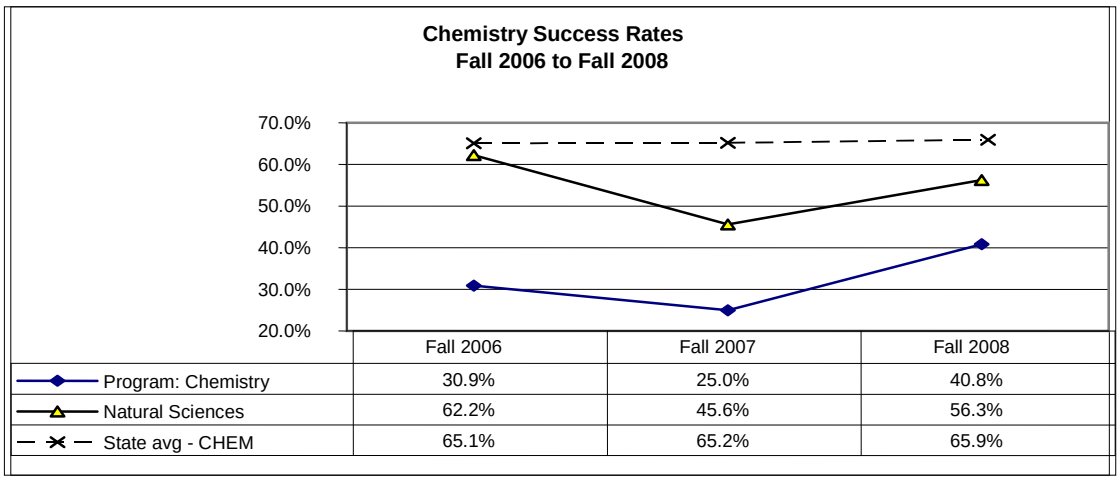
*Data provided by ECC Institutional Research

Percent Retained in Courses



	Fall 2006	Fall 2007	Fall 2008
Program: Chemistry	32.7%	30.0%	56.1%
Natural Sciences	75.6%	57.6%	69.9%
State avg - CHEM	79.0%	78.9%	79.6%

Percent Successful in Courses



	Fall 2006	Fall 2007	Fall 2008
Program: Chemistry	30.9%	25.0%	40.8%
Natural Sciences	62.2%	45.6%	56.3%
State avg - CHEM	65.1%	65.2%	65.9%

The data in the tables and graphs above indicate that chemistry retention and success rate average are far below the state average. Chemistry is a time demanding course. Success depends strongly on the preparation before class and review after class. Most of our students are older students (See Student Profile, demographic and enrollment characteristics provided by Institutional Research ECC). They have jobs and other responsibilities; it is hard for the students to find time to study after school. A suggestion should be made to our students to take less units.

Another main factor contributing to the failure of our students is the lack of basic skills. In order to pass chemistry the students have to have college reading level and be able to apply basic math skill. Also based on the observation of many faculty over the years, one- third to one-half of the students do not have books until the third week. The lack of study during the first two weeks of the semester makes them fall behind the schedule and the pace of Chemistry 20 is one chapter per week.

Also the Tables and graphs indicate the Chemistry 20 retention and success rate average are lower than other Science Courses. Chemistry 20 is the only science course that requires basic math skill in the Education Center and the lack of basic math skills may contribute to the lower retention rate. The 2008 average indicates the success rate is improving and we have to see the success rate of 2009 to determine whether the general trend has been maintained.

3. STUDENT LEARNING OUTCOMES

A. Inorganic chemistry

The faculty from Compton Center, working with El Camino Chemistry Department during the flex days, have been actively writing, assessing, and analyzing SLO since Spring 2008 and we expect to complete the SLO for Chemistry 20 by Spring 2010. For Fall 2009, the SLO is entitled "Equation Writing". Students are asked to predict the products of simple chemical reactions and to write chemical equations and balance equations. In order to do that, students are mastering the nomenclature and doing well with these basic equations.

At Compton Center, we are working with students to review basic math skills: Conversion factor, proportion, inverse proportion, ratio, and percentage. The students are asked to apply these skills in chemical calculations, gas law calculations, and concentration of solution calculations. Students will predict the gas behavior and relate to the environmental issues. Students have to comprehend the solubility rules and be able to describe the change in concentration of solute and solvent in the process of osmosis and dialysis. After finishing the inorganic part, students will also be able to master the concept of acid and base, the role of buffer in maintaining the pH, writing the simple acid-base reactions and predicting the results, and applying the logarithm in pH calculation.

B. Organic Chemistry

The student will be able to

1. Use the common and IUPAC Systems to name simple examples of various classes of organic compounds, including: alkane, alkene, alkyne, aromatic, haloalkane, alcohol, ether, thiol, aldehyde, ketone, carboxylic acid, ester, amine , and amide.

2. Draw structural formulas of simple examples of various classes of organic compounds as indicated in part 1 above. And also be able to describe their physical properties related to their structures.

3. Write equations, using structural formulas for common reactions of organic compounds – combustions, addition reactions, oxidation of different classes of alcohol and thiol, neutralization of carboxylic acids and esterification.

4. Draw structural formulas which illustrate a knowledge of structural isomerism, geometric isomerism, and stereoisomers.

C. Biochemistry.

In the past few years, due to the time constraints of a sixteen-week semester, only a couple chapters in biochemistry are covered.

1. Carbohydrates:
    a. Understand the functions of carbohydrates.
    b. Draw open chain and ring structural formulas for monosaccharide units and describe the linkage between the units.
    c. Relate the process of digestion to the hydrolysis of carbohydrates.

2. Lipids

    a. Describe the classes of lipids and draw the structural formula of a fatty acid and a triglyceride.
    b. Draw the structural formulas of at least three saturated and one unsaturated fatty acid.
    c. Explain the function of a fatty acid in a membrane in terms of the structure of the fatty acid.
    d. Draw a general structure for a phospholipids and the ring system found in steroids.

4. STAFFING

A. FACULTY

The Chemistry Department at the Compton Education Center currently has one full-time tenured faculty member and also another tenured faculty who teaches both Chemistry and Micro. This year the Center offers one chemistry class (Chemistry 20) with seven sections. Five (5) sections are taught by full-time faculty and two (2) sections are taught by adjunct faculty. Both the full-time and part-time are qualified by academic background and experience to carry out their program responsibilities in accord with purposes of the program. We have hired two part-time faculty this semester (Fall, 2009). Teaching effectiveness remains the principal criterion for selection of the adjunct faculty. A teaching demonstration during the interview plays a major role in the selection process. Because each chemistry course includes a laboratory component, individual course load are such that a part-time faculty member can teach only one class. If more sections of chemistry are offered in the future, more adjunct faculty has to be hired. The Division Chair and full-time faculty are required to mentor and to evaluate the adjunct faculty to maintain the quality of teaching for this department.

With the only full-time faculty in the Chemistry Department planning to retire this coming school year, the Department needs one full-time faculty to ensure the quality of the student learning outcomes (SLO), to supervise the classified personnel, to actively be involved in hiring and evaluation of the part-time faculty, and to develop and to update the curriculum.

B TECHNICAL STAFF

The Physical Science Department has only one technical staff (Lab. Assistant) for Chemistry, Physics, Astronomy, Geography, and Geology. The Lab. Assistant prepares materials for laboratory, demonstrates sample experiments and assists students during laboratory hours. Since there is no physics class with laboratory offered at the Center, the sole responsibility of the lab assistant is working in the chemistry lab. If physics classes with laboratory are offered in the future, more supporting personnel will be needed.

C. SUPPORTING SERVICES

At the Center, supporting services are provided by the Math/Science Division and the Learning Resource Center. Tutoring is available to the students six days a week, and computer lab in the Division is open five days a week. Tutors are from the neighboring four-year colleges with majors in chemistry or chemical engineering. Full-time faculty has to post office hours of five hours per week and be available to answer questions through E-Mail. Special arrangements can be made with the Lab. Assistant for working students who can’t attend or miss the regular lab sessions.

5. PLANNING

A. CURRICULUM

1. Chemistry 4 is an introductory course and serves a dual purpose: to provide a foundation for those who intend to continue the study of chemistry and other science courses. It is also intended to help the students, in science and engineering majors as well as non-science majors, to develop an understanding of chemistry and its role in society. This course is more math-oriented than Chemistry 20 and requires higher level of math (Math 70, intermediate algebra). This is a course that our students have the chance to apply what they have learned in Math. The mission of the chemistry program in this Center is to prepare students to posses the knowledge and skills to pursue further education and careers in the chemical, physical, and health sciences. Chemistry 4 is the first step in fulfilling this mission. Chemistry 4 also is the pre-requisite for Chemistry 1A and can also prepare our students to take lower level chemistry in 4-year schools.

2. Chemistry 20 is an introductory course covering the area of general chemistry, organic chemistry and biochemistry. The course is designed for students pursuing careers in health sciences and in related fields, including nursing, medical technology, dietetics and environmental science. The course requires less math than chemistry 4, but the students have to be able to apply basic math skills and simple algebra in chemical calculations. Our retention is very low for this class because of the lack of math background of the students. Students have either taken Math 40 and do not know how to apply it in chemistry or had math in some other school that does not meet the pre-requisite. Success and retention rates strongly depend on the student meeting the math requirement. A math placement test for this course is highly recommended. The test should include but not limited to: Conversion factors, proportion, inverse proportion, ratio, percentage, and logarithm operations. Chemistry 20 is generally known to our students as a demanding 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 order to learn new material. Study typically requires repetition of the material as well as a great deal of time. Students who have failed the course or dropped from the classes should be evaluated by the counselor to see what kind of basic skill the student needs before retaking this class in order to be successful.

3. A hybrid chemistry (online lecture, traditional lab) can be offered at Compton Center even though very few community colleges have done so. The online class will allow students to learn chemistry on their own time and pick up the lab section at their convenience. High school students can learn basic chemistry on their own and earn two or three college units. Faculty members can develop this course online and get the curriculum approved. Collaboration will need to occur with the Math Department since it already offers online classes.

B. FACULTY

The increased interest in the Nursing and other Allied Health careers has increased the demand for chemistry 20. More sections have been offered to accommodate these students. Enrollment however is limited by laboratory size, and safety concerns prohibit instructors from over-enrolling in these classes. At least one full-time and two adjunct faculty are required for the current enrollment. More adjunct faculty is needed if more sections are offered in the future. One more full-time faculty is needed if Chemistry 4 is offered in the near future to update the course and revise the laboratory curriculum.

C. TUTOR.

The Chemistry Department will need to work with the Learning Resource Center to find and hire qualified tutors for the chemistry students. Tutors should aim to explain the basic concepts of chemistry and answer questions for the students rather than doing homework for them.

D. EQUIPMENT

There is a strong need to improve our laboratory facilities. We need modern analytical balances and microscales, chromatographic equipment (for gas-liquid chromatography), UV and visible spectrometer, atomic spectrometer, mass spectrometer, titrimeters, and other updated equipment.

The following list is for equipment that will be needed in addition to or to replace old equipment for Chemistry 20 and Chemistry 4 in the next five years.

Item	qty	Total
BENCH PH METER ELECTRODE KIT	3	$1,500
HOTPLATE w/STIRRER, 120V	6	$2,200
THERMOMETER, NON-MERCURY, -20C to 110C	25	$600
COMPACT ELECRONIC SCALE, 200GRAM, +/- 0.1GRAM	15	$1,800
CYLINDER GRADUATED 500 ML	12	$350
METER STICKS	24	$400
DELUX DEMONSTRATION MODEL KIT	5	1300
	Total	$8,150.00

If Chemistry 1A or 1B is offered then additional equipment will be needed.

6. STUDENT PROFILE

Chemistry 20 classes, like other classes at Compton Center, has a large number of Hispanic and African-American students, composes eighty to ninety percent of the class population. The other ten to twenty percent are foreign students, Pacific Islanders and Whites. Chemistry 20 is mainly designed for students in the Nursing and Allied Health majors who are predominately female students, about eighty percent.

Demographic and Enrollment Characteristics
Students Enrolled in Chemistry Courses, Compton Center
Fall 2006 to Fall 2008

Fall 2008

Characteristic	Category	Fall 2006		Fall 2007		Fall 2008		Compton	
		n	%	n	%	n	%	n	%
All Enrolled	Total	55	100.0 %	61	100.0%	98	100.0 %	4,923	100.0 %
Gender	Female	46	83.6%	40	65.6%	79	80.6%	3,247	66.0%
	Male	9	16.4%	21	34.4%	19	19.4%	1,668	33.9%
	Unknown	0	0.0%	0	0.0%	0	0.0%	8	0.2%
Ethnicity	African-American	29	52.7%	29	47.5%	40	40.8%	2,555	51.9%
	Amer. Ind. or Alask	0	0.0%	0	0.0%	0	0.0%	17	0.3%
	Asian	2	3.6%	3	4.9%	2	2.0%	114	2.3%
	Filipino	2	3.6%	6	9.8%	9	9.2%	117	2.4%
	Latino	17	30.9%	18	29.5%	36	36.7%	1,706	34.7%
	Other	0	0.0%	0	0.0%	2	2.0%	52	1.1%
	Pacific Islander	0	0.0%	0	0.0%	1	1.0%	66	1.3%
	White	0	0.0%	2	3.3%	4	4.1%	123	2.5%
	Unknown or Decline	5	9.1%	3	4.9%	4	4.1%	173	3.5%
Age/Age Group	Under 17	0	0.0%	0	0.0%	2	2.0%	159	3.2%
	17	0	0.0%	3	4.9%	1	1.0%	204	4.1%
	18	2	3.6%	2	3.3%	2	2.0%	410	8.3%
	19	1	1.8%	0	0.0%	3	3.1%	460	9.3%
	20	2	3.6%	1	1.6%	6	6.1%	381	7.7%
	21	4	7.3%	5	8.2%	6	6.1%	298	6.1%
	22	7	12.7%	8	13.1%	5	5.1%	246	5.0%
	23	3	5.5%	3	4.9%	13	13.3%	240	4.9%
	24	1	1.8%	0	0.0%	7	7.1%	222	4.5%
	25-29	16	29.1%	13	21.3%	18	18.4%	721	14.6%
	30-39	12	21.8%	16	26.2%	22	22.4%	764	15.5%
	40-49	7	12.7%	7	11.5%	12	12.2%	531	10.8%
	50-64	0	0.0%	3	4.9%	1	1.0%	258	5.2%
	65+	0	0.0%	0	0.0%	0	0.0%	28	0.6%
Class Load	Full-time	25	45.5%	16	26.2%	27	27.6%	1,187	24.1%
	Part-time	30	54.5%	45	73.8%	71	72.4%	3,249	66.0%
	Not enrolled or N/A	0	0.0%	0	0.0%	0	0.0%	486	9.9%

*Data provided by ECC Institutional Research

7. CONCLUSION

At present, Chemistry 20 is the only chemistry class offered at the Center and many students enrolled are ill-prepared. Chemistry 20 is an introductory course and so requires no previous chemistry, but the students do not have enough math skills or science background to grasp the concept of chemistry. The passing rate for the past few years is somewhere around forty percent and most of the students will not be able to finish to the end of the semester. Some students have been able to learn and pass the class when they dedicated more time to study. But the working schedule and family responsibility of many of the students prohibited them to do so. Over eighty percent of the students in Chemistry 20 are nursing students, therefore we are extremely dependent on the nursing program to keep our chemistry program going. Students graduating from high schools of this district hardly have any chance to be successful in science and engineering. In the past years, Chemistry 4 (Chemistry 2 for Compton College) had been offered each semester but then would be cancelled due to low enrollment. Chemistry 4 is prerequisite for students taking Chemistry 1A. Students do not want to take chemistry 4 after they have taken high school chemistry; they think it is repeating what they have learned. But the chemistry program of the high schools around here is not sufficient for them to pass the placement test and go directly into college chemistry (1A). Generally, our students have to take Chemistry 4 to be prepared for the challenge of Chemistry 1A. Without other chemistry courses offered, the Chemistry Department at the Center is offering the same class many times a year and it is very discouraging. If we have to maintain the minimum of twenty-five students to open a class, we do not anticipate there will be a Chemistry 4. Without Chemistry 4, Chemistry 1A and 1B cannot be offered. Therefore, the Chemistry program at this Center has a limited future.