

# EVERGREEN VALLEY COLLEGE

DIVISION OF MATH, SCIENCE & ENGINEERING

## Chemistry

Program Review Self-Study

2016 – 2017

*...A mind once stretched by a new  
idea never regains its original  
dimensions...*



## **Program Review**

Chemistry  
Academic Year 2016-2017

Prepared by:

Faculty

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Evergreen Valley College



**Department/Program Name: Chemistry**

**Last Review: 2011**

**Current Year: 2017**

**Preparers' Names: Brown, Bonnie; Duong, Van; Srinivasan, Preeti; Tran, Vu; Valentín, José**

**Area Dean: Michael Highers**

## Overview of the Department/Program ("Program")

1. Provide a brief summary of your program. Assume the reader does not know anything about it. Your explanation should include a brief history and a discussion of any factors that have been important to the program's development. Please explain the purpose of your program, what students you serve, what services you provide, and why these services are valuable.

The Chemistry Program encompasses a diverse field of courses sharing the unique Evergreen Valley College (EVC) mission: "With equity, opportunity and social justice as our guiding principles, Evergreen Valley College's mission is to empower and prepare students from diverse backgrounds to succeed academically and to be civically responsible global citizens." This program includes one foundational chemistry course (Fundamental of Chemistry), the two-semester Introduction to Chemistry (for health science majors), the chemistry major's sequence which includes the two-semester General Chemistry, and the two-semester Organic Chemistry sequences. These courses have been submitted to constant review and upgrades, incorporating new instructional methods and technologies as delivered by the ever growing Silicon Valley high tech industry.

Guided by the college's Commitments to Action and focusing on Student Centeredness, Community Engagement, and Organizational Transformation, the Chemistry program is committed to providing education to students of all ages and backgrounds, preparing them to succeed in a global and multicultural society. The program primarily offers the Associate of Arts in Chemistry degree, which allows students to transfer to a four-year institution as a chemistry major. Our courses also satisfy the general education requirements for other AA or AS degrees offered by the College. The Associate of Science for Transfer (AS-T) in Chemistry is available, but currently our courses require more units than is allowed for this degree (60 units). We are waiting for the State Academic Senate to revise the AS-T requirements to allow for more units in this degree. Chemistry courses are scheduled around student availability and schedule, providing state-of-the-art equipment and facilities, while delivering methods and supplemental learning opportunities off-classroom, textbook price reduction, and others. In addition, the program has committed to hire new faculty, continued staff professional development, creating campus activities, and performing outreach functions.

2. Please state at least three recent accomplishments for your program which show how it contributes to the College's success.

*Student retention and success rate* - According to data showed in section A5, the Chemistry program has maintained a consistent trend on student enrollment, which is a positive landmark. The Chemistry Department offers degrees that are not the top choices of students entering community colleges. However, students take our courses as part of their



requirement for graduation in other majors: Biology, Computer Sciences, Physics, and Engineering. We plan on reversing this trend by strengthening our ties with Universities and stretching our reach to middle and high schools.

*SLO Implementation and SLO Assessment:* In the previous program review, our Chemistry labs were reported outdated and in need of major improvements. In particular, several SLO's in Organic Chemistry could not be assessed for lacking of equipment needed to train students, and evaluate them on skills required for their majors. We were left to include questions only on the theoretical aspects of those laboratories instrumentation techniques in examinations. Below is a list of accomplishments that allow us to better assess the practical aspects of the SLO.

Below are our recent accomplishments:

- A. We upgraded lab instrumentation by acquiring a new Nuclear Magnetic Resonance (NMR) spectrometer as well as updating some of the old instrumentation we have been using including a Fourier Transform Infrared (FTIR) spectrometer and a Gas Chromatograph/Mass Spectrometer (GC/MS). This will enable our students to be better prepared to work in any laboratory type of environment with more updated instruments.
- B. Collaborative efforts are under way with NASA-Ames Research Center which will provide future student internships. This valuable experience will provide practical links between what our students learn at EVC and the real world.
- C. New laptops equipped with chemistry software have been acquired for use in chemistry lab experiments. Advances in the use of computers in the chemistry labs provides our students with the links between lab experiments and computers.
- D. We acquired new facilities (a new Math and Science building with lecture and laboratory rooms) with state-of-the-art visuals we now use to conduct our lectures and facilitate our students' success in the chemistry courses.

### 3. Where would you like your program to be three years from now?

We would like to make the following changes in our programs and courses in the next 5 years:

We envision a program that will provide not only the fundamental training our students need before transferring into 4-year universities but also the development of additional courses (for instance, an introductory course in the field of Physical Chemistry) to help them succeed in advanced courses they will be required to take to finish their B. S. degrees in Chemistry, Biochemistry, and Chemical Engineering.

In the next year or two, we would like to have the Associate of Science for Transfer (AS-T) degree, which would enable our students to more easily transfer to a four-year institution, especially to California State University campuses.

Currently, our AA degree in Chemistry contains too many units to fit into the 60 unit threshold established by the State Academic Senate template. Most community colleges have asked the State to allow more units in this "high-unit" major.



## PART A: Program Effectiveness and student success

1. State the goals and focus of this department/program and explain how the program contributes to the mission, strategic initiatives, comprehensive academic offerings, and priorities of the College and District.

### Analysis for Chemistry

The mission of the Chemistry program is to provide a lower division science foundation for those interested in pursuing chemistry as a major field of study and related- areas.

The goals of the program are to:

- Provide the lower division science course foundation needed for our graduating students to be adequately prepared to take upper division courses at the university level.
- Provide the opportunity to earn an Associates level degree in chemistry for those students transferring to universities.
- Provide technical training in chemistry/biochemistry/teaching for students interested in careers as diverse as health sciences, engineering, industrial chemistry, pharmacy, materials science, and teaching.
- Meet the needs of business and industry for employees who can apply scientific methodologies and math skills, communicate effectively, and think critically.
- Enhance college retention and success efforts, outlined in the College Educational Master Plan and Enrollment Management Plan, by providing greater flexibility in meeting individual student educational and employment objectives.

In keeping with the college's mission of equity, opportunity, and social justice while empowering the student as our guiding principles, the aforementioned goals will prepare students from diverse backgrounds to succeed academically, and to be civically responsible global citizens.

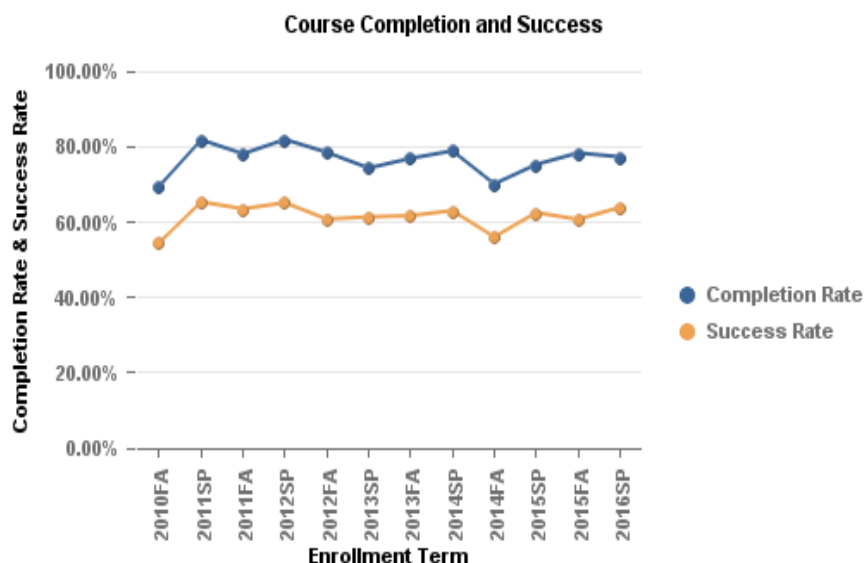
The Chemistry Program as part of the Physical Sciences Program encompasses a diverse field of courses sharing the unique Evergreen Valley College (EVC) mission: "With equity, opportunity and social justice as our guiding principles, Evergreen Valley College's mission is to empower and prepare students from diverse backgrounds to succeed academically and to be civically responsible global citizens." It includes all fields of natural sciences, linked to the branches of Biology and the Physical Sciences Program departments (i.e., Physics, Astronomy, and Earth Sciences), and maintains a diverse range of courses.

These chemistry courses have been submitted to constant review by both the Division and College curriculum committees resulting in upgrades, incorporating new instructional methods and technologies as delivered by the ever-growing Silicon Valley high tech industry. The list of courses includes foundational chemistry courses (Fundamental of Chemistry and the two-semester Introduction to Chemistry), chemistry majors sequence (the two-semester General Chemistry and two-semester Organic Chemistry).

2. What is your program set standard (baseline standard that you don't fall below) for successful course completion to measure effectiveness? (Please use program 5 year average

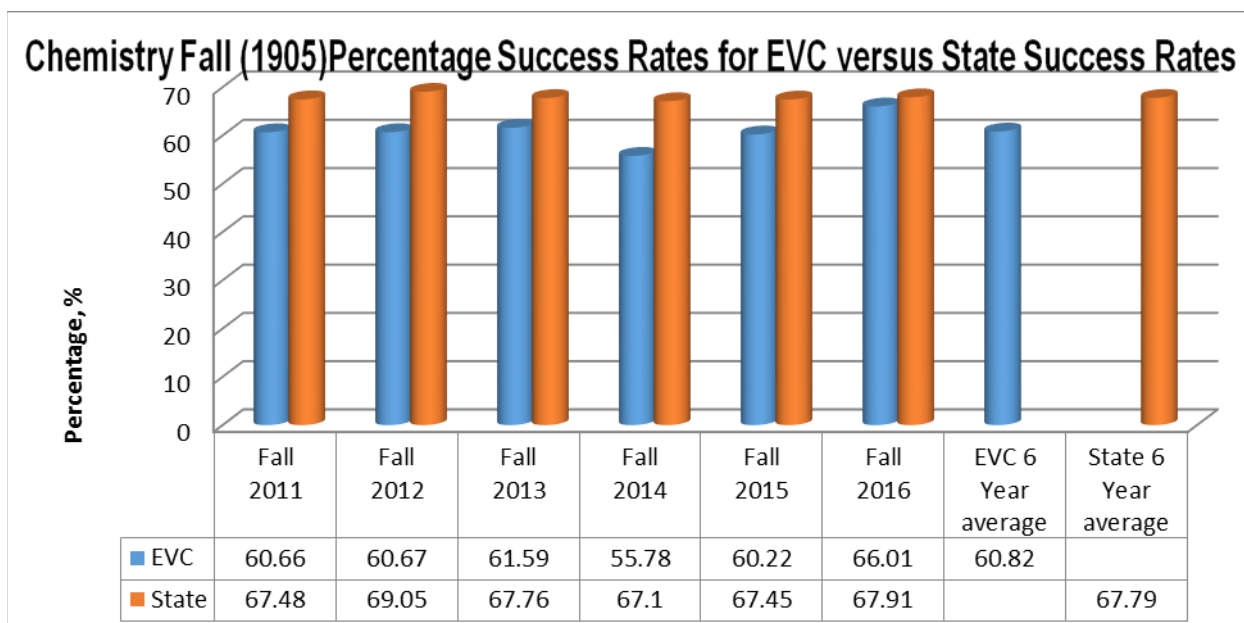


success rate and review 5 year state average to set the program set standard).How did your program do against this program set standard?



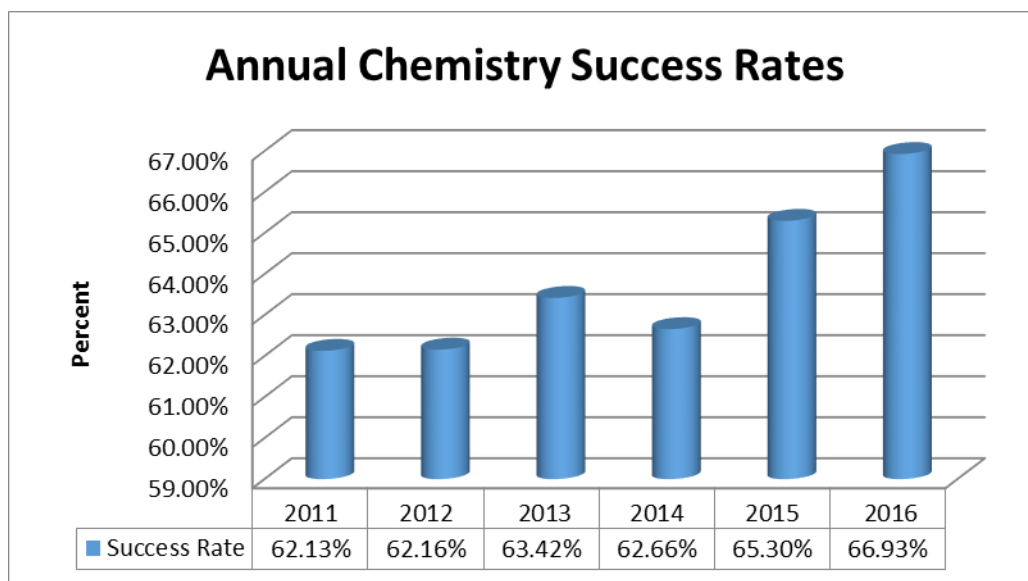
The average success rate for all chemistry classes over the five year period studied is 61.4%, just slightly below the college standard of 64%. A high mark of 65% was achieved during the spring semester of 2012 with the lowest success rate of 54% during the fall 2010 semester. We would like to have 55% as our absolute lowest success rate, we believe that the Department can remain closer to the 64% success rate in the future, and that the 54% mark was an anomaly. Ideas for improvement in our teaching methods, and strategies for increasing success rates in all sections will be discussed in monthly Department meetings. The Chemistry Department's completion rate hovers between 70 and 80% which is rather good for this difficult subject.

The base line for individual semester student success rates is 60.00% to 64.00%. However, on an annual basis which include three terms (fall, spring, summer), the baseline is 64.00% to 70.00%. The fall data listed below is within the allowable limits but the department is aiming at closing the gap (~8.0%) between the state's fall average and the program's fall average. Various pedagogical methods, will be employed along with guidance and tutoring to improve success rates.



3. Identify student success rate and patterns within the department/program and compare your results to the overall college institutional set standard of 64% successful course completion with “c” or better and your program set standard (questions 2)?

The annual student success rate is compatible to the overall college institutional set standard of 64% success course completion at an annual average of 63.77%. This data shows a favorable success rate for the program since the nature of the subject material is considered to be quite different than the general population’s material. The incorporation of all terms allows for an improved average of the success of students over the entire year.



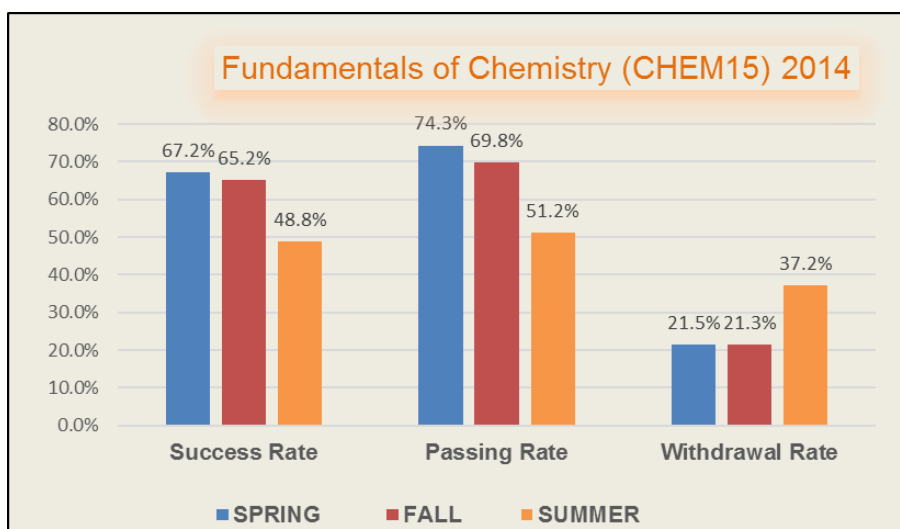
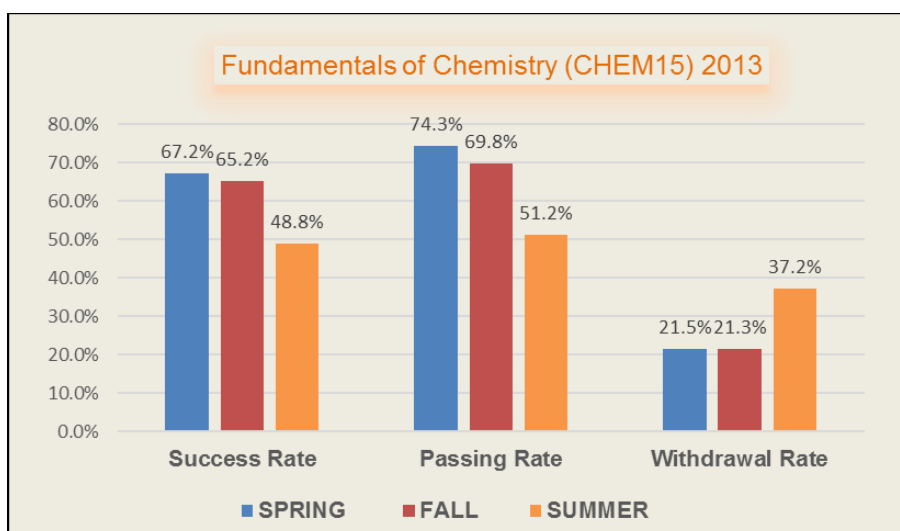
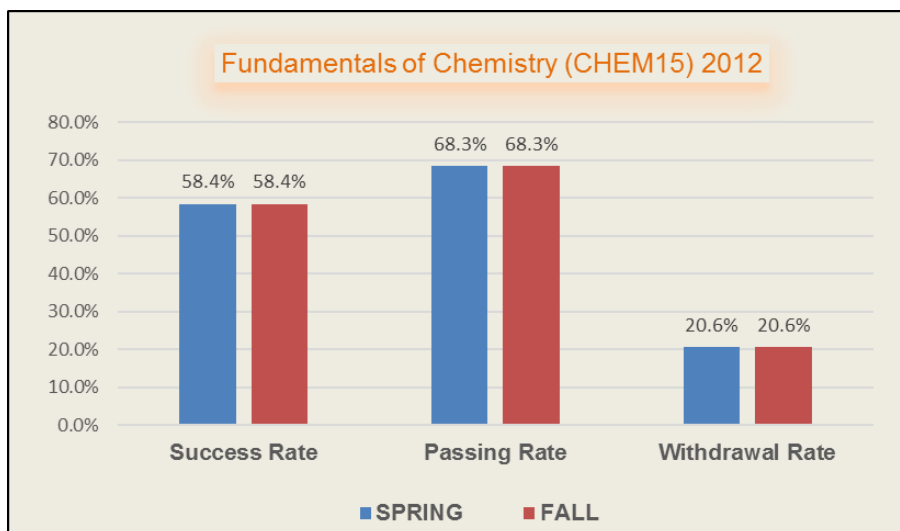
An analysis of success rates by course follows.



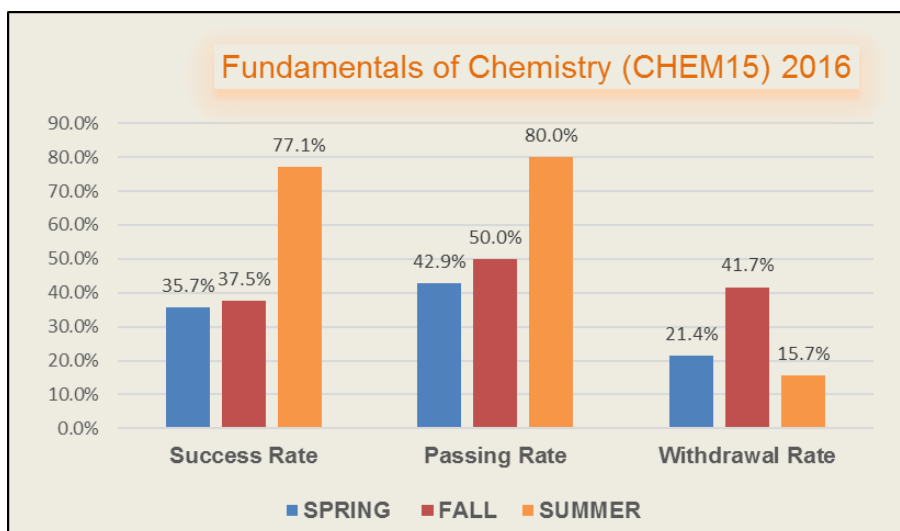
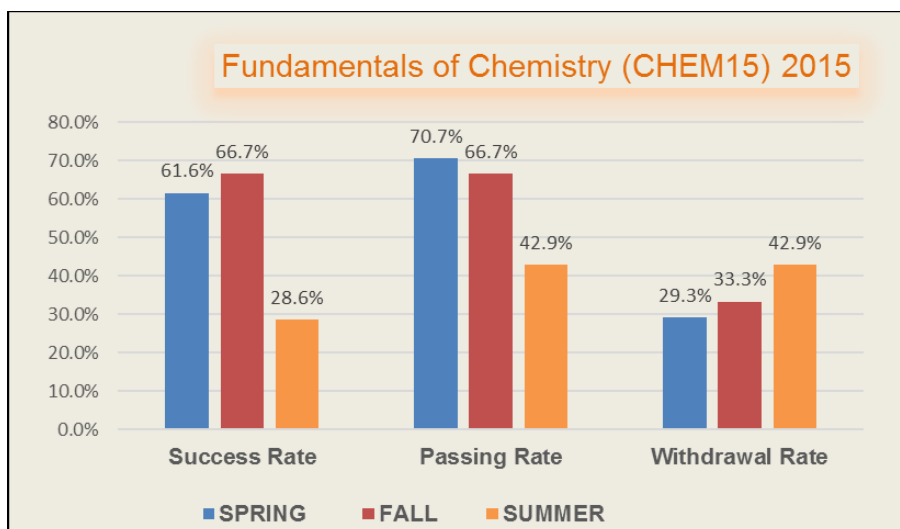
## Course Success and Passing Rates with Enrollment Measures

Graphed by Year and Semesters

### Fundamentals of Chemistry (CHEM 15)



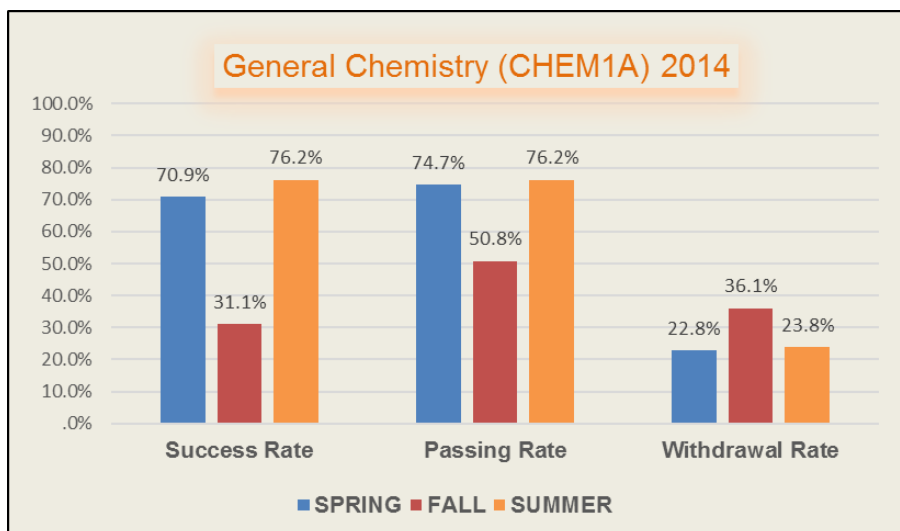
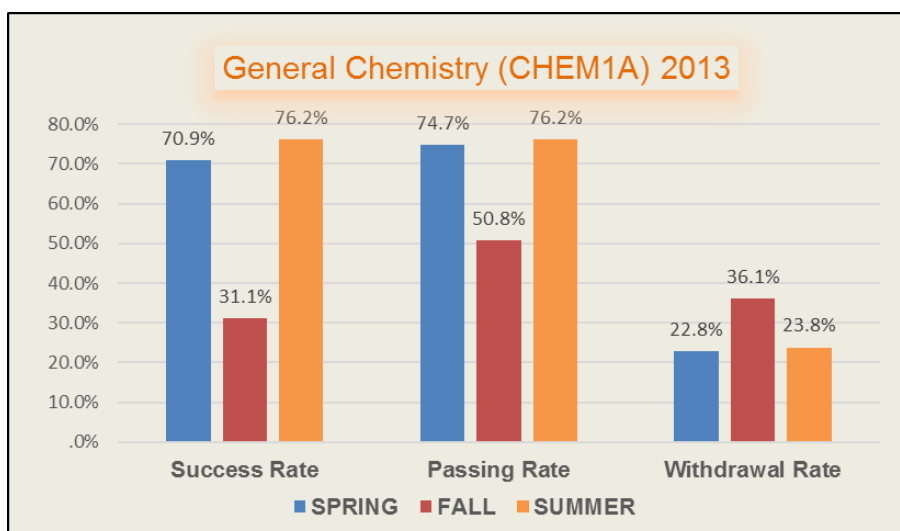
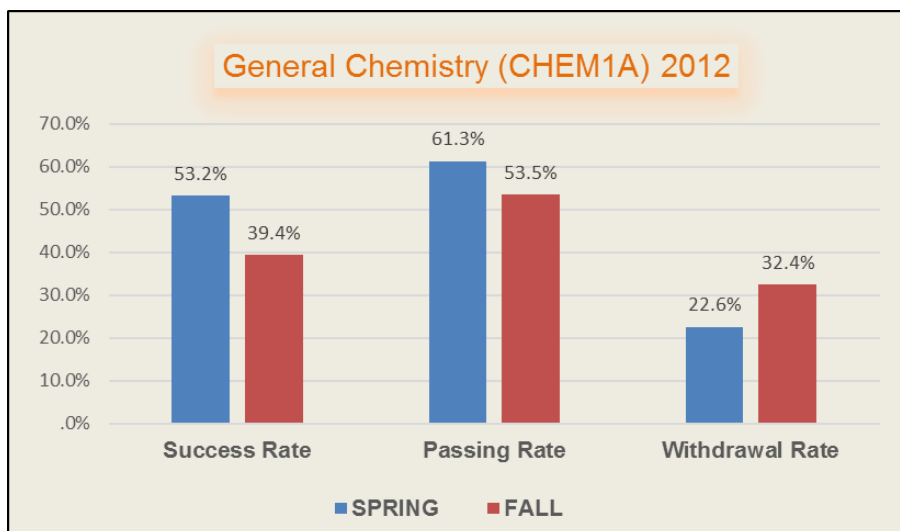


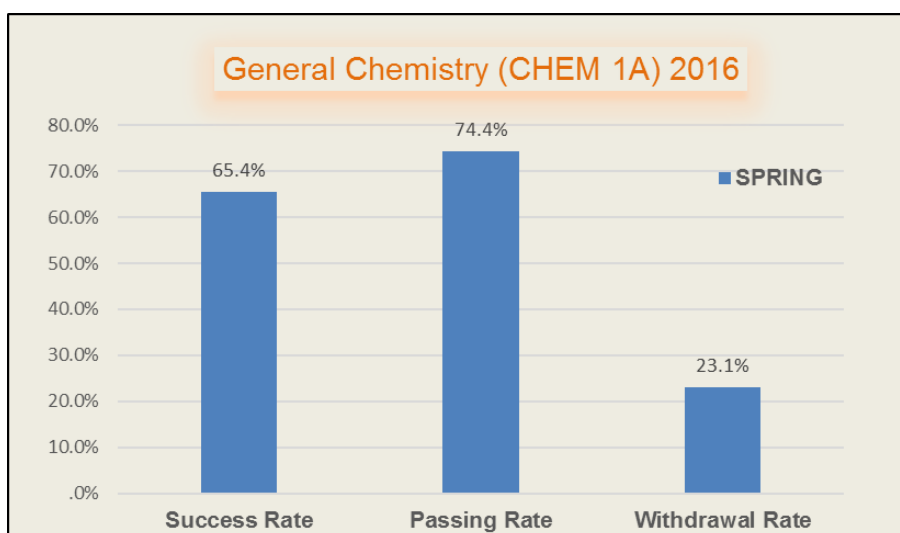
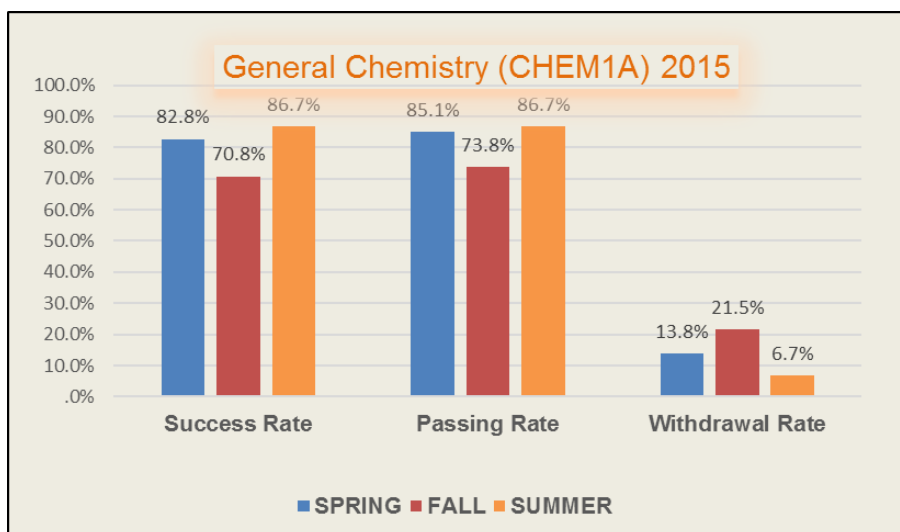


In Chemistry 15, the % of “Success Rate” and “Passing Rate” are within a few % points with the “Passing Rate” % being higher than the “Success Rate” %. This can be explained in terms of student having a border line success grade (A – C) just before the final exam. These students perform lower than a “C” grade in the final exam causing them to earn a “D” grade. During the summer of 2016 the “Success Rate” and “Passing Rate” % were much higher than during the fall and spring semesters which is quite unusual when comparing those rates with the ones shown on previous years.



## General Chemistry (CHEM1A)

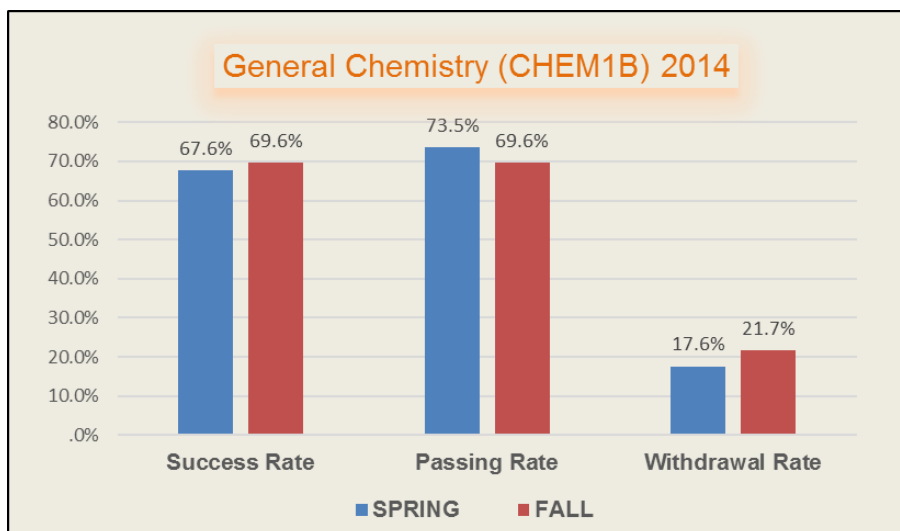
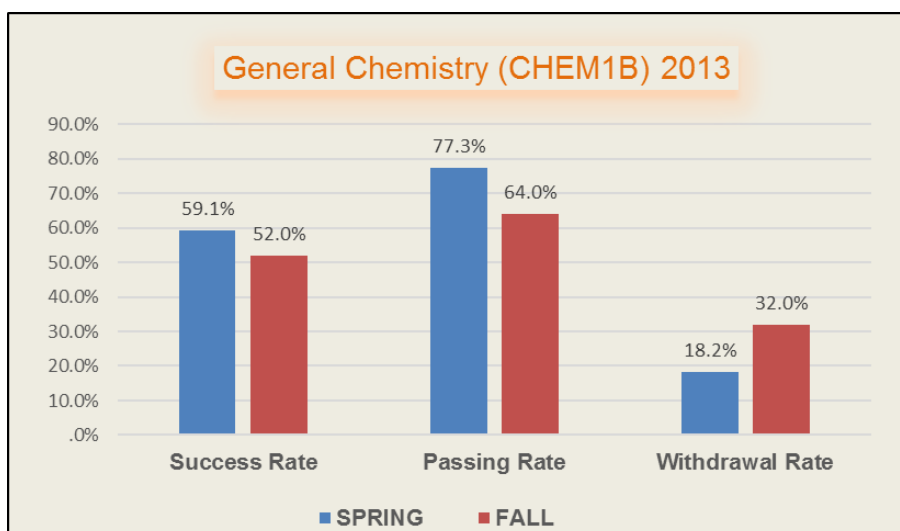
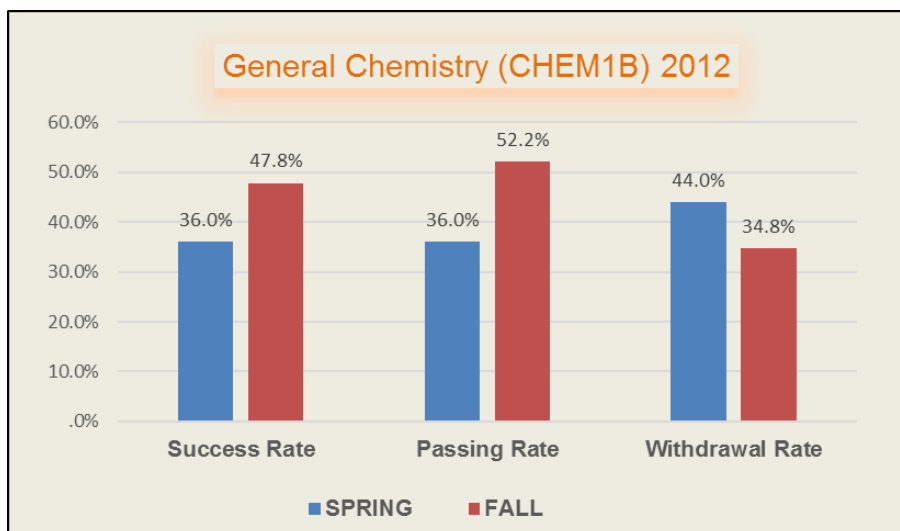


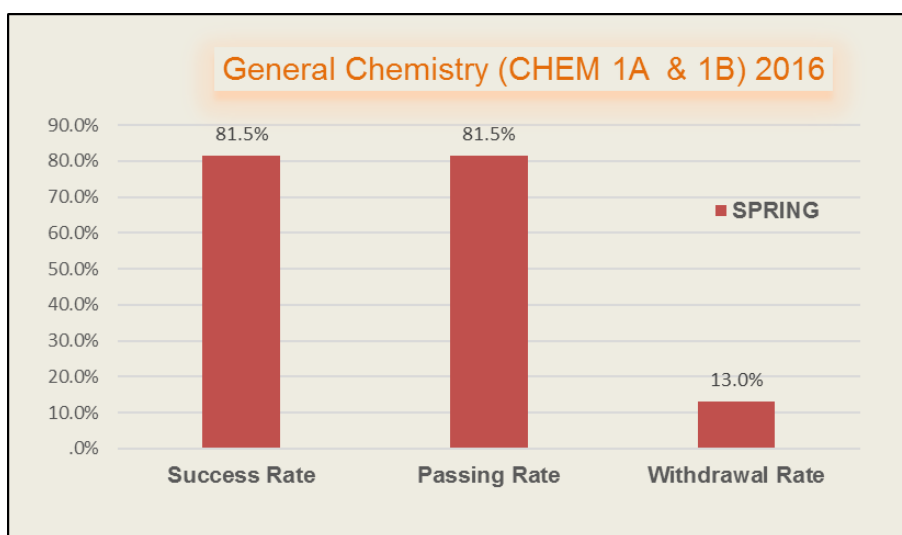
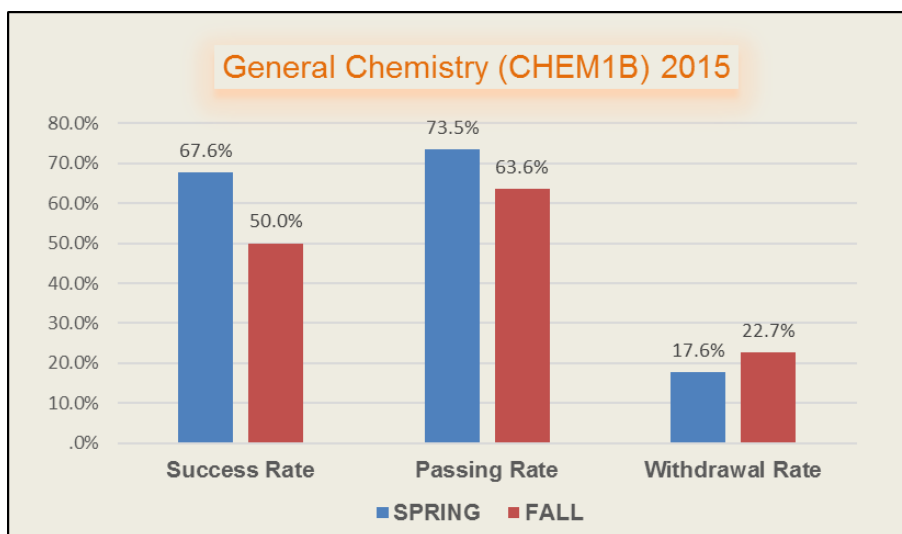


In Chemistry 1 A, the % of “Success Rate” and “Passing Rate” are within a few % points with the “Passing Rate” % being higher than the “Success Rate” %. This can be explained in terms of student having a border line success grade (A – C) just before the final exam. These students perform lower than a “C” grade in the final exam causing them to earn a “D” grade. These data is almost identical for all the school sessions this course was taught for all the years shown



## General Chemistry (CHEM1B)

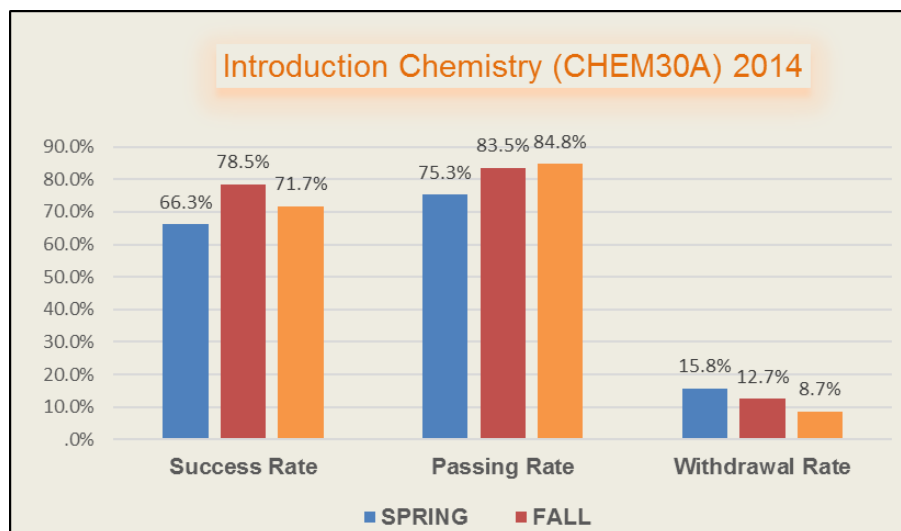
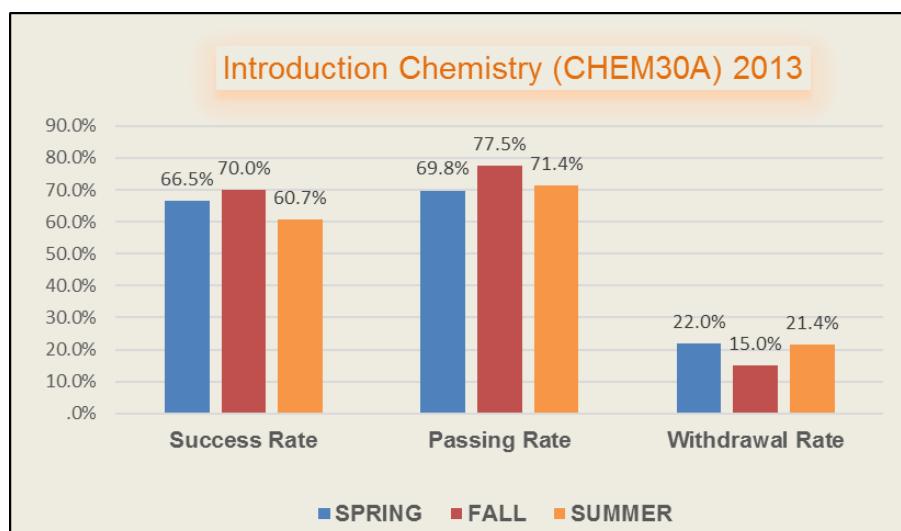
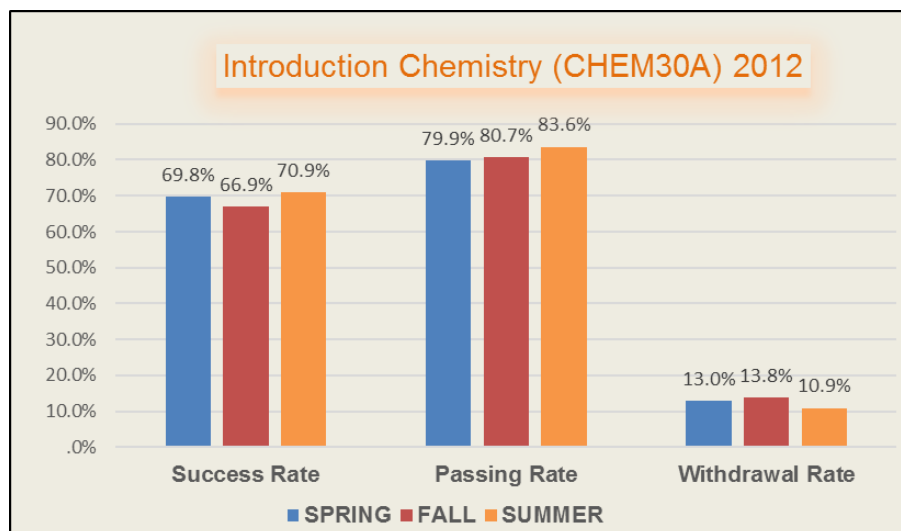


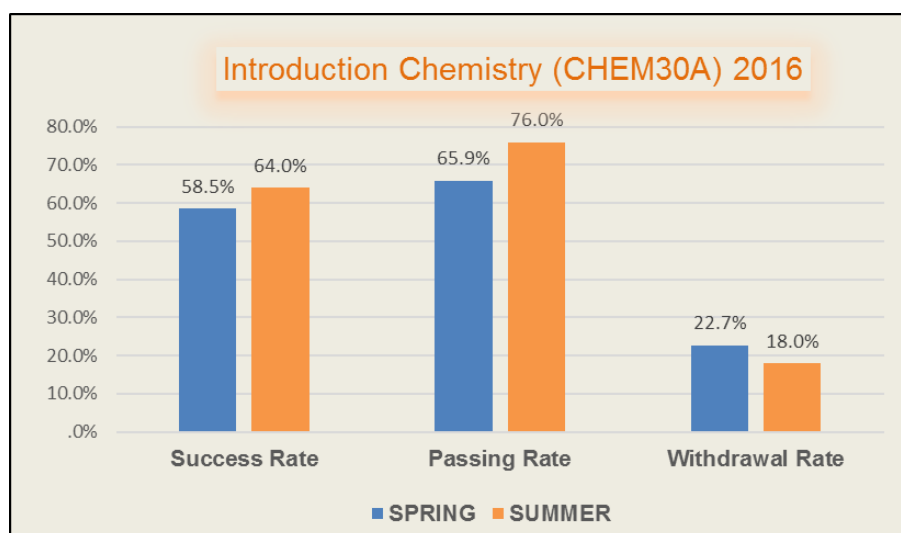
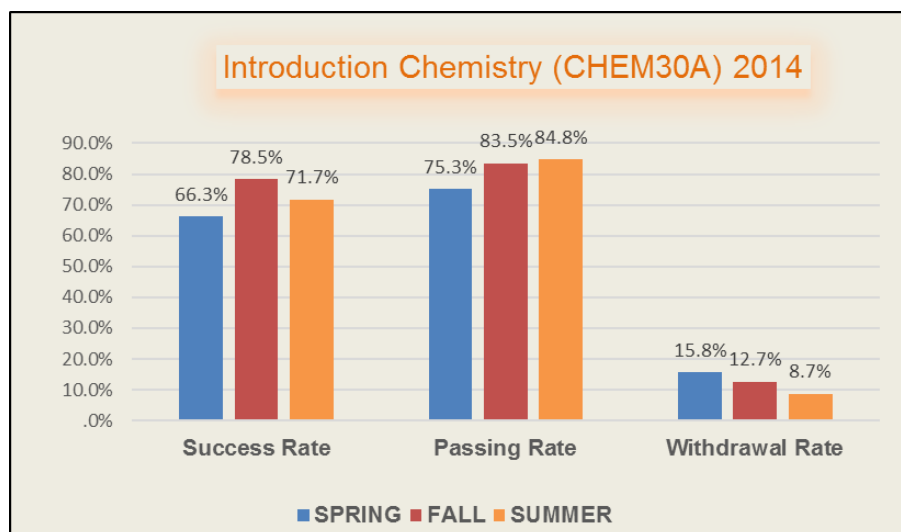


In Chemistry 1 B, the % of “Success Rate” and “Passing Rate” are within a few % points with the “Passing Rate” % being higher than the “Success Rate” %. This can be explained in terms of student having a border line success grade (A – C) just before the final exam. These students perform lower than a “C” grade in the final exam causing them to earn a “D” grade. These data is almost identical for all the school sessions this course was taught for all the years shown.



## Introduction Chemistry (CHEM30A)

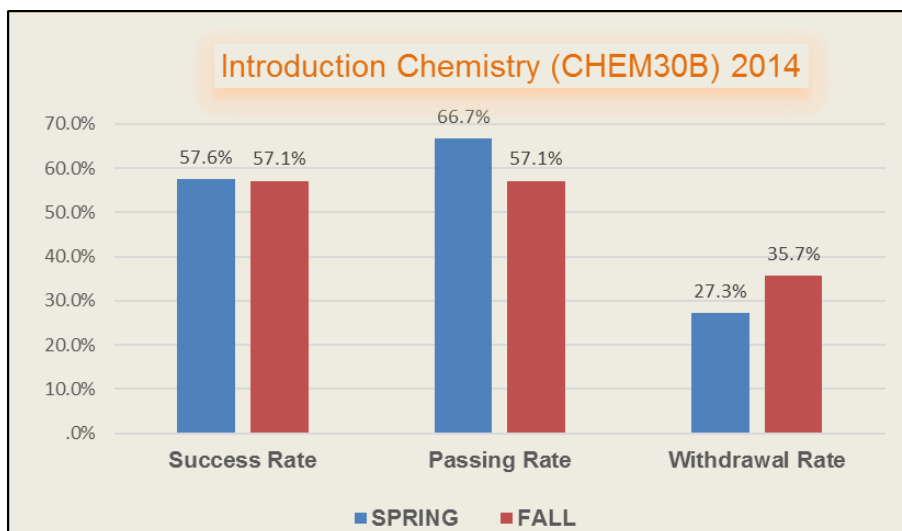
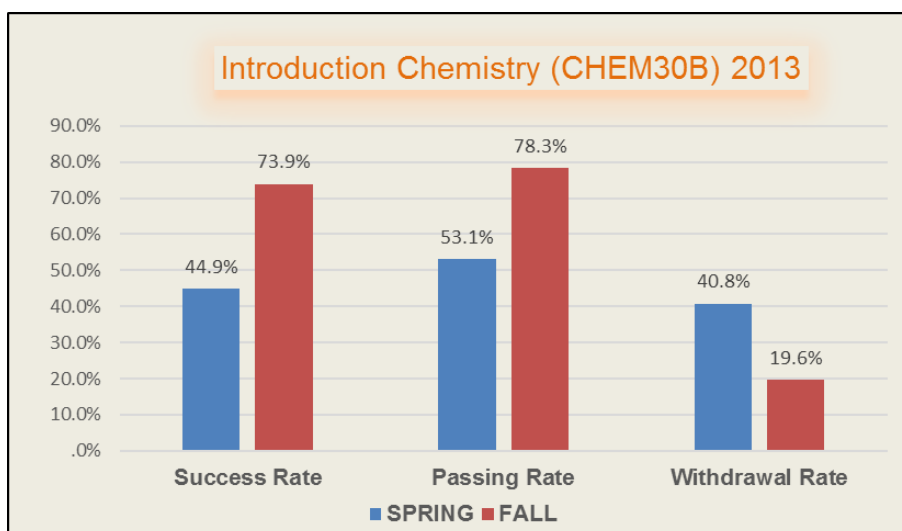
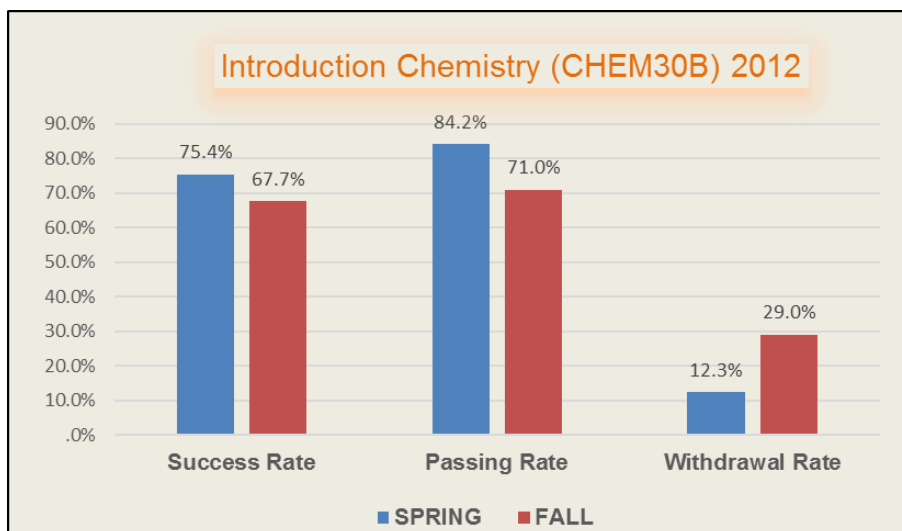




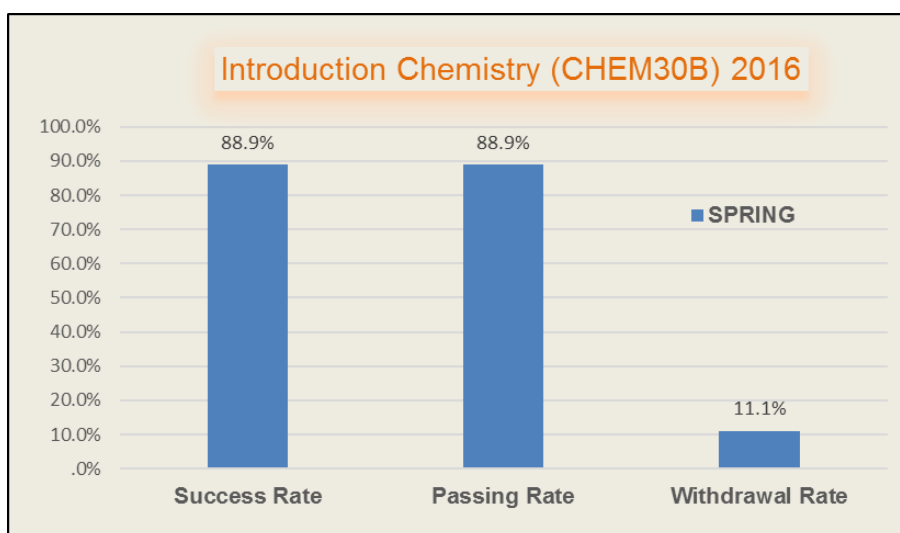
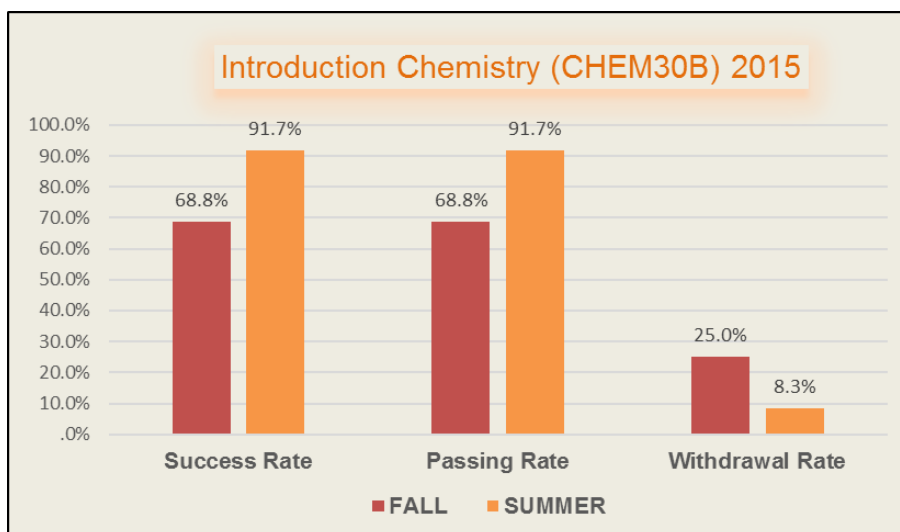
In Chemistry 030 A, the % of “Success Rate” and “Passing Rate” are within a few % points with the “Passing Rate” % being higher than the “Success Rate” %. This can be explained in terms of student having a border line success grade (A – C) just before the final exam. These students perform lower than a “C” grade in the final exam causing them to earn a “D” grade. These data is almost identical for all the school sessions this course was taught for all the years shown.



## Introduction Chemistry (CHEM30B)



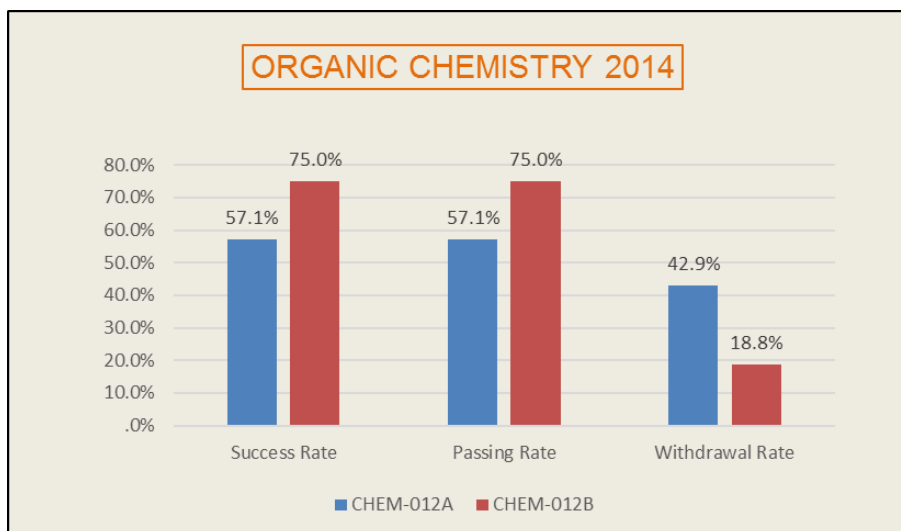
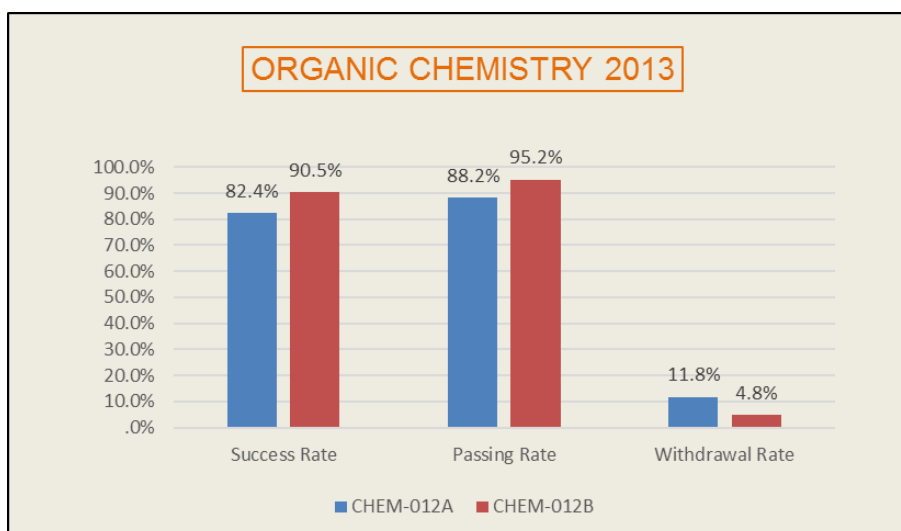
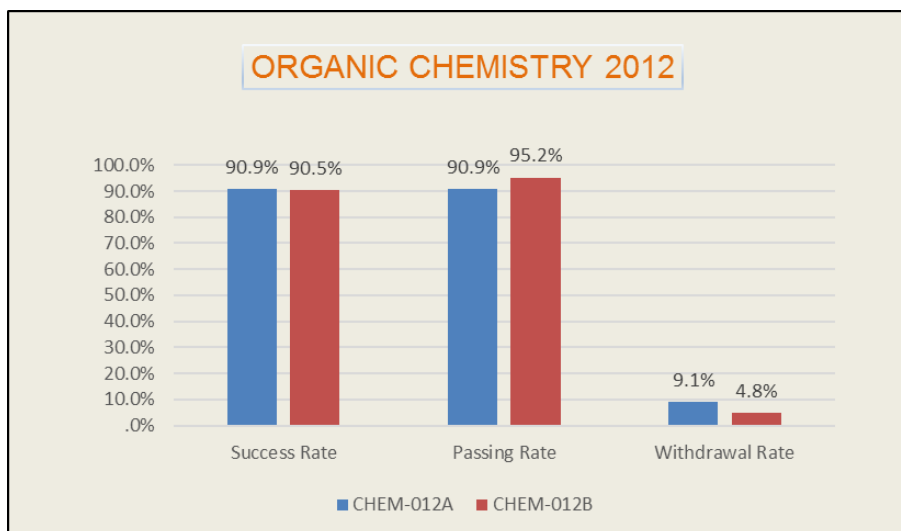


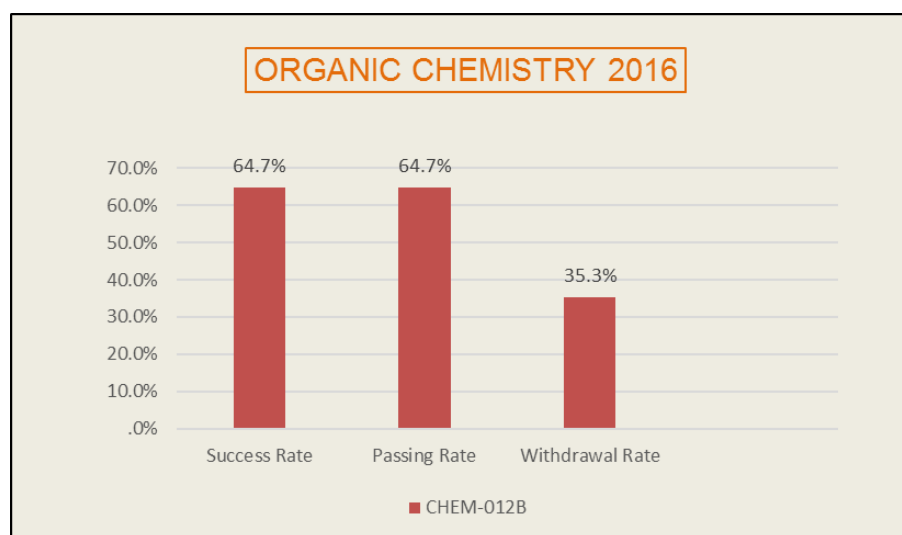
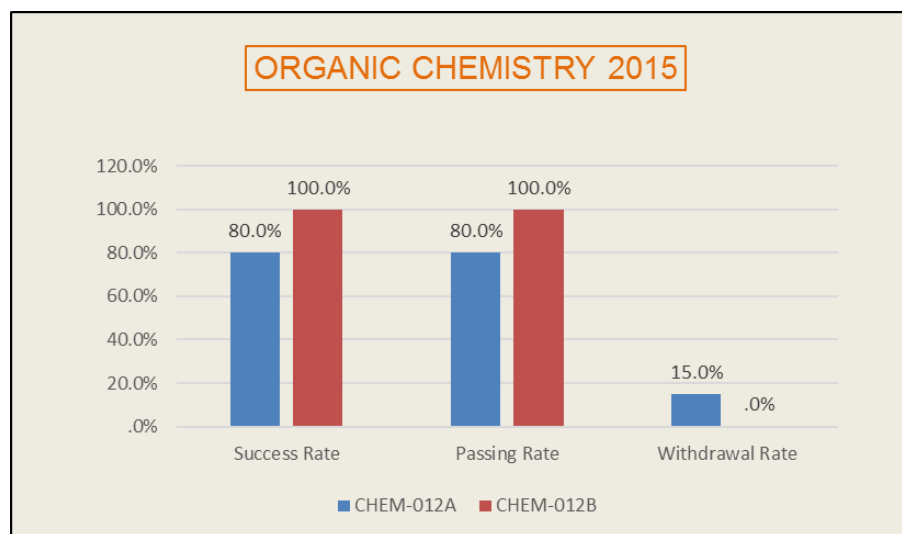


In Chemistry 030 B, the % of “Success Rate” and “Passing Rate” are within a few % points with the “Passing Rate” % being higher than the “Success Rate” %. This can be explained in terms of student having a border line success grade (A – C) just before the final exam. These students perform lower than a “C” grade in the final exam causing them to earn a “D” grade. These data is almost identical for all the school sessions this course was taught for all the years shown.



## Organic Chemistry

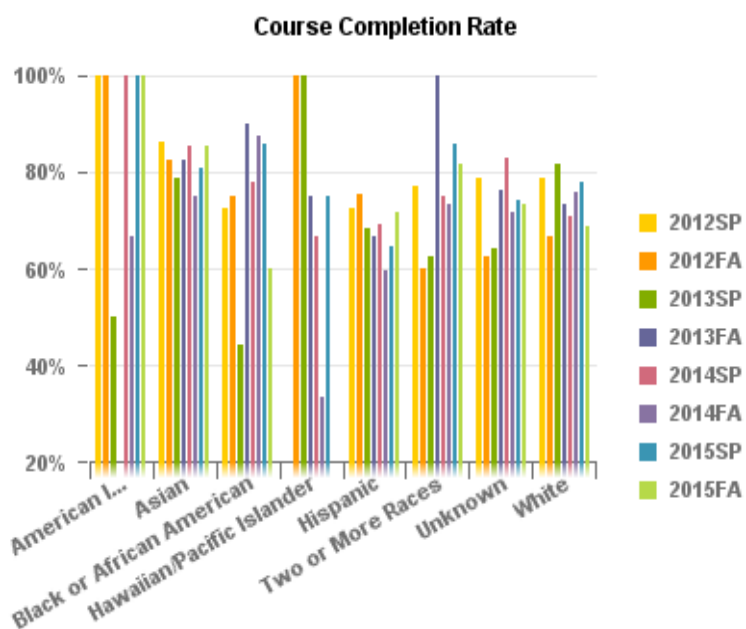


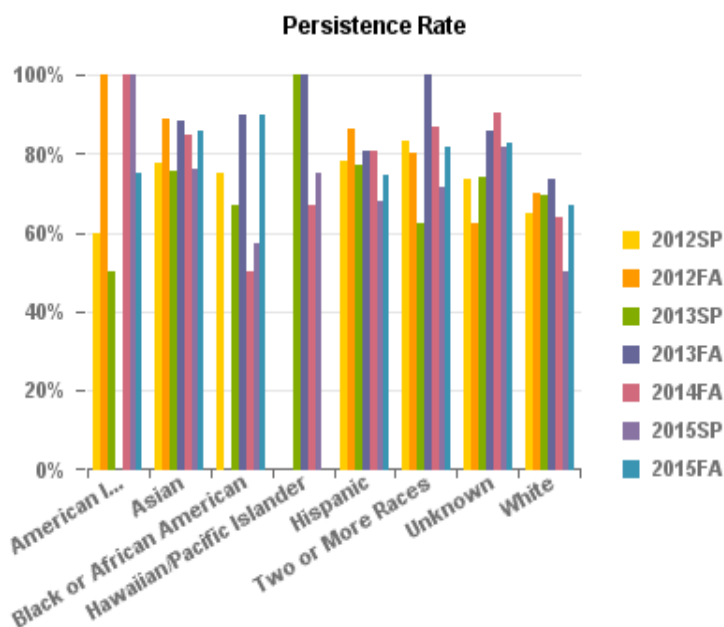


In Chemistry 12A and 12B (A one year Organic Chemistry course), the % of “Success Rate” and “Passing Rate” are within a few % points with the “Passing Rate” % being higher than the “Success Rate” %. This can be explained in terms of students having a border line success grade (A – C) just before the final exam. These students perform lower than a “C” grade in the final exam causing them to earn a “D” grade. These data are almost identical for all the school sessions this course was taught for all the years shown.



## Completion and Success Rates by Ethnicity





### Overall Success Rate by Ethnicity

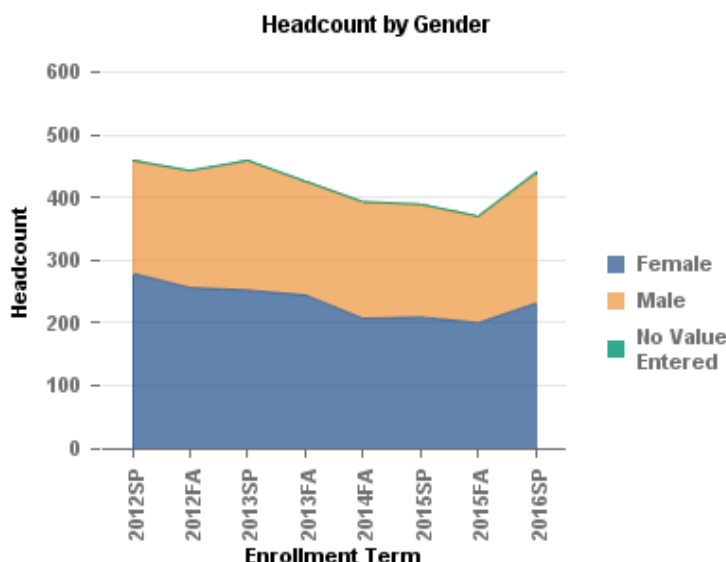
Ethnicity	Average Success (%)
American Indian	63.4
<b>Asian</b>	<b>69.6</b>
African American	60.7
Hawaiian/Pacific Islander	65.0
Hispanic	48.3
Two or More Races	55.2
Unknown	57.4
White	60.4
<b>AVERAGE</b>	<b>60.0</b>

As shown in this table the average successes percent (success means a final GPA of a passing grade of “C”) for most ethnic groups are with a +/- margin of 5% the total average with two exceptions. Our Asian student population had an average success % of 69.6 % which is above the overall average, but at the same time, our Hispanic student population had an average success percent well below the total average with an average of 48.3 % success and it was the lowest among all ethnic groups.

We are in the process of addressing the low percent success among our Hispanic population by offering on-site college courses our nearest high-school. One of the factors that could contribute to this lower success rate is the language barrier, and this is a factor we will consider in our Department meetings when discussing our success rates as many of these students are probably use English as a second language.

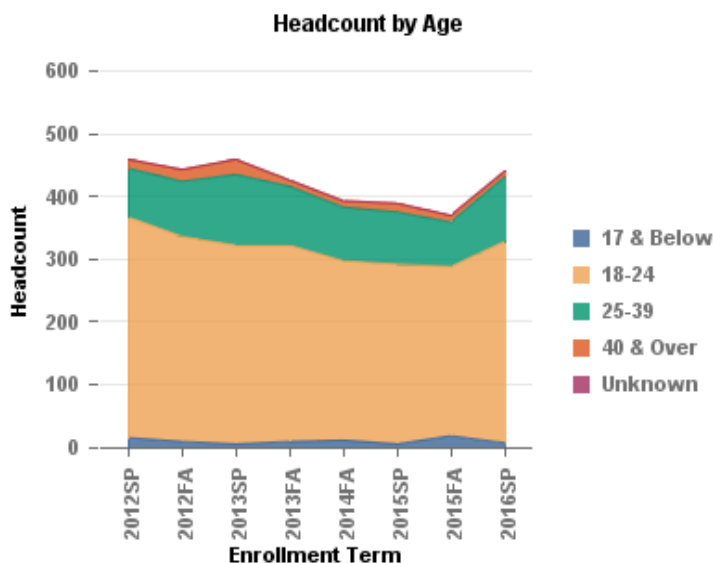


4. Identify current student demographics. If there are recent changes in student Demographics, explain how the program is addressing these changes.



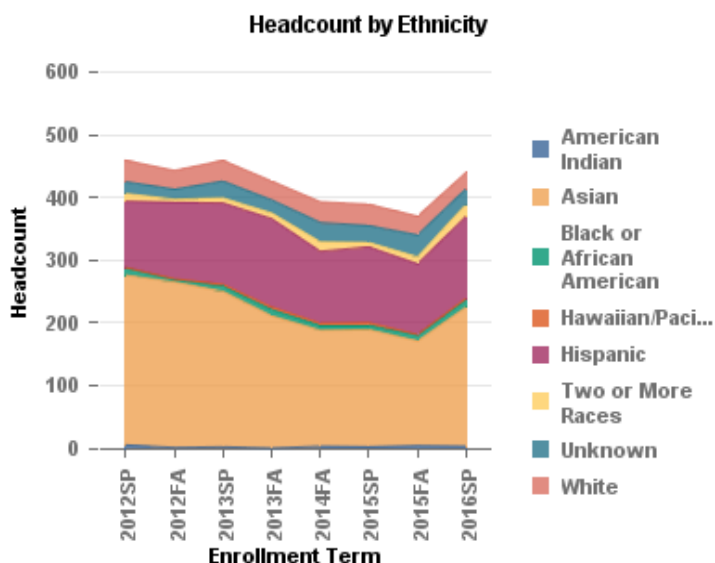
### Headcount by Gender

During the last 5 years very little has changed in the male population but a sharp increase in the male population between the fall 2015 and the spring 2016. The highest percent female enrollment occurred in the spring of 2012 at 608%, and the lowest female enrollment occurred in the spring of 2016 at 52.5%. The female population fluctuated between these figures over the past six years. In general there is a small gap between the male and female populations favoring the male enrollment by up to 10%. We need to increase our female population in our courses. On way to accomplish this is by showing role models of former as present female scientists and encouraging more female scientists to become involved as science teachers and mentors.



### Headcount by Age

During the last 5 years very little has changed in this category for all group ages. Most of our students are between the ages of 18-24 due to the fact that most of them have recently graduated from high school. These data comparable with data submitted in previous program review.



### Headcount by Ethnicity

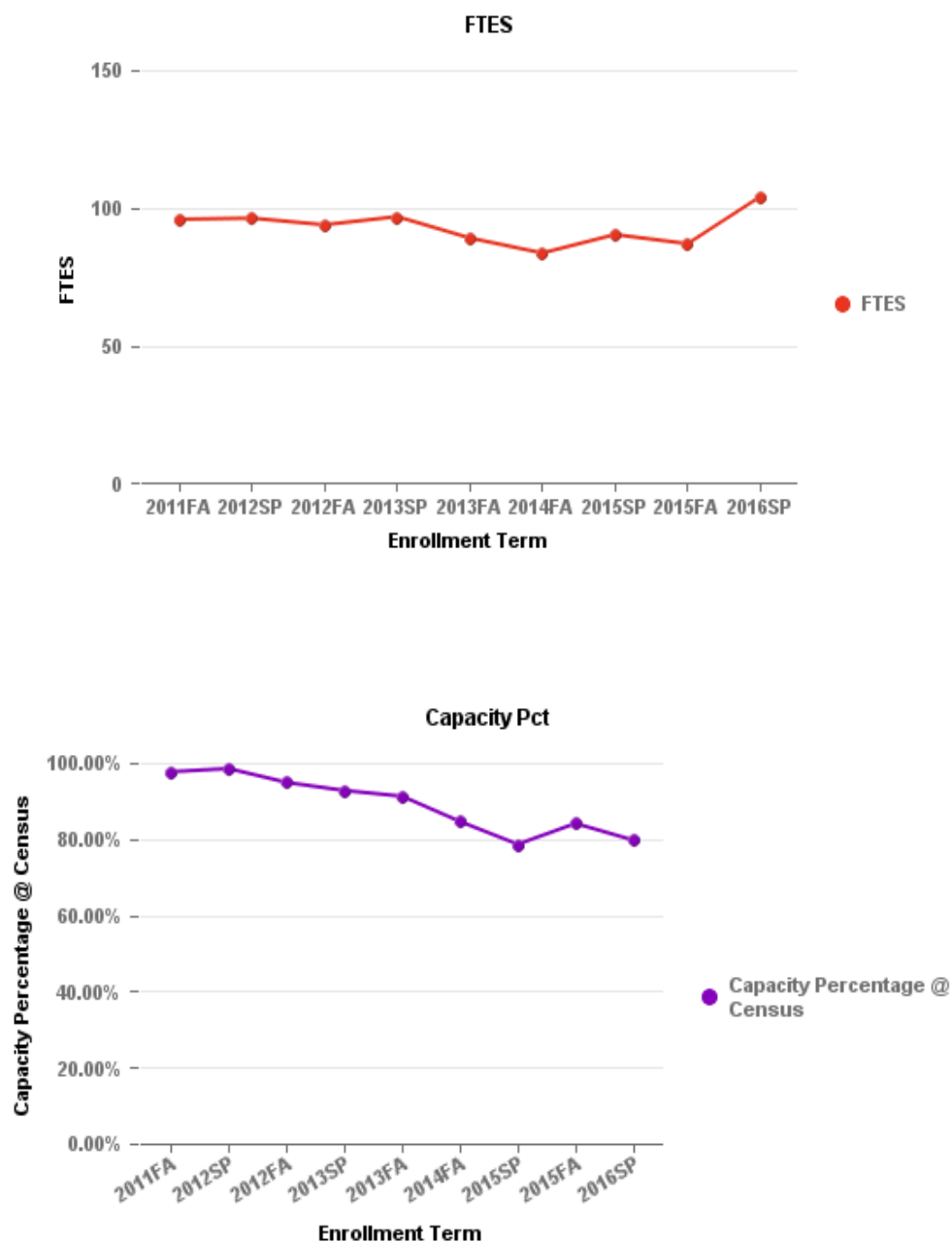
The average ethnicity for Asians for the previous six years through spring of 2016 is 53.4% of the Chemistry enrollment, with a high in spring 2012 of 59% and a low of 45% in the spring of 2015. Asian population varied from a high of in the fall of 2013 and a low 23.1% of in the spring of 2012, making up an average of 25.2% of the Chemistry population. The third most frequent ethnicity was whites making up an average of 7.5% of the Chemistry enrollment over the six-year period, varying from as low of about 6% to a high of 8.4%. There seems to be no recognizable trend in ethnicity over this period.

During the last 5 years very little has changed in this category. There was a continuous decrease between the spring 2013 until the fall 2015, followed by a sharp increase between the fall 2015 and the spring 2016. Most of our chemistry students are Asian. Even though EVC is a "Hispanic Serving Institution", the head count is about half of the Asian students. The head count of our African American population is even lower than that of the Hispanic head count. Obviously there is room for improvement in these numbers. In order to be able to improve the head count of Hispanic and African American students, alternative outreach methods need to be developed.



5. Identify enrollment patterns of the department/program in the last 6 years and provide an analysis of any notable trends or patterns.

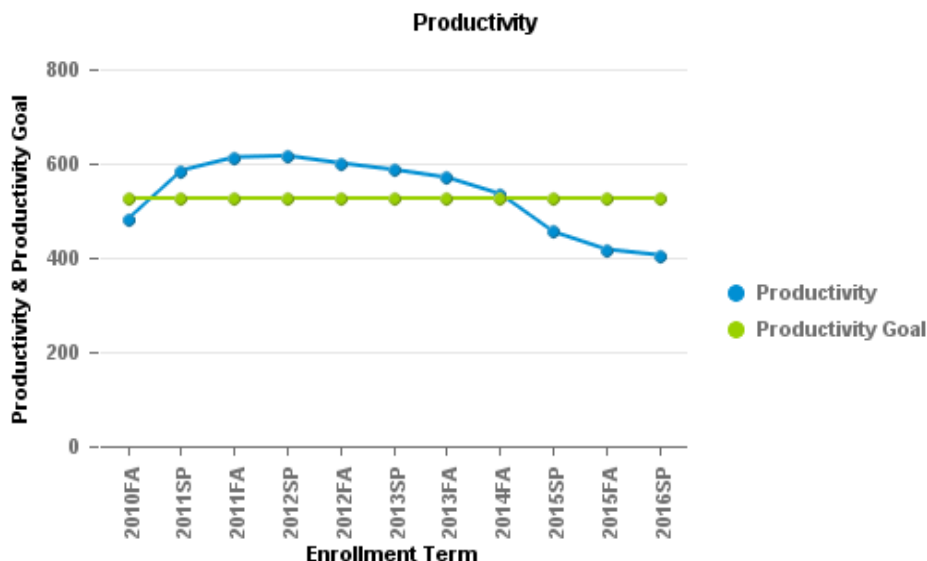
Enrollment in Chemistry has held steady in the high 80's and 90's, with a sharp upswing in the spring of 2016 where it reached 104. Generally Chemistry courses are easy to fill, with new sections being added in the last few semesters, with an average fill rate of 91%.







6. (Data) Identify department/program productivity (WSCH/FTEF).



As stated previously, the fill rate in Chemistry courses is fairly high, and is reflected in the productivity graph shown above. The College's goal is to have a productivity of 525, and from spring 2011 to the fall of 2014, the Department met or exceeded this goal. There has been a drop-off in recent semesters to a low of 404, most probably to an increase in the number of sections offered (21 in spring of 2016). This increase is an effort to increase the variety of times the course is offered during the week.

7. If the program utilizes advisory boards and/or professional organizations, describe their roles.

This is not applicable to the Chemistry Program.



## PART B: Curriculum

### 1. Identify all courses offered in the program and describe how the courses offered in the program meet the needs of the students and the relevant discipline(s).

1) Introductory Chemistry courses. Both Chem 30A and 30B are for students who, with no background in chemistry, need beginning chemistry for pre-Nursing in order to go on into Microbiology and Physiology, or for other technical career, or to satisfy the General Education transfer requirement for a laboratory science. Chemistry 15 is the prerequisite for Chemistry 1A and 1B, but it also satisfies the General Education transfer requirement for a laboratory science.

Course Dept/No	Course Title	Semester Units
Chem 30A	Introduction to Chemistry	4.0
Chem 30B	Introduction to Chemistry	4.0
Chem 15	Fundamentals of Chemistry	4.0

**CHEM 030A: Introduction to Chemistry** covers the basic principles of chemistry. Content includes measurements; matter and energy; atomic structure, periodicity; chemical bonding and nomenclature; chemical reactions and equations; gases, solutions and colloids; oxygen, hydrogen and water; and acids, bases and salts. CHEM 030A is a prerequisite for microbiology and physiology and is designed to meet the chemistry requirements for nursing and other allied health majors. This course meets the General Education requirements for a laboratory science.

**CHEM 030B: Introduction to Chemistry** introduces the basic principles of introductory organic and biological chemistry. It is designed for allied health and industrial technology majors. Content includes hydrocarbons, alcohols, ethers, carbonyl compounds, carboxylic acids, esters and amines, and an introduction to structures and properties of carbohydrates, lipids, and other biopolymers.

**Chemistry 015: Fundamentals of Chemistry** covers the fundamentals of modern inorganic chemistry with emphasis on atomic structure, chemical bonding, chemical formulas, nomenclature, equations, stoichiometry, gas laws, solutions, and related topics. Chemistry 015 is intended primarily as a preparation for the Chemistry 001A and 001B sequence. The central nature of chemistry among other branches of science is stressed, and examples of the important role that chemistry plays in our lives are presented. The course also meets the general education requirements for a laboratory science.

2) There are four courses required for the Associate in Arts (A.A.) degree and they are recommended by the American Chemical Society (ACS) Guidelines for Chemistry in Two-Year College Programs:

Course Dept/No	Course Title	Semester Units
Chem 1A	General Chemistry	5.0
Chem 1B	General Chemistry	5.0
Chem 12A	Organic Chemistry	5.0
Chem 12B	Organic Chemistry	5.0
Total		20.0



**CHEM 001A – General Chemistry** is required for students majoring in biology, chemistry, geology, physics, forestry, pharmacy, veterinary medicine, dentistry, and medicine. Chem 001A also meets the one semester chemistry requirement for all engineering majors. This course covers basic chemical principles: atomic structure, bonding, periodicity, nomenclature, chemical reactions, stoichiometry, thermochemistry, physical states of matter, solutions, acids and bases, and dynamic equilibrium. The role that chemistry plays in everyday life, industry, and human welfare is emphasized.

**CHEM 001B – General Chemistry** is a continuation of Chemistry 001A, the second semester of a one year college level general chemistry sequence. The content includes thermodynamics, chemical kinetics, chemical equilibrium, electrochemistry, coordination compounds, nuclear chemistry, and organic chemistry. The laboratory emphasizes qualitative and quantitative analyses of inorganic compounds and introduces electronic instrumentation. The course is required for students majoring in physical and biological sciences and pre-professional majors such as pre-medicine and dentistry. The course also completes the basic chemistry requirements for students majoring in chemical and materials engineering.

**CHEM 012A – Organic Chemistry** is the first semester of a year-long comprehensive organic chemistry course with emphasis on structure, reaction mechanisms and their kinetics. Topics include nomenclature, stereochemistry, mechanisms, reactions, and spectroscopic studies of organic compounds. Problem-solving techniques will be used to elucidate mechanistic, structural and stereochemical features of reactions and molecules. Lecture and laboratory will cover synthesis, isolation, purification, elucidation and identification of organic structures, instrumental methods and data interpretation.

**CHEM 012B – Organic Chemistry** is the second semester of a year-long organic chemistry course designed to follow Chemistry 012A. Topics include nomenclature, stereochemistry, mechanisms, reactions, and spectroscopic studies of aliphatic and aromatic alcohols, aldehydes, ketones, acids, and other classes of organic and biological compounds (such as amino acids, proteins, and nucleic acids). Problem-solving techniques will be used to elucidate mechanistic, structural, and stereochemical features in chemical reactions. Lectures and laboratory methods will focus on synthesis, isolation, purification, elucidation and identification of organic structures as well as instrumental methods and data interpretation.

2. All course outlines in this program should be reviewed and revised every six years. If this has not occurred, please list the courses and present a plan for completing the process, including timelines and dates for each course.

Dept/No	Course Title	Semester Units	Revision Approval Date
Chem 30A	Introduction to Chemistry	4.0	12/10/2015
Chem 30B	Introduction to Chemistry	4.0	4/24/2014
Chem 15	Fundamentals of Chemistry	4.0	6/22/2015
Chem 1A	General Chemistry	5.0	9/24/2013
Chem 1B	General Chemistry	5.0	4/25/2013
Chem 12A	Organic Chemistry	5.0	4/25/2013
Chem 12B	Organic Chemistry	5.0	4/25/2013



### 3. Identify and describe innovative strategies or pedagogy your department/program developed/offered to maximize student learning and success. How did they impact student learning and success?

Chemistry is essential in understanding many fields, including agriculture, astronomy, animal science, geology, medicine, applied health technology, fire science, biology, molecular biology, environmental science, materials science, and teaching. Studying chemistry allows the students to learn to solve problems (critical thinking) and develop effective study habits that will be helpful in their future academic as well as professional endeavors, and gain a deep appreciation for the powerful role of chemistry in contemporary societal and global issues.

Our Chemistry program is a component of our school mission to “empower and prepare students from diverse backgrounds to succeed academically, and to be civically responsible global citizens.” Moreover, our program meets the needs of business and industry for employees who can apply scientific methodologies and math skills, communicate effectively, and think critically. We accomplish this with a team of very dedicated, engaging, intellectually excited and enriched faculty and staff to address needs and foster excellence; and tutoring services provided in the Math and Science Resource Center.

As instructors and mentors we provide an atmosphere that encourages:

#### A. Cultivation of critical thinking skills

Many students view chemistry as a burden, a necessary evil, rather than a process of thinking and reasoning. Students often do not have the basic tools to succeed in chemistry because they cannot make the leap from rote memorization to critical thinking. The pedagogies of lecturing, construction of quizzes, inquiry-based experiments and investigations, all aim to help students to develop and practice critical thinking skills, empowering them to solve problems creatively and logically.

#### B. Performing inquiry-based small group investigations

Students engage in online discussion groups; plan and perform hands-on activities, and give class presentations. This small-group format has enhanced deep learning, cultivated positive interdependence, promoted members’ learning, reduced gender and racial bias, and improved leadership and conflict management skills. Surveys, reflection, student self-ratings of accomplishment, and anecdotal evidence have been very positive.

#### C. Learning chemistry by writing

Writing is an essential skill of practicing chemists. Chemists convey ideas in persuasive research proposals, describe original research, and write peer reviews. Writing is also an important component to learn chemistry and foster critical thinking skills.

- Homework assignments involve three stages: read and understand source materials and write an essay; peer review other students’ essays and finally own essay.
- Enhance student learning by writing and discussing important topics in chemistry by using small-group cooperative learning activities via the web.
- Submit research-style lab reports and expository writing.



D. Using technology, including computers and the web

- Become information literate and know how to find, analyze, and use effectively the needed information.
- Pass weekly online (Moodle and Canvas) prelab quizzes prior to each experiment. The quizzes are designed to help the students understand the experiments and the important safety measures, and as an incentive to study the experiment in advance.
- Use Excel to create line graphs, column and pie charts. Interpret graphs, trend line, formulas, tables, and draw inferences from them.

E. Implement the California Chemistry Diagnostic Test to evaluate knowledge, skills, and abilities students need for success in General Chemistry

Underprepared students are advised and redirected to Chem 15, the prerequisite course. Many of our students have expressed thanks for having had Chem 15 preparation for Chem 1A.

Our students are empowered by the first-rate academic preparation we provide. Visits and communications from former students now at UC's and other four-year schools attest that the chemistry courses at EVC are superior, typically surpassing those of their "straight-through-UC" peers. Many alumni (a) including Ph.D.'s, physicians, pharmacists, professors, engineers thank us for our high standard and training for life-long skills that allow them to become successful professionals.

4. Discuss plans for future curricular development and/or program (degrees & certificates included) modification. Use a Curriculum Mapping form as needed.

Since the number of total units required to earn an AA degree in Chemistry is higher than the maximum of 60, we have not been able to establish an AS-T degree in Chemistry. This is a common issue with most of the California community colleges. The state of California is in the process of dealing with this issue. As soon as this is done we will be in the process of developing our own AS-T in Chemistry.

5. Describe how your program is articulated with the High School Districts, and/or other four year institutions. (Include articulation agreements, CID, ADTs...)

At present we have articulation agreements with other 4-year institutions allowing our students to transfer all the major Chemistry courses required to finish their B. S. degrees in Chemistry, Biochemistry, and Chemical Engineering.

At present we don't have articulation transfer agreements with high schools. The reasoning behind this is that the Chemistry courses offer at the high school level do not offer the necessary laboratory preparation to help our students succeed in more advanced chemistry courses. Chemistry is 100% an experimental science. Experience in laboratory experiments is a critical aspect of learning chemistry.

6. If external accreditation or certification is required, please state the certifying agency and status of the program.

None



## PART C: Student Learning Outcomes and Assessment

1. On the program level, defined as a course of study leading to a degree or certificate, list the Program Learning Outcomes (PLO), and how they relate to the GE/ILOs (link to ILOs). If you are completing this program review as a department or discipline and do not offer any degrees or certificates, please disregard this question.

**Associate in Arts (A.A.) in Chemistry** The purpose of the A.A. Degree in Chemistry is to provide a lower-division science foundation for those interested in pursuing chemistry or biochemistry as a major field of study. This major prepares students to transfer to any California State University or University of California campus. Students considering careers in research, teaching, scientific consulting, or medicine, and the chemical, pharmaceutical, or biotechnology industries, find the Chemistry major an ideal academic preparation for entry into these professions.

### Degree Requirements:

Major Requirements		Credit Hours: (20 Required)
CHEM 001A	General Chemistry	5
CHEM 001B	General Chemistry	5
CHEM 012A	Organic Chemistry	5
CHEM 012B	Organic Chemistry	5
Major Electives		Credit Hours: (10 Required)
MATH 071	Calculus I with Analytic Geometry	5
MATH 072	Calculus II with Analytic Geometry	5
General Education		Credit Hours: (30 Required)
Area A: English Language Communication & Critical Thinking (9 units)		
Area B: Scientific Inquiry and Quantitative Reasoning (9 units)		
Area C: Arts and Humanities (9 units)		
Area D: Social Science (9 units)		
Area E: Lifelong Learning and Self-Development (3 units)		
		<b>Total: 60</b>



**Program Learning Outcomes** (and how they relate to the Institutional Learning Outcomes (ILO))

Upon successful completion of this program, students will be able to

1. Provide lower division science course foundation needed for our graduating students to be adequately prepared to take upper division courses at the university. (ILO#1 - Communication, ILO#2 – Inquiry and Reasoning, ILO#4 – Social Responsibility)
2. Provide the opportunity to earn an Associates level degree in chemistry for those students transferring to universities. (ILO#1 - Communication, ILO#2 – Inquiry and Reasoning, ILO#3 – Information Competency)
3. Provide technical training in chemistry/biochemistry for students interested in careers as diverse as health sciences, engineering, industrial chemistry, pharmacy, materials science, and teaching. (ILO#1 - Communication, ILO#2 – Inquiry and Reasoning, ILO#3 – Information Competency)
4. Meet the needs of business and industry for employees who can apply scientific methodologies and math skills, communicate effectively, and think critically. (ILO#1 - Communication, ILO#2 – Inquiry and Reasoning, ILO#3 – Information Competency)
5. Enhance college retention and success efforts, outlined in the College Educational Master Plan and Enrollment Management Plan, by providing greater flexibility in meeting individual student educational and employment objectives. (ILO#1 - Communication, ILO#4 – Social Responsibility)

The Department will review these program outcomes in the fall of 2017 and write new ones that are easier to measure.

2. Since your last program review, summarize SLO assessment results at the course and program level (if this is your first program review, please summarize your SLO assessment results over the past 6 years). Please include dialogue regarding SLO assessment results with division/department/college colleagues and/or GE areas. Provide evidence of the dialogue (i.e. department meeting minutes or division meeting minutes...)

Please see the SLO assessment matrices that follow.



## Student Learning Outcomes Assessment for Chemistry 030A

## :: INTRODUCTION TO CHEMISTRY - CHEM 30A

Student Learning Outcomes (SLOs) As listed on EVC ACCC Course Outline "On completion of this course, the student will..."	Assessment Tool List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	Evaluation Timeline When will the SLO be assessed?	Assessment Results Summarize collected data including how data were collected and number of students.	Analysis/Action Plan and Timeline What, if any, changes will be made to instruction, or the SLO and when?
SLO #1 Express physical measurements of matter using proper units and significant figures.  ILO#2: Inquiry and Reasoning	Pre- and post-teaching survey and pre- and post-teaching multiple choice quiz	Week 4 of Spring 2012	One hundred and twelve students from sections 201-204 took the pre- and post-teaching quizzes on physical measurements; and the average scores were 37.0% and 78.8% respectively.	During Spring 2012 1. Inquiry-based learning incorporated into a laboratory activity. 2. Question and answer sessions embedded in lectures to reinforce concepts. 3. Homework assignments to increase the critical thinking in solving problems.  These interventions were implemented in Fall 2014. 4 multiple choice questions from Midterm Exam 1 were selected for the reassessment. An average of 85.8% of the 99 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 54% respectively. The interventions will continue.
SLO #2 Describe atomic structure, be able to name and write the formula for simple acids, bases, and salts, and distinguish between compounds and mixtures.  ILO#2: Inquiry and Reasoning	Embedded multiple choice questions in laboratory quiz.	Mid April 2012	Fifty-one students from sections 203 and 204 took a laboratory quiz on compounds, mixtures, chemical names and formulas. The average score was 67.9%, with the highest 96.7% and the lowest 20.7%.	During Spring 2012 1. Group and individual tutoring as a lab exercise and at office hours. 2. Question and answer sessions embedded in lectures to reinforce concepts. 3. Homework assignments to increase the breadth and depth of understanding.  These interventions were implemented in Fall 2014. 5 multiple choice questions from Midterm Exam 2 were selected for the reassessment. An average of 76.6% of the 98 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 20% respectively. The interventions will continue.
SLO #3 Predict chemical reactivity, bond types, and molecular polarity from the Periodic Table, explain the concepts of chemical stoichiometry, and apply it to chemical problems from real-world information.  ILO#2: Inquiry and Reasoning	Embedded multiple choice questions in exam.	Fall 2012	1) Eight multiple-choice questions on the final exam were selected for assessing this SLO. An average 68.3% of the ninety students tested got all correct responses. The highest and lowest percentage of correct responses were 96% and 41% respectively.	In Spring 2013 1. Group and individual tutoring as a lab exercise and at office hours. 2. Question and answer sessions embedded in lectures to reinforce concepts. 3. Surprise quizzes to encourage students to keep up with day-to-day reading.  These interventions were implemented in Fall 2014. 5 multiple choice questions from the final exam were selected for the reassessment. An average of 84.3% of the 98 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 54% respectively. The interventions will continue.
SLO #4 Solve gas law problems and use Kinetic Molecular Theory to explain how gases behave.  ILO#2: Inquiry and Reasoning	1. Embedded multiple choice questions in exam. 2. Lab activity.	Spring 2013	1) Six multiple-choice questions on the final exam were based on Gas Laws. An average 62.1% of the forty one students tested got all correct responses. The highest and lowest percentage of correct responses were 95% and 15% respectively. 2) Forty two students completed a lab experiment and report on the Charles' Law equation. The average score was 86.4%.	In Fall 2013: 1. Group and individual tutoring as a lab exercise and at office hours. 2. Surprise quizzes to encourage students to keep up with day-to-day reading.  These interventions were implemented in Fall 2014. 4 multiple choice questions from the final exam were selected for the reassessment. An average of 63.9% of the 98 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 56% respectively. In the Charles' Law lab experiment, the average score was 92.9% for 72 students. The interventions will continue.
SLO #5 Explain how liquids, solids, solutions, acids, and bases behave and calculate the various types of solution concentrations including titration values for both lab and real-world situations.  ILO#2: Inquiry and Reasoning	1. Embedded multiple choice questions in exam. 2. Lab activity.	1) Spring 2014 - Final exam 2) Fall 2013 - lab activity	1) 5 multiple-choice questions on the final exam were selected to assess this SLO. An average 53.3% of the 51 students tested got all correct responses. The highest and lowest percentage of correct responses were 72% and 42% respectively. 2) Thirty two students completed a prelab quiz on Titration. The average score was 94.5%. Thirty five students completed the lab experiment and report on Titration. The average score was 100%.	In Fall 2014: 1. Group and individual tutoring as a lab exercise and at office hours. 2. Question and answer sessions embedded in lectures to reinforce concepts. 3. Surprise quizzes to encourage students to keep up with day-to-day reading. 4. Review sessions in-class and on Moodle chat prior to exams.  These interventions were implemented in Fall 2014. 4 multiple choice questions from the final exam were selected for the reassessment. An average of 64.4% of the 98 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 31% respectively. In the titration lab experiment, the average score was 100% for 47 students. The interventions will continue.





In summary, interventions for CHEM 030A were implemented in fall 2014 for the two-year assessment cycle. Test questions from class midterms and final exam, as well as lab activities were selected for reassessment. Highest, lowest, and average scores were determined. Interventions will be continued.

### Student Learning Outcomes Assessment for Chemistry 030B

=: CHEM 30B - Introduction to Chemistry

Student Learning Outcomes (SLOs) As listed on EVC ACCC Course Outline "On completion of this course, the student will..."	Assessment Tool List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	Evaluation Timeline When will the SLO be assessed?	Assessment Results Summarize collected data including how data were collected and number of students.	Analysis/Action Plan and Timeline What, if any, changes will be made to instruction, or the SLO and when?
SLO #1  Distinguish and compare the chemical and physical properties associated with the various classes, functional groups, and biochemical types of organic compounds.  ILO- Information Competency	Embedded multiple choice questions in exam.	1) FALL 2012 - First and Second Midterm Exams 2) Fall 2013 - First and Second Midterm exams 3) Spring 2014- Final exam	1) The exams were a combination of multiple-choice and short answer type questions. The class average was 53.2% and 68.0% on Exams 1 and 2 respectively. A total of 7 multiple choice questions were selected overall between the two exams to assess this SLO. An average of 63.5% of the 57 students tested got all correct responses. The highest and lowest percentage of correct responses were 93.5% and 34.4% respectively.  2) 7 multiple choice questions were selected overall between the two exams to assess this SLO. An average of 65.7% of the 42 students tested got all correct responses. The highest and lowest percentage of correct responses were 95.0% and 43.0% respectively.  3) A total of 22 students participated in the activity. 75.4% of the students answer these questions correctly.	1. Group and individual tutoring as a lab activity and at office hours. 2. Question and answer sessions embedded in lectures to reinforce concepts. 3. Homework assignments and additional practice worksheets to increase the breadth and depth of understanding. These interventions were implemented in Fall 2014. 19 students were reassessed for this SLO. A total of 9 multiple choice questions from Midterm Exams 1 and 2 were selected and an average of 75.5% of the students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 60% respectively. The interventions will continue.
SLO #2  Recognize, interpret, and write simple reactions for different organic functional groups.  ILO#2: Inquiry and Reasoning	Embedded multiple choice questions in exam.	1) FALL 2012 - First and Second Midterm Exam 2) Fall 2013 - First and Second Midterm Exams 3) Spring 2014- Final exam	1) The exams were a combination of multiple-choice and short answer type questions. The class average was 53.2% and 68.0% on Exams 1 and 2 respectively. A total of 11 multiple choice questions were selected overall between the two exams to assess this SLO. An average of 72.5% of the 57 students tested got all correct responses. The highest and lowest percentage of correct responses were 96.5% and 29.0% respectively.  2) 7 multiple choice questions were selected overall between the two exams to assess this SLO. An average of 73.8% of the 40 students tested got all correct responses. The highest and lowest percentage of correct responses were 95.0% and 25.0% respectively.  3) A total of 22 students participated in the activity. 59.2% of the students answer these questions correctly.	1) Group and individual tutoring during lab hours and office hours. 2) Review of past exams and quizzes prior to a midterm/final exam in class. 3) Homework assignments and extensive practice worksheets to increase the breadth and depth of understanding. 4) In-class surprise quizzes to ensure that students keep up with their reading. These interventions were implemented in Fall 2014. 19 students were reassessed for this SLO. 4 multiple choice questions from Midterm Exam 2 were selected for assessment. An average of 64.8% of the students tested got all correct responses. The highest and lowest percentages of correct responses were 90% and 50% respectively. It appears that the interventions did not show a significant improvement. Increase in the credit units that will be effective Spring 2015 might allow for more classroom contact hours and hence might facilitate learning. The interventions will continue.
SLO #3  Interpret the effect of structure and isomerism on a molecule's physical properties and its importance in organic chemistry.  ILO#2: Inquiry and Reasoning	Embedded multiple choice questions in exam.	1) Fall 2013 - Second midterm Exam 2) Spring 2014- Final exam	1) 6 multiple choice questions were selected from this exam to assess this SLO. An average of 61.7% of the 40 students tested got all correct responses. The highest and lowest percentage of correct responses were 95.0% and 30.0% respectively.  2) A total of 22 students participated in the activity. 88.8% of the students answer these questions correctly.	1) Group and individual tutoring during lab hours and office hours. 2) Additional practice worksheets in-class to increase breadth-and-depth of understanding. 3) In-class surprise quizzes to ensure that students keep up with their reading. These interventions were implemented in Fall 2014. 4 multiple choice questions from Midterm Exam 2 were selected for the reassessment. An average of 76.1% of the 19 students tested got all correct responses. The highest and lowest percentages of correct responses were 90% and 56% respectively. The interventions will continue.



SLO #4	Describe the importance of various biochemical substances such as carbohydrates, lipids, proteins and biopolymers.  ILO- Information Competency	Embedded multiple choice questions in exam.	1) FALL 2012 - Third Midterm Exam 2) Fall 2013 - Third Midterm Exam 3) Spring 2014- Final exam	1) The exam was a combination of multiple-choice and short answer type questions. The class average on Exam 3 was 69.8%. A total of 7 multiple choice questions were selected from this exam to assess this SLO. An average of 67.0% of the 42 students tested got all correct responses. The highest and lowest percentage of correct responses were 91.7% and 50.0% respectively.  2) 7 multiple choice questions were selected from this exam to assess this SLO. An average of 70.4% of the 35 students tested got all correct responses. The highest and lowest percentage of correct responses were 100% and 17.0% respectively.  3) A total of 22 students participated in the activity. 89.5% of the students answer these questions correctly.	1) Group and individual tutoring during lab hours and office hours. 2) Review of past exams and quizzes prior to a midterm/final exam in class. 3) Additional practice worksheets in-class to increase breadth-and-depth of understanding. 4) In-class surprise quizzes and group chat sessions on Moodle to ensure that students keep up with their reading. These interventions were implemented in Fall 2014. A total of 17 students were reassessed for this SLO. 6 questions from the final exam were selected and the results show that an average of 80.0% students answered them correctly. The highest and lowest percentage of correct responses were 100% and 60.0% respectively. The interventions will continue.
SLO #5	Describe the three-dimensional structure of biomolecules and recognize the relationship between the structure and function of these molecules.  ILO#2: Inquiry and Reasoning	Embedded multiple choice questions in exam.	1) FALL 2013 - Final Exam 2) Spring 2014-Final exam	1) 6 multiple choice questions were selected from the final exam to assess this SLO. An average of 67.5% of the 36 students tested got all correct responses. The highest and lowest percentage of correct responses were 100% and 39.0% respectively.  2) A total of 22 students participated in the activity. 54.5% of the students answer these questions correctly	1) Group and individual tutoring during lab hours and office hours. 2) Review of past exams and quizzes prior to a midterm/final exam in class. 3) Extensive practice worksheets in-class to increase breadth-and-depth of understanding. 4) In-class surprise quizzes and group chat sessions on Moodle to ensure that students keep up with their reading. These interventions were implemented in Fall 2014. A total of 17 students were reassessed for this SLO. 4 questions from the final exam were selected and the results show that an average of 73.0% students answered them correctly. The highest and lowest percentage of correct responses were 100% and 29.0% respectively. The interventions will continue.
SLO #6	Describe some important biological processes such as enzymatic regulation, hormonal regulation and nucleic acid synthesis, and give a brief explanation of selected biological metabolisms.  ILO#2: Inquiry and Reasoning	Embedded multiple choice questions in exam.	1) FALL 2013 - Final Exam 2) Spring 2014-Final exam	1) 10 multiple choice questions were selected from the final exam to assess this SLO. An average of 68.5% of the 36 students tested got all correct responses. The highest and lowest percentage of correct responses were 100% and 39.0% respectively.  2) A total of 22 students participated in the activity. 57.1% of the students answer these questions correctly.	1) Group and individual tutoring during lab hours and office hours. 2) Review of past exams and quizzes prior to a midterm/final exam in class. 3) Extensive practice worksheets in-class to increase breadth-and-depth of understanding. 4) In-class surprise quizzes and group chat sessions on Moodle to ensure that students keep up with their reading. These interventions were implemented in Fall 2014. A total of 17 students were reassessed for this SLO. 6 questions from the final exam were selected and the results show that an average of 86.2% students answered them correctly. The highest and lowest percentage of correct responses were 100% and 50.0% respectively. The interventions will continue.

In summary, interventions for CHEM 030B were implemented in fall 2014. Test questions from class midterms and final exam, as well as lab activities were selected for reassessment. Highest, lowest, and average scores were determined. There was an overall class average improvement 82.3% (F2012), 84.9% (F2013), 88.3% (F2014). Interventions will be continued.



## Student Learning Outcomes Assessment for Chemistry 015

=: Chem 015

Student Learning Outcomes (SLOs)	Assessment Tool	Evaluation Timeline	Assessment Results	Analysis/Action Plan and Timeline
As listed on EVC ACCC Course Outline <i>"On completion of this course, the student will..."</i>	List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	When will the SLO be assessed?	Summarize collected data including how data were collected and number of students.	What, if any, changes will be made to instruction, or the SLO and when?
SLO #1 Present laboratory data using the correct number of significant figures, using scientific notation when needed. Be able to handle graphing and precision of data using simple statistics.	Lab activity Use of Excel Practices	Spring 2012	Online Practices Exercises: Ninety-seven(97) students participated in exercises with seventeen(17) questions on topics presented through Moodle. Seventy(70) students achieved the goal of above 72% correct. Twenty-seven students scored below the goal of completion. Computer Generated Graphs: Completion of graph was above 95%.	Topic introduced first few class meetings and more time and instruction will be allocated for these concepts. No Change for the Computer Generated Activity.
SLO #2 Describe the internal structure of atoms using subatomic particles, and the meaning of nuclear symbols and isotopes. Classify elements and compounds and be able to identify ionic vs. covalent compounds and their chemical formula	Survey Embedded test question Practice exercises	First week and last week of class for survey, Test II Fall 2012	Test questions describing isotopic symbol given to 81 student with a correct responses from 78 students. Three student gave no response.  A list of compounds given to same number of students asking which were ionic with 86 correct responses.	Questions will continue to be utilized for SLO evaluation since it met goals of 80% or higher correct.  Encourage students to use practices on Moodle to increase proficiency in recognition of ionic versus covalent compounds.
SLO #3 Explain the concepts of chemical stoichiometry in both macroscopic and particulate level terms, apply this concept to solve chemical reaction problems from real-world information.	Survey Quiz/Test questions Practice exercise	First week and last week of class for survey, Test III Spring 2013	Embedded questions given on Test III involving stoichiometry and application skills. Test given to sixty-two students with an average score of 83% correct for stoichiometry problems. OWL (Online Web Learning) homework provided problem solving and tutorials for this concept.	Continue using Lab Practices and OWL homework since goals were achieved above 80%.
SLO #4 Predict the nature of chemical bonds and molecular polarity from the periodicity of elements and predict physical and chemical properties of compounds.	Survey Lab activity Embedded test question	First week and last week of class for survey, Test III, Spring 2014	The same survey questions were given at beginning of course and again at the end of the course. Fifteen students participated in the pre/post SLO evaluation. One-third of the students reported having no knowledge of these topics at the beginning of the course and at the end of the course no students reported not ever doing these tasks. No students reported in the beginning of course as being very experienced with these skills but fourteen percent felt they were very experienced with the topics at the end of the course. Sixty percent of the students at the start of the class felt they had limited exposure to these skills but were not confident with the task. However, by the end the class thirty-six percent felt they had limited exposure and were not comfortable with the task. Also, at the start of the class six percent felt they had done the tasks many times and felt comfortable with these skills. However, by the end of the course fifty percent of the class felt they had done these tasks many times and felt comfortable with the task.	All students were able to achieve the goals of these student learning outcomes (SLO) but with varying degrees of confidence. Increasing the exercises and activities in this SLO can improve the confidence of the students from the group with perceived limited exposure, although, there was nearly a twenty-four percent decline in groups perception from the beginning of the course to the end of the course.
SLO #5 Explain gas behavior using macroscopic properties and microscopic molecular dynamics and solve problems of gases using the combined gas law and ideal gas law.	Survey Lab activity Embedded test question	First week and last week of class for survey, Test III Spring 2013	Embedded questions given on Test III for kinetic molecular theory and various gas laws. Sixty-four (64) students given questions involving gases with an average score of 79%.  Lab activity explored gas laws with 93% completion of exercise for four lab sections.	More exercises and activities will be used to improve the gas concepts to meet goals of 80% or higher.  Lab activity will continue as reinforcement of gas principle.
SLO #6 Apply units of concentrations to solve chemical problems encountered in lab and real world. Describe acid-base properties, pH and electrolytic behavior; do hands-on titrations in lab and perform subsequent calculations to obtain results	Survey Lab Activity Embedded test question Practice exercises	Last week of class for survey, Test III, Fall 2012	A survey was given at the end of the course with forty-eight responds. One student responded to having never done the tasks while twelve students felt they had done the tasks many times and felt very comfortable with their skills. Moreover, eight students felt they were very experienced with these skills. Students with perceived low exposure were ten who felt they had done the task a few times. The largest group (seventeen) was the students who felt they had done the task several times but did not feel confident in their skills.  Lab activity of titration and calculations were achieved by all students in four sections (85).	All students were able to achieve the goals of these student learning outcomes (SLO) with varying degrees of confidence except one. These concepts are numerous and varied which are introduced late in the semester. I will consider moving some topics to an earlier time in the course so more time can be devoted to them. More problem solving will be required to boost confidence.  Lab activity will be continued since it achieved hands-on experience and all students completed this task.



## Student Learning Outcomes Assessment for Chemistry 001A

:: CHEM 1A GENERAL CHEMISTRY

Student Learning Outcomes (SLOs)	Assessment Tool	Evaluation Timeline	Assessment Results	Analysis/Action Plan and Timeline
As listed on EVC ACCC Course Outline <i>"On completion of this course, the student will..."</i>	List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	When will the SLO be assessed?	Summarize collected data including how data were collected and number of students.	What, if any, changes will be made to instruction, or the SLO and when?
<p>Distinguish ionic vs. covalent compounds; write and name chemical formulas; and classify and balance chemical reactions.</p> <p>ILO#2: Inquiry and Reasoning</p> <p>SLO #1</p>	Pre- and post-teaching surveys and pre- and post-teaching quizzes	Week 4 of Spring 2012	<p>Thirty seven students from sections 201 and 202 took the pre- and post-teaching quizzes for chemical names and formulas; and the average scores are 40.5% and 64.7%, respectively. Thirty six students from the same two sections took the pre- and post-teaching quizzes for chemical reactions; and the average scores are 39.6% and 52.7%, respectively. Twenty six students from section 203 took the pre- and post-teaching quizzes for chemical names and formulas; and the average scores are 48.0% and 73.0% respectively. Twenty six students from the same section took the pre- and post-teaching quizzes for chemical reactions; and the average scores are 49.8% and 70.1%, respectively.</p>	<p>During Spring 2012</p> <ol style="list-style-type: none"> <li>1. Group and individual tutoring as a lab activity and at office hours.</li> <li>2. Question and answer sessions embedded in lectures to reinforce concepts.</li> <li>3. Homework assignments to increase the breadth and depth of understanding.</li> </ol> <p>Fall 2014:</p> <p>A total of 28 students participated in the surveys on 11/24/2014 and 11/25/2014. Their responses to the intervention strategies are:</p> <ol style="list-style-type: none"> <li>1. Homework assignments have increased the breadth and depth of understanding: 89.3% agreed.</li> <li>2. Individual tutoring during office hours and additional group tutoring in lab have empowered the students to construct and extend knowledge; and to cultivate thinking skills: all 11 students who regularly participated agreed (100%); the remaining students could not participate due to conflict with family obligation/classes/work.</li> <li>3. Questions-and-answers; learning checks in lecture and in lab have drilled the students to identify misconceptions and illusory understandings; and to learn how to learn: 96% agreed.</li> </ol>
				All these interventions are very effective and will be used during the next cycle of SLO assessment.
<p>Interpret chemical reactions occurring in the macroscopic world using microscopic principles, and recognize quantitative relationships from balanced chemical equations.</p> <p>ILO#2: Inquiry and Reasoning</p> <p>SLO #2</p>	Embedded multiple choice questions in exam.	Mid April 2012	<ol style="list-style-type: none"> <li>1) Thirty three students from sections 201 and 202 took the stoichiometry test. The average score is 55.2%, with the highest 100% and the lowest 20%. Twenty six students from section 203 took the stoichiometry test. The average score is 83.3%, with the highest 100% and the lowest 0%.</li> <li>2) A total of forty one students from three sections attempted the stoichiometry multiple choice question on the final exam in Spring 2016. 75.6% of the students answered it correctly.</li> </ol>	<p>During Spring 2012</p> <ol style="list-style-type: none"> <li>1. Group and individual tutoring as a lab activity and at office hours.</li> <li>2. Question and answer sessions embedded in lectures to reinforce concepts.</li> <li>3. Homework assignments to increase the breadth and depth of understanding.</li> </ol> <p>Fall 2014:</p> <p>A total of 28 students participated in the surveys on 11/24/2014 and 11/25/2014. Their responses to the intervention strategies are:</p> <ol style="list-style-type: none"> <li>1. Homework assignments have increased the breadth and depth of understanding: 89.3% agreed.</li> <li>2. Individual tutoring during office hours and additional group tutoring in lab have empowered the students to construct and extend knowledge; and to cultivate thinking skills: all 11 students who regularly participated agreed (100%); the remaining students could not participate due to conflict with family obligation/classes/work.</li> <li>3. Questions-and-answers; learning checks in lecture and in lab have drilled the students to identify misconceptions and illusory understandings; and to learn how to learn: 96% agreed.</li> </ol> <p>All these interventions are very effective and will be used during the next cycle of SLO assessment.</p>





SLO #3	Describe gaseous behavior using the Kinetic Molecular Theory as a theoretical model and use this model to solve problems.  ILO#2: Inquiry and Reasoning	1. Embedded multiple choice questions in exam. 2. Lab activity	Spring 2013	1) Six multiple-choice questions on the final exam were based on Gas Laws. An average 60.4% of the forty students tested got all correct responses. The highest and lowest percentage of correct responses were 90% and 28% respectively.  2) Forty students completed a lab experiment and report based on the Ideal Gas Law equation. The average score was 94.9%.	During Spring 2013 1) Group and individual tutoring during lab hours and office hours. 2) Review of past exams and quizzes prior to a midterm/final exam, both in class and on Moodle chat. 3) In-class surprise quizzes to ensure that students keep up with their reading.  These interventions were implemented in Spring 2015. 3 multiple choice questions from final exam were selected for the reassessment. An average of 76.9% of the 55 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 33% respectively. In the lab experiment and report based on the Ideal Gas Law equation, the average score was 98.5% for 28 students. The interventions will continue.
SLO #4	Correlate the properties of liquids, solids, and solutions with molecular geometry and intermolecular interactions.  ILO#2: Inquiry and Reasoning	1. Embedded multiple choice questions in exam. 2. Lab activity	Spring 2013	1) Six multiple-questions from the final exam were selected for assessing this SLO. An average of 58.9% of the forty students tested got all correct responses. The highest and lowest percentage of correct responses were 78% and 30% respectively.  2) A total of forty one students from three sections attempted the multiple choice question on properties of liquids and gases on the final exam in Spring 2016. 58.5% of the students answered it correctly.	During Spring 2013 1) Group and individual tutoring during lab hours and office hours. 2) Review of past exams and quizzes prior to a midterm/final exam, 3) In-class surprise quizzes to ensure that students keep up with their reading.  These interventions were implemented in Spring 2015. 4 multiple choice questions from the final exam were selected for the reassessment. An average of 79.6% of the 55 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 43% respectively. The interventions will continue.
SLO #5	Use technology, including computers and the web.  ILO#1: Communication  ILO#3: Information Competency	1. Assignment on annotated bibliography to critically evaluate sources and information. 2. Essay to assess writing with clarity, logic, and correct grammar and punctuation. 3. Assignment on different graphing tools in Excel. 4. Lab activity on quantum mechanics and molecular modeling using the Spartan software.	Spring 2012, Fall 2012, Spring 2013, Spring 2014, Spring 2015	All four are on-going activities. Spring 2012: 1. Chem 1A students learned internet research skills by sorting out at least four good sources of information on "There is more to Salt than the Taste." For each source, the students provided a) APA citation, b) short description of the source, and c) reasons why they rate it highly, based on the five criteria for evaluating sources (accuracy, authority, objectivity, currency, and coverage.) The average of this annotated bibliography is 82.1%. 2. The students also integrated the information to write a short essay of no longer than two (2) typed pages exploring the same topic. The average is 97.8%.  Fall 2012: 3. The Excel graphing activity involves the construction of three graphs: "X-Y" scatter, pie chart, and column chart. The average score for this assignment is 86.1% for fifty eight students.  Spring 2013: 1) Students demonstrated their internet literature search skills by locating at least four good sources of information and completing an essay on the topic "MSG - Is it just a flavor enhancer?" The average score for the annotated bibliography and essay assignment was 85.6% for 43 students. 2) The average score for the Excel graphing activity was 96.8% for 47 students.  Spring 2014: 1) Students demonstrated their internet literature search skills by locating at least four good sources of information and completing an essay	All four are on-going activities. 1 and 2: Students will have sufficient experience in written communication of scientific information. They can presenting information in a clear and organized manner, write well organized and concise lab reports, and cite sources properly. 3. Graphing data helps the readers to understand the topics. A simple, clear, and informative graph condenses lots of information and gives much greater visual impact than column of numbers. The students will continue to apply comprehensive strategies and background knowledge to construct and interpret information from diagrams, graphs, and charts; to use trendline and equation to calculate and to predict.



				<p>on the topic "Fossil fuels – A Climate and Energy Crisis?" The average score for the annotated bibliography and essay assignment was 88.7% for 40 students.</p> <p>2) The average score for the Excel graphing activity was 97.5% for 40 students.</p> <p>Spring 2015:</p> <p>1) Students demonstrated Internet literature research skills by locating at least four good sources of information and completing an essay on the topic "Eat your Genes! – Genetically Modified (GM) Crops and Their Future" The average score for the annotated bibliography and essay assignment was 79.3% for 29 students.</p> <p>2) The average score for the Excel graphing activity was 94.6% for 28 students.</p>	
SLO #6	<p>Use critical thinking skills to understand and perform macroscale and microscale experiments; and apply significant figures, scientific notation, and statistics to calculate and analyze lab data.</p> <p>ILO#1: Communication</p> <p>ILO#2: Inquiry and Reasoning</p>	<p>1. Embedded multiple choice questions in exam</p> <p>2. Lab activity</p>	Spring 2014	<p>1) Seven multiple choice questions were selected from the first midterm exam for assessing this SLO. An average of 62.9% of the 51 students tested got all correct responses. The highest and lowest percentage of correct responses were 84.6% and 19.2% respectively.</p> <p>2) The students completed a laboratory experiment on Density. They calibrated and used different instruments to measure the mass and volume of various substances, used significant figures and units to report data and calculate density, and applied statistical methods to analyze data. The average score was 85.6% for 40 students.</p>	<p>During Spring 2014</p> <p>1) Group and individual tutoring during lab hours and office hours.</p> <p>2) Review of past exams and quizzes prior to a midterm/final exam, both in class and on Moodle chat.</p> <p>3) In-class surprise quizzes to ensure that students keep up with their reading.</p> <p>These interventions were implemented in Spring 2015. 5 multiple choice questions from Midterm Exam 1 were selected for the reassessment. An average of 75.4% of the 61 students tested got all correct responses. The highest and lowest percentages of correct responses were 100% and 44% respectively. In the Density laboratory experiment, the average score was 86.6% for 28 students. The interventions will continue.</p>

In summary, interventions for CHEM 001A in the two-year assessment cycle were implemented in fall 2014.

Interventions included extra and online homework assignments, individual and group tutoring during office hours and lab, learning checks, online chat sessions for exam reviews. Questions from class midterms and final exam, as well as lab activities were selected for reassessment. Highest, lowest, and average scores were determined. Interventions will be continued.



## Student Learning Outcomes Assessment for Chemistry 001B

: Chem 1B - General Chemistry

Student Learning Outcomes (SLOs) As listed on EVC ACCC Course Outline "On completion of this course, the student will..."	Assessment Tool List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	Evaluation Timeline When will the SLO be assessed?	Assessment Results Summarize collected data including how data were collected and number of students.	Analysis/Action Plan and Timeline What, if any, changes will be made to instruction, or the SLO and when?
SLO #1 Express the Rate Law using the initial rate study and calculate activation energy given rate vs. temperature data; recognize the relationship between the Rate Law and the reaction mechanism. ILO -Inquiry and Reasoning	SLO imbedded test questions	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 4 students participated in the activity. 50% of the students answer this question correctly.	As the result of assessment and analysis no changes is being planned to the course SLOS.  The instruction will be modified to emphasize the kinetics concepts including the Rate Law and it's application for the determination of the rate of chemical reactions.
SLO #2 Recognize the concept of chemical equilibrium according to Le Chatelier's Principle and apply the concept to aqueous systems such as acid-base, precipitation, and complex ions to analyze unknowns using inductive and deductive reasoning. ILO- Information Competency	SLO imbedded test questions	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 4 students participated in the activity. 75% of the students answer this question correctly.	As the result of assessment and analysis no changes is being planned to the course SLOS.  Additional practice problems will be assign to emphasize the relation between reactants and products as they relate to the equilibrium constant expression and its applications for various equilibrium systems.
SLO #3 Predict the spontaneity of chemical reactions using the Second Law of Thermodynamics (entropy and Gibbs free energy) and apply the Second Law of Thermodynamics to voltaic cells and electrolytic cells. ILO -Inquiry and Reasoning	SLO imbedded test questions	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 4 students participated in the activity. 50% of the students answer this question correctly.	As the result of assessment and analysis no changes is being planned to the course SLOS.  The instruction will be modified to emphasize the link between thermodynamics and electrochemistry. Additional practice problems will be done during the lectures.
SLO #4 Describe the bonding theories of coordination compounds and their chemical behavior. ILO -Inquiry and Reasoning	SLO imbedded test questions	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 4 students participated in the activity. 75% of the students answer this question correctly.	As the result of assessment and analysis no changes is being planned to the course SLOS.  Additional practice problems will be assign to emphasize the three dimensional structures of complex ions using the Crystal Field Theory.
SLO #5 Describe nuclear disintegration processes and explain their nuclear behavior. ILO -Inquiry and Reasoning	SLO imbedded test questions	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 4 students participated in the activity. 75% of the students answer this question correctly.	As the result of assessment and analysis no changes is being planned to the course SLOS.  Additional practice problems will be assign to emphasize the particles produced during radioactive decay types of nuclear processes.
SLO #6 Classify organic molecules according to functional groups and structure and summarize their main chemical reactions. ILO- Information Competency	SLO imbedded test questions	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 4 students participated in the activity. 50% of the students answer this question correctly.	As the result of assessment and analysis no changes is being planned to the course SLOS.  Additional practice problems will be assign to emphasize the relationship between organic functional groups, their structures, and chemical reactions.



## Student Learning Outcomes Assessment for Chemistry 012A

:: Chem 12A - Organic Chemistry

Student Learning Outcomes (SLOs) As listed on EVC ACCC Course Outline "On completion of this course, the student will..."	Assessment Tool List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	Evaluation Timeline When will the SLO be assessed?	Assessment Results Summarize collected data including how data were collected and number of students.	Analysis/Action Plan and Timeline What, if any, changes will be made to instruction, or the SLO and when?
SLO #1 Employ the scientific method of testing, observing, and drawing conclusions through inductive and deductive reasoning  ILO -Inquiry and Reasoning	Critical thinking lab experiments including essay style lab reports and lab quizzes.	Assessed in the Fall 2014	Data for this SLO was collected using the lab reports and lab quizzes that emulated the experiences the students gained doing lab work. A total of 8 students participated in the activity. The grade average for the quizzes was 70%. The grade average for the lab reports was 93%. This large difference in percentages between the lab reports and the lab quizzes could be explained in terms of the additional time the students have in generating these lab reports versus the limited time they have to critically analyze similar lab experiences in a lab quiz.	As the result of assessment and analysis the following modifications will be made to improve the % in the lab quizzes:  Beginning in the Fall 2015: 1) The instruction will be modified to emphasize real time student participation during the lab experiments. 2) A detail discussion of quizzes already given will be encouraged to help them improve future grades.
SLO #2 Apply the 3-D nature of organic molecules to study major organic reactions including descriptions of reaction kinetics, mechanisms, and stereochemistry of products  ILO- Information Competency	SLO imbedded test questions in Test 3	Assessed in the Fall 2014	Data for this SLO was collected using the final exam. A total of 8 students participated in this activity. the average grade was 73.4 %.  Reactions mechanisms is at the heart of Organic Chemistry and one of the hardest concepts comprehend. Since this concept is cover over a whole year, the students due improve in the performance of this SLO during the 2nd part of this course (Chem 12 B)	As the result of assessment and analysis no changes is being planned to the course SLOS.  During the Fall 2015: Additional practice problems will be done in real time during the lectures by asking for "volunteers" to practice reactions mechanisms on the board.
SLO #3 Describe the theoretical and experimental aspects of common organic laboratory techniques for separation, purification and compound characterization  ILO- Information Competency				
SLO #4 Compare and contrast major classes of organic compounds in their physical and chemical properties by application of bonding theories, intermolecular forces, steric and electronic forces  ILO -Inquiry and Reasoning				
SLO #5 Apply physical spectroscopic theories and laboratory techniques for compound elucidation.  ILO- Information Competency	exam questions	Fall 2012		

In summary, following the initial assessment of CHEM 12A SLOs, interventions were implemented starting fall 2015. Strategies used were real-time student participation in discussion of lab experiments, inquiry-based group discussion on reaction mechanisms in class, detailed review of past sample questions prior to a quiz or a midterm.





## Student Learning Outcomes Assessment for Chemistry 012B

:: Chem 12 B - Organic Chemistry

Student Learning Outcomes (SLOs)	Assessment Tool	Evaluation Timeline	Assessment Results	Analysis/Action Plan and Timeline
As listed on EVC ACCC Course Outline "On completion of this course, the student will..."	List the tools to assess each SLO (such as rubrics, projects, assignment, survey, etc.)	When will the SLO be assessed?	Summarize collected data including how data were collected and number of students.	What, if any, changes will be made to instruction, or the SLO and when?
SLO #1 Employ the scientific method of testing, observing, and drawing conclusions through inductive and deductive reasoning in synthesis and spectroscopy experiments  ILO -Inquiry and Reasoning	SLO imbedded quiz and tests questions and laboratory experiments lab reports.	Assessed during the Spring of 2014	Data for this SLO was collected using the first exam and subsequent lab reports. A total of 12 students were participated in the activity. A % score of 65% is a passing score for this course. The average score for this question on test # 1 was 64%. The average score for the lab reports was 78%.	As the result of assessment and analysis no changes is being planned to the course SLOS.  The instruction will be modified to perform real time practice on the interpretation of spectra of organic compounds to elucidate their structures.
SLO #2 Apply the 3-D nature of organic molecules to study major organic reactions for alcohols, ketones, aldehydes, carboxylic acids and derivatives including descriptions of reaction kinetics, mechanisms, and stereochemistry of products  ILO- Information Competency	SLO imbedded test questions.	Assessed during the Spring of 2014	Data for this SLO was collected using 4 questions in the final exam and the qualitative experiment lab reports. A total of 12 students were participated in the activity. A % score of 65% is a passing score for this course. The average score for these question on the test was 44% The average score for the lab reports was 82%.	As the result of assessment and analysis no changes is being planned to the course SLOS.  The instruction will be modified to perform real time rigorous practice of organic chemical reactions and their mechanisms.
SLO #3 Compare and contrast major classes of organic compounds such as alcohols, ketones, aldehydes, carboxylic acids and derivatives in their physical and chemical properties by application of bonding theories, intermolecular forces, steric and electronic forces  ILO -Inquiry and Reasoning	SLO imbedded test questions and laboratory experiments lab reports.	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam and the qualitative experiment lab reports. A total of 12 students were participated in the activity. A % score of 65% is a passing score for this course. The average score for these questions on the test was 52% The average score for the lab reports was 82%.	As the result of assessment and analysis no changes is being planned to the course SLOS.  The instruction will be modified to perform real time rigorous practice of organic chemical reactions, their derivatives including their mechanisms.
SLO #4 Apply physical spectroscopic theories and laboratory techniques for compound elucidation including alcohols, ketones, aldehydes, carboxylic acids and derivatives  ILO -Inquiry and Reasoning	SLO imbedded quiz and tests questions and laboratory experiments lab reports.	Assessed during the Spring of 2014	Data for this SLO was collected using the first exam and subsequent lab reports. A total of 12 students were participated in the activity. A % score of 65% is a passing score for this course. The average score for this question on test # 1 was 64%. The average score for the lab reports was 78%.	As the result of assessment and analysis no changes is being planned to the course SLOS.  The instruction will be modified to perform real time practice on the interpretation of spectra of organic compounds to elucidate their structures.
SLO #5 Relate organic reactions of functional groups in the design and synthesis of more complex systems including polyesters, polyamides, and polypeptides.  ILO -Inquiry and Reasoning	SLO imbedded 8 questions in the final test.	Assessed during the Spring of 2014	Data for this SLO was collected using the final exam. A total of 12 students were participated in the activity. A % score of 65% is a passing score for this course. The average score for these questions on this was 44%.	The instruction will be modified to perform real time rigorous practice of the 3-D structures and reactions of biochemical molecules.



## Program level SLO Assessment for the A.A Degree in Chemistry

m: A.A. Degree in Chemistry

March 23, 2012

Program SLOs	Assessment Plan for each Program SLO	Program Courses								Analysis/Action Plan and Timeline
		Course	Course	Course	Etc.					
SLO #1	Provide lower division science course foundation needed for our graduating students to be adequately prepared to take upper division courses at the university.  ILO#1: Communication ILO#2: Inquiry and Reasoning ILO#4: Social Responsibility	CHEM 1A	CHEM 1B							CHEM 1A: Homework and laboratory activities were assigned. Students employed real life experiments using "Green Chemistry". Students were also exposed to the fundamentals of first year college chemistry in terms of the nomenclature and structure of organic and inorganic compounds using computer software, quantitative and qualitative analyses in theory and in the laboratory. Communication skills were strengthened by preparing essay types of laboratory reports and by presenting a oral report in front of the class. Students Exams were used to assess progress. Students conducted weekly experiment and their lab performances and their written reports were satisfactory. The results were satisfactory and no changes are being proposed.  CHEM 1B: Homework and laboratory activities were assigned. Students applied the concepts of equilibrium to similar systems used by humans in controlling pH in the blood. Students applied the concepts of kinetics to described mechanisms of chemical reactions. Both equilibrium and kinetics concepts will be applied in Organic Chemistry. Exams were used to assess progress. Students conducted weekly experiment and their lab performances and their written reports were satisfactory. Several lab experiments included the application of Excel to represent experimental data in graphs format and applied those graphs to perform calculations. Communication skills were strengthened by preparing essay types of laboratory reports and by presenting a oral report in front of the class. The results were satisfactory and no changes are being proposed.
		I	I							
		P	P							
		M	M							
SLO #2	Provide the opportunity to earn an Associates level degree in chemistry for those students transferring to universities.  ILO#1: Communication ILO#2: Inquiry and Reasoning ILO#3: Information Competency	CHEM 1A	CHEM 1B	CHEM 12A	CHEM 12B					Chem 1A, 1B, 12A, 12B: Students were given exams to assess their preparation in taking sequential courses in both the lecture and laboratory with specific requirements. The results of lab and exam assessments were satisfactory. No changes are being planned.
		I	P	P	P					
		P	M	M	M					
		M								
SLO #3	Provide technical training in chemistry/ biochemistry for students interested in careers as diverse as health sciences, engineering, industrial chemistry, pharmacy, materials science, and teaching.  ILO#1: Communication ILO#2: Inquiry and Reasoning ILO#3: Information Competency	Chem 1A	CHEM 1B	CHEM 12A	CHEM 12B					Chem 1A, 1B, 12A, 12B: Twice a week students received extensive laboratory training in the theoretical concept learned in the lecture component of these courses. The laboratory techniques learned included the performance of qualitative and quantitative analyses of chemical substances, training in the use of laboratory glassware and analytical instrumentation.  Moreover, students learned internet research skills by sorting out at least four good sources of information on various scientific topics. For each source, the students provided a) APA citation, b) short description of the source, and c) reasons why they rate it highly, based on the five criteria for evaluating sources (accuracy, authority, objectivity, currency, and coverage.). The students also integrated the information to write an essay or in presenting it as a short seminar in front of the class using Power Point. The results of lab and exam assessments were satisfactory. No changes are being planned.  The results were satisfactory and no changes are being proposed.
		I	I	I	I					
		P	P	P	P					
			M	M	M					
SLO #4	Meet the needs of business and industry for employees who can apply scientific methodologies and math skills, communicate effectively, and think critically.	Chem 1A	Chem 1B	Chem 12A	Chem 12B					Students demonstrated competency in laboratory procedures and safe handling of chemicals. Students applied analytical instrumentation techniques to solve real-life questions. Students used their critical thinking skills to propose alternative methodologies of experimental procedures. The results were satisfactory and no changes are being proposed.
		I	I	I	I					
		P	P	P	P					
			M	M	M					

[illegible]

1. What plans for improvement have been implemented to your courses or program as a result of SLO assessment?

Due to the high demand for our courses we have increased the number of sections. We have only one full-time lab tech who is quite overwhelmed by the responsibilities of not only the preparation of all the chemical reagents for all the different courses including their multiple number of sections but also with the safety and handling hazardous waste materials as required by the California EPA. We need an additional full-time lab tech to not only keep up with the present responsibilities of our Chemistry Department but also to increase the number of available sections our students will need.



## PART D: Faculty and Staff

1. List current faculty and staff members in the program, areas of expertise, and how positions contribute to the program's success.

### Bonnie C. Brown, Chemistry Faculty

#### Education

B.S., Tuskegee Institute; M.S., San Jose State University

#### Areas of Expertise:

- Physical Chemistry with a Master of Science in Chemistry with emphasis in teaching at the Community College level.
- Taught chemistry at Evergreen Valley College and several other San Francisco Bay Area institutions as a lecturer to promote excellence and equity for all students.

#### How Does My Position Contribute to Program Success?

- Provides a positive impact to foster education and encourage students in investigating scientific query while improving their lives and the greater society.
- Provides service to working students and students unable to attend day classes for Chemistry 030A, 015, 01A and 01B with evening offerings and summer offerings.
- Provides a more diverse community by participation as an Affirm instructor.
- Fosters a respect for cultural diversity through collaborative research project which promotes and develops writing skills.
- Serve as a mentor to students through guidance for higher education, internship programs and employment.

#### Professional Memberships

- Membership in American Chemical Society(ACS)
- ACS Two-Year College Chemistry Consortium (2YC3)

### Preeti Srinivasan, Ph.D., Chemistry Faculty

#### Education

Ph.D. (Medicinal Chemistry), University of Kansas, Lawrence

#### Areas of Expertise

- Medicinal Chemistry
- Organic Chemistry and Synthesis
- Analytical Chemistry
- Physical and Physical Organic Chemistry
- Biochemistry
- Drug Design
- Spectroscopy and Instrumentation



- Laboratory Techniques
- Radiation Safety Protocols
- Online learning pedagogies such as WebCT, Blackboard, and Moodle.

Dr. Srinivasan has worked for over 5 years in the biotechnology and pharmaceutical industry on research in drug design, discovery, and development before starting her career in teaching. The courses she has taught include Introductory Chemistry, General Chemistry, Organic Chemistry, and Chemistry for Biotechnology majors.

#### How Does My Position Contribute to Program Success?

My role as an educator at the College and in this Program encompasses the following areas:

- In the classroom, she focuses on her students' content learning and technical expertise, critical thinking and problem-solving, to ensure that they are competent with their peers, across the board. In addition to imparting them content knowledge, she works on the development of the whole person and helps students build their core abilities, identify personal, educational, and career goals as well as make satisfying decisions for transition to the workforce as productive members of society.
- Assists in student guidance and tutoring in the Math Science Resource Center.
- Assist in the operation and safety in laboratories, help in laboratory equipment set up and data acquisition and analysis.
- Participates in the Evergreen Valley College Chapter's yearly Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) Outreach Conference. The purpose of this conference is to familiarize high school students with college life, and expose them to the different career options in math, science, and engineering.
- She has served as a member of the EVC Academic Senate since August 2014.
- Participates in the College's annual —Day of the Green: Freshman Orientation|| for new, first-time in college students matriculating from local area high schools. This event is designed to introduce students and their parents to the College campus and provide opportunities for them to learn about resources for academic and personal success.
- Participates in screening committees for hiring science faculty and science laboratory personnel.

### **José R. Valentín, Ph.D., Chemistry Faculty**

#### Education

Ph.D. Chemistry, Southern Illinois University, Carbondale, Illinois

#### Areas of Expertise:

- Theoretical and experimental chemistry specifically in the fields of Organic Physical Chemistry, and Analytical Chemistry.
- Research Scientist at NASA (15 years) in the development of analytical instrumentation for the analysis of gas samples in planetary atmospheres and using mathematical methods for the analysis of data collected from those instruments.
- Online learning pedagogies such as WebCT, Blackboard, Moodle
- Computer-interfaced experiments with PASCO interface.
- Currently teach all courses from Introductory Chemistry to Organic Chemistry



- Has knowledge of the use of the Gas Chromatograph-Mass Spectrometer and the Fourier Transform Infrared Spectrometer which are used in Organic Chemistry.

#### Proposed Professional Development Activities and Reasons for Such Activities

Teaching is a complex task and emerging educational standards in math and science, across local, state, and national levels, requires teachers to, not only, study, implement, and assess learning outcomes, but also to provide meaningful, engaged learning (cognitively, socially, and culturally) for a very diverse student population. My focus in this respect will be on the following activities:

1. Learn new internet-based pedagogical tools as needed, to enhance student learning.
2. Gather exciting new research findings from regional and national Chemistry meetings and journals, and keep students abreast with new developments in science.
3. Incorporate inquiry-based learning in the classroom, focus on core concepts and encourage a deep understanding of the course material while developing higher- order thinking skills.
4. Update and revise chemistry laboratory experiments, to incorporate more green chemistry techniques. This will allow a cleaner, safer environment, for the students to work in, as well as, will keep up with the changing times.
5. Take classes, attend workshops and conferences, and apply grants, with the goal to achieving students' success.

To further enhance student learning, the Chemistry program requests one additional, highly qualified and dedicated full-time faculty and one additional lab tech to provide positive, individualized student learning experiences, one computer lab to expand hands-on student learning, resources to replace heavily-used, worn-out equipment, and more faculty and staff professional development opportunities.

#### 2. List major professional development activities completed by faculty and staff in this department/program in the last six years and state proposed development and reasoning by faculty in this program.

##### **Bonnie C. Brown**

- Participated in On Line Teaching Conference virtually.
- Participated in division's PLO development and attended campus wide workshop.
- Received Diversity training for screening committees.
- Completed Equivalency Training for screening faculty.
- Served as Senator for Math, Science and Engineering division 2011-2013.
- Participate in SLO workshops provided on PDD.
- Familiarize and investigate Chemistry requirements for C-id and AS-T degree implementation.
- Attended workshop for computer resources through NBC Learn.
- Attend the yearly Hazmat Trainings and hold certificates
- Participated in 2YC3 webinar NSF on Grant Writing



### Workshops & Other Activities

- Participated in numerous workshops provided at PDD, such as Safety and Emergency Preparedness; Sexual Harassment/Hostile Workplace/how we treat one another and interface with students; Academic Senate policies, procedures, process, equivalency guidelines; Open textbooks, and Program Review.
- Implemented Green Chemistry laboratory for Chemistry 015 for environmental as well as budgetary reasons.
- Attended campus workshop on safety in the laboratory, PDD.
- Implemented safer and newer equipment for student usage in laboratory.
- Help students with textbook cost by selecting a custom-book and implementing an alternative optional e-book.
- Revitalized and implemented laboratory experiment with safer environment and microscopes techniques for Chemistry 01B to reduce chemical usage and learn modernize skills.
- Updated chemistry courses 015, with revitalized student learning outcomes.
- Attended brief orientation on Grant writing at division workshop.
- Assisted in orientation of new adjunct and faculty members with certain course procedures (arranged or set-up of lab Schedules).
- Participated in Academic Senate Outreach committee for increasing visibility of EVC campus.
- Publicize the program by participation in the annual Society for the Advancement of Chicanos and Native Americans in Science (SACNAS) Outreach Conference.
- Participated in Affirm orientation for high school students interested in attending EVC to promote the chemistry program and encourage students to become interested in the area of chemistry.
- Participated in panel discussion on the importance of STEM education courses and STEM careers.
- Help with update of course pamphlet used to publicize the Chemistry department's program.
- Evaluate adjunct faculty and administer each semester student evaluation forms.

### **José R. Valentín**

- Hazardous Communication Training & Hazardous Waste Handling Training at Evergreen Valley College, April 30, 2010
- California State University workshops for students interested in becoming science teachers
- Update laboratory experiments by creating more open-ended experiments to allow students to plan, observe record, analyze, and interpret results.
- Use varying teaching activities, anecdotes, related to my trips to foreign countries so my students learned how to study and collaborate together.
- My learning philosophy includes providing my students an environment that allows the sharing of new ideas and opinions on the very challenging subjects discussed during my lectures.
- I make sure my students know that I am aware that learning involves hard work but there are many life rewards to be gained. During my lectures I try, as much as possible, to bring real life applications so the students feel the connection with their own daily experiences

### **Preeti Srinivasan**

- Beyond Benign, Green Chemistry Workshop, Mission College, Santa Clara, August 19-20, 2010
- Quality Education for Minorities (QEM)/National Science Foundation (NSF)- Supported Workshop for Women Faculty in Science, Technology, Engineering, and Math (STEM) at Hispanic-serving Institutions (HSI), Las Vegas, July 30-31, 2010



- Hazardous Communication Training & Hazardous Waste Handling Training at Evergreen Valley College, April 2016
- QEM Network Outreach Forum on Building STEM Research and Education Capacity at HSI, Albuquerque, October 25-26, 2009
- Moodle Bootcamp @ONE San Jose Summer Institute, Evergreen Valley College, June 8-10, 2009
- EDIT010 Computers in Education, an online course (three units) at Evergreen Valley College, Spring 2009

### 3. Describe the departmental orientation process (or mentoring) for new full-time and adjunct faculty and staff (please include student workers such as tutors and aides).

#### a. Departmental Orientation Process for New Faculty

No tenure-track new faculty has been added to the program in the last six years. However, the procedure for new faculty orientation does exist. In addition to the orientation process given by the school, the department also has a mentor program. For each of the new faculty members, in his/her first semester of service, the Department appoints a tenured faculty member as the mentor for the new faculty member. The mentor serves as a guide and supporting person, assisting the new member in the school environment and answering questions related both to students (such as admission and registration procedures, adding and dropping classes, etc.) and faculty (such as tenure procedure, teaching assignments, and committee work).

#### b. Departmental Orientation Process for Adjunct Faculty

Most of our adjunct faculty members have been teaching for us for several years. For new adjunct faculty, when he or she is hired to teach a particular class, we provide the learning objectives for the class and the syllabus used by our current faculty members, and describe in detail how our classes are conducted, together with student matters such as adding and dropping students, attendance policy, etc.

#### c. Departmental Orientation Process for Staff (including student workers such as tutors and aides)

Only one full-time lab tech was recently hired after the previous one retired. He was oriented by the Dean on school procedures and by faculty members on the facilities, equipment and safety issues related to the Chemistry Program.

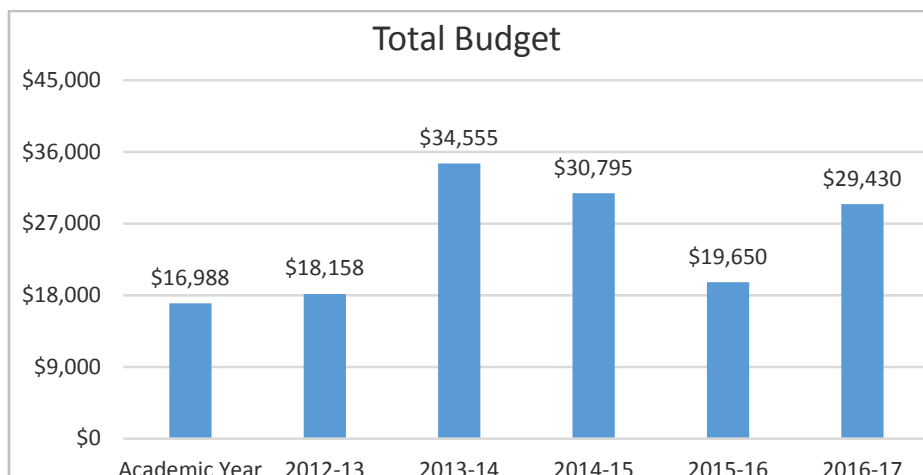




## PART F: Budget Planning and Resource Allocation

### 1. Current Budget

- A. Identify the budget currently allocated for the department/program through the division budget (fund 10). Discuss its adequacy in meeting your program's needs.



Only two of the fiscal years shown (2013-14 and 2012-13) was the Chemistry Department funded by monies from fund 10 as most came from fund 17. The Chemistry budget was cut in FY2012-13 due to problems with excess inventory and laboratory clean up problems. The Department has managed to ask for and receive extra funds since then as is shown in the chart above. Much of this has been used to resupply the laboratories with glassware, chemicals, kits, spectrophotometers, and the like.

The Department also received one-time bond funds in the spring of 2013 to acquire a gas chromatograph-mass spectrometer to be used in the organic chemistry classes. Moreover, as a part of the building fund for the new MS3 building, the Department received funds to buy a nuclear magnetic spectrometer (NMR) to use in organic chemistry labs. The Department needed this equipment to qualify for the C-ID which makes this course transferable to universities in the CSU system.

- B. Identify any external (fund 17) funding the department/program receives, and describe its primary use.

Most of the fund 17 monies have been used for supplies and equipment as stated above. The greatest expense has been for the purchase of the Gas Chromatograph-Mass Spectrometer (GCMS) and the Nuclear Magnetic Resonance instrument (NMR) which amounted to \$127,000 dollars. The GCMS was paid for by one-time funds in 2013, and the NMR was purchased with the 2016 Bond funds designated for buying equipment for the new building. Eight centrifuges with a total cost of \$18,300 were purchased with one-time equipment funds in 2014.



- C. Explain any grants or other external funding sources (partnerships) from which your program is benefiting.

None at this time.

- D. Explain any grants or other external funding sources for which your program would be a good candidate. Do you have plans to apply for such sources?

The Department will continue with a collaborative effort with NASA scientists for grant opportunities to involve both students and faculty with research projects involving chemistry, physics, and astronomy. A previous effort in 2014-2015 was attempted, and our application was accepted, but due to budget cuts, no funding was available for the EVC Chemistry Department.

## PART F: Future Needs:

1. Please describe any unmet needs for your program and how you plan to address them. Are any additional resources needed to accomplish your program's outcomes? Please provide rationale on how the requests tie into the strategic initiatives, college mission, SLO Assessment or Student Success.

We summarize below our needs for the following 5 years:

Item	Cost	Link to College SLO/Mission/Student Success
1. 7820A GC (Gas Chromatograph) with TCD, PC, monitor, printer, OpenLab GC ChemStation operating software	\$45,000	SLO Organic Chemistry: Apply physical spectroscopic theories and laboratory techniques for compound elucidation
2. 5977E GC-MSD (Gas Chromatograph/Mass Spectrometer) with TCD (dual inlets), PC, monitor, printer, GCMS ChemStation operating SW, NIST library.	\$76,000	SLO Organic Chemistry: Apply physical spectroscopic theories and laboratory techniques for compound elucidation
3. Pasco Sensors and Software	\$28,000	SLO General Chemistry: Explain the structure of atoms and periodic trends and properties using quantum and atomic theories.
4. Laptops (28) (\$3000.00/.each)	\$84,000	SLO General Chemistry: Explain the structure of atoms and periodic trends and properties using quantum and atomic theories.
5. Printers for laptops (10) (\$300.00/each)	\$3,000	ILO General Chemistry: Communication: The student will demonstrate effective communication, appropriate to the audience and purpose.



Item	Cost	Link to College SLO/Mission/Student Success
6. Mini-scale distillation kits, essential oil steam distillation kit, Graham Condenser, all glassware clamps, (28 @\$115.78/each)	\$3,242	SLO Fundamentals of Chemistry: Explain how liquids, solids and solution behavior can be understood using intermolecular dynamics and modified kinetic molecular theory, and solve solution concentration problems along with explaining acid-base reactions, electrolytic behavior, and performing pH and titration calculations.
7. 1220 Infinity LC, PC, monitor, printer, OpenLab LC, ChemStation operating software	\$52,000	ILO General Chemistry: Communication: The student will demonstrate effective communication, appropriate to the audience and purpose.
8. Microscale Distillation Kits (20 @ \$600.00/each)	\$12,000	SLO Organic Chemistry: Describe the theoretical and experimental aspects of common organic laboratory techniques for separation, purification and compound characterization
9. AGCN100, Analytical Balances (20 @ \$1500.00/each)	\$30,000	ILO All Courses: Inquiry and Reasoning: The student will critically evaluate information to interpret ideas and solve problems.
10. Fourier Transform Infrared instrument	\$26000	SLO Organic Chemistry: Apply physical spectroscopic theories and laboratory techniques for compound elucidation
11. Lab Supplies Budget for next 6 years(\$30K per year)	\$180000	Chemical reagents, consumables, glassware, hardware, thermometers. Relate to ILO Inquiry and Reasoning: The student will critically evaluate information to interpret ideas and solve problems.
12. 10 Melting Point Measurement Instrument (\$750 each)	\$7500	Organic Chemistry ILO: Inquiry and Reasoning: The student will critically evaluate information to interpret ideas and solve problems.

**FUTURE LABORATORY NEEDS:**

The chemistry program needs to replace our old instruments used in the General, Introductory, and Organic chemistry laboratories. These instruments are indispensable to conduct most of the experiments in a chemistry lab type of environment and needed to meet the minimum requirements of the SLOs of these courses.

Instruments, such as FT-IR, GC, and GC/MS, are the workhorses of Organic Chemistry. The students use them every lab after the isolation, synthesis, and analyses of organic compounds. Currently, we have one very old (more than 15 years old) FT-IR that need to be replaced with one that includes a state-of-the-art sample compartment a Gas Chromatograph/Mass Spectrometer (GC/MS), and a nuclear magnetic spectrometer (NMR). We lost a very old (more than 15 years old)



Gas Chromatograph due to not being able to find replacement parts when it broke down. Replacing this instrument is critical for the performance of some of the experiments our organic chemistry students need to do during this course. Moreover, in order to keep up with recent instrumentation technology we need to pursue the development of newer analytical instrumentation techniques used in organic chemistry. One of them includes the technique of High Performance Liquid Chromatography which lends itself very nicely to application in the field of Organic/Biochemistry.

For our introductory and general chemistry courses we need to update our lab experiments using computers interfaced with our lab experiments in order to be able our competitiveness with other community colleges. In order to be able to accomplish this we will need to acquire PASCO interfaces with laptops and printers. In addition, we need to replace our old distillation equipment with newer ones that

Without these tools our students will be at a disadvantage after they transfer to a four-year institution.

## 2. What faculty positions will be needed in the next six years in order to maintain or build the department? Please explain. What staff positions will be needed in the next six years in order to maintain or build the department? Please explain.

At present the number of full-time (four) and adjunct chemistry instructors is inadequate to meet the needs of our department and our students. As the number of sections increase, we will need additional full-time instructors. At the end of spring 2016, we lost a full-time instructor, and another full-time instructor is considering retirement at the end of AY 2018.

Moreover, we need an additional full-time chemistry lab-tech due to the increased in number of lab sections. At present having only one lab tech is not enough to keep up with the daily routine of preparing the diverse types of reagents and equipment needed to perform the experiments and manage the handling of hazardous materials.

## 3. Does your program require any additional facilities, equipment, technology and/or supplies over the next six years (above and beyond the program's current budget)?

As mentioned in part F-1 "Future Needs" up to date instrument facilities will be needed to make sure our students keep up with the latest developments in the field of instrumentation.

Something that needs urgent attention, in terms of facilities, is the subject of safety in the chemistry labs. Our new labs (at the MS3 new building) contains working benches that are inadequate due to the surface color of these benches. When our students need to use the Bunsen burners, they are not able to see the flame unless the ceiling lights are turn off. The top of these benches must be replaced with a black color type of surface which is the color use in chemistry labs.

At present, one of the chemistry labs still remains in the Acacia Building where General Chemistry II is taught. This building is to be torn down in the future, and that lab facility will be lost. In the plans for the new MS3 Building, the architects designed one of the classrooms to be converted into a lab at a later date. When the Acacia lab is demolished, the Department hopes that Bond funds will be available to build a new classroom building which would free one of the current classrooms in MS3 to be converted into another chemistry laboratory space. This will enable the Chemistry Department to offer more laboratory sections.

**PART G: Additional Information**

No additional information.

**PART H: Annual Assessment: Program Faculty and PR Committee**

Not Applicable.

**PART I: Resource Allocation Table**

Program Reviews provide a valuable source of information for the College as it makes decisions on resource allocation, both in terms of funding and cuts. The following information, in table format, will be used by the College Budget Committee to help inform EVC's Budget and Planning Process.

Item Title	Response
Productivity (WSCH/FTEF)	Most recent Academic year, averaging Fall and Spring (404)
Student Success Rate (Retention Rate)	Most recent Academic year, averaging Fall and Spring (67%)
Number of class sections offered by your program	Most recent academic year (51 sections)
Changes in enrollment	Most recent academic year vs. three years ago (+2%)
Your Program's Current Budget (from Fund 10)	Most recent Fiscal Year \$706,444.00
Current External Funding (from Fund 17)	Most recent Fiscal Year \$29,430.00
Future Needs: Faculty (Estimated Additional Cost)	Annual cost* \$260,000 to replace one retiree and one potential retiree
Future Needs: Staff (Estimated Additional Cost)	Annual cost* \$40,000 for an additional lab tech, especially for weekend work
Future Needs: Facilities (Estimated Additional Cost)	Total cost over useful life of facilities* The "Estimated Additional Costs" for future facilities is unknown at this time because it will be determined by the expenses associated with the cost of replacing the chemistry lab at present located at the Acacia building after this building is demolished. In addition other costs linked to the new construction expenses for our department using Measure X funds is unknown at this time. These costs will be determined at a later time.
Future Needs: Supplies (Estimated Additional Cost)	Estimated Total cost (\$30,000 per year)

***\* Do your program's future needs assume that your program's enrollment will remain stable or do they depend upon enrollment growth? If they depend on growth, please explain the growth projections on which you are basing your assumptions. You may attach any supporting documentation to explain or support assumptions.***