

Instructional Program Review Report

Sierra College, 2018-19

Department/Program Name: Chemistry

Date Submitted: February 22, 2019

Submitted By: Michael Brelle

Ideally, the writing of a Program Review Report should be a collaborative process of full-time and part time faculty as well as well all other staff and stakeholders invested in the present and future success of the program at all sites throughout the district. The Program Review Committee needs as much information as possible to evaluate the past and current performance, assessment, and planning of your program.

Please attach your Department Statistics Report (DSR) and your planning report with your Program Review.

1) Relevancy: This section assesses the program’s significance to its students, the college, and the community.

1a) To provide context for the information that follows, describe the basic functions of your program.

The chemistry program at Sierra College serves many critical functions for our students. Our primary function is the education of chemistry and the methods of science. This in itself serves many functions by preparing students for educational/vocational goals in the sciences, engineering, medical/dental/veterinary school, and allied health programs such as nursing, dental hygiene, physical therapy, and radiology to name a few. Also, by emphasizing the importance of laboratory work, we are able to prepare our students for hands on applications of the scientific method and to prepare them for real world skills necessary in many scientific/engineering/health occupations. Students succeeding in our courses will have grown not only in their knowledge of chemistry but also will develop critical thinking and problem-solving skills helpful in whatever career path they choose.

1b) How does your program support the district mission, as quoted below?

“Sierra College provides an academic environment that is challenging and supportive for students of diverse backgrounds, needs, abilities, and goals with a focus on access, equity, student-centered learning, and achievement. The college is committed to practicing diversity and inclusion, and recognizes that a diverse and inclusive curriculum and workforce promotes its educational goals and values. Institutional learning outcomes guide the college’s programs and services, encouraging students to identify and expand their potential by developing knowledge, skills, and values to be fully engaged and contributing members of the global community. Sierra prepares

students by offering Associate's and transfer degrees, certificates, career and technical education, foundational skills, as well as lifelong learning and enrichment." [update]

Please include an analysis of how your program supports ISLOs (Institutional Student Learning Outcomes): Communication, Technology and Information Competency, Critical and Creative Thinking, and Citizenship? [we could make this a separate question]

Chemistry is often labeled as the central science since all sciences derive some information or require some basic understanding of chemistry to master. The Chemistry Department offers students of all levels the opportunity to learn and master chemistry so that every student has the chance to move into any scientific/engineering/health field of their interest.

Those who excelled in high school chemistry can take university transferable courses in general chemistry, organic chemistry, and analytical chemistry (Sierra College is one of the few Community Colleges in the State to offer a course in analytical chemistry, a required course for anyone going into the fields of chemistry and forensics/criminalistics).

We also offer Chem A, a course for preparing students for Chem 1A/B or Chem 2A who did not take or do well in high school chemistry. We also offer Chem 3A/B as an excellent alternative for Chem 1A for students needing the extra help and time to succeed in college level chemistry that may have weak math skills or simply have not seen high school chemistry in a long time.

We also offer the necessary chemistry courses (Chem 2A and Chem 2B) for students pursuing degrees/programs in the allied health fields (nursing, vet tech, etc).

With many of the core courses such as Chem 1A, 1B, 2A, and 2B we offer problem solving classes to further enhance the learning environment, retention, and success of our students.

So regardless of the student's background, the Chemistry Department is prepared to teach and build the skills necessary for any student to have the opportunity to succeed in college level science/engineering/health courses.

Students who successfully complete our courses will have demonstrated all four of the institutional student learning outcomes (ISLOs). Science and chemistry require careful reading/review of the problems, discussion, and proper communication of the findings and results (ISLO 1-communication).

Working in the lab with both old and modern instruments helps to build students hands on technical and problem-solving skills (ISLO 2-technology and information competency). The problems that students must address and work on in Chemistry require a critical and creative analysis of what is wanted (purpose), what is known or can be known (data), how does one connect the purpose and data (experiment), and finally how to communicate the findings and the process in a lab report. (ISLO 3-critical and creative thinking). Students are taught responsible and safe lab skills as well as proper disposal of chemical waste. Students learn to respect the potential danger of many chemicals and this helps bring them to a better understanding of our global environment and how both natural and human induced chemical-based actions can play a significant role in our well-being (ISLO 4-citizenship).

1c) Program offerings align with which of the following mission categories; check all that apply:

- Transfer Career Technical Education
 Basic Skills Personal Development/Enrichment Lifelong Learning

1d) Please analyze your department's performance in supporting the mission categories marked in 1c above. Please provide evidence in support of this analysis, including data from the dashboard relevant to this evaluation; relevant data includes the equity and diversity goals of the department and College.

If any of the following apply to your program, please address them in your analysis.

- Degrees, certificates, and/or licenses your department has generated:
 - The alignment of these awards with the district's mission and/or strategic goals. (See the district "Awards Data File, available from Research and Planning, for your numbers).
- Job placement or labor market information for your program's awards and licenses.
- The contribution your program makes to student transfer.
- Participation in basic skills programs.

The Chemistry Program is a very high demand program. With the current facilities and staff limitations it is not possible to meet the current and future student demand for additional sections of the courses we offer.

Students who are required to take our courses as requirements for their majors or future interest include all science majors (chemistry, biology, geology, physics, etc), all engineering majors, any student interested in going to medical/dental/veterinary school, and all allied health students. In short, the Chemistry Department provides a foundational education for an extremely large number of our students here at Sierra College.

For students with no background or a minimal background in chemistry, the department offers Chemistry A as a chance for all members of the student body to have the opportunity to succeed in our sequence of chemistry courses.

Although our Department does offer an AS degree and an ADT degree in Chemistry few students earn them. This is primarily due to the fact that most of our students who take the necessary courses for these degrees have a primary goal of transferring to a four-year college to earn a BA/BS in chemistry. The recently approved AST degree has not increased the number of students taking a 2-yr degree in chemistry as expected. We believe this is due to many of our chemistry majors transferring to UC schools where the AST degree is not yet accepted.

Preparing students for transfer to four-year schools or professional programs by offering a complete chemistry course load for the first two years (one year general chemistry, one year organic chemistry, and one semester of analytical chemistry) is where the Chemistry Department makes a major contribution. These courses are typically required of all chemistry majors but also are required for most science related degrees, pre-med, pre-dental, and pre-vet. Our chemistry courses are a prerequisite for many biology courses (Bio 1, 4, 6, and 8) and therefore we help sustain the Biology Program by preparing biology students as well.

- 1e) Optional Additional Data: Describe any other relevant contributions of your program to the district mission, goals, outcomes, and values not incorporated in the answers above. Examples include but are not limited to contributions to student equity and success, diversity, campus climate, cultural enrichment, community ties, partnerships and service, etc. Include specific data and examples.

The Chemistry Department is committed to supporting *student equity and success* by assisting students having little/no prior chemistry experience with programs such as "Coffee & Cram" and sponsoring the Chemistry Club tutoring sessions. Chemistry faculty nurture *diverse* needs of Sierra College students by

providing a complete program of Chemistry course offerings, organizing the NCC Women in STEM forum, participating in Social Justice Days and the Ghidotti Early College High School advising committee. The Chemistry Faculty also seek to support our *diversity* student body by completing trainings such as Safe Space, Unconscious Bias and Veterans Support. The Chemistry Departments strives to develop a rich campus climate that will engage students by offering Honors Contracts, advising the Science Club, participating in Earth Days and even festively decorating of the hallways in Sewell Hall. In addition, Chemistry faculty work to improve *campus climate* by serving on campus committees such as the Natural History Museum committee, Integrated Guided Pathways committee and the R4S committee.

Chemistry courses are taught in-line with the *district mission statement* emphasizing transfer as well as career and technical training. The Chemistry Department develops laboratory exercises to engage and train students in the latest scientific technologies and instrumentation. This training qualifies our students to participate in research internships and volunteer activities in local community. Chemistry faculty also builds strong *community ties* by participating in outreach events such as Dinosaur Days and developing programs such as the NCC Science Presentation Series. The Chemistry Department hosted a chemistry conference for local colleges and universities to promote *partnerships* between chemistry departments in our region. In addition, our department participates in programs such as the 7th grade experience to build *partnerships* with K-12 institutions in Nevada County and expose students to opportunities available at Sierra College. Finally, the Chemistry Department supports *community service* programs to collect basic resources for our community such as food, glasses, and clothing products.

2) Currency: This category assesses the currency of program curricula as dictated by Title 5 and the currency of efforts in meeting accreditation standards as well as improving pedagogy and engaging in professional development.

2a) Curriculum: Comment on the currency of your program's curricula, including discussion of any recent or projected changes. Please describe your process and the criteria, including state and/or professional mandates, for evaluating and revising curriculum, including the use of SLOs.

As relevant, please address the impact of the development of MAPs, Interest Areas, and Guided pathways on curriculum and program planning and assessment

The Chemistry Department has made excellent progress in Curriculum Review with most of the courses measuring and reporting selected, specific course outcomes every year. These outcomes have been reviewed by the individual faculty members and groups of faculty members teaching different sections of the same course and appropriate modifications have been made or are being made in methodology and/or sequence relative to these outcomes. The Chemistry Department will be under Curriculum Review during the 2019-2020 school year.

Our Curriculum and outcomes are written and maintained to align with the standard of the American Chemical Society. Due to the sequential nature of the prerequisites for chemistry courses, a pathway was already built into the timeline for students majoring in chemistry. This made the process of developing a chemistry major MAP rather straightforward.

Since very little data is yet available and the College structure is just beginning to change to implement Interest Areas and MAPS, we have not had the opportunity to truly allow MAPs, Interest Areas, and Guided pathways to impact on our curriculum and program planning and assessment as of now. As Guided pathways begins to take shape on our campus, we are excited to help in the development and to

use the resources and data provided from it so that we can shape our department to better improve student success and to close equity gaps.

- 2b) Student Learning Outcomes Assessment: Analyze your program's assessment of course outcomes, analysis of results, and improvements/changes made to the program as a result of this assessment. Please provide specific data and analysis in the space provided.

In the space below, please describe or attach the cycle you have developed for outcomes assessment.

The Chemistry Department assesses course/program outcomes with higher frequency than institutionally required. Each course, in every program, assesses at least one outcome every year with some courses assessing course outcomes every semester. Each program outcome is assessed every semester. (See outcome cycle attached) Course outcomes are assessed using exams, quizzes and laboratory activities to gather data on specific (e.g. Demonstrate proficiency in problem solving and analyzing data related to physical and chemical equilibrium) and general (e.g. Demonstrate proficiency in scientific communication) course objectives. Program outcomes are assessed using cumulative standards developed by the American Chemical Society (ACS) to determine how the students are performing overall relative to their peers at other schools (including four-year universities).

The Chemistry Department facilitates program workgroups every semester to review course and program outcome data. Course outcomes are reviewed in a group setting and ideas for improving success in individual course outcomes are developed. The general chemistry courses (Chem 1A/1B) have collected course outcome data for over 20 years demonstrating that students enter underprepared for basic course outcomes such as solving problems related to stoichiometry (CSLO1). In Fall 2014, the chemistry and counseling departments used this data to implement an ACS standardized entrance exam for all Chem 1A courses with the hope that this new prerequisite will increase student success in general chemistry. Since the ACS entrance exam has been utilized, we have seen an increase in our overall retention and success in our general chemistry courses with far fewer students dropping and retaking the course.

Program outcome data (based on ACS standards) are analyzed and compared to National statistics where the Chemistry Department strives to maintain outcome scores above the National median (50th percentile) in both the overall scores and in the individual topic areas. Faculty workgroups review overall and individual subject matter areas in regular breakout sessions and propose schedule/curriculum changes to address shortfalls. Sierra College general and organic chemistry students (Chem 1A/1B; 12A/12B) students regularly score above the 80th percentile overall. However, general chemistry students have consistently lower scores in subject matter such as equilibrium. To address these lower assessments the department has begun implementing new PASCO Scientific technology to improve/update laboratory exercises and provide students with modern activities to explore and practice course concepts.

- 2c) Professional development: Please describe how your department's individual and group activities and professional development efforts serve to improve teaching, learning and scholarship.

Please describe your staff development needs based on this analysis.

The Chemistry department is actively involved in many professional development activities. All full time and some part time faculty regularly attend monthly department meetings, and to promote a friendly and collegial environment, each person signs up to provide lunch at one of these monthly meetings. The faculty and staff participate in various institutional flex activities related to a myriad of topics including technology, equity, student academic and personal needs, kognito, and others.

Within the department the chemistry faculty facilitate various flex meetings to discuss topics related to curriculum development that supports improvement of SLOs, new and updated lab experiments, lab safety, attention-getting/exciting demos that enhance student understanding, uses of technology in the lab/classroom, and innovative presentation ideas that improve teaching and learning.

At our Planning and Assessment meetings the chemistry faculty examine and analyze student assessment data each semester. Even though the cSLOs must be assessed every three years, most chemistry courses are assessed and analyzed on an annual basis. As a result, faculty are up to date on effectiveness of teaching methods and student learning. Faculty who teach common courses collaborate to identify areas of learning that need improvement and discuss possible strategies that can be implemented to improve learning.

Many faculty are involved in informal mentoring of new full time and part time instructors. The majority of the chemistry faculty are members of ACS, the American Chemical Society. One member of the department attended the national American Chemical Society meeting last fall in San Francisco and shared recent discoveries and innovations with fellow chemistry faculty.

One faculty member has recently applied to the National Science Foundation to participate in a two-day grant writing workshop. The goal is to learn how to successfully write grants to close the equity gap in STEM fields.

Two faculty members have created a new General Chemistry Lab Manual that is being used in both the 3A/3B and 1A series. Two faculty members have created a new General Chemistry Lab Manual that is being used in the Chem 1B course. The current labs now incorporate the use of our new Pasco instrumentation, current technology which is useful in measuring and obtaining data in inorganic labs. All faculty have received training on the use of this equipment. One faculty member has created an Allied Health Lab Manual for the Chem 2A course. All faculty who have coursepacks and/or labpacks make improvements and updates to these student resources on an annual basis.

The Organic Chemistry program has gotten a new GC-MS (gas chromatograph mass spectrometer); five faculty members received an all-day training on the use of it.

All faculty are working cooperatively to write and update program review.

Over the past several years' faculty members attended the annual conference hosted by the chemistry department at CSU Chico and helped to host the most recent meeting. The Chemistry Community College Conference at Chico State enabled chemistry instructors to meet one another and share recent developments in chemistry, innovative teaching and learner-centered strategies, lab curriculum, and demonstrations among other topics. A few years ago, Chico decided to discontinue the event. Our chemistry department was disappointed because we valued and enjoyed this collegial and informative event. As a result, our chemistry department has hosted a community college chemistry seminar and invited local and regional community colleges and CSUs.

Chemistry faculty have expressed a strong interest in attending regional and national conferences and workshops but this is difficult due to lack of funding. In STEM related disciplines there are many new developments and rapid changes, and travel funds are needed so that our faculty can be well-informed, current and relevant in today's world and uphold the high standards of our department.

2d) Optional Additional Information: Please describe and explain any additional information that supports your evaluation of your program's success.

Our results from the ACS exams in all of our courses when compared to normalized National results have consistently shown our classroom averages to score in the 70-90th percentile group which is an excellent indicator of our programs effectiveness. In short, this means on average, our students are performing better than 70-90% of their peers in chemistry throughout the entire nation, including those at public and private four-year universities.

3) Effectiveness: This section assesses the effectiveness of the program in light of traditional measurements.

3a) Retention and Success: Assess and evaluate the three-year trends in your program's data contained in the DSR and analyze any relevant information found in the data dashboard related to retention and success. Please include the results of any relevant outcomes assessments, as appropriate. Address separately the data for on ground and online courses, as well as the data for the campus or centers at which you operate. Please describe any challenges experienced by your program; if you determine that you need to improve the program's performance, please describe how you plan to achieve this goal.

As relevant, please address your program's role in the development of MAPs, Interest Areas, and Guided pathways and the impact of these developments on program planning and assessment.

For the last three years, the chemistry department's student retention and success numbers have hovered consistently around 86% and 76%, respectively. This is an improvement from the past. In the last Instructional Program Review Report (IPRR), the chemistry department noted a regular spring-fall fluctuation that had occurred because of the difference of the nature of the courses offered each semester. In the past, the department numbers tended to be better for the spring because there were more sections of advanced sequence courses offered in the spring semester; only *successful* students were able to proceed to the next course in the sequence. In both the fall and spring semesters the lowest chemistry numbers are traditionally in Chemistry A and Chemistry 1A, which are entry-level courses. These entry-level courses are very challenging and under-prepared students have difficulty completing them, which leads to lower retention and success numbers. Our solution to this problem was to implement a diagnostic exam to ensure that underprepared students were herded into the Chemistry 3A-3B sequence, which is designed for underprepared students. This has led to greater success for our students. The success and retention of Chemistry 2A/B students could also be improved through the use of a diagnostic exam as well as increasing the math requirement to Math D to help encourage under prepared students to first take Chemistry A to build the skills necessary to be successful in Chemistry 2A/B. Further retention and success in our courses can be improved by promoting the successful Chemistry Problem Solving courses; reinstating the successful PLTL program; and expanding the tutor program for chemistry students. With the implementation of Guided pathways/Interest Areas and the Colleges commitment to close equity gaps on our campus, the department hopes this new structure will provide the resources needed to improve student success. Currently, one of our faculty members, Michael Brelle, who is also the STEM Interest Area liaison, is working to write a NSF S-STEM grant that will be due in Spring 2020. If awarded, the grant will provide between \$500,000-\$1,000,000 to be used to develop a program at Sierra College that will provide both financial (scholarships) and academic (program development/tutoring) support for our underrepresented STEM students with the goal of closing the current equity gaps in our STEM courses.

3b) Enrollment Trends: Assess and evaluate the three-year enrollment trends in your program's DSR data. In addition, analyze any relevant information found in the data dashboard related to these trends. Include an analysis of fill rates, wait lists, course cancellations, program completion, and classroom use. Address separately the data for on ground and online courses, as well as the data for the campus or centers at which you operate. Please describe any challenges experienced by the program; if you determine that you need to improve the program's performance in any way, please describe how you plan to achieve this goal.

As relevant, please address your program's role in the development of MAPs, Interest Areas, and Guided pathways and the impact of these developments on program planning and assessment.

In the past three years, the number of sections and the number of FTES has grown due to the addition of a full-time faculty member and a new lecture building (AT3) and lab (ST3). As predicted in our previous Program Review, the additional full-time faculty member and room/lab resource and led to a large increase in the number of enrollments. Our total enrollment numbers were as follows: 2015-16 we had 2423 enrollments; 2016-17 we had 2763 enrollments; and in 2017-18 we had 3018 enrollments. In three years, we were able to increase the number of enrollments by 22%. Our total section number increased from 56 in Fall 2015 to a high of 73 in Fall 2017. Our fill rate has a 93% three-year average; our waitlists are full. One of the current challenges the department faces is having enough full-time faculty to properly utilize the space we have. We recently lost two full time faculty members but have only been approved for one replacement in Fall 2019 (for Nini Cardoza). We will be requesting a much-needed replacement for Pam Gamel during the 2019-2020 year. Missing two full-time faculty members has compounded the problem the department faces in adequately staffing our courses. The difficulty in hiring suitable adjunct faculty has led to the department cancelling classes or making massive adjustments to live schedules both of which negatively affect student success.

However, even with the addition of a full-time faculty member and buildings AT3 and ST3, the current student demand would support even more growth. Based on the early data from Ad Astra, to meet the demand for chemistry courses listed on student MAPS the department would have to nearly double in size (space, faculty, staff, equipment, etc). With the passing of Measure E the department looks forward to the new science building and will happily increase the number of sections if the design of the building and hiring of faculty allows. Unfortunately, the current design of the new Science Building will not increase the number of chemistry lab rooms, which is the primary limitation in how many students we can serve. Therefore, we do not at this point predict a growth in FTES until phase 2 of the Science building is finished when additional lab space is supposed to be added.

3c) Equity: Analyze and evaluate your program's performance in promoting and/or achieving equity for at risk students and equity in general. Based on this analysis, describe any plans you have to sustain or improve the program's contribution to student equity as a central component of student success.

The Chemistry Departments retention rate is at or above the district average for all groups. However, there are numerous groups (African-American, American Indian, Pacific Islander, and Hispanic) that are at or below the district average in success rates. This clearly needs to be addressed. The department is committed along with the College to improve these numbers by starting with a new hiring process to

bring in instructors that have experience and/or are dedicated to closing these equity gaps. In addition, as previously stated, one of our faculty members, Michael Brelle, who is also the STEM Interest Area liaison, is working to write an NSF S-STEM grant that will be due in Spring 2020. If awarded, the grant will provide between \$500,000-\$1,000,000 to be used to develop a program at Sierra College that will provide both financial (scholarships) and academic (program development/tutoring) support for our underrepresented STEM students with the goal of completely closing the equity gap in our chemistry and STEM courses.

3d) Optional information: Please describe and evaluate any additional relevant information supporting the evaluation of your program's success.

We have asked for more full-time faculty and have been fortunate to have been able to hire more to meet student demands. We are now in the process of hiring a retirement replacement. This will improve student learning having more classes taught by dedicated full time faculty with all advantages that full-time faculty get over part time faculty. We have been able to purchase Pasco Scientific Instruments and a new GC-MS, both have been requests that had been on our PAR for some time. We also requested more lab and lecture space and that need is being met with new modular buildings (ST3 and AT3). These new additions, equipment and buildings, to the chemistry department has improved our student learning and greatly improved the number of students served.

3e) Analysis and Planning: Referring to the analysis in 3a-d, to your ongoing planning and assessment documents, and to any relevant information from section 2 above, please describe your program's plans to maintain or increase its effectiveness and analyze and evaluate your efforts to achieve these goals. As relevant, please address your program's role in the development of MAPs, Interest Areas, and Guided pathways and the impact of these developments on program planning and assessment.

The Chemistry Department plans to continue to meet on a monthly basis in department meetings to discuss and develop plans to maintain and improve student success and to close equity gaps within our courses. Having monthly meetings allows for discussions to be current and to allow for a more rapid response to how we can be a more effective department for our students. As we develop and try out new ideas, we capture success/failure via student/program outcomes measurements (such as standardized ACS exams, lab activities, etc) as well as the data provided from the Research department. We plan to use this data to help guide and develop our program so that our department can better serve students in our STEM Interest Area as well as the many students that require chemistry in the various other Interest Areas (such as nursing students). We look forward to improved coordination between the various STEM departments as well as Counseling to improve the student experience.

4) Resources: This category assesses the adequacy of current resources available to the program and describes and justifies the resources required to achieve planning goals by relating program needs to the assessments above.

- 4a) Please describe the future direction and goals of your program for the next three years in terms of sustaining or improving program effectiveness, relevance, and currency. Include any relevant analysis of equity goals and the development of MAPs, interest areas, and guided pathways. Please incorporate analysis of any relevant outcome or other data in this description, including any data from the dashboard.

Our goal is to maintain and continue to build an effective chemistry program. This will be accomplished through the further and continued development and assessment of Program Outcomes and Course Outcomes by using nationally normed exams, lab reports, lecture/lab exams, homework, and student surveys. These results will also help us to achieve another important goal for the chemistry department to obtain consistent student scores/competencies for all sections of the same course.

With the strong emphasis on the laboratory component of our courses, it is critical to the program that we adequately equip and maintain laboratory rooms with modern, fully functional equipment. This includes meeting the district agreement with the tax payers of Placer County to offer a complete allied health curriculum at the NCC campus. This would require the establishment of a Chem 2B course with all necessary lab equipment at NCC.

We plan to continue to strengthen the pathway between local high school chemistry programs and the chemistry program at Sierra College. This pathway will be further strengthened through the new collaborative work created by Interest Areas occurring between counseling and our department. Our department is committed to working with the college on the development and growth of interest areas and Guided pathways. We believe this is a great opportunity to improve overall student success and ultimately help achieve our goal of closing equity gaps. As mentioned earlier, one of our faculty members, Michael Brelle, who is also the STEM Interest Area liaison, is currently working to write an NSF S-STEM grant that will be due in Spring 2020. If awarded, the grant will provide between \$500,000-\$1,000,000 to be used to develop a program at Sierra College that will provide both financial (scholarships) and academic (program development/tutoring) support for our underrepresented STEM students with the goal of completely closing the equity gap in our STEM courses.

- 4b) Please describe and justify any projected requests for additional staff, new or augmented technology/equipment, and additional or remodeled facilities necessary to support these goals. Please incorporate any relevant data related to SLOs, student success, and equity.

Equipment/Technology: Equipment and Technology requirements can be divided into two areas, the lecture room and the lab. For the lecture room it is agreed upon throughout the department that smart rooms in S-101 and S-102 are necessary to enhance instruction and student learning, since this would provide a cohesive method for presenting instructional materials such as PowerPoint, overheads, videos, etc., for all chemistry instructors. At the very least, there is a need for ceiling mounted projectors to give consistency and continuity between the instructors and the instructional equipment that is available at both Rocklin and NCC. Other needs for the lecture room are whiteboards throughout the classrooms and labs at Rocklin, since the chalkboards do not provide a good writing surface for instruction. The department also needs funding for clickers to strengthen student participation and provide instructors with awareness of student understanding while lecturing for both Rocklin and NCC. The department would also like to purchase manipulatives to enable students to grasp the more abstract concepts of chemistry instruction, such as the crystal lattice structures models recently obtained that help students visualize different solid crystal lattice structures at the atomic level. Many of the aforementioned requirements will be met through the construction of the new Science building.

The Sierra College chemistry department has an upper division organic chemistry course and needs to have the proper instrumentation to compete with other upper division organic chemistry courses taught at other colleges/universities. Therefore, the department not only needs new instrumentation, but preventative maintenance to keep the instrumentation working at its best. Funding needs for the future include maintenance and replacement, if necessary, of the following: all balances (especially analytical), hot plates, our new GC-MS (gas chromatography-mass spectrum), NMR (nuclear magnetic resonance), HPLC (high-pressure liquid chromatographer), power supplies for element emission bulbs, rotary evaporators, heating mantles, MelTemps, and centrifuges. The department requires funding for the routine calibration of balances (maintenance) and the stocking/replacement of chemicals and glassware necessary for student laboratory experiments.

Facilities: The Chemistry Department fill rate of 93% is excellent and demonstrates the high demand of the courses taught by the Department as well as the need for additional facilities and staff to meet this demonstrated demand. The actual fill rate for our transferable courses on the Rocklin campus is near 100%; the fill rate value reported is lower due to low enrollment on our remote campuses as well as a lower enrollment in our axillary problem-solving courses.

Currently there is not enough space in Sewell Hall and the new temporary science buildings so many faculty must teach in rooms spread across campus. The primary issue with this is that most of the rooms are inadequate for chemistry instruction as they lack Periodic Tables (a must) as well as the equipment to safely perform demonstrations. The rooms that offer these opportunities are in very short supply.

Due to high demand many of our Problem-Solving classes such as Chem 2X are being offered in rooms with too low a capacity and thus many students are being turned away.

ST-1 is beginning to really have issues that are not helpful for student success and learning. Issues ranging from pest infestations, to a floor that bows and moves as students walk which can drastically alter readings on balances or burets thus effecting students ability to work accurately and precisely, two elements critical in many chemistry laboratory assignments.

The addition of the new Science Building using Measure E funds will help alleviate many of these problems.

Staff: The Department FT/PT Ratio is significantly higher than that of the District. However, this number is not accurate since full time faculty in chemistry are able to teach multi-section lectures. The multi-section lectures allow full-timers to teach 3-4 times the number of students that a part-time faculty can teach and thus the FT/PT ratio does not accurately reflect the true make-up of the department. This ratio also does not include overloads which are generally being taught due to shortage of available qualified, competent part-time faculty. With the current hiring process of an additional full-time instructor to replace Nini Cardoza the department will be able to more smoothly operate and offer additional chemistry courses that are in high demand. An additional full-time hire is still needed to replace the tenured full timer that was released from employment by Human Resources and the Board of Directors in Fall 2018.

4e) Please check the appropriate boxes in the chart below indicating the general reasons for the resource requests described above (please check all that apply):

Function/Role	Maintenance	Development	Growth	Safety	Outcomes	Other success measures	No Requests
X	X	X	X	X	X		

5) Summary/Closing

5a) Based on the analysis above, briefly summarize your program's strengths, weaknesses, opportunities, and challenges.

The Chemistry Department strengths are its dedicated, competent, qualified, professional full and part-time faculty members and classified staff members. These members have built an excellent, efficient team/family that delivers the highest quality educational services to our students. The Curriculum is relevant and rigorous, meeting the highest internal and external standards. Our students continue to do well upon transfer and our Pre-nursing Chemistry Program continues to produce qualified, competent students for the Nursing Program. Many Sierra College graduates are active and productive members of health professions in our community such as nursing, dental hygiene, physical therapy, and radiology. The facilities and equipment are aging but the staff manages to use them effectively. Additional resources in the 2000, 4000, 5000, and 6000 areas are needed to address the identified weaknesses in these areas. The critical facilities challenge will likely only be met when the new Science Building and phase two of its construction is built. With the very strong demonstrated demand for Chemistry courses the future for the Department is very positive. Once the facilities, staffing, and equipment/supply needs are met, the Department will see significant growth in FTES as demonstrated with the recent addition of ST3 and AT3.

5b) How has the author of this report integrated the views and perspectives of stakeholders in the program?

All members of the faculty (full-time, part-time, and classified) were asked to participate and chose section of the Program Review to work on. Each member of the department shared information with one another and were provided the DSR data and given the opportunity to provide comments and information where they felt they could constructively add. Following this review/feedback opportunity, the Program Review was once again discussed and developed during FLEX week in our Department Meeting. Through the use of Student Surveys given every few years by the Chemistry Department, student feedback was easily incorporated into the evaluation and needs of the Department.