**Bakersfield College**

**Comprehensive Program Review**

**I. Program Information:**

Program Name: Chemistry

Program Type:  Instructional  Student Affairs  Administrative Service

***Bakersfield College Mission****:* Bakersfield College provides opportunities for students from diverse economic, cultural, and educational backgrounds to attain Associate and Baccalaureate degrees and certificates, workplace skills, and preparation for transfer. Our rigorous and supportive learning environment fosters students’ abilities to think critically, communicate effectively, and demonstrate competencies and skills in order to engage productively in their communities and the world.

**Describe how the program supports the Bakersfield College Mission:**

The chemistry program offers a complete two-year sequence of courses required for the career pathways of a wide variety of students. The core classes (Chem B1a/b, B30a/b, and B11) are prerequisites for the various STEM programs (e.g. physical and biological sciences, engineering, and allied health sciences). All transfer to four year institutions. Additionally, a number also serve as general education requirements and are a part of liberal studies majors’ requirements for education degrees and some agriculture degrees (in particular, chem B2a and physical science B12).

The chemistry AS-T degree is in the middle of its approval at the state level; it is one of the highest unit degrees in the system and requires tremendous focus by students. Once in place we will be contributing to the college's stable of transfer programs designed to smooth the transition of our students to CSU's and other 4-year institutions.

Overall, a very large number of students pass through our doors as part of their journey at BC. Just within the declared STEM major crowd we are working with about 1500 students who need our courses--this does not include declared allied health majors or liberal arts/general education. Our methods involve multiple pedagogical approaches to learning styles to build students' critical thinking skills, and include a large amount of scientific writing, applied mathematics, research-styled laboratory engagement, group work, and exposure to modern research environments.

We are highly focused on student success and directly support the core values of the college. Our work in the STEM area as a whole is strongly tied to BC's current student success initiatives.

**Program Mission Statement:**

The primary mission of the chemistry program is to provide the rigorous science foundation necessary for students to acquire the skills, knowledge, intellectual curiosity and scientific literacy essential for a wide variety of careers in this rapidly changing world. The department primarily offers transfer-applicable courses designed to satisfy the needs of science, engineering, premed, architecture, and allied health majors, college general education requirements, and liberal studies teacher credential programs. Community outreach efforts comprise a smaller, yet still important, part of the work we do.

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| ***Instructional Programs only:***   1. List the degrees and Certificates of Achievement the program offers 2. If your program offers both an A.A. and an A.S. degree in the same subject, please explain the rationale for offering both. 3. If your program offers a local degree in addition to the ADT degree, please explain the rationale for offering both. |

**II. Progress on Program Goals, Future Goals, and Action Plans:**

1. List the program’s current goals. For each goal (minimum of 2 goals), discuss progress and changes. If the program is addressing more than two goals, please duplicate this section.

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| **Current Program Goals** | **Which institutional goals from the 2015-2018 Strategic Directions for Bakersfield College will be advanced upon completion of this goal? (select all that apply)** | **Progress on goal achievement**  **(choose one)** | **Comments** |
| 1. Discipline promotion | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement | Completed: \_\_\_\_\_\_\_\_\_\_ (Date)  Revised: \_\_\_\_\_\_\_\_\_\_ (Date)  Ongoing: 09/11/2016 | A **very active ACS club** was started, with activities both inside and outside of BC. This included speakers and guests. We **have not been** persistent in promoting the degree directly to those who could qualify. Shows up in # degrees awarded vs. people known to qualify who transfer. |
| 2. Improve professional  development through training  in areas specific to STEM and  pedagogy. | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement | Completed: \_\_\_\_\_\_\_\_\_\_ (Date)  Revised: \_\_\_\_\_\_\_\_\_\_ (Date)  Ongoing: 09/11/2016 | All chemists attended the 2016 Biennial Conference on Chemical Education. Participants fully agreed to its benefits to **helping/stimulating thoughts about classroom structure/pedagogy**. |
| 3. Generate two new courses which will help attract GE-seeking students  into the STEM area, and finalize our offerings for transfer degrees. | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement | Completed: \_\_\_\_\_\_\_\_\_\_  (Date)  Revised: \_\_\_\_\_\_\_\_\_\_ (Date)  Ongoing: 09/11/2016 | Currently responding to state requests for modifications to submitted AS-T. |

1. List the program’s goals for the next three years. Ensure that stated goals are specific and measurable. State how each program goal supports the College’s strategic goals. Each program must include an action plan.

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| **Future Goals** | **Which institutional goals from the 2015-2018 Strategic Directions for Bakersfield College will be advanced upon completion of this goal? (select all that apply)** | **Action Plan** | **Timeline for Completion** | **Lead person for this goal** |
| 1. Acquire three additional faculty. | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement | Gain support of management through demonstration of need, followed by recruitment, hiring, and training/support. | At least one by end of 2016-17, remaining before 2019. | Department chair |
| 2. | 1: Student Learning  2: Student Progression and Completion  3: Facilities  4: Oversight and Accountability  5: Leadership and Engagement |  |  |  |

There are three driving forces behind the goal to acquire new faculty. First is the conflict in demands placed on us by an externally created obligation (support for the Wonderful Academy (“WA”) ) which competes with our own growth and widening demand through the STEM areas at BC itself. The support of the WA demands having someone in place who is 1) qualified to teach chemistry at the college level, 2) qualified to teach high school students, and 3) is willing to do the latter. Teaching at that level takes a distinctly different set of skills than college; at least two of us “escaped” that environment by coming to BC for a position. We absolutely need to hire into our group a person who has such skills ***and*** the desire to fill the WA spot. This person would support Delano and the main campus at other times.

The second force for another hire relates back to our own growth based on student demands for more classes at higher levels. The chemistry 1a/b waitlists continue to be flooded despite the addition of more sections, and the second-year organic course has now grown into multiple sections. We also offer summer sessions of all classes except organic both on the main campus and Delano.

The third force involves the foreseen retirement of faculty members. While not certain at this time, certain events are pointing strongly at the loss of one of our crew. Those classes need to be supported. Our adjunct list continues to be abysmal.

**III. Trend Data Analysis:**

Review the data provided by Institutional Research. Provide an analysis of program data throughout the last three years, including:

1. Changes in student demographics (gender, age and ethnicity).
2. Changes in enrollment (headcount, sections, course enrollment, and productivity).
3. Changes in achievement gap and disproportionate impact.
4. Success and retention for face-to-face as well as online/distance courses.
5. Degrees and certificates awarded (three-year trend data for each degree and/or certificate awarded).
6. Other program-specific data (please specify or attach).
7. List degrees and certificates awarded (three-year trend data for each degree and certificate awarded). Include targets (goal numbers) for the next three years.

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| Full Name of Degree or Certificate | 2011- 2012 | 2012- 2013 | 2013- 2014 | 2014- 2015 | 2015- 2016 | 2016- 2017 |
| Chemistry AS Degree | 1 | 0 | 2 | 3 | 4 | N/A! |
| Chemistry AS-T Degree (pending) | N/A | N/A | N/A | N/A | N/A | N/A! |

The last three years have shown a marked growth both in the student interest in and the number of students passing through our chemistry program. The demographics are not substantially different than college-wide numbers, nor are most other figures tracking our students. Retention/success is quite reasonable compared with the college and state as a whole given the associated difficulty of the classes taught (84%/69% vs. 88%/71% college-wide and 85%/71% state-wide in chemistry—DataMart figures). The FTES/FTEF falls into a similar basis for comparison—with classes restricted strongly by laboratory size, the 15.1 value is not surprising, and has been consistent over the years. Our enrollments have substantially increased this last year which correlates directly to the two new folks we have brought on board. They have done a remarkable job and strengthen the department both in drive and discipline perspective for the students. The group as a whole has functioned incredibly well.

In other numbers there isthe strong suggestion of a substantial growth over the near future. In the past three years we have had more people get chemistry degrees than the department has seen **in total in many years before this time**. While 9 may not seem like many, it is anecdotally known that another 10 or 15 left BC without their degrees over the last two years. The marked increase in enrollment in the science-majors level second-year organic series is another strong indication of interest in our offerings. We believe degree awards will increase as we work to lift many of our students out of ignorance (a large number of those in the organic classes will qualify for the degree without knowing it before they transfer). It is very apparent in these and the continuing large waitlist numbers that we have a significant backlog of students trying to begin their journey down their chosen STEM pathway.

A point worth mentioning which reinforces the above expectation of continued strong demand comes from understanding the revised state-wide UC expectations for chemistry, chemical engineering, and biological science STEM major transfers; they have clearly outlined the need for these folks to have completed an entire two years of chemistry curriculum. Our entire sequence through organic chemistry is needed by all these BC students.

Like other STEM areas we have done well with having our students having completed educational plans. That is due almost entirely to the excellent support of MESA and the STEM counselors. For many, the MESA program gives various forms of support to minority students and students with economic challenges. It provides free tutoring and an on-site counselor to help students with transfer applications. Keeping the students on track and on target is a primary goal of both groups of people.

**IV. Program Assessment:**

Use attached **Assessment Report Form Comprehensive Tab**

1. Discuss your program’s strengths.

The department works closely to make sure students learn the information necessary to advance to the next course and enable them to be successful on transfer. The instructors in the B1A/B1B series use the same text so students can save money on texts. It is an open source text. The CHEM B1A instructors work together to make sure they cover the same material, do the same labs, and grading is similar.

1. Discuss your program’s weaknesses.

The professors in the chemistry department have more than a full load. When someone becomes ill or misses class due to a family emergency or death, it is very disruptive to the schedules of the instructors. This is not just difficult on the instructor. The students are also affected. It takes time away from an instructor being able to work on improving their class. It can also take time away from an instructor helping a student or cause office hours to be arranged.

1. *If applicable,* describe any unplanned events that affected your program.

*There were a number of professors that are out on medical leave.*

**V. Resource Analysis:** To request resources (staff, faculty, technology, equipment, budget, and facilities), please fill out the appropriate form. <https://committees.kccd.edu/bc/committee/programreview>

1. Human Resources and Professional Development:
2. If you are requesting any additional positions, explain briefly how the additional positions will contribute to increased student success. Include upcoming retirements or open positions that need to be filled.

We continue to feel the effects of growth across the board in the STEM disciplines. All these programs cause an increase in the demand for our courses, general chemistry in particular. With expansion in physics and biology, we are once again finding ourselves becoming a bottleneck for the area in general. Another instructor will help us in broadening our section offerings both on the main campus and in Delano.

The rural-initiatives, dual enrollment program needs to have a full-time instructor. This position is an all-encompassing job that a professor cannot just do part time whilst they also try to teach the college courses. These courses are much harder to teach than college courses. It must be taught like a college course to high school students. There is also a great deal of cooperation and communication that must go on continually.

As mentioned elsewhere, there is a reasonable chance that a faculty member will be retiring. If that happens we will be badly hit in our offerings of physical science. Hiring someone who can teach both this and either physics or biology would be ideal.

1. Professional Development:
2. Describe briefly the effectiveness of the professional development your program has been engaged in (either providing or attending) during the last year, focusing on how it contributed to student success.

The entire chemistry department attended the 2016 BCCE conference. They attended many symposiums spanning a multitude of topics. New ideas for teaching are being implemented. At this time it is not known what affect this will have on student learning. There were also ideas gained for technology in the classroom but the chemistry room is not well equipped and very small for more electronics to be added.

1. What professional development opportunities and contributions can your program make to the college in the future?

-Using canvas for pre-chapter learning.

-Using clickers for real-time assessment

-Exploring classroom flipping and other pedagogical approaches to the class

1. Facilities:
2. How have facilities’ maintenance, repair or updating affected your program in the past year as it relates to student success?

A long standing problem: our laboratory hoods. The design of the classrooms are for classes to share a few hoods. There are barely enough hoods for one class. There are definitely not enough hoods for two classes at a time, which is unfortunately the norm as our class times are not staggered.

In addition, organic chemistry should have its own space that the other students do not have access to. We have had numerous incidents of cross-contamination with inorganic materials going into the organic containers. Additionally the requirements for hood usage by the general chemistry crowd (commonly involving the use of burners) conflicts directly with the needs of the organic classes' needs for space to work with volatile and flammable materials as well as temporary storage of containers of the same, and waste storage.

The hoods in SE only have two settings: high and off. This does not allow for Bunsen Burners to be used in the hoods very easily and definitely not safely. Many labs involve students needing to use a Bunsen Burner in the hood.

They are aging as well. Of the 5 hoods serving SE-26/27, one is non-functioning so is useless for experiments requiring the safety of its confines. The others are showing distinct signs of old age, being difficult to get the motors “fired up” and running (they sometimes require several hits with the breaker switches to get them to run without stalling).

The design of the hoods also makes it difficult to watch the students in the classroom and the students in the hood area at the same time. This is a safety concern and a concern for being able to promote the reputation of the science department. The students are aware the facilities are too small and do not function well.

Another issue we have is poor management of instrumental upkeep. This is in part due to the expectation that our budget is simply not going to be expanded such needs, but that expectation is going to change now. Those monies will be requested in anticipation of preventing potential undesired stoppages, as is occurring right now (loss of the FT-IR laser, costing $5200 to replace/update, with laboratory work coming to a complete halt in that area).

1. How will your Facilities Request for next year contribute to student success?

There is little that can be done in the current SE building to address the hoods. Placing a checklist for instrument management into the budget will address the issue highlighted above (assuming the money is given to us).

C. Technology and Equipment:

1. Understanding that some programs teach in multiple classrooms, how has new, repurposed or existing technology or equipment affected your program in the past year as it relates to student success?

There has not been any new technology added to the chemistry department in the last year.

1. How will your new or repurposed classroom, office technology and/or equipment request contribute to student success?

Students will be safer in the laboratory.

1. Discuss the effectiveness of technology used in your area to meet college strategic goals.

CBLs are used in a number of experiments. This allows students to learn to save, transfer, and analyze data in order to develop critical-thinking skills. This supports the strategic goal of employment and transfer; both which will involve using technology and critical thinking skills.

1. Budget: Explain how your budget justifications will contribute to increased student success for your program.

A department that is staffed correctly and has rooms with appropriate technology and safety design allows an instructor to concentrate on designing the class and spending quality time grading and helping students. In addition, it allows the instructor time to be involved in college-wide meetings and events and outreach to the community.

**VII. Faculty and Staff Engagement:**

1. Discuss how program members have engaged in institutional efforts such as college committees, presentations, and departmental activities.

The department has members on assessment, curriculum, FCDC, program review, safety advisory, and academic senate. The department has a chemistry club that is very active in outreach and campus events.

1. Instruction Only: Discuss how adjunct faculty are included in departmental training, discussions and decision-making.

Adjunct faculty are invited to the department meetings and are encouraged to include their opinions. They are included on all e-mails.

**VIII. Conclusions and Findings:**

Present any conclusions and findings about the program. This is an opportunity to provide a brief abstract/synopsis of your program’s current circumstances and needs.

The enrollment for the majors' first year chemistry and physical science is still well beyond what the department can offer. Therefore, there are many students that have to wait a year or more to enroll in a course. There may even be students decide to stop trying to enroll at BC, but we don’t have those statistics. The pathways “promise” BC has made can NOT be met if students are not able to register for the courses they need. We additionally may lose a faculty member soon which would cripple the physical science side of our offerings.

Nonetheless we have made some substantial changes in supporting our students over the past three years including an increase in the support of courses at Delano (now including general chemistry B1a) and offerings of both semesters of the chemistry B1 series during the summer.

The AS-T degree is well in progress, and our majors' courses have been articulated at the UCs and a number of CSU's, which is excellent for transfers. Several of us are actively exploring alternative pedagogical approaches to our classes, looking for ways to better the success of all of our students.

The chemistry department works very closely to support one another. They collaborate to make sure students have a seamless progression through the 5-course sequence (B2a through B30b), and the allied health class is well run and able to maintain a good number of sections. The student average on the ACS (American Chemical Society) standardized national exam is usually at the national level or higher. Many students transfer and are very successful in graduating from a university and finding employment.