Status: **Reviewed**

Entry #: 247

Date Submitted: 9/14/2020 1:29 PM

OVERVIEW OF PROGRAM REVIEW AND PLANNING FOR INSTRUCTIONAL PROGRAMS

Program Review is about documenting the plans you have for improving student success in your program and sharing that information with the community. Through the review of and reflection on key program elements, program review and planning identifies program strengths as well as strategies necessary to improve the academic discipline, program, or service to support student success. With our new Guided Pathways plan, this review becomes even more crucial for the success of our students and college.

We are using the Strengths, Opportunities, Aspirations, Results (SOAR) strategic planning technique to help us focus on our current strengths and opportunities, create a vision of future aspirations, and consider the results of this approach.

BASIC PROGRAM INFORMATION

Academic Year
2020-2021

Are you completing a comprehensive or annual PRP?
Comprehensive

Department Name
Chemistry

Discipline Name
Chemistry (CHEM)

Department Chair Name
Jennifer Zabzdyr

Division Name
Mathematics, Science and Engineering

Website address for your discipline
https://www2.palomar.edu/pages/chemistry/

Discipline Mission statement
The mission of the Palomar College Chemistry Department is to support student learning for success. Our primary goal is preparing our diverse student population for the pursuit of Bachelor degrees in Chemistry, as well as other Natural Science degrees with which they may enter the workplace. We provide students with the fundamental concepts, knowledge and laboratory techniques in a healthy and safe environment.

(click here for information on how to create a mission statement)

Does your discipline have at least one degree or certificate associated with it?
Yes

Are any of your programs TOP coded as vocational (CTE/CE)?
No

List all degrees and certificates offered within this discipline.
AS
Certificate of Achievement

Please list the names and positions of everyone who helped to complete this document.
Jennifer Zabzdyr, Chemistry Chair

Use the link to provided to help answer the staffing questions below. This form requires a login and password to access. Please use your Palomar email and password to log in.

Link: Permanent Employees Staff Count

Full-time Faculty (total number of FT faculty in your discipline)
9

Full-time Faculty (FTEF)
8.00

Part-time faculty (FTEF)
10.47

Classified and other permanent staff positions that support this discipline
Academic Department Assistant (ADA)--12 months, 90%
Instructional Support Assistant IV (ISA-IV)--12 months, 100%
Instructional Support Assistant IV (ISA-IV)--12 months, 100%

Additional hourly staff that support this discipline and/or department
None. Hourly staff (student workers) were let go after we transitioned to work-from-home.

PROGRAM INFORMATION

In this section you are asked to consider your programs, their learning outcomes, the annual number of completions, goals for completions and enrollment and efficiency trends.

PROGRAM LEARNING OUTCOMES

Begin this section by reviewing the Program Review reports for programs and courses in Nuventive Improve (TracDat). All active course and program learning outcomes should be systematically assessed over a 3-year cycle. First, look at program learning outcomes.

- **Program** = Leads to a degree or certificate
- **Discipline** = A group of courses within a discipline

*Programs will be able to complete program completion and outcome questions.

How well do your program's learning outcomes communicate the scope and depth of the degree/certificate offered?
The program learning outcomes are

(1) Chemical Lab Technique: Successful students will be able to set up and execute general and intermediate chemical reactions in the lab using a chemical technique.

(2) Application of the Scientific Method: Successful students will be able to apply the scientific method by stating a question, performing experiments and/or analyzing a data presentation.

Problem solving using the scientific method and being capable of using chemical lab techniques are key requirements of a degree of any type in chemistry. They are necessary skills for transfer students to have,so that they are prepared for the more advanced upper division chemistry coursework.

How do they align with employer and transfer expectations?
Proficiency at general chemistry and organic chemistry lab techniques are prerequisites for upper division coursework at a university, as is the ability to use the scientific method to solve general and organic chemistry problems.

Describe your program's plan for assessing program learning outcomes.
(1) Chemical Lab Technique: Laboratory Students will prepare specifically-selected, written lab reports for which a rubric will be followed. The instructor will observe student technique/performance and evaluate it against a standard protocol. Successful students will score 70% or higher.

(2) Scientific Method: In laboratory classes, students will prepare specifically-selected, written lab reports for which a rubric will be followed. The instructor will observe student technique/performance and evaluate it against a standard protocol. In lecture classes, students will be evaluated using embedded questions on final exams. Successful students will score 70% or higher. Students in the final course in the program (CHEM 221) will be given a comprehensive (national), final examination administered by the American Chemical Society and evaluate it against the national score results. Successful students will score in the 60th percentile or higher on the ACS exam.

Summarize the major findings of your program outcomes assessments.
(1) Chemical lab technique: At the last assessment, 79% of students scored 70% or higher.

(2) Scientific method: At the last assessment,79% of students scored in the 60th percentile or higher on the ACS exam.

Reflecting on the major findings you summarized, what are some questions you still have about students' learning in your program that you have not yet been able to address with your outcomes assessments?
The program outcome assessments evaluate student learning at the end of organic chemistry (which is the end of our program). As such, the assessments focus only on organic chemistry lab techniques and organic chemistry problem-solving. While all students must take general chemistry before progressing to organic chemistry, our current program assessments do not evaluate lab techniques or problem-solving specific to general chemistry. Thus, we have no data to evaluate student learning at the end of general chemistry (aside from SLOs).

Depending on the degree or transfer goals of our students, they have the choice of three different GE pathways:

- Associate Degree GE Requirements
- CSU GE Requirements
- IGETC Requirements

Palomar College has identified a set of General Education/Institutional Learning Outcomes, which represent the overall set of abilities and qualities a student graduating from Palomar should possess. Click here for a link to Palomar's GE/ILOs.

Next, review your course outcomes as they relate to Palomar's GE/ILOs.

How do the courses in your discipline support General Education/ Institutional Learning Outcomes? In your response, please specify which GE/ILO(s) your discipline supports.
All of the courses in our discipline support 4 of the 6 GE/ILOs.

Communication
Students are taught to evaluate and communicate experimental results orally and in writing during lab meetings. Students regularly write lab reports and give oral reports of their findings.

Computation
Chemistry is a highly computational science. In each of our courses, students must translate a chemistry word problem into a math problem, which they must then solve.

Creative, Critical, and Analytical Thinking
Assessment of critical thinking is one of our program outcomes. Students are taught in each chemistry class to analyze a problem and propose a solution.

Foundation Knowledge of Discipline
At the end of our program, successful students will be well-versed in general and organic chemistry, which is the foundation of any BS or higher degree in chemistry.

Summarize the major findings from your course outcomes assessments that are related to the General Education/Institutional Learning Outcomes that your discipline supports.
CHEM 110 and 110L: On average, 69% of students were able to successfully apply the scientific method to separate a mixture of 3 compounds and 100% of students were able to execute general chemistry experiments to collect data and compute a result on their lab practical exam. These assessments are related to the computation, critical thinking, and foundation knowledge of discipline GE/ILA's.

CHEM 115 and 115L: On average, 80% of students are able to achieve the course outcomes for CHEM 115, based on assessments given in the final exam. On average, 70% of students achieve the course outcomes in CHEM 115L, based on lab practical assessments on their final exam. These course outcomes are related to the computation, critical thinking, and foundation knowledge of discipline GE/ILA's.

CHEM 220 and 221: On average, 87% of students are able to achieve the course outcomes for CHEM 220 and 79% for CHEM 221, as assessed by questions embedded on exams and the administration of the American Chemical Society standardized test. These course outcomes are related to the computation, critical thinking, and foundation knowledge of discipline GE/ILA's.

PROGRAM COMPLETIONS

Student success is at the core of what we do in assisting students in achieving their goals.

The Chancellor's Office Vision for Success stresses the importance of Program Completion as a major goal for our students. In addition, transfer and career readiness are key components of Palomar College's mission statement. This year, our funding formula has also changed reflecting this emphasis, providing additional funding as a function of the number of completions.

In this section we will identify a program standard and a stretch goal (what you would like to move toward) for program completions.

The standards represent the lowest number of program completions deemed acceptable by the College. In other words, if you were to notice a drop below the set standard, you would seek further information to examine why this occurred and strategies to increase completions.

In this section we will identify a program standard and a stretch goal (what you would like to move toward) for programs.

List the number of completions for each degree/certificate for the previous year.
3 AS degrees
2 certificate of achievement

Have your program completions Increased, decreased, or stayed the same over the last 5 years?
Increased

What factors have influenced your completion trends?
Our program completions have most likely increased over the last 5 years because students are informed of the process by faculty and counselors.

Are the courses in your discipline required for the completion of other degrees/certificates?
No

Do you have programs with 7 or fewer completions in the last 5 years?
Yes

What steps are you taking to address these completions?
General and organic chemistry are foundation courses for many STEM majors. Most students who complete chemistry courses are not chemistry majors. As such, they have little interest in obtaining an AS degree in chemistry. They would be more likely to obtain an AS degree in their designated major. Most chemistry majors will be focused on transferring with the goal of a BS in chemistry. To try and increase the completions, faculty are working to identify chemistry majors and encourage them to petition for the degree.

What is your program standard for program completion?
2

Why did you choose this standard?
We have no standard for program completion. This number represents the average number of completions per year, as defined by the number of AS degrees/certificates that are awarded. If we expanded the definition of "completion" to include students who complete the entire chemistry sequence (CHEM 110, 110L, 115, 115L, 220, and 221) we could potentially have between 18 and 36 completions per year.

What is your Stretch goal for program completion?
10

How did you decide upon your stretch goal?
We have 5 completions for the last academic year and 10 represents a little less than half of our maximum possible number of completions per year. I think that it is conceivable that we could convince that many students to petition for the degree.

ENROLLMENT AND EFFICIENCY TRENDS

Palomar College uses the WSCH/FTEF ratio as one indicator of overall efficiency in addition to the overall fill-rate for courses.

Although the college efficiency goal is 525 WSCH/FTEF and 85% fill-rate (minimal), there are many factors that affect efficiency (i.e. seat count / facilities / accreditation restrictions).

This information can be found by going to the "Program" page in the PRP Data Dashboard.

What was your enrollment trend over the last 5 years?
Increased

What was your efficiency trend over the last 5 years?
Increased

Were these trends expected? Please explain.
College enrollment has dropped over the last 5 years, but our enrollment has increased, most likely do to chemistry being a required course for many STEM majors. The college fill rate has increased from 82% in 2014 to 89% in 2019, whereas our fill rate has dropped from 94% in 2014 to 86% in 2019. This could be due to the opening of the Fallbrook and Rancho Bernardo campuses. To support those centers, classes with low enrollment were permitted. The college WSCH/FTEF increased from 441 in 2014 to 497 in 2019, whereas our WSCH/FTEF went from 499 in 2014 to a peak of 571 in 2016 and back down to 519 in 2019. The decrease in fill rate in 2018 and 2019 is likely responsible for the drop in WSCH/FTEF in those same years.

Program Information Summary

Consider your program outcome assessments, completions, and enrollment/efficiency trends, as well as other internal and external factors.

How have these factors contributed to the success of your program(s)?
Our program outcome assessments lead us to believe that our program is successful in preparing the chemistry student to transfer as a chemistry major to a 4-year school. From an administrative point of view, our enrollment has been consistently increasing and our efficiency is in line with the college's expectations. The limited number of completions do not reflect the success of our program, as there are factors outside of our control that limit completions. It is ultimately up to the student to petition for the degree.

How have these factors presented challenges for your program(s)?
The number of completions do not reflect the success of our program. We have between 18 to 36 students per year completing the program, but only a few petition for the degree.

The Chancellor's Office Vision for Success stresses the importance of reducing equity gaps through faster improvements of underrepresented groups.

ACCJC also requires that colleges establish institutional and program level standards in the area of success rates. These standards represent the lowest success rate deemed acceptable by the College. In other words, if you were to notice a drop below the rate, you would seek further information to examine why the drop occurred and strategies to address the rate.

Click on this link to review the course success rates (A, B, C, or Credit) for your discipline.

In this section we will identify a course success rate standards and a stretch goal (what you would like to move toward) for programs.

Course Success Rates by gender, age, ethnicity, special population, location, and modality (You can access the Student Equity Plan on the SSEC website https://www2.palomar.edu/pages/ssec/)

COURSE INFORMATION

COURSE SUCCESS AND RETENTION

What is your program's standard for Discipline COURSE Success Rate?
66.0%

Why did you choose this standard?
Chemistry is a very challenging subject so success rates are traditionally lower than the campus standard, as seen in our success rates over the past 5 years (66% to 68%). A more realistic success rate would be 2/3 of all students (66%).

Have your overall course success rates increased, decreased, or stayed the same over the last 5 years?
Stayed the same

Was this expected? Please explain.
Success rates have remained stable for the past 5 years (66% in 2015 versus 65% in 2019). This is expected. Chemistry is a challenging subject and I would not expect success rates to drastically increase.

What is your stretch goal for course success rates?
66.0%

How did you decide upon the goal?
66% success rate is already reasonable. It is vitally important to the department to maintain academic rigor so that our students are prepared to transfer as upper division chemistry students.

Have your overall course retention rates increased, decreased, or stayed the same over the last 5 years?
Stayed the same

Was this expected? Please explain.
Our retention rates over the last 5 years have been very stable (90% in 2015 versus 91% in 2019).

Are there differences in success or retention rates in the following groups? (choose all that apply)

When or where (time of day, term, location) Age

Ethnicity

When or Where: Why do you think differences based on when or where the course is offered exists? What do you need to help close the gap?
Retention rates are not affected, but success rates are. In 2019, success rates at the Rancho Bernardo (68%) and San Marcos (65%) campuses are higher than those at the Fallbrook campus (61%). Students at the Fallbrook campus do not have easy access to the STEM center, tutoring, or SI support within the classroom. This is likely a factor in the decreased success rate. To close the gap, we would need to increase the chemistry tutoring options and availability at the Fallbrook campus.

Age: Why do you think age differences exist? What do you need to help close the gap?
In 2019, the 25 to 45 age demographic has marked lower retention rates (86%) compare to the 19 and under (93%) and 20 to 24 (91%) demographics. Students in this demographic are more likely to have a full time job while going to school than students in other demographics. Students in this demographic are also more likely to have family obligations (such as kids and spouses). To help close the gap, we can provide tutoring and other support services at a wide variety of days and times so that working students and students with families can benefit.

Ethnicity: Why do you think ethnicity differences exist? What do you need to help close the gap?
Hispanic and black/african american students have significantly lower success rates than do all other ethnic groups. In 2019, hispanic students had a 57% success rate and black/african american students had a 60% success rate. For comparison, the average success rate for all other ethnic groups was 71%. It is possible that students in these demographics are more likely to come from low socioeconomic backgrounds and are less prepared for college level chemistry courses. To help close the gap, we need to provide additional support services (tutoring, mentoring, workshops, bootcamps, etc) targeted to this demographic.

Are there differences in success/retention between on-campus and online courses?
N/A

Please share any best practice methods you use for online courses.

COURSE LEARNING OUTCOMES

How is course assessment coordinated across sections and over time?
All courses are assessed every 3 years. Assessments are coordinated for a given course such that all students in a given course (across all sections) are evaluated using the same method, questions, and rubric. Typically, the course coordinator will write the assessment with input from other instructors. The assessment will be distributed to all faculty teaching the course and implemented on the final exam.

How have you improved course-level assessment methods since the last PRP?
Lab courses SLOs now require assessment of lab skills. Lab practical exams are given and students are assessed on how well they can perform lab skills without help from the instructor or other students.

Lecture courses now have more specific SLOs that can be more easily quantitatively assessed on a final exam across all sections.

Summarize the major findings of your course outcomes assessments.
Data was collected Spring 2019 using lab practical exams for CHEM 100 (lab) and CHEM 115L (lab). The average score for CHEM 100 lab across all sections was 36%, indicating improvement is needed. The average score for CHEM 115L across all sections was 70.76%, indicating students are achieving their lab SLOs.

Across all of our courses, between 75% and 90% of students are able to achieve the lecture SLOs.

Reflecting on the major findings you summarized, what are some questions you still have about student learning in your courses that you have not yet been able to address with your outcomes assessments?
Our outcomes assessments address lab skills and problem-solving, but do not address scientific writing (which is very different from the style of writing taught in most English classes). This is a potential gap in our students' chemical education.

What are some improvements in your courses that have been, or can be, pursued based on the key findings from your course learning outcomes assessments?
Lab practical assessments have resulted in a big improvement in student lab skills. They are here to stay. One improvement for our lab courses would be to teach scientific writing (in the context of writing lab reports) AND include it on lab course assessments.

PROGRAM CURRICULUM ALIGNMENT, MAPPING, SCHEDULING, & PLANNING

The Chancellor's Office Vision for Success stresses the importance of decreasing the average number of units accumulated by CCC students earning degrees.

Palomar College's Guided Pathways plan includes clarifying paths for students by sequencing course offerings so that they support scaffolding and timely completion. Our goal is to ensure learning through:

- The mapping and assessment of clear program outcomes that are also aligned to employer and/or transfer institution expectations.
- Engaging and applied learning experiences.
- Effective instructional practices to support students in achieving success.

How do your course outcomes help your students achieve their program outcomes?
Program outcomes are outlined below.

Chemical Lab Technique: Successful students will be able to set up and execute general and intermediate chemical reactions in the lab using a chemical technique.

Basic lab skills and lab equipment are introduced in CHEM 100 lab and further reinforced in CHEM 110L. By the end of CHEM 110L, students should be able to identify common lab equipment by name and be proficient at using the lab equipment to make measurements. Specific equipment includes analytical balances, burets, graduated cylinders, and other glassware. In CHEM 115L, students are taught to use more sophisticated equipment, including pH meters, spectrophotometers, and pipets/autopipets. By the end of CHEM 115L, students should be able to calibrate a pH meter, measure solution pH using a pH meter, set up a pH titration, use a pipet to dispense a volume of liquid, and use a spectrophotometer. In CHEM 220, students are introduced to common organic chemistry glassware and are taught common organic chemistry purification techniques, such as distillation, extraction, and gas chromatography. Students are also introduced to instrumentation used in organic chemistry to confirm identity of a compound, such as NMR and IR spectroscopy. In CHEM 221, students will be taught to apply the techniques learned in CHEM 220 to organic synthesis. By the end of CHEM 221, students should be able to propose a synthetic method, implement the method to synthesize a compound (execute general and intermediate chemical reactions), purify the compound, and confirm identity of the compound (using lab techniques), thus meeting the program outcome.

Application of the Scientific Method: Successful students will be able to apply the scientific method by stating a question, performing experiments and/or analyzing a data presentation.

Students are introduced to basic chemistry problems and chemical reaction types in CHEM 100. This knowledge is reinforced and expanded upon in CHEM 110. By the end of CHEM 110, students should know chemical nomenclature, how to write chemical equations, balance chemical reactions, and set up/solve basic stoichiometry problems. Students use this foundational knowledge in CHEM 115, where they are introduced to chemical kinetics, chemical equilibrium, applications of chemical equilibrium, and electrochemistry. By the end of CHEM 115, students should be able to set up and solve general equilibrium and kinetics problems. They should also be able to apply equilibrium principles to acid-base chemistry and electrochemistry. In CHEM 220, students are introduced to organic nomenclature and organic reaction types. In CHEM 221, students learn how to propose a synthetic method (stating the question), synthesize the compound (performing the experiment), and confirm the identity of the compound, thus meeting the program outcome.

How do your degree maps and scheduling strategy ensure scaffolding (how all parts build on each other in a progressive, intentional way)? How do you share the maps with students?
Classes are scheduled such that students can begin the chemistry sequence (starting with the CHEM 100 prerequisite) at any semester. All classes are offered every semester to permit completion of the program without taking a semester off, regardless of when a student begins the sequence. The map is shared with student using the Palomar pathways mapper tool.

What is your departmental strategy on how you schedule your courses including the time of day you offer courses? Do you use 4-week, 8-week, or block scheduling (putting required classes near each other) to organize required classes to meet the needs of disproportionately impacted students? Please explain.
For all of our courses, we schedule sections so that students can choose what best fits their schedule. We have morning, afternoon, and evening classes. We also schedule courses on both a Monday/Wednesday and a Tuesday/Thursday meeting pattern. We do schedule labs directly before and directly after the lecture co-requisite, though students have the option of choosing whichever lab fits their schedule. We do not use 4-week or 8-week scheduling. Chemistry lectures require time to digest and master the material. Chemistry labs require time to practice and master the lab skills. Full-semester scheduling gives the students the time they need.

How do you work with other departments that require your course(s) for program completion?
Many of our students are simultaneously enrolled in CHEM 220/221, BIO 200/201, and Physics 230/231. We met with with those departments and developed a schedule that permits simultaneous enrollment.

Does your discipline offer cross-listed courses?
No

Are there curriculum concerns that need to be resolved in your department? What are they?
No.

Are there courses that should be added or removed from your program - please explain?
No.

How is the potential need for program/course deactivation addressed by the department?
We discuss it in department meetings and come to a consensus based on enrollment trends and how often we are allowed to offer the course.

Is your department pursuing non credit or not-for credit options at this time?
No

Are there areas you would like to expand?
We may need to expand our CHEM 100 course offerings. CHEM 100 is now an enforced prerequisite for CHEM 110/110L. As such we are expecting an increase in interest of that course.

Click here for information about Noncredit and Community Education

Is your department offering online classes?
No

How do you consider student needs when determining which classes and how many classes should be offered online versus face-to-face?
In non-pandemic times, chemistry classes are only offered face-to-face. We do not offer online courses, unless a state of emergency is declared by the governor and/or federal government.

Describe other data and/or information that you have considered as part of the evaluation of your program
N/A

CAREER AND LABOR MARKET DATA

The Chancellor's Office Vision for Success stresses the importance of increasing the percent of exiting students who report being employed in their field of study. It is important for us to consider how ***all*** of our programs connect to future careers.

Go to this website https://www.onetonline.org/ and enter your discipline in the bubble on the top right for ideas about potential occupations. Click on an example to see more detail.

What kinds of careers are available for people who complete your programs (and/or transfer)? (Refer to link above) Are there any new or emerging careers and if so how would the new or emerging careers impact your future planning?
Chemistry teachers, chemical technicians, chemists, professors, chemical engineers, biochemical engineers, soil/plant scientists, chemical equipment operators, medical/clinical lab technologists/technicians, biochemists, biophysicists, quality control/analysis. Careers with a bright outlook include medical/clinical lab technologists/technicians, biochemists, biophysicists, and quality control analysts.

What are the associated knowledge, skills, abilities (KSA's) needed for the occupations listed above? (click examples in the link above to get ideas)
Most require a minimum of a B.S. degree in chemistry or biochemistry. Some occupations require a graduate degree in chemistry or biochemistry. Knowledge, skills, and abilities will vary, but will include:

KNOWLEDGE
Chemistry — Knowledge of the chemical composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.
Mathematics — Knowledge of arithmetic, algebra, geometry, calculus, statistics, and their applications.

SKILLS
Science — Using scientific rules and methods to solve problems.
Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
Reading Comprehension — Understanding written sentences and paragraphs in work related documents.
Active Listening — Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
Mathematics — Using mathematics to solve problems.

ABILITIES
Deductive Reasoning — The ability to apply general rules to specific problems to produce answers that make sense.
Inductive Reasoning — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
Oral Comprehension — The ability to listen to and understand information and ideas presented through spoken words and sentences.
Written Comprehension — The ability to read and understand information and ideas presented in writing.
Mathematical Reasoning — The ability to choose the right mathematical methods or formulas to solve a problem.

How does your program help students build these KSA's?
KNOWLEDGE: Our program teaches students the chemistry knowledge they will need in order to transfer and pursue a more advanced degree in chemistry or biochemistry.

SKILLS: Critical thinking is a key component of all our courses and one of our program SLOs. Problem solving, using the scientific method, is emphasized in all of our classes.

ABILITIES: Oral and written communication skills are learned in the lab, through the writing of lab reports and giving oral presentations.

Work Based Learning

Applied and work-based learning (WBL) allows students to apply classroom content in professional settings while gaining real-word experience. WBL exists on a continuum that reflects the progress of experiences from awareness-building to training. Students often cycle back through the continuum many times throughout college and throughout their career. Faculty play a critical role in ensuring these experiences are embedded into curriculum and support learning.

Have you incorporated work based learning (work experience, internships, and/or service learning) into your program?
No

Do you want more information about or need assistance integrating work-based learning into your program?
No

How do you engage with the community to keep them apprised of opportunities in your program?
Outreach activities to local middle schools (Woodland Park Middle and San Marcos Middle).
STEM Conference: The chemistry department hosts workshops and shows to engage middle and high school students and their parents as a part of a wider conference in STEM education.
Other service learning activities that are hosted by the Chemistry Club.

Program Goals

In the previous sections, you identified opportunities for improvement. Using these opportunities, develop 3-year SMART goals for your department. Goals should be Specific, Measurable, Attainable, Relevant, Time-Specific. Ensure your goals align with the mission of your department and/or the College's strategic plan.

Please list all discipline goals for this three-year planning cycle. Click here for previous PRPs and goal information.

Goals

Goal 1

Brief Description
To increase retention and persistence rates for low-income students in CHEM 110 and CHEM 115.

Is this a new or existing goal?
Existing

Goal Status
Ongoing

How will you complete this goal?
We could apply for for an NSF S-STEM grant which will be used to fund scholarships and interventions for 16 academically talented, low-income students per year over a 5 year period. 60% of the grant money would be used to provide scholarships, 23% for research costs, 11% for interventions, and 6% for faculty compensation. Evidence-based interventions could include (but are not limited to):

1. Cohort Welcome Day
2. Extended hours of the STEM Center to include some evenings and Saturday mornings
3. Specialized counseling
4. Mandatory learning sessions for cohort members
5. Community service requirement for cohort members
6. Educational sessions and involvement of the students' family and community

Due to the limited budget for interventions, assistance from Palomar College would be required.

Outcome(s) expected (qualitative/quantitative)
Quantitative. With higher persistence and retention, students would complete their program earlier. This could translate into a higher number of completions for the college. The number of repeat students should also decrease, opening up more space for new students to enroll.

How does this goal align with your department mission statement, the college strategic plan, and /or Guided Pathways?
Strategic Goal 1, Objective 1.2: Encourage and promote innovative instructional and student support practices and strategies focused on strengthening teaching and learning.

Faculty will serve as dedicated mentors to scholarship recipients to help ensure that they successfully complete the CHEM110/115 sequence. Faculty will work to establish sustainable community events and to create a culture of community and family involvement at the college. Cohort students will participate in the events to encourage service learning.

Strategic Goal 2, Objective 2.6: To address opportunity gaps among the college's diverse student body.

The project with help alter the status quo by addressing issues of equity and access. The grant will target low income students, providing scholarship assistance which can be used to invest in technology and personal laptops.

Expected Goal Completion Date
8/17/2026

Goal 2

Brief Description
To update technology (chemical instruments) in order to remain current with chemical education pedagogy.

Goal Status
Ongoing

Is this a new or existing goal?
Existing

How will you complete this goal?
We would need an increase in our budget to allow purchase and replacement of chemical instruments for use in CHEM 100, 110L, 115L, 220, and 221.

Outcome(s) expected (qualitative/quantitative)
Quantitative and qualitative.
Chemical Instrumentation (CHEM 115L)
Learning to calibrate and use pH meters is one of the SLOs for CHEM 115L. We need to have enough meters for students to work individually if they are going to attain this SLO by the end of the semester. pH meters are used in about half of our lab curricula and we need to replace them as they quit working.

Chemical Instrumentation (CHEM 220/221)
Organic chemistry relies heavily on chemical instrumentation (GC, NMR, etc). The instruments are expensive to purchase and expensive to maintain. However, for our students to transfer and be competitive with their university peers, they need experience using these instruments.

Across the board, updating our chemical instrumentation would allow us to offer lab curricula that is current with current chemical education pedagogy. This will ensure that our students are fully prepared to begin their upper division coursework and are not at a disadvantage compared to their university peers. We would also be able to offer more undergraduate research opportunities to our students. This will give them the hands-on experience that they will need to be competitive with their peers and ready them to participate in undergraduate research at their 4-year institution.

How does this goal align with your department mission statement, the college strategic plan, and /or Guided Pathways?
Strategic Goal 1, Objective 1.2: Encourage and promote innovative instructional and student support practices and strategies focused on strengthening teaching and learning.

The ability to offer updated lab curricula and opportunities for research projects is in line with Goal 1, Objective 1.2.

Strategic Goal 2, Objective 2.6: To address opportunity gaps among the college's diverse student body.

Having computers available for all students to check out, rather than expect that all students can provide their own computers, will help to address the opportunity gap between higher income and lower income students, while ensuring that all students can benefit from our updated curriculum.

This goal is also aligns with our department mission to prepare students for transfer as an upper division chemistry major. Ensuring that we are offering curriculum that is consistent with that offered at universities will ensure that our students transfer and be on equal footing with their university peers.

Expected Goal Completion Date
8/21/2023

Goal 3

Brief Description
To increase our presence in the community through outreach.

Is this a new or existing goal?
Existing

Goal Status
Ongoing

How will you complete this goal?
With institutional support from Palomar College and an increase in our budget, we can host events, such as the STEM conference, more often. We can also participate in more events outside of Palomar, such as Science Night at San Marcos Middle School. Hosting and attending events such as these cost money, including but not limited to chemicals and other materials for demos, transportation costs, and compensation for time spent prepping for the events.

Outcome(s) expected (qualitative/quantitative)
Qualitative

How does this goal align with your department mission statement, the college strategic plan, and /or Guided Pathways?
One of Palomar College's values that is shared by the department is "physical presence and participation in the community". This is exactly what we would like to accomplish with this goal.

Expected Goal Completion Date
8/21/2023

RESOURCES

Congratulations! You are nearing completion. In this section, you will consider the resources you need to implement your three-year program review plan and/or address any findings from your assessment of your discipline.

The section is organized into the following four parts:

PART 1: Staffing Needs (Faculty and Additional Staff)

PART 2: Budget Review

PART 3: Technology and Facilities Needs

PART 4: One Time Request for Other Needs (NonTechnology Equipment, Supplies, Operating Expenses, Travel)

PART 1: STAFFING NEEDS

Requests for faculty will follow the prioritization process currently in place in IPC, and the IPC SubCommittee. Requests for new staff positions will be prioritized at the division level and reviewed at Exec.

Are you requesting additional full-time faculty?
No

NOTE: If you are requesting full-time faculty, you must go back to the Labor Market section of the form to complete that section. It is required when requesting additional faculty positions.

Are you requesting new Classified, CAST or AA positions?
No

PART 2: BUDGET REVIEW

Review your Budget/Expenditure reports for 2018, 2019, 2020. Consider your three-year PRP plan.

Click on the link below to access directions to the *Available Budget Report* to complete this section.

How to Request the Available Budget Report

Reflecting on your three-year PRP plan, are there any budget considerations you would like your dean/supervisor to be aware of for the upcoming year?
No

NOTE: PARTS 3 and 4 – TECHNOLOGY, FACILITIES AND OTHER NEEDS

This year the College is implementing two new processes related to resource needs coming from the PRP process.

1. One-Time Fund Requests. The college is implementing a process for prioritizing and allocating funds for one-time needs/requests tied to Program Review and Planning. Prioritization will take place through participatory governance in planning councils and the Budget Committee. Then, a recommendation will be made to Exec for funding of request utilizing various funding sources.

   For more information about funding sources available, see IELM BLOCK GRANT, LOTTERY, PERKINS AND STRONG WORKFORCE GUIDELINES.

   Consider submitting one-time requests only if you have verified that you cannot fund the request using your general discretionary funds or other funds.

2. Technology and Facilities Review. From now on, ALL requests for technology will go through an institutional review process. If you request technology here, you will see a description of the process below.

PART 3: TECHNOLOGY AND FACILITIES NEEDS

Will you be requesting any technology (hardware/software) this upcoming year?
No

Do you have resource needs that require physical space or modification to physical space?
No

PART 4: OTHER ONE-TIME NEEDS

For more information about funding sources available, see IELM BLOCK GRANT, LOTTERY, PERKINS AND STRONG WORKFORCE GUIDELINES. Please check with your department chair on the availability for this cycle.

Do you have one-time requests for other items (e.g., Non-Technology Equipment, Supplies, Operating Expenses, Travel) that your budget or other funding sources will NOT cover?
No

I confirm that the Program Review is complete and ready to be submitted.
Yes

Enter your email address to receive a copy of the PRP to keep for your records.
jzabzdyr@palomar.edu

Review

Chair Review

Chair Comments
None

Chair Name
Jennifer Zabzdyr

Chair Sign Date
10/30/2020

Dean Review

Strengths and successes of the discipline as evidenced by the data and analysis:
The department has successfully collaborated with other MSE departments to ensure that students can complete courses that are commonly taken together. This has likely led to the increase of STEM transfers across the division and is evidenced by transfer rates listed in other PRP's. The offering of chemistry courses to include morning, afternoon, and evening offerings also supports disproportionately impacted students by increasing access. The department has a strong understanding of the need to provide support systems outside of the division to include tutoring, supplemental instruction, and outreach.

Areas of Concern, if any:
Outreach efforts are hindered by lack of funds. Work based learning has become a required component of curriculum but is not addressed in this years plan. Programmatic outcomes are measures only for those students who complete the entire sequence of classes through organic chemistry but the majority of STEM majors will complete their series after the physical chemistry sequence. Completion rates are low but expected considered the low number of chemistry majors across the region.

Recommendations for improvement:
I would recommend that the department develop program outcomes for those students who complete their chemistry sequence prior to organic chemistry. The department can reach out to Title V (STEM grant) staff to support outreach events. The STEM Center staff will be reaching out to the department by the end of this semester to discuss the possibility of offering workshops in difficult chemistry topics that align with syllabi.

Dean Name	Dean Sign Date
Patricia Menchaca	11/3/2020

IPC Review

Strengths and successes of the discipline as evidenced by the data and analysis:
The following comments are submitted by IPC member April Cunningham:

The department did a great job identifying gaps in their retention and success rates that could be addressed with changes in tutoring hours and modalities that would increase access. Once these changes are made, course-based interventions to highlight the value and accessibility of tutoring are likely to be needed to directly address the gaps the department has identified.

The well-developed program outcomes assessment methods, which include broad participation from faculty throughout the department, are an excellent model for other programs. Recent improvements in course SLOs also seem to be leading to improved insights into students' learning. The next step of adding content and assessments about scientific writing sounds great.

The following comments are submitted by IPC member Kelly Falcone:

The department did a great job utilizing data to support their program review. It was interesting to see that although overall enrollment is down, Chemistry enrollment has stayed stable. I appreciated the explanation of the changes in efficiency trends that occurred at the same time as the opening of the Fallbrook and Rancho Bernardo centers, it is important for the college to understand how large changes, such as opening new centers, likely impacts the data.

Areas of Concern, if any:
The following comments are submitted by IPC member April Cunningham:

The department's analysis highlights the concern that they are not collecting evidence of students' programmatic outcomes outside of the Organic Chemistry course. Since students are building their capacity to meet program outcomes in general Chemistry courses as well, it would make sense for the Department to develop a method for gathering assessment data related to lab technique and application of the scientific method in additional courses. The SLO coordinators and/or faculty leaders in Chemistry programs in the region may be able to provide examples of how to achieve this.

The following comments are submitted by IPC member Kelly Falcone:

Having a stretch goal of 10 completions from 2 seems like a very high goal, but I do think that is doable. I am curious the steps the department might take to "convince that many students to petition for the degree" and not rely solely on the student petitioning for the degree.

I understand that Chemistry is a difficult discipline, even with that, it is concerning to know that only 2/3 of our students pass the course. However, it was great to see that retention remained high even with low success rates, leaving me to assume that many students are committed to the course and my guess is they likely retake it again.

Recommendations for improvement:
The following comments are submitted by IPC member April Cunningham:

There was one answer that I had questions about. In the report section about Program Completions, in the answer to the question Why did you choose this standard? the following statement was not clear to me: “If we expanded the definition of "completion" to include students who complete the entire chemistry sequence (CHEM 110, 110L, 115, 115L, 220, and 221) we could potentially have between 18 and 36 completions per year.” Does completing the chemistry sequence fulfill the requirements for the Chemistry certificate of achievement? It sounds like it might, but I can’t tell. If it does, then perhaps stating that more directly would improve clarity. If it does not, then perhaps the Department would consider reviewing the requirements for the certificate of achievement so that they align with completing the entire chemistry sequence, since increasing completions may be a goal.

In the Program Information Summary in the answer to the question How have these factors contributed to the success of your program? it may be worth re-visiting the statement that “It is ultimately up to the student to petition for the degree.” While this is true, the fact that the program leads up to Organic Chemistry, which serves as something like a capstone class, means that you have a ready-made audience for additional interventions that could encourage more students to file for their certificate of achievement as they get close to completing that class.

One of the Chemistry faculty participated in the Strong Workforce Institute about analyzing retention and success data. Perhaps her project will lead to additional suggestions for closing the gaps in these rates that you identified in your report.

Although the PRP form does not list them as a Work Based Learning (WBL) approach, inviting guest speakers who work in industries related to your courses is generally considered to be a low-threshold form of WBL. If hearing from professionals is something that is or could be incorporated somewhat systematically into the program that may be something worth mentioning in the WBL section of the report.

It seems like Goal 2, to update technology and instruments, might merit a one-time resources request (see Part 4: Other One-Time Needs, in the Resources section). Perhaps your department is holding off on this until it’s clearer what will happen next with pandemic-related restrictions on in-person instruction. But the need seems clear and some technology or instruments could be requested through the sources of funding that are outlined in the Guidelines that are linked in this section of the form rather than a budget augmentation from general funds.

The following comments are submitted by IPC member Kelly Falcone:

As April mentioned above, it seems the department does have budget or one-time cost needs that would support their ability to accomplish their goals, but are not requested in the PRP. Along with Goal 2 that April mentioned, Goal 3 "increase presence in community" states that "With institutional support from Palomar College and an increase in our budget, we can host events, such as the STEM conference, more often." I would suggest an increase in annual budget or one-time cost to support the community outreach events. Goal 1 also addresses a financial need that their low budget makes it difficult to implement interventions to increase retention and persistence. An increase in budget may also be necessary to provide the instructional support needed at Fallbrook to address the lower success/retention and the comment that "To close the gap, we would need to increase the chemistry tutoring options and availability at the Fallbrook campus."

As April mentioned, I too was interested in what was meant about “If we expanded the definition of "completion" to include students who complete the entire chemistry sequence (CHEM 110, 110L, 115, 115L, 220, and 221) we could potentially have between 18 and 36 completions per year.” I noticed this sequence is included in the "Pathways to CSUSM Chemistry (Education Option) Major". Might is be possible to encourage more completions of this certificate? Since this certificate seems to be only for CSUSM, might it be possible for another chemistry focused local certificate that students might consider completing besides with CSUSM?

IPC Reviewer(s)
April Cunningham and Kelly Falcone

IPC Review Date
11/23/2020

Vice President Review

Strengths and successes of the discipline as evidenced by the data and analysis:
collaborative work with related departments for positive student impact

Areas of Concern, if any:
1. completions
2. view of success rates as tied solely to academic rigor -- couldn't it also be tied to SLO assessments to identify areas of curriculum where students struggle and inspire conversations on how to help students be more successful in those difficult spots?
3. lack of support for scientific writing
4. lack of WBL

Recommendations for improvement:
1. work with dean and outreach/marketing to identify institutional support for such activities
2. work with dean to identify institutional support for identifying students pursuing your major
3. provide an opportunity for students in capstone courses to apply for certificate or degree
4. work with Manager of STAR and deans of MSE and LL to train tutors in supporting students' need for successful scientific writing
5. meet with Nichol Roe to discuss WBL and Career Continuum; you may be surprised at what may be of value to your students, even if they are not hopping right into a career -- many could use the exposure to the working world in an area related to their intended field and even begin to build relationships with employers. Conversations here may also impact your discussion re: employer expectations and PLOs.
6. work with dean to track need for updated equipment purchase (sound like a 10-year plan?) and to identify potential funding sources
7. work with dean to discuss outreach and marketing needs and identify institutional support

Vice President Name	**Vice President Sign Date**
Shayla Sivert	1/2/2021