The Program Review Process

Program review ensures that the college’s academic programs are effective and responsive to students and the local community within the limitations of available resources. The review process includes the systematic collection, analysis and interpretation of relevant data, an assessment of progress made in achieving student learning outcomes, the fulfillment of program needs, and the accomplishment of program objectives and goals.

Academic program review is an integral part of educational planning, supports the Enrollment Management Plan, and enables the college to meet the accreditation standards of the Accreditation Commission for Community and Junior College (ACCJC).

The major objective of program review at Feather River College is to guide the development of the Education Plan. Essential items within program reviews include the following:

1. Collect and analyze accurate and complete data on key performance indicators, student learning outcomes, program activities, and accomplishments.
2. Ascertain and document program weaknesses and strengths.
3. Develop program objectives and goals.
4. Justify program budget requests.
5. Comply with Federal and State law, Title 5, Student Equity, VTEA, matriculation (including prerequisite and co-requisite standards), ADA (American with Disabilities Act), and other legal or certification requirements.

**Academic Program Link to College Mission**

Feather River College provides high-quality, comprehensive student education as well as opportunities for learning, workforce preparation, and achievement in a small college environment. The College provides general education, associate and bachelor’s degrees, certificates, transfer programs, and life-long learning for a diverse student population by serving local, regional, national and international students through traditional face-to-face instruction as well as distance education. The College also serves as a cultural and economic leader for all communities that lie within the District and embraces the opportunities afforded by its natural setting.

**[Name] Program Review**

###### Connection to Mission

1. Briefly describe your program objective(s) and how the program supports and furthers the College’s mission.

The objective of this program is to provide high quality science education to students wishing improve their understanding of the physical world and/or prepare themselves for transfer to a four-year institution, where they may wish to pursue a variety of science-based degrees. This goal is consistent with the college’s mission to provide high quality educational experiences for students.

###### B. Program Curriculum, Instruction & SLO Assessment

1. Describe how your program’s curriculum and instruction connect with the program objectives (see Appendix G-2: Data Sets for supporting information).

The Physical Science degree is designed for students pursuing the foundations of a continued physical science education. Most students graduating with this degree will move to a four-year institution to pursue degrees in physics, chemistry, engineering etc. In the past, this degree would have also served students hoping to pursue degrees in geology and other earth science courses. Since the last CPR, our college has introduced degrees in geology, environmental science, and mathematics, all of which may now attract students, who in the past completed the physical science degree. Still, this degree offers a very flexible approach to STEM preparation, requiring a mathematics core, but then allowing students to choose from a variety of major courses, so that each student will be able to complete the course work that will be appropriate to prepare them for a future B.S. degree of their choosing.

1. What are the Program-level Student Learning Outcomes (PSLOs) for the degrees and certificates in your program? (see also Appendix G-1: SLO Assessment Forms from Prior Years).

Program SLOs include:

* Know, use and interpret scientific explanations of the natural world.
* Generate and evaluate scientific evidence and explanations
* Understand the nature and development of scientific knowledge
* Participate productively in scientific practices and discourse

1. How do PSLOs support college-wide SLOs (CWSLOs)?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Commun-ication** | **Critical Thinking** | **Info**  **Assessment** | **Ethics** | **Sense of Self** | **Inter-personal** | **Respon-sibility** |
| **Know, Use, and Interpret Science** | 2 | 3 | 3 | 1 | 2 | 1 | 2 |
| **Generate and Evaluate Scientific**  **Evidence** | 2 | 3 | 3 | 2 | 2 | 2 | 2 |
| **Understand Development of Science Knowledge** | 1 | 2 | 3 | 2 | 2 | 1 | 2 |
| **Participate Productively in Practices and Discourse** | 3 | 2 | 2 | 1 | 2 | 3 | 2 |
| **Total Impact** | **8** | **10** | **11** | **6** | **8** | **7** | **8** |

*Table 1: CWSLOs to Physical Science PSLOs*

1. **PSLO does not address CWSLO**
2. **PSLO scarcely touches on CWSLO**
3. **PSLO addresses the CWLSO to a moderate degree**
4. **PSLO strongly meets the CWSLO**

Curriculum in this program, as with other science-based programs, prepares students by emphasizing critical thinking and information assessment and analysis. The curriculum is less focused on college-wide SLO including ethics, sense of self, and interpersonal skills.

1. How do course-level student learning outcomes (CSLOs) and other program learning experiences support the PSLOs?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Phys Sci Elective Courses** | **Know, Use, and Interpret Science** | **Generate and Evaluate Scientific Evidence** | **Understand Development of Science Knowledge** | **Participate Productively in Practices and Discourse** |
| BIOL 102 | 3 | 3 | 3 | 3 |
| CHEM 102 | 3 | 3 | 3 | 3 |
| CHEM 104 | 3 | 3 | 3 | 3 |
| CHEM 106 | 3 | 3 | 3 | 3 |
| ENVR 142 | 3 | 3 | 3 | 2 |
| ENVR 142L | 3 | 3 | 3 | 3 |
| ENVR/GEOG 201 | 3 | 3 | 3 | 3 |
| GEOG 102 | 3 | 1 | 2 | 2 |
| GEOL 102 | 3 | 2 | 3 | 3 |
| GEOL 104 | 3 | 2 | 3 | 3 |
| PHYS 102 | 3 | 3 | 3 | 3 |
| PHYS 104 | 3 | 3 | 3 | 3 |
| PHSC120 | 3 | 1 | 2 | 2 |
| PHYS 202 | 3 | 3 | 3 | 3 |
| PHYS 204 | 3 | 3 | 3 | 3 |
| **Total Impact** | **45** | **39** | **43** | **42** |
|  | | |  |  |
| *Table 2: Physical Science PSLOs to courses* | | |  |  |
| **0-       Course does not address PSLO** | | |  |  |
| **1-       Course scarcely touches on PSLO** | | |  |  |
| **2-       Course addresses the PSLO to a moderate degree** | | | |  |
| **3-       Course strongly meets the PSLO** | | |  |  |

Overall, courses meet program SLOs very successfully. Most all courses have a required laboratory component. In these lab classes students gain hands-on experience, participating productively in the development and analysis and interpretation of scientific evidence. A few of the elective course do not have laboratory components, and so those courses are overall less successful at meeting program SLOS 2-4.

1. What methods did you use to assess these PSLOs (methods may include student survey, portfolio, exit class, etc.)?

We have a very small number of program completers, typically not more than one per year). Most students completing these electives are instead enrolled in the courses to fulfill general education requirements or major requirements for other science majors on campus. Accordingly, tools such as exit surveys don’t provide much meaningful evidence about program success. Instead, program faculty attempted to assess the progress towards meeting program SLOs by completing the analysis in table 2 (above).

1. What were the most meaningful findings from the assessment of PSLOs (which outcomes showcase student achievement; which indicate a need for program improvement?)?

Overall program SLOs are met well by students enrolled in program courses. SLOs (such as SLO 2) that require student to develop their own scientific evidence, are achieved more successfully in courses with a laboratory component. Any student completing the major, would be required to take at the very minimum three laboratory courses, and so should have lots of opportunity to become proficient in program SLO areas.

1. What are the program’s overall strengths and weaknesses? Describe any changes in the following since the last program review. Explain the reasons for those changes, and their impact on the program.
   1. Curriculum (including articulation and course scheduling)

* Strengths
  + Many of these course have very standard outlines and will transfer well to all potential institutions.
  + Students completing many physical science course, should be well prepared to take on upper division coursework in a variety of science majors.
  + Our courses do a good job of exposing non-majors to basic science and earth process concepts.
* Weaknesses
  + Lack of regular course offerings
    - Physics 102, 104, 202 and 204 should be offered regularly. There has been a several-year gap since any these courses have been scheduled. It appears at least Phys 202 will be offered in fall 2018. But, this alone is likely not enough to really fill the curricular gap.
    - Organic Chemistry is another course that should be offered regularly to support students in this and in related programs.
  + Lack of program community
    - Perhaps one reason that this major is very small is the lack of community and cohort development. Bagley has recently developed the STEAM Team club, which has been effective at starting to build a community. However, several students participating in this club have opted to pursue our local math degree or other degrees, such as biology, instead of completing the Physical Science degree. With Bagley leaving at the end of the term, we should work to continue to support this student community.
  1. Instructional methodology (i.e., distance education)
     + Strengths
       - Small class sizes allow for lots of hands-on experience for students.
     + Weaknesses
       - Due to the required laboratory components, none of these courses are offered via an online section. There is likely an interest from some students to complete a science course online. We should consider choosing a lab free or appropriate lab course and build curriculum to offer this online. Perhaps ENVR 142/142L or GEOG 102, both program electives, could be appropriate choices

.

* 1. SLO Assessment
     + All area SLOs are complete.

1. Describe any proposed future changes to the following. Explain how these changes will positively impact the program and improve achievement of PSLOs?
   1. Curriculum (including articulation and course scheduling)

General Chemistry I, the most in-demand of the physical science courses, continues to be scheduled during the fall and spring semesters. Every semester, this course continues to reach its maximum enrollment capacity with a wait list of at least four students. With the anticipation of offering the introductory organic course, the instructor is actively researching new course materials, labs, and equipment required to effectively teach this course.

As noted above, we are hoping to offer physics courses, as well as organic chemistry, on a more regular schedule. In addition, there is a need to offer an introductory physical science course to support the Elementary Teacher Prep TMC. We have created PHYS 140 to fulfill this requirement, but have yet to offer the course. If we continue to move in the direction of supporting this TMC, we will need to begin offering this course.

As noted above (B1), since the last CPR, our college has developed degrees in geology, environmental science, and mathematics. All of these majors overlap to some extent with the curriculum of the physical science program. In the past, this program acted as a catchall STEM prep major for students hoping to pursue variety of science-based bachelor’s degrees. Now that these other physical science area degrees are available, it may not be as appropriate to include as many earth science electives in the major. In addition, the creation of the local math degree may be more likely to capture students wishing to pursue physics and engineering. However, there are still students, for example those with an interest in chemistry or those who are still exploring, for whom this major be be a good choice. But overall, it may be a good time to reflect on who this major is hoping to serve, and how well the current design of the major is serving them.

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* 1. Instructional methodology (i.e., distance education)

Perhaps we will try to offer one course, such as ENVR 14 or GEOG 102, online in the next couple of years. This way FRC local and distance-education students will have the opportunity to complete a science breadth course online.

* 1. SLO Assessment

No changes are planned.

**C. Physical Resources**

1. How is the program affected by the size, type and quality of available:
   * Physical space and facilities

* Years of old chemical and hazard waste has been removed from the chemistry lab.
* It would most beneficial for the students and the institution to install four new hoods. Students are still overcrowded in the limited hood spaces. This restricts the types of experiments conducted and the students’ learning experience as well as raises a safety concern.
  + Information technology
    - Information technology is mostly adequate.
    - New computers were installed in the chemistry lab since the last CPR. These computers have been used regularly by students in physical science courses. When many students are trying to use ArcGIS programs at once, the processing speed of the computers is VERY slow. Facilities is aware of this issues, and –hopefully-will plan to add more RAM to some computers to address this concern.
  + Library holdings and services
    - Library holding are adequate
  + Instructional equipment and supplies
    - In an effort to improve the hands-on learning experience in the general chemistry laboratories, new balances and additional supplies were purchased using general and Lottery funds.
    - To adequately offer a transferrable introductory organic chemistry course, the infrared and gas chromatography instruments need to be upgraded as does the distillation equipment. Purchasing of microscale distillation units will reduce the high cost of organic supplies and the removal of hazardous waste/carcinogenic materials. Additionally, the vacuum system needs to be operational.
    - The new physics instructor may find that equipment for physical labs need repairs or that some new equipment is required.

1. Have there been significant changes in the program’s facilities, technical infrastructure, or other resources since the last review? If so, how have the changes impacted the program?

* As stated above, new computers were purchased for the chemistry lab, to total 12 student computers, since the last CPR. These computers are used very regularly and have a very positive impact on students in the program. With these new tools, they can get more practice analyzing data, using mapping software, and gaining other relevant skills.

1. What are the program’s projected needs in facilities, technology, or other resources, and how are these needs related to program goals? Are these goals supported by results from the assessment of program and course-level student learning outcomes?
   * As stated above, in order to have a bona fide introductory organic chemistry lab, the equipment, supplies, and instrumentation needs to be upgraded to ensure the students receive quality instruction. Since this course has not been recently taught, there is no recent SLO assessment
   * As additionally stated above, reviving the physics courses may require some investment in lab equipment. Again, this has not been recently documented in an SLO assessment, since the courses have not been recently taught.

###### D. Staffing

1. What is the full- to part-time ratio of faculty within the program? (Determine the ratio by counting up the number of sections taught by full-time faculty and the number of sections taught by part-time faculty in the most recent semester for which the data is available).
   * With the loss of the Arrowsmith, the associate astronomy instructor, all physical science courses have been offered by the full-time chemistry instructor and the full-time earth/environmental science instructor.
   * The physics course offered in fall 2018, and hopefully beyond, will be offered by associate faculty. In addition, future offerings of PHYS 140 (to support the ETE TMC) and hopeful future offerings of Astronomy will likely be offered by associate faculty . . . unless we hire a full-time professor qualified to teach physics !!!!!!!!!!!!!!!!!!!!!!!!!!!!
2. How does the current staffing structure positively and/or negatively affect the program?
   * With current course offerings, the ability of full-time faculty to cover classes is ideal. We have even expanded the load of the full-time chemistry instructor to include a spring offering of General Chemistry I, to meet student demand.
   * If organic chemistry were to be offered, the load of the chemistry faculty may be overextended.
   * However, we are not regularly offering several classes, mostly in the physics area, which are required by many of our students. This is in part due to our struggle to find qualified associate faculty to teach in this area. We are considering hiring a new full-time math instructor, who could meet physics minimum qualifications, to help us bridge this gap.
3. What are the objectives and goals in staffing to make this program more effective? Are these goals supported by results from the assessment of student learning outcomes described in Section B? (see also Appendix G-1: SLO Assessment Forms from Prior Years)?
   * As stated several times above, finding appropriate associate or full-time faculty to regularly offer physics and physics science courses, like PHSY 140 and Astronomy, is both a challenge and an important focus of our program.

###### E. Student Retention and Success

1. Describe any significant trends within the student demographics of the program (see Appendix G-2: Data Sets for supporting information).

Due to the way institutional data is collected and the fact that this program is very interdisciplinary, it is difficult to find data for physical science courses alone. In our campus DataMart, data is collected for math and physical science courses jointly. Accordingly, the data below reflects program data for math and physical science students and only shows data from 2015 and 2016, which is the most current data reflected as of the writing of this report.

**MATH and PHYSICAL SCIENCE COURSES**

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Category** | **Fail (D or below)** | **Succeed (C or above)** |
| **2016** | Total | 421 | 902 |
|  | **% Total** | 32% | 68% |
|  | Female | 185 | 336 |
|  | **% Female** | 36% | 64% |
|  | Male | 236 | 566 |
|  | **% Male** | 29% | 71% |
|  | White | 157 | 433 |
|  | **%White** | 27% | 73% |
|  | POC | 262 | 469 |
|  | **% POC** | 36% | 64% |
| **2015** | Total | 393 | 791 |
|  | **%Total** | 33% | 67% |
|  | Female | 151 | 305 |
|  | **% Female** | 33% | 67% |
|  | Male | 242 | 486 |
|  | **% Male** | 33% | 67% |
|  | White | 177 | 506 |
|  | **%White** | 19% | 81% |
|  | POC | 216 | 285 |
|  | **% POC** | 43% | 57% |
| *Table 3: Disaggregated Student Success Data for 2015 and 2016*  **POC= person of color, including students who identify as "other"** | | | |
| **% Female/Male = What percentage of female/male students enrolled at census passed or failed** | | | |
| **% White = What percentage of the white students enrolled at census passed or failed** | | | |
| **% POC = What percentage of the students of color, or non-white students, enrolled at census passed or failed** | | | |
|  | | | |

Overall, male and female students have similar success outcomes, while there is a greater discrepancy between white students, with higher success rates, and students of color, with lower success rates.

**Chemistry and Earth Science Courses**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Chem I | Chem II | Geog 102 | Geog 201 | Geol 102 | Geol 104 | Geol 120 | PHSC 120\* |
| 2018 | ND | ND | ND | ND | ND | ND | ND | ND |
| 2017 | ND | ND | ND | ND | ND | ND | ND | ND |
| 2016 | 61% | 75% | 84% | 100% | 73% | ND | 57% | ND |
| 2015 | 87% | 67% | 66% | 100% | 61% | ND | ND | ND |
| **Course Avg** | **74%** | **71%** | **75%** | **100%** | **67%** | **ND** | **57%** | ND |

*Table 4: Percentage of students enrolled at census receiving a C or better for 2015 & 2016*

**Note: \*Statistics for Astronomy are not listed in data mart. Physics courses have not been recently offered.**

The chemistry courses follow a sequential pattern. Of the students who pass Gen Chem I, 50% go on to take Gen Chem II. Students enrolled in the second semester of chemistry are almost always those pursuing STEM majors.

1. What are the program’s strengths or weaknesses in the area of student retention and success (see Appendix G-2: Data Sets for supporting information)?

Some students enrolled in the physical science courses are overwhelmed or unprepared for the quantitative components of the coursework. However, anecdotally, those students who wish to pursue STEM majors after transfer, tend to have high success rates in their physical science coursework at FRC.

1. What objectives are needed to better ensure student retention and success? Are these goals supported by results from the assessment of student learning outcomes described in Section B? (see also Appendix G-1: SLO Assessment Forms from Prior Years)?

The success of all students is predicated on their ability handle coursework and complete mathematical calculations. Perhaps more tutoring services can help all students, with the desire to succeed, to do so. More thorough tutoring can come from better faculty outreach to identify appropriate peer tutors and to identify those in need of tutoring early in the semester. Extending hours of peer tutoring may help student success as well.

**F. Outreach and Compliance**

If program faculty and staff are tasked with outreach and/or compliance efforts, which can include outreach, working with advisory committees, consulting or technical assistance, service-based instruction, compliance with laws or regulations, or economic development, please respond to the following.

1. In what types of community outreach does the program engage, and how is the program’s academic and professional expertise extended to the local communities?

Program faculty have participated in science night at Quincy Elementary and have help support the Sustainability Action Team’s Spring Sustainability Series, which promotes community and campus events to educate participants about relevant science and environmental issues. .

1. If there is a program advisory committee, list the names and titles of members, and the meeting dates since the last program review. Describe any advisory committee involvement in this program review.

N/A

1. How does the program help the College comply with laws, regulations, and other legal or certification requirements?

Mathematics faculty have been involved in the push to create streamlined math curriculum to help students meet their educational math achievement goals as well as their science requisites. The curricular changes are due to the legislative implementation of AB 705, which means that faculty will carefully revise existing courses to suit STEM and Non-STEM majors so that students complete transfer level math within a one-year timeframe.

**G. Appendices**

1. SLO Assessment Forms should be attached for the previous years, depending on the program’s review cycle.

See submission on SharePoint.

1. DATA SETS

**Note: As stated above, institutional research data is collected for math and physical science courses jointly, so, unless otherwise noted, data reflects both program areas.**

1. Program FTES

|  |  |
| --- | --- |
| FTES for Math and Physical Science | |
| Year | FTES |
| 2010-2011 | 92 |
| 2011-2012 | 94 |
| 2012-2013 | 114 |
| 2013-2014 | 123 |
| 2014-2015 | 138 |
| 2015-2016 | 159 |
| 2016-2017 | 113 |
| 2017-2018 | 50\* |
| *Table 5: Math & PS FTES*  **\*Does not yet have data for S 2018** | |

Chemistry Specific Data

|  |  |
| --- | --- |
| Term | Chem I Total |
| S 2017 | 5.83 |
| F and S2016 | 12.13 |
| F and S 2015 | 18.90 |
| F 2014 | 8.87 |
| F 2013 | 5.20 |
| Avg | 10.19 |

*Table 6: Chem I FTES*

|  |  |
| --- | --- |
|  | Chem II Total |
| S 2017 | 2.57 |
| S 2016 | 2.80 |
| S 2015 | 2.10 |
| S 2014 | 2.40 |
| S 2013 | 1.20 |
| Avg | 2.21 |

*Table 7: Chem I FTES*

1. Duplicated Headcount

|  |  |
| --- | --- |
| Duplicated Headcount for Math and Physical Science | |
| Year | DHC |
| 2011 | 711 |
| 2012 | 649 |
| 2013 | 734 |
| 2014 | 629 |
| 2015 | 709 |
| 2016 | 740 |

*Table 8: Duplicated Headcount*

1. Demographic Information (duplicated headcount): Gender, Age, Ethnicity

See Table 3 in Section E1.

Chemistry Specific Data

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **S 2013** | **F 2013** | **S 2014** | **F 2014** | **S 2015** | **F 2015** | **S 2016** | **F 2016** | **S 2017** |
| **% Female** | 86 | 62 | 58 | 71 | 82 | 65 | 44 | 47 | 30 |
| **% Male** | 14 | 38 | 42 | 29 | 18 | 35 | 56 | 53 | 70 |

*Table 9: Chemistry Enrollment Data - Gender*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **S 2013** | **F 2013** | **S 2014** | **F 2014** | **S 2015** | **F 2015** | **S 2016** |
| **% White Non-Hispanic** | 71 | 84 | 67 | 82 | 73 | 76 | 83 |
| **% Black Non-Hispanic** | 0 | 8 | 17 | 5 | 0 | 12 | 0 |
| **% Hispanic** | 14.5 | 4 | 8 | 5 | 9 | 0 | 0 |
| **% Other** | 14.5 | 4 | 8 | 8 | 18 | 12 | 17 |

*Table 10: Chemistry Enrollment Data - Race*

1. Number of Students with Declared Majors in Program

As of spring 2018

Physical Science – 10

Related Majors

Math – 7

Geology – 0\*

Geography 0\*

*\*Admissions and Records tells me these are not yet approved by the Chancellor’s Office and cannot be declared by students I think this is an error that needs other worked out.*

1. Number of Courses Offered

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Chemistry** | **Earth Sci**  **(GEOL/GEOG/PHSC)** | **Physics** | **Math** |
| **#of unique courses in**  **2017-2018+Sum 2018** | 2 | 4 | 0 | 11 |
| **# of sections** | 3 | 8\* | 0 | 23\*\* |

*Table 11: Courses and Sections*

**\*Earth Science includes three sections of GEOG 102 ISP**

**\*\* Does not include ISP Data**

1. Number of Sections Offered

See Table 11 in previous section

1. Average Enrollment per Section

Not known.

1. Course Completion Rate (# of students who received a grade/total students enrolled at census)

94% in 2015 and 2016.

1. Student Success Rate (# of students with C or better/total students enrolled at census)

See Tables 3 and 4 (section E1)

67% in 2015 and 68% in 2016

Data can be found here:

<http://frc-sps-01/Admin/IR/TabularDataTest/Forms/AllItems.aspx>

This template is an adaptation of the Instructional Program Review template designed by Saddleback College.