**El Camino Community College**

# PROGRAM REVIEW 2018

## NATURAL SCIENCES DIVISION

## EARTH SCIENCES


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## SECTION 1
## Overview of the Program

**A) Provide a brief narrative description of the current program, including the program's mission statement and the students it serves.**

The Mission Statement for the Earth Sciences Department is:

> *"The Earth Sciences Department provides an opportunity for all undergraduates to learn about Earth, its resources, and the processes that change it. By emphasizing the importance of the scientific method to discovery, courses in Geography, Geology, Meteorology, and Oceanography train students to think critically about the relationship humans have with the environment. We seek to prepare future community members, educators, and leaders to apply their knowledge about earth science in a way that ensures a sustainable future."*

The Earth Sciences Department at El Camino College is one of the largest and most respected programs amongst community colleges in the state of California. Many of the students who declare a major in the Earth Sciences successfully transfer to CSU, UC, and other schools and universities every year. Students who transfer credit their success to a dedicated faculty, excellent facilities, and the diverse array of lecture and laboratory classes. These classes include ones in: Geography, Geology, Meteorology, and Oceanography. Beginning in 2019, we will offer a class in Environmental Science (Spring 2019), and a section of Geography 1 will be taught online (Fall 2019).

Our facilities and equipment are outstanding in comparison to other community colleges in California. A fully equipped stockroom contains thousands of items, including samples of minerals, rocks, and fossils, maps for laboratory activities, binocular microscopes, field mapping and water sampling tools, rock preparation tools, and two dedicated computer labs, and GPS equipment. The stockroom and facilities are maintained by a full-time laboratory technician dedicated exclusively to the Earth Sciences Department.

The Earth Sciences Department offers lecture and laboratory courses that satisfy most of the lower division requirements, and lead to the AA-T and AS-T degrees, for transfer to CSU and UC, and other schools and universities:

(a) Nine courses in Geography (AA-T degree, A.S. degree), including Meteorology, an Honors section in Geography, and Geographic Information Systems (GIS)

(b) Twelve courses in Geology (AS-T degree), including field laboratory classes, Environmental Science, and Distance Education sections

(c) Ten sections of Oceanography (CSU, UC transferable), including an Honors section, and Distance Education sections

The Earth Science Department has seven full-time instructors:

(a) Four instructors teach Geology, Oceanography, and Environmental Science

(b) Three instructors teach Geography, GIS, and Meteorology

(c) Seven, sometimes more, part-time instructors teach introductory classes in Geography, Geology, and Oceanography

Although the Earth Sciences Department is small in size relative to other programs on campus, our impact at ECC is fairly large. Forty sections of Earth Sciences courses were offered during the Spring 2018 semester, and 2 sections were given during the Winter 2018 intersession. Eight sections were taught during the Summer 2018 session. Forty-two sections will be taught during the Fall 2018 semester. In total, the Earth Sciences Department taught or will be teaching 92 class sections during all sessions and semesters of 2018, enrolling more than 3000 students.

Classes in the Earth Sciences Department are popular for students seeking to fulfill their graduation and transfer requirements in Natural Science. Some students choose to "check off the box," in order to satisfy their degree and transfer requirements. However, many dedicated and passionate students from diverse backgrounds choose to major in the Earth Sciences. These students thrive at ECC and upon transferring exemplify the excellent reputation of our department.

Faculty conduct at least two seminars per semester every year to inform students who have declared an interest in the Earth Sciences about how to navigate their major. Topics discussed during the seminars include: courses, transfer schools, internships, and careers and jobs. In addition, faculty are now emphasizing the priority of obtaining the AA or AT transfer degree. The seminars are popular because they promote collegiality amongst the students and show that faculty do care about their success at El Camino College.

Since the previous Program Review (2012), the number of students enrolled in Geology classes has increased, as well the number of students transferring with a major declared in the Earth Sciences. In addition, the Earth Sciences Program has improved its success and retention rates above and beyond the goals stated in the Program Review (2012). The combination of strong demand for Geology majors to meet the increasing number of available jobs in the Earth Sciences, and the continued dedication of a passionate faculty in the Earth Sciences Department create a positive, growth-oriented environment for our program as we continue forward in the 21$^{st}$ Century.

In order to sustain the Earth Science Department's continued excellence we identify a strong need for new digital visualization software and increased computer processing speed for teaching our classes. Data presentation in the Earth Sciences is increasingly being delivered via computers and specialized software. Our department desires to stay current with this trend. We strongly believe that providing our students access to up-to-date computer software and hardware will keep them current with modern techniques in the Earth Sciences, in turn increasing their success when they transfer, and/or seek employment in this high-demand field.

Faculty in the Earth Sciences Department participate in campus-wide activities such as: Science Club, Honors Transfer Program, Onizuka Space Science Day, Accreditation, Academic Senate, and a variety of campus committees. Faculty also engage in community service, including the South Bay Lapidary and Mineral Society, Los Angeles Geographical Society, California Geographical Society, and Onizuka Space Science Day.

**B) Describe the degrees and/or certificates offered by the program.**

The Earth Science Department offers an AA-T degree in Geography, and A.S. degree in Geography, and an AS-T degree in Geology.

**C) Explain how the program fulfills the college's mission and aligns with the strategic initiatives.**

*The mission of El Camino College is to make a positive difference in people's lives by providing a comprehensive educational programs and services that promote student learning and success in collaboration with our diverse communities.*

The Earth Sciences Program supports the College's Mission Statement by teaching classes that are popular, exciting, inspiring, and directly impact the daily lives of our students. Students must accurately understand how our planet functions so that they can guide their families and communities toward a secure future on an ever changing planet. Our courses emphasize the use of the scientific method so that all students will be able to recognize reliable information (and unreliable information), an important skill for all citizens. The Earth Sciences Department maintains a very strong collaboration with the Learning Resources Center (LRC) to promote student success. Faculty constantly consult with the Earth Science tutor at the LRC so that students receive the assistance that they require to be successful in our classes.

## STRATEGIC INITIATIVES

### 1. Student Learning:

The Earth Sciences Department provides provocative and exciting courses that encourage critical thinking and problem solving using the scientific method within student-centered learning activities. These activities are not restricted to the classroom – a major, and very successful, component of our program are field trips, both during class time and over multiple days, to observe geographic, geologic, and oceanographic phenomena exhibited by the Earth.

### 2. Student Success and Support:

We use a variety of currently popular educational methods and techniques in order to engage students and promote learning within the classroom. A strength of our program is the more "hands-on" aspect of the Earth Sciences – where students can see and touch things they have learned about in the classroom. Our field trips are designed to provide students with this "hands-

on" learning to meet a variety of different modalities of learning so that students will be successful in their courses. The Geographic Information Systems (GIS) class is designed for students to become competent in using software to achieve success in their training toward their degree program. The Earth Sciences Department has also collaborated with the Supplemental Instruction program, and continues to utilize student tutors at the LRC to increase student success.

### 3. Collaboration:

The Earth Sciences Department collaborates with the other departments in the Natural Sciences Division, especially on the annual Onizuka Space Day, providing an introduction to space science for middle and high school students.

### 4. Community Responsiveness:

The Earth Sciences Department is active in the community. Students and faculty give lectures to the South Bay Lapidary and Mineral Society and help to run their annual Gem and Mineral Show. A reciprocal part of the relationship with the South Bay Lapidary and Mineral Society is that they fund the Wally Ford Scholarship, given annually to higher achieving students in the Earth Sciences Department at ECC. We participate annually in Onizuka Space Science Day, aimed to inspire middle- and high school student to take an interest in the sciences.

### 5. Institutional Effectiveness:

The Earth Sciences Department participates regularly in student assessment, student learning outcomes, program planning, and program review.

### 6. Modernization:

The Earth Sciences Department utilizes technology for teaching our classes. There are two dedicated computer labs with a total of 16 computer workstations. In addition, we constantly purchase tools, supplies to keep current with needs of students. We seek to upgrade our computer hardware and software facilities to stay current with modern trends in teaching classes in the Earth Sciences.

## D) Discuss the status of recommendations from your previous program review.

1. **Recommendation:** Four new multimedia ceiling projectors are indispensable to enhancing facilities and teaching, in keeping with Strategic Initiatives A and F (cost estimate = $6,000.00).
   **Status:** Completed
   **Notes/Comments:** All ceiling projectors are in use.

2. **Recommendation:** Twenty-five Garmin eTrex handheld GPS Navigator receivers to enhance teaching, as identified by Strategic Initiative A (cost estimate = $5,000.00).
   **Status:** Completed
   **Notes/Comments:** GPS units are in use in classes.

3. **Recommendation:** Models for the new display cases and classroom instruction will help the department to align with Strategic Initiative A (cost estimate = $2,000.00).
   **Status:** Completed
   **Notes/Comments:** Models of fossils were purchased during 2016-2017 for display cases and classroom instruction.

4. **Recommendation:** Twenty Ryobi Non-Contact Infrared Thermometers to measure the temperature of surfaces are needed for Geography and Geology courses to assist in meeting the goals of Strategic Initiative A (cost estimate = $600.00).
   **Status:** Completed
   **Notes/Comments:** The thermometers are in use in Geography and Geology classes.

5. **Recommendation:** Transportation funds are necessary in order for Geography 20abcd to achieve the goals of Strategic Initiatives A, B, and C. This field studies course has not been offered for a number of years, which is partially due to a lack of adequate funds (annual cost estimate = $2,000.00).
   **Status:** Active
   **Notes/Comments:** Geography faculty continue to seek solutions to fund teaching this class.

6. **Recommendation:** One full-time instructor in Geography will maintain and strengthen quality education, as stated in Strategic Initiative B (cost estimate = $100,000.00).
   **Status:** Completed
   **Notes/Comments:** Rebecca Donegan was hired in 2016 as an Assistant Professor in Geography.

7. **Recommendation:** One full-time instructor in Geology/Environmental Science will maintain and strengthen quality education, as stated in Strategic Initiative B (cost estimate = $100,000.00).
   **Status:** Active
   **Notes/Comments:** The Earth Science Department continues to request a new faculty position with each round of hiring at ECC.

## SECTION 2
## Analysis of Research Data

### A) Head count of students in the program

**Total students for Earth Science Department (Annual Enrollment)**

| YEAR | STUDENTS |
|---|---|
| 2008-2009 | 3311 |
| 2009-2010 | 3289 |
| 2010-2011 | 2952 |
| 2011-2012 | 2879 |
| 4-year average | 3108 |
| 2013- 2014 | 2938 |
| 2014- 2015 | 2842 |
| 2015- 2016 | 2947 |
| 2016- 2017 | 2897 |
| 4-year average | 2906 |

**Geography**

| YEAR | STUDENTS |
|---|---|
| 2008-2009 | 1600 |
| 2009-2010 | 1573 |
| 2010-2011 | 1387 |
| 2011-2012 | 1320 |
| 4-year average | 1470 |
| 2013- 2014 | 1342 |
| 2014- 2015 | 1277 |
| 2015- 2016 | 1352 |
| 2016- 2017 | 1318 |
| 4-year average | 1322 |

**Geology and Oceanography (combined)**

| YEAR | STUDENTS |
|---|---|
| 2008-2009 | 1711 |
| 2009-2010 | 1716 |
| 2010-2011 | 1565 |
| 2011-2012 | 1559 |
| 4-year average | 1637 |
| 2013- 2014 | 1596 |
| 2014- 2015 | 1565 |
| 2015- 2016 | 1595 |
| 2016- 2017 | 1579 |
| 4-year average | 1584 |

**Geology**

| YEAR | STUDENTS |
|---|---|
| 2008-2009 | 932 |
| 2009-2010 | 900 |
| 2010-2011 | 858 |
| 2011-2012 | 831 |
| 4-year average | 880 |
| 2013- 2014 | 902 |
| 2014- 2015 | 858 |
| 2015- 2016 | 950 |
| 2016- 2017 | 970 |
| 4-year average | 920 |

**Oceanography**

| YEAR | STUDENTS |
|---|---|
| 2008-2009 | 779 |
| 2009-2010 | 816 |
| 2010-2011 | 707 |
| 2011-2012 | 728 |
| 4-year average | 758 |
| 2013- 2014 | 694 |
| 2014- 2015 | 707 |
| 2015- 2016 | 645 |
| 2016- 2017 | 609 |
| 4-year average | 664 |

Head counts (annual enrollment) for students in the Earth Sciences Department from 2013 to 2017 (Fall semesters) show:

(a) Annual enrollment for the Earth Sciences Department shows small variations around the 4-year average of 2906 students during the 2013 - 2017 academic years. There is, however, an overall decline in student enrollment in the Earth Sciences that continues from the 2008 – 2012 academic years (4-year average = 3108). This enrollment decline most likely is due to the overall demographic and employment changes occurring within California and the community around ECC.

(b) Enrollment trends (2013-2017) for Geography classes both increase and decrease a small amount around the 4 year average of 1322 students. The 4-year average for 2013 – 2017 (1322) is less than the 4-year average for 2008 – 2012 (1470 students), indicating an overall decline in number of students taking Geography classes in comparison to the 2008 – 2012 academic years (prior Program Review). Total number of students taking Geography classes from 2008 – 2012 was 5736 (not counting Geography 7, 8) and 5289 for 2013 – 2017, again indicating the overall decline in student numbers.

(c) Enrollment trends for Geology classes from 2013 - 2017 show an increase in number of students. The 4-year average for 2013 – 2017 (920) of students taking geology classes reverses the decline in the 2008 – 2012 enrollment statistics (4-year average = 880 students), and the total number of students enrolled in Geology classes from 2013 – 2017 (3680) exceeds the total number of students taking Geology classes from 2008 – 2012 (3521).

(d) Enrollment trends for Oceanography classes are in decline. This is a long term trend in decreasing enrollment that continues from the 2008 – 2012 data (Program Review). The 4-year average of students from 2008 – 2012 was 758 students; the 4-year average for 2013 – 2017 is 664 students. The number of sections being taught is the same.

**B) Course grade distribution**

| ES Dept overall % | 2008-12 (avg) | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| A | 25 | 21 | 23 | 21 | 24 |
| B | 31 | 31 | 32 | 33 | 31 |
| C | 29 | 30 | 29 | 34 | 28 |
| D | 8 | 8 | 6 | 7 | 7 |
| F | 7 | 11 | 9 | 10 | 9 |

The distribution of course grades for the Earth Sciences Department are consistent for the last 8 years. This consistency is remarkable considering some changes in full-time faculty, and the

variable number of part-time instructors that come and go. The data suggests that course content and criteria for evaluation of students are consistently maintained across the years within the Earth Sciences Department. The overall average grade for the Earth Sciences Department is a B – high C. There are more F's given to students in comparison to D's. The F's are most commonly due to students that stop attending and turning in assignments. Unfortunately, these students have a job, family responsibilities, and other coursework that prevents them from being successful in our classes. We will endeavor to support them more in achieving success. Students who earn D's in our classes are most likely very close to passing a class in the Earth Sciences program, but need just that little bit "extra" to be successful. Our long-term goal is to get the D's up to a C through tutoring programs, encouraging students to visit office hours, and peer collaboration.

The discussion that follows regarding overall grade distribution, and success and retention for each discipline within the Earth Sciences Department is based on the following:

(i) data is combined for all classes in the disciplines of Geography and Geology; in other words separate sections that consist of 3 unit lecture classes and 1 unit lab classes are treated the same. There are no combined lecture and lab classes in Geography and Geology. Distance Education classes are discussed separately later in the report.

(ii) Oceanography data is for all sections of the same class – a 4-unit class of combined lecture and lab called Oceanography 10.

**Geography**

| Geog, lect and lab % | 2008-12 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| A | 25 | 20 | 20 | 20 | 23 |
| B | 29 | 28 | 32 | 28 | 27 |
| C | 32 | 30 | 35 | 37 | 34 |
| D | 9 | 9 | 6 | 5 | 9 |
| F | 4 | 12 | 7 | 10 | 7 |

Grade distribution for Geography classes shows that the average grade is a C, with the number of C's increasing, and B's decreasing, in comparison to the 2008-2012 average.

**Geology**

| Geol=lect,lab | 2008-12 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| A | 24 | 23 | 27 | 19 | 26 |
| B | 29 | 28 | 31 | 34 | 32 |
| C | 28 | 31 | 23 | 30 | 22 |
| D | 8 | 6 | 6 | 7 | 6 |
| F | 10 | 12 | 13 | 10 | 14 |

Grade distribution for lecture and laboratory classes, no Distance Education classes, shows an increase in number of B's from 2013 to 2016 in comparison to the 2008-12 average; and indicates that overall grade average for the Geology classes is a B. A's and C's have a curious inverse grade distribution, more A's = less C's, and vice versa. A higher overall grade average of B for the Geology program may reflect more lab classes that overlap with lecture material and support student success.

**Oceanography**

| OCN lect lab | 2008-12 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| A | 25 | 20 | 23 | 21 | 28 |
| B | 36 | 40 | 35 | 36 | 41 |
| C | 27 | 27 | 26 | 28 | 23 |
| D | 5 | 8 | 6 | 8 | 3 |
| F | 7 | 5 | 10 | 7 | 5 |

The overall average grade for Oceanography classes is a B. There is a much greater percentage of B's for the Oceanography classes, and fewer F's, in comparison to the Geology classes. The higher grade average, and fewer F's, most likely reflects the integrated lecture-lab format of the Oceanography classes which strengthens the students' understanding of the material. The inverse relationship between A's and C's, similarly to the Geology classes is also present.

**Summary**

The overall average grade of C for the Geography program in comparison to a B for the Geology program may be due to more lab classes being offered within Geology. The combination of lecture and lab for Oceanography 10 class (combined 4 units of lecture and lab) produces the overall higher grade of B, and demonstrates the effectiveness of combining the lecture and lab component into a single class. Perhaps Geography, and Geology also, might consider creating more of these type of classes.

**C) Success rates (Discuss your program's rates, demographic success characteristics and set a success standard for your program.)**

**Success and Retention Rates**
The percentages for the Fall 2013 – Fall 2016 semesters (averages) for in-class courses are:

**Fall 2013**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geography | 685 | 73 | 86.3 |
| Geology | 464 | 67 | 82.1 |
| Oceanography | 279 | 73.5 | 84.6 |

**Fall 2014**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geography | 635 | 72.4 | 84.7 |
| Geology | 423 | 67.6 | 83.7 |
| Oceanography | 305 | 66.6 | 79.3 |

**Fall 2015**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geography | 666 | 71.6 | 84.8 |
| Geology | 459 | 68.2 | 81.9 |
| Oceanography | 293 | 74.4 | 86.7 |

**Fall 2016**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geography | 640 | 71.9 | 85.9 |
| Geology | 407 | 73.2 | 91.2 |
| Oceanography | 257 | 75.5 | 82.1 |

**Fall 2013 – Fall 2016 (4-year average)**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geography | 657 | 72.2 | 85.4 |
| Geology | 438 | 69.0 | 84.7 |
| Oceanography | 284 | 72.5 | 83.2 |

**Fall 2008 – Fall 2011 (4-year average)**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geography | 648 | 67.9 | 81 |
| Geology | 369 | 64.7 | 80.4 |
| Oceanography | 363 | 72.1 | 83 |

A comparison of success and retention rates (4-year average) for the 2013-2016 data versus the 2008-2011 data show and improvement for Geography and Geology, and remain the same for Oceanography.

The standard for success for the Earth Science Department was set at 65% during the previous Program Review (2012). The 4-year average (2013-2016) shows that this benchmark is being exceeded across all disciplines, and shows an improvement from the 2008 – 2011 (4-year average) data. A goal of the Earth Sciences Department is to award more transfer degrees and the improvement in the success data indicates that we are moving successfully toward that goal. Retention rates have also improved since the previous Program Review – and combined together, the improved success and retention rates point toward a dedicated faculty that want students to complete their classes successfully.

**Demographic Success Characteristics**

The following table shows the demographic distribution of students taking classes in the Earth Sciences Department.

**Earth Sciences Depatment, Fall semesters, 4-year average (2013 – 2016)**

| | Geography | Geology | Oceanography | ECC, Fall 2016 |
|---|---|---|---|---|
| Headcount | 619 | 364 | 309 | 24,000 |
| Females (%) | 51 | 46 | 55 | 52 |
| Males (%) | 50 | 52 | 48 | 48 |
| African-American % | 12 | 13 | 12 | 15 |
| American Indian % | 0.1 | 0.3 | 0.2 | 0.2 |
| Asian % | 18 | 10 | 18 | 15 |
| Latino % | 49 | 52 | 49 | 52 |
| Pacific Islander % | 0.7 | 0.7 | 0.9 | 0.6 |
| White % | 15 | 16 | 17 | 13 |
| Two or more % | 5.15 | 6 | 5 | 4.6 |
| Unknown/decline % | 1.23 | 0.95 | 1.05 | 0.5 |

Overall, students taking classes in the Earth Sciences Program are representative of the general student population at ECC. Some small differences are noted:

(a) Fewer African-Americans (%) are taking classes in the Earth Sciences Program in comparison to the general population at ECC.

(b) There appears to be more Asian students enrolled in Geography and Oceanography classes in comparison to the Geology classes. In addition, there are more Asian students in the Geography and Oceanography classes, and fewer in Geology classes, in comparison to the general ECC population.

(c) The largest percentage of students by race taking classes within the Earth Sciences Department are Latino, comparable (%) to the overall percentage of Latino students at ECC.

(d) Slightly more (%) white students are enrolled in the Earth Sciences classes in comparison to the general ECC population.

The following table shows the demographic **age distribution** for students taking classes in the Earth Sciences Department.

**Earth Sciences Depatment, Fall semesters, 4-year average (2013 – 2016)**

| Age range (ES) | Geography % | Geology % | Oceanography % | ECC, Fall 2016 (%) | |
|---|---|---|---|---|---|
| ≤18 | 2.83 | 3.19 | 2.39 | ≤17 | 1.95 |
| 19-20-21 | 17.89 | 17.54 | 19.47 | 18-19-20 | 13.23 |
| | | | | 21 | 9.8 |
| 25-29 | 10.7 | 11.125 | 10.65 | 25-29 | 13.2 |
| Full-time | 50.35 | 48.4 | 60.3 | | 32.8 |
| Part-time | 48.23 | 49.48 | 42.5 | | 66.3 |

The demographic age data shown in the table above is focussed on the most abundant groups of students enrolling in classes in the Earth Sciences Department and at ECC. In comparison to the general population of 18 to 21 year-olds at ECC, students taking classes in the Earth Sciences Department are skewed slightly older with more students in the 19-20-21 and 22 year-age group in comparison to 18-19-20 year-olds. The data might be suggesting that students do not take Earth Sciences classes in their freshman year at ECC, preferring to wait until their second or third years. The 25 – 29 year age group is the second most abundant group of students at ECC; and fewer students in this age group appear to be enrolled in Earth Science classes. Student populations are equally split between full-time and part-time for the Geography and Geology programs, while most students enrolled in Oceanography classes are full-time. In contrast to the general ECC population, more full-time students enroll in Earth Sciences classes.

So perhaps a typical age demographic for students in Earth Science classes at ECC may be described as slightly older within the 18-22 year-old cohort, preferring to wait until their second or third year to take a science class, mostly takes day classes, is likely full-time, has at least a high-school degree, and is intending to transfer.

The following table shows the success rates according to race for students taking classes in the Earth Sciences Department. Data for success (%) within the Earth Sciences Department for the 4 most abundant demographic groups at ECC are shown. Data for each discipline is a 4-year average from the Fall semesters (2013 – 2016). There are no meaningful differences in success rates for students according to M/F and age group.

| Success rates | 4-year average for the Fall semester (2013 – 2016) | | | |
|---|---|---|---|---|
| | Geography | Geology | Oceanography | Earth Sciences |
| African-American | 59 | 56 | 45 | 53 |
| Asian | 77 | 80 | 76 | 78 |
| Latino | 68 | 67 | 69 | 68 |
| White | 80 | 79 | 82 | 80 |

The success rates for students from different races shows the following:

(a) Asians and Whites achieve a 76-82 % success rate across all 3 disciplines within the Earth Sciences Department. This success rate is well above the previous Program Review (2012) success rate goal for all students taking Earth Science classes of 65 %, our current 4-year success rate of 70 %, and our new goal to achieve a success rate of 75 %. It appears that Asian and White students are fairly well-prepared to be successful in classes within the Earth Sciences Department.

(b) The Latino students are achieving success in Earth Science classes above the previous standard of success (Program Review 2012 = 65 %), but are slightly below the current average for this Program Review of 70 %. In order to achieve a success rate of 75 %, our stated goal for the Earth Sciences Department in the near future, we will have to create new pathways for our Latino students to be more successful in our classes.

(c) About half of the African-American students that take classes in the Earth Sciences Department are successful – this is not a good result. And, a somewhat puzzling observation is that over the 4-year average, only 45 % of African-American students are successful taking an Oceanography class (values range from 33 % to 57 %). There is an overall (4-year average, 2013-16) success rate of 73 % within the Oceanography sections – a good and expected result because this class integrates lecture and lab into a 4-unit class. We seek solutions to close the achievement gap for African American students.

It appears that African-Americans may be either less prepared to achieve success in the Oceanography class, and other classes within the Earth Sciences Department, and/or faculty must implement strategies to ensure equity in all Earth Science classes. Faculty desire to close this achievement gap – and new strategies must be implemented to do so. We seek techniques to ensure that all are classes are presented in a fair and equitable manner in order for all students to be successful.

**Success Standard for the Earth Sciences Department**

Success and retention rates within the Earth Sciences Program have exceeded the 65 % success rate identified in the prior Program Review (2012). Our current 4-year average (2013-2016) is greater than 70 % (except for Geology at 69 %). The faculty are confident that we will continue to increase student success within our classes into the future and will aim for a success rate of 75 %.

In order to successfully guide our students through their classes in the Earth Sciences Department, faculty will attend activities offered through Professional Development that are geared toward teaching and mentoring the different student populations at El Camino College. Faculty will also seek to collaborate with student support programs on campus such as Project Success to identify areas for improvement in student success and sensitivity to student equity.

**D) Retention rates (if applicable, include retention based on placement method)**

Discussed above

**E) A comparison of success and retention rates in face-to-face classes with distance education classes**

Distance Education classes are offered for Geology and Oceanography; there are no Distance Education classes in the Geography program at this time. However, Professor Gard will be teaching an online section of Geography 1 during the Fall 2019 semester.

The Tables below show the Success and Retention rates for in-classroom courses for Geology and Oceanography in order to compare with the Distance Education classes.

**In Classroom**

**Fall 2013 – Fall 2016 (4-year average)**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geology | 438 | 69.0 | 84.7 |
| Oceanography | 284 | 72.5 | 83.2 |

**Fall 2008 – Fall 2011 (4-year average)**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geology | 369 | 64.7 | 80.4 |
| Oceanography | 363 | 72.1 | 83 |

**Distance Education**

(Geology = online, Oceanography = hybrid, lecture online, in classroom lab)

**Fall 2013**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Oceanography | 27 | 41 | 70.4 |

**Fall 2014**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Oceanography | 29 | 24 | 58.6 |

**Fall 2015**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geology | 29 | 79.3 | 86.2 |
| Oceanography | 25 | 40 | 64 |

**Fall 2016**

| Discipline | Total # of Grades | Success Rate (%) | Retention Rate (%) |
|---|---|---|---|
| Geology | 25 | 76.0 | 88.0 |
| Oceanography | 21 | 28.6 | 57.1 |

The success and retention rates for in-classroom versus distance learning courses show that the online Geology classes have rates that are somewhat better than the face-to-face classes. Data for the hybrid Oceanography classes (online lecture, in-classroom lab) show that neither success nor retention are as strong in comparison to face-to-face classes. Low success and retention rates for the Oceanography classes were also reported during the previous Program Review cycle (2012); 45.5% and 69.7%, respectively.

Low success and retention rates in the hybrid Oceanography section may be due in part for the following reason. First of all, in the online environment, students must have superior reading, writing, and time management skills, as well as a willingness to ask for help and feedback. The hybrid Oceanography class is designed to support these skills with in classroom laboratory activities.

However, a major problem with the online-hybrid Oceanography class as currently configured during registration, is that many students, when they sign up for the class, are unaware that they are required to come to campus to complete labs. Students incorrectly believe that the class is completely online, and therefore choose this class because they often want an online class - typically because of their full work schedules. Although the Oceanography 10 hybrid class is clearly marked as hybrid in the physical schedule of classes, this is not apparent in the online search function.

The confusing nature of the Oceanography hybrid class designation that requires in-classroom activities creates the following situation. After the students register for the class they then discover the in-classroom requirement and try to find some way to fit the labs into their schedule, at least for a time. Unfortunately most soon discover that this is not possible. Students then miss labs, in turn losing the chance to get immediate feedback and refine their ideas, which leads to low success rates in the lecture (online) portion of the class. Improvement in the search function for this class is needed so that students understand their commitment to this class.

## F) Enrollment statistics with section and seat counts and fill rates

Data for enrollment statistics with head count and fill rates for Fall Semesters is summarized below:

| | Geography | Geology | Oceanography |
|---|---|---|---|
| | Head count, fill rate (%) | Head count, fill rate (%) | Head count, fill rate (%) |
| 08-09 | 1600 (93) | 932 (96.1) | 779 (105) |
| 09-10 | 1573 (98) | 900 (103.2) | 816 (108.3) |
| 10-11 | 1387 (106.8) | 858 (109.6) | 707 (113.3) |
| 11-12 | 1320 (105.3) | 831 (114.1) | 728 (119.4) |
| 13-14 | 1342 (102.9) | 902 (106.2) | 694 (104.1) |
| 14-15 | 1277 (99.8) | 858 (95.5) | 707 (102.1) |
| 15-16 | 1352 (100.0) | 950 (96.8) | 645 (97.2) |
| 16-17 | 1318 (96.4) | 970 (85.2) | 609 (93.6) |

Enrollment statistics for head count and fill rate show the following:

(i) Geography: an overall decrease in head count since 2008, a large increase in fill rate through 2011-12, followed by a decrease in fill rate since Fall of 2011.

(ii) Geology: a decrease in headcount but increase in fill rate through 2013-14, followed by an increase in number of students taking Geology classes with a decrease in fill rate. These changes most likely track the addition and elimination of classes through the years. During 2016-17, there are more students with more sections being offered.

(iii) Oceanography: An overall decrease in headcount and fill rate (the number of sections has remained the same).

**G) Scheduling of courses (day vs. night, days offered, and sequence)**

| | Geography Day/Night (%) | Geology Day/Night (%) | Oceanography Day/Night (%) |
|---|---|---|---|
| 08-09 | 74/26 | 73/19* | 59/28* |
| 09-10 | 72/28 | 84/15 | 70/30 |
| 10-11 | 80/20 | 76/19* | 58/36* |
| 11-12 | 74/26 | 73/27 | 64/36 |
| 13-14 | 77/23 | 80/20 | 79/21 |
| 14-15 | 77/23 | 72/28 | 75/25 |
| 15-16 | 80/20 | 70/25* | 71/29 |
| 16-17 | 80/20 | 71/22* | 71/29 |

*weekend classes: Geology 08 = 6.8 %, 10 = 5.4 %; 15 = 6.3 %, 16 = 6.4 % Oceanography 08 = 13 %, 10 = 6 %

The chart shows that most classes within the Earth Sciences Program for all three disciplines are offered during the day and the approximately 70/30 balance (Day/Night) has been in place for many years. We believe that this Day/Night distribution of class offerings is adequate to meet the needs of the student demographic at ECC. There have been a few classes offered intermittently through the years on the weekends. Currently during the Fall semester 2018, a single section of Oceanography is being offered on Saturdays.

There are no sequence classes within the Earth Sciences program, classes may be taken in any order at any time.

**H) Improvement Rates (Course success by placement method, if applicable)**

**I) Additional data compiled by faculty.**

**J) List any related recommendations.**

(1) Recommendations regarding issues with low success and retention rates for the Oceanography 10 hybrid class are discussed in detail in Section 3 regarding Curriculum. Earth Science faculty that teach the Oceanography 10 hybrid class recognize there may be issues with both the curriculum for the online portion of the class and with how the class is searchable within the online course registration system at El Camino College.

(2) Faculty members teaching Distance Education courses will strive to improve the relatively low success and retention rates to better match the the rates for in-class sections of the same courses.

(3) Faculty in the Earth Sciences Department will seek to use ECC Connect to promote integrated student support toward student success in their classes.

## SECTION 3
## Curriculum

Review and discuss the curriculum work done in the program during the past four years, including the following:

**A) Provide the curriculum course review timeline to ensure all courses are reviewed at least once every 6 years.**

| COURSE | CTE | active | 2011-2012 | 2012-2013 | 2013-2014 | 2014-2015 | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GEOG 1 | N | Y | X | | | | | | X | | |
| GEOG 2 | N | Y | | X | | | | | | 6 YR | |
| GEOG 20 | N | Y | | | X | | | | | | 6 YR |
| GEOG 5 | N | Y | | X | | | | | | 6 YR | |
| GEOG 5H | N | Y | | | | | | NEW | | | |
| GEOG 6 | N | Y | X | | X | | | | | | 6 YR |
| GEOG 7 | N | Y | | | X | | | | | | 6 YR |
| GEOG 8 | N | Y | | | X | | | | | | 6 YR |
| GEOG 9 | N | Y | | | | | X | | | | |
| GEOG 99 | N | Y | | | | X | | | | | |
| GEOL 1 | N | Y | | X | X | | | | | | 6 YR |
| GEOL 15 | N | Y | | | X | | X | | | | |
| GEOL 2 | N | Y | | X | X | | | | | | 6 YR |
| GEOL 3 | N | Y | | | X | | | | | | 6 YR |
| GEOL 30 | N | Y | | | X | | | | | | 6 YR |
| GEOL 32 | N | Y | | X | | | | | | 6 YR | |
| GEOL 34 | N | Y | X | | | | | | X | | |
| GEOL 36 | N | Y | | X | | | | | | 6 YR | |
| GEOL 4 | N | Y | | X | | | | | | 6 YR | |
| GEOL 6 | N | Y | | | X | | | | | | 6 YR |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **GEOL 7** | **N** | **Y** | | | | | | | **NEW** | | |
| **GEOL 99** | **N** | **Y** | | | | **X** | | | | | |
| **OCN 10** | **N** | **Y** | | | | **X** | | | | | |
| **OCN 10H** | **N** | **Y** | | | | | **NEW** | | | | |

Curriculum review of all classes within the Earth Sciences Department are completed in a timely manner within the 6-year cycle at El Camino College.

**B) Explain any course additions to current course offerings.**

The table below shows all classes currently offered by the Earth Sciences Department.

| Course | Transfers to: | IGETC | CSU | ECC degree |
|---|---|---|---|---|
| Geog 1 | CSU, UC | 5A | B1 | A.S., AA-T |
| Geog 2 | CSU, UC | 4E | D5 | A.S., AA-T |
| Geog 5 | CSU, UC | 4E | D5 | A.S., AA-T |
| Geog 5H | CSU, UC | 4E | D5 | A.S., AA-T |
| Geog 6 | CSU, UC | 5C | B3 | A.S., AA-T |
| Geog 7 | CSU, UC | 4E | D5 | A.S., AA-T |
| Geog 8 | CSU, UC | 5A | B1 | A.S., AA-T |
| Geog 9 | CSU, UC | 5A | B1 | A.S., AA-T |
| Geog 20 | CSU | | B3 | A.S., AA-T |
| Geog 99 | CSU | | | Transfer limitations |
| Geol 1 | CSU, UC | 5A | B1 | AS-T |
| Geol 2 | CSU, UC | 5A | B1 | AS-T |
| Geol 3 | CSU, UC | 5C | B3 | AS-T |
| Geol 4 | CSU, UC | 5C | B3 | AS-T |
| Geol 6 | CSU | | B1, B3 | AS-T |
| Geol 7** | CSU | | B1 | AS-T |
| Geol 15 | CSU, UC | 5A | B1 | AS-T |
| Geol 30 | CSU, UC | 5C | B3 | AS-T |
| Geol 32 | CSU, UC | 5C | B3 | AS-T |
| Geol 34 | CSU, UC | 5C | B3 | AS-T |
| Geol 36 | CSU, UC | 5C | B3 | AS-T |
| Geol 99 | CSU | | | Transfer limitations |
| OCN 10 | CSU, UC | 5A,5C | B1, B3 | AS-T |
| OCN 10H | CSU, UC | 5A, 5C | B1, B3 | AS-T |

** will be offered during Spring 2019 semester

A new section, called Geology 7 – Environmental Science I, will be offered for the first time during the Spring 2019 semester. The class consists of 3 units of lecture and transfers to the CSU system.

**C) Explain any course deletions and inactivations from current course offerings.**

There are no course deletions or inactivations of current course offerings.

**D) Describe the courses and number of sections offered in distance education. (Distance education includes hybrid classes.)**

The following is a list of Distance Education classes offered during the **2018 semesters and intersessions:**

| | |
|---|---|
| **Winter Intersession:** | Geology 1 (3 units of Physical Geology online lecture) |
| **Spring Semester:** | Geology 1<br>Geology 15 (3 units of Natural Disasters online lecture)<br>Oceanography 10 (4 units, hybrid class = online lecture and in-classroom laboratory activities) |
| **Summer Intersession:** | Geology 1 (online lecture)<br>Oceanography 10 (hybrid class) |
| **Fall Semester:** | Geology 1 (2 sections of online lecture)<br>Oceanography 10 (hybrid class) |

**E) Discuss how well the courses, degrees, or certificates meet students' transfer or career training needs.**

1. **Have all courses that are required for your program's degrees and certificates been offered during the last two years? If not, has the program established a course offering cycle?**

   All courses required for the AA-T and AS-T degrees have been offered during the past two years, with the exception of Geography 20. The following classes are offered only one time per year: Geography 8 and 9, Geology 2, 4, 6 and 15. Geography 20 (Field Studies class) has not been taught since 2014.

The Geology Laboratory classes, Geology 30-32-34-36 are each scheduled only once every two years because each class is offered, in sequence, during the Fall and Spring semesters:

Fall 2016 = Geology 32
Spring 2017 = Geology 30
Fall 2017 = Geology 36
Spring 2018 = Geology 34
Fall 2018 = Geology 32

2. **Are there any concerns regarding program courses and their articulation to courses at other educational institutions?**

   No concerns at this time.

3. **How many students earn degrees and/or certificates in your program? Set an attainable, measurable goal related to student completion of the program's degrees/certificates.**

   The number of declared majors within the Earth Sciences Department was relatively large during 2017-18: Geography = 7 majors that transferred, Geology = 20, no declared majors in Oceanography, 1 declared major in Environmental Science. However there are relatively few AA-T and AS-T degrees awarded per year (Geography = 2, Geology = 2).

   We believe that few transfer degrees are being awarded at this time because the faculty do not emphasize enough the importance of achieving the transfer degree. Our goal is to ensure that all transferring students will complete their transfer degree in the Earth Sciences. Faculty seek to achieve this goal by announcing in class multiple times during the semester, or putting on their syllabi, the importance of why students should acquire a transfer degree. It is also recommended that faculty in the Earth Sciences and Counselors, particularly the Counselor assigned to the Natural Sciences Division, meet with students who are majoring in Earth Science to support their transfer degree goals. The Earth Science Department already conducts at least two seminars per semester to provide support for Earth Science majors. In the future, seminars will include a Counselor that will attend to work with students to achieve their transfer degrees.

   During the next Program Review cycle (2024) we will assess our success of the measurable goal of all students achieving their transfer degree.

4. **Are any licensure/certification exams required for program completion or career entry? If so, what is the pass rate among graduates? Set an attainable, measurable goal for pass rates and identify any applicable performance benchmarks set by regulatory agencies.**

   Not applicable

**F) List any related recommendations.**

(1) Recommendations regarding issues with low success and retention rates for the Oceanography 10 hybrid class:

Study other colleges who offer online lab classes, and revise the curriculum to make the class fully online. This is particularly feasible for the science of oceanography, because most of the labs involve analysis of oceanographic data on maps and graphs. If this is not a viable option, a

lecture-only oceanography course could be developed that would only be offered online. We could also study if a nighttime lab class would allow more students to attend lab.

*Recommendation:*

Revise how the course is listed in the online searchable class schedule so that the hybrid nature of the course and the requirement to meet on campus is clear. Below is a screenshot from the fall 2018 semester:

| | Term | Status | Section Name and Title | Location | Meeting Information | Distance Ed. | Faculty | Available/ Capacity/ Waitlist | Credits | CEUs | Academic Level |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Fall Semester 2018 | Waitlisted | OCEA-10-4857 (4857) Intro to Oceanography | El Camino Online/Offsite | 08/25/2018-12/14/2018 Online Lecture Days to be Announced, Times to be AnnouncedONLINE, Room ONLI (more)... | Meeting Information | T. Noyes | -2 / 33 / 12 | 4.00 | | Undergraduate |

There is no mention of the hybrid nature of the course. The meeting information link goes to the Distance Education page, not to specific instructions for this course. Students have to then have to find the proper document, click on its link, and search for the meeting information in the document.

If you click on the link OCEAN-10-4857…, the information after "(more") is revealed to be:

| | |
|---|---|
| Title | Intro to Oceanography |
| Course Section Number | OCEA-10-4857 |
| Description | This introductory course in oceanography presents the ocean in terms of its physical, chemical and biological environments. The topics include studies of: formation and modification of various wave types; tidal behavior; formation of water masses and ocean currents; beaches and the changing shoreline; coral reefs; physical and chemical properties of ocean water; marine environments; marine sediments; origin of sea floor and coastline features; the spreading sea floor and drifting continents. |
| Credits | 4.00 CEUs |
| Start Date | 25 August 2018 End Date 14 December 2018 |
| Academic Level | UG - Undergraduate |

**Meeting Information**

08/25/2018-12/14/2018 Online Lecture Days to be Announced, Times to be AnnouncedONLINE, Room ONLI 08/25/2018-12/14/2018 Online Lab Friday 09:30AM - 12:40PM, Natural Science, Room 218

| Faculty name | Phone | Extension | E-mail address | Instructional Method |
|---|---|---|---|---|
| Dr. T. James Noyes | | | | Online Lecture, Online Lab |

**Requisite Courses**

The Friday lab is inaccurately described as an "Online Lab" (!).

In light of the desire to achieve more retention and success in the Oceanography hybrid class, the instructor (Jim Noyes) continues to try new strategies. During Fall 2017, he began a new discussion format within the class. Results suggest that more students are engaging with the class. Another tactic has been to implement smaller assignments and quizzes that are more accessible, and with fewer consequences for noncompletion. Students may choose to retake quizzes, and resubmit assignments after receiving feedback to achieve a better score.

During the Fall 2018 semester, Dr. Noyes has implemented recommendations of the Professional Development Day speaker, Dr. Harris, to reach out to students individually during the first weeks of the semester. The goal is to plant the seeds of good communication and rapport that will bear fruit later in the semester in terms of retention and success.

## SECTION 4
## Assessment of Student and Program Learning Outcomes (SLOs & PLOs)

**A) Provide a copy of your alignment grid, which shows how course, program, and institutional learning outcomes are aligned. (This will be Appendix A.)**

APPENDIX A

**B) Provide a timeline for your course and program level SLO assessments. (This will be Appendix B.)**

APPENDIX B

**C) State the percent of course and program SLO statements that have been assessed.**

100% of course and program SLO statements were assessed during the last 4 years.
See the table in section D below for specific results from each assessment.

**D) Summarize the SLO and PLO assessment results over the past four years and describe how those results led to improved student learning. Analyze and describe those changes. Provide specific examples.**

Improvements in student learning derived from question by question analysis of student responses to the SLO activities are being implemented. Faculty examine the questions that students miss most often on an SLO activity and infer the most common misconceptions by the incorrect answers that they selected. Teaching strategies and other changes are then coordinated across the curriculum to improve student learning.

For example, in the SLO about the Scientific Method – which is administered to all the Earth Sciences classes, faculty assessed the results and met to discuss their implications. In order to assess student learning about the scientific method, both a pre-test at the beginning of the semester, and post-test at the end of the semester were administered. After the first times this SLO was assesssed, we realized that students were very confused about the differences between an hypothesis and a theory, and that many students were unable to answer the prompts. We believe that there were some challenges to understanding the concepts based upon student basic skills such as reading and perhaps some equity issues. As a result, the SLO was modified to more explicitly differentiate between the two, and a more visual presentation of the scientific method is being used, i.e. a map. All faculty are now more explicitly separating the different steps of the scientific method in their classroom presentations. Also, some faculty have incorporated the SLO about the scientific method into their curriculum. Faculty apply the same coordinated analysis, implementation, and modification of the other SLO's being designed and administered within the Earth Sciences Department.

The table below shows some of the results from the assessment of each SLO, and some of the actions that were taken or will be taken to improve student learning.

| Course | SLO | Some Results of Assessment | Example actions taken to improve student learning |
|---|---|---|---|
| **Geog-1** | **#1** | Students did meet the standard: 77.6% got a score of 7 or higher, well above the 50% target. Poor scores on latitude and longitude. | Use an illuminated globe to teach latitude and longitude |
| **Geog-1** | **#2** | 19.9% of students scoring 10+ on the multiple choice. Standard not met. | Use IR thermometers outdoors with students to show the contrast of surface temperatures between natural (e.g. grass) and false surfaces (e.g. pavement) as a way to demonstrate the Urban Heat Island effect concept. |
| **Geog-1** | **#3** | The data demonstrate that at the end of the course students were better able to identify and distinguish between the different elements of the scientific method. Initially 85% of students' scores fell in the range from 20% to 80%. By the end of the semester, 85% of students' scores fell in the range from 40% to 100%. Only about 25% of students achieved an 80% of above on the post-assessment, so there is some way to go to meet the standard (80% of students scoring an 80% or above). | Modify a current assignment: Students will highlight the 3 steps of the scientific method they identified in a publication. |
| **Geog-2** | **#1** | Students did not meet the standard: 22% got a score of 7 or higher, not 50%. Only 44% of students achieved a score of 5 or higher, not 80%. | There should be greater coordination between Cultural Geography instructors in the future to ensure that all important concepts are taught during the semester. Greater emphasis will be placed in class on the topics from questions #1 and #10. |
| **Geog-2** | **#2** | With only 64% of students scoring 7+ on the multiple choice questions, we did not meet the standard | Develop a worksheet focusing on certain countries (Afghanistan, Bosnia, Poland, Uruguay) and consider their topography (mountainous or flat, based on |

| | | | |
|---|---|---|---|
| | | | referring to a physical map of the world) and recent political stability/instability. Make correlations between environment and stability. |
| **Geog-2** | **#3** | Standard not met. The pre-test scores ranged from two to eight correct answers of the ten questions given. Over all the average score was 50%. However, on the post-test the students scored between four to ten correct answers, with an average score of 70%. This demonstrates that the lowest score went up by 20%, as did the highest scores. | The students definitely need practice with distinguishing between observation, hypothesis, test and theory. Using these terms in lectures and examples will be vital. Not only should the scientific method terms be used by the instructor and students in assignments, but the instructors should also teach students about the secondary wording of sentences as clues. For example, words like "if," "then," "believe," "perhaps," and "may" are part of the hypothesis process, whereas words like "have been found," "have moved," and "experiments show" are words that make a statement, indicating conclusion/theory. |
| **Geog-5** | **#1** | Students did not quite meet the standard: 48% got a score of 7 or higher, just short of our goal of 50%. There were 74% of students that achieved a score of 5 or higher, a bit short of our goal of 80%. | Improve coordination and communication between World Regional Geography instructors to ensure that all important concepts are taught during the semester. |
| **Geog-5** | **#2** | With only 64% of students scoring 7+ on the multiple choice questions, we did not meet the standard. However, the mean (7.02 of 10) was above 7 and is a C grade. | Develop a worksheet diagraming major migration movements on a world map with the main reason for those movements, or a student's family migration history within the USA, Southern California, or world with the main reasons for those movements. |
| **Geog-5** | **#3** | Standard not met. In terms of the raw pre- and post-test scores, there was little improvement (or regression) across all knowledge base levels, indicating students exited the class with as much knowledge of the scientific method as they had coming into it. | Because the scientific method is inherently difficult to integrate into World Geography, perhaps a more intense, standalone approach would improve scores. Having the students find a popular media news piece that refers to 1 or 2 steps of the scientific method and then writing a few paragraphs on it might encourage |

| | | | |
|---|---|---|---|
| | | | them to internalize the steps more fully. If they are asked to identify and describe a few steps on their own, as opposed to just having the answers supplied in front of them, then perhaps their retention would be better. |
| **Geog-6** | **#1** | Students did not meet the standard: 32% got a score of 7 or higher, short of our goal of 50%. There were 66% of students that achieved a score of 5 or higher, which was short of our goal of 80%. | Spend more lab time on the topics of map scale and topographic maps (including contour lines). |
| **Geog-7** | **#1** | Students met the standard: 91.6% got a score of 7 or higher, much higher than the 50% target. Moreover, no students scored lower than at least 6 correct answers. | Questions #1, #3, #5, #6, #7, #8 and #10 will be replaced with new questions where more improvement is possible. |
| **Geog-7** | **#2** | With only 67% of students scoring 7+ on the multiple choice questions, we did not meet the standard. | Develop a worksheet focusing on certain climate regions of California. Make correlations between latitude, proximity to the ocean, and altitude on temperature and rainfall. |
| **Geog-7** | **#3** | 66.4% attained the lowest level of knowledge acquisition. Standard not met. | The non-science geography classes, such as this one, should descriptively explain the scientific method. For example, illustrations of experiment, test, conclusion, etc. can be drawn when discussing topics such as census-taking or California earthquake analysis. |
| **Geog-8** | **#1** | Students did meet the standard: 100% got a score of 12 or higher, obviously well above the 50% target. Because this particular class of 15 students (most of whom were earth science majors) was especially strong, the high scores are not surprising. | All Questions except #5,#6, #8, #11, #12, and #14 will be replaced with new questions where more improvement is possible. We increased the level of difficulty for future classes. |
| **Geog-8** | **#2** | With a mean of only 5.06, we did not meet the standard. Some of this failure can be explained by the technological bent of this course. Because the course focuses on broad level spatial analysis and mapping | Discuss more of the human-environment concepts in the lecture component of the course. Although the emphasis of the course is technological, more examples that speak to SLO #2 |

| | | | |
|---|---|---|---|
| | | software, so much of the time is dedicated to application strategies rather than concepts related to humans and the environment, except when illustrated as part of a mapping technique. The good news is that students mainly excelled with the questions relying on cartographic theory and techniques. | can be incorporated to illustrate both GIS function and people's relationship with the natural world. |
| **Geog-8** | **#3** | The data demonstrate that at the end of the course students were better able to identify and distinguish between the different elements of the scientific method. Initially 85% of students' scores fell in the range from 20% to 80%. By the end of the semester, 85% of students' scores fell in the range from 40% to 100%. However, only about 25% of students achieved an 80% of above on the post-assessment, so there is some way to go to meet the standard (80% of students scoring an 80% or above). | GIS is a computer-based course that has lecture and lab components. During lecture I need to incorporate more map-based examples of research and ask them to identify elements of the scientific method. Getting immediate feedback (via short, informal trial tests) among the small group of students would be quite simple and would help the instructor to track progress.<br>For the lab component, I will add or modify questions in the lab assignments so that the students explicitly describe the hypotheses, tests, observations, and conclusions related to their experiments. The scientific method elements would conveniently speak to the GIS data and methods used in that particular lab, ones the student is dealing with firsthand. |
| **Geog-9** | **#1** | Students did meet the standard: 55.5% got a score of 12 or higher, above the 50% target. 92.5% achieved a score of 9 or higher, above the 80% target. | For the three questions that students scored lowest on, I will dedicate more time to each topic. I will spend more time drawing examples of the ELR on the whiteboard and use hand gesture calisthenics (i.e. I ask the students to say "Air gets cooler the higher you go in the troposphere" as they move their hands upward) (question #2). An interactive student-driven condition matrix should be written on the |

| | | | |
|---|---|---|---|
| | | | whiteboard in the lecture and/or included in an assignment to identify all components of tornado weather (question #9).The poor performance on question #12) was most disappointing to me because the atmosphere's role in global heat transfer is emphasized from the first week of the term throughout its duration. A few more videos and more frequent reminders of this foundational concept will be woven into all assessments, lectures, and assignments. |
| **Geog-9** | **#2** | With only 33.3% of students scoring 7+ on the multiple choice, we did not meet the standard | New Activity: Have students create a pollution contour map of the United States for acid rain. Prevailing winds and urban centers should also be drawn to emphasize movement of pollutants from west to east (Question 6). |
| **Geog-9** | **#3** | The data demonstrate that at the end of the course students were better able to identify and distinguish between the different elements of the scientific method. Approximately 90% of students' scores fell in the range from 20% to 80% throughout the semester, indicating little change in those with the lowest scores. Standard not met. | Meteorology is a lecture- based course, but I incorporate hands-on activities and short lab- like exercises. Free online data, programs, and maps are plentiful; therefore, it will be useful and easy to complement the lecture instruction on the scientific method with student-centered learning on scientific discovery. After students have finished with the activities, immediate feedback will be given verbally. |
| **Geog-20** | **#1** | Standard met. Basic knowledge of Geography Field Studies improved for every student that took the pre- and post-assessments. The data show that raw percentage increases of "extensive" knowledge (scores of 80% or more) went from 15.8% to 89.5%, indicating remarkable improvement for the highest level of | We will modify the assessment to concentrate on areas where students did not perform as well. Question 1 ("What rock is most commonly found in caves, as at Mitchell Caverns?") and Question 3 ("How is a lava tube formed, as in the Mojave National Preserve?") will be removed because the scores |

| | | | |
|---|---|---|---|
| | | content mastery. The pre- and post-difference in "considerable" knowledge (scores of 60% or more) decreased from 36.8% to 10.5%. The pre- and post difference in "some" knowledge (scores of at least 40%) was 31.6% to 0%, respectively. By the end of the class, 0% of students had scores below 40%, which was an improvement on the 16% that fell within this category at the start of the class. Student proficiency did not change much in the C average and below ranges because the majority of students achieved "extensive" knowledge acquisition. | were generally high on the pretest. The new questions should perhaps not hint at the answer so overtly in the question (e.g. Question 3). |
| **Geol-1** | **#1** | Students did meet the standard: 56.5% got a score of 17 or higher, not 50%. Better yet, 80% of students did achieve a score of 12 or higher. | The faculty updated their teaching lessons to stress the learning deficits such as the hazards of volcanoes, the effect of water on landslides, and the difference between minerals and rocks. |
| **Geol-1** | **#2** | Students did not meet the standard. However, when students selected incorrect answers, they typically chose partially incorrect answers (not the best answers) that suggest they do have some knowledge of the important impacts that geology has on their lives and on the climate. For example:<br>* Bolt your home to its foundation to prepare for an earthquake.<br>* The appearance and disappearance of animals impacts our climate | A module has been devoloped in which students designed a climate hazard map of Los Angeles, drawing on course content and applying it to our community. |
| **Geol-1** | **#3** | The data demonstrate that at the end of the course students were better able to identify and distinguish between the different elements of the scientific method. Initially 75% of students' scores fell in the range from 40% to 100%. By the end of the semester, 84% of students' scores fell in the range from 40% to | We have created paragraph vignettes describing experiments and now have the students explicitly describe the hypotheses, tests, observations, and conclusions related to the experiments. |

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| | | 100%.achieved an 80% of above on the post-assessment, so there is some way to go to meet the standard (80% of students scoring an 80% or above). | |
| **Geol-2** | **#1** | Overall the students performed well on the SLO activity. 73 % of the students answered more than 80 % of the questions correctly, and 10 % of the students answered all of the questions correctly. 77 % of the students answered more than 70 % of the questions correctly. Overall, 95 % of the class answered 77 % of the questions correctly. Problematic questions where students did not meet the standard were regarding the origin of the Moon, the relationship between bacteria and the evolution of humans, that continents grow larger with time, punctualism versus gradualism as models of evolution, anapsids as the ancestor of reptiles, and when was the time that fish appeared. Although the students scored between 60 % and 70 % on these questions, overall, the result is not too bad, only suggesting that more work is necessary in emphasizing these concepts. | A strategy to improve students' performance on this SLO activity is to emphasize the topics that the students found difficult to recall. |
| **Geol-2** | **#2** | The students easily surpassed the standard that 50% of students will score 50% or better on the assessment. An essay question asked students to describe and discuss how the amounts and distribution of organisms are changing and how these changes are affecting life on Earth, including humans. A range of answers were received, including the following: habitat loss, humans have changed nature's balance, humans are now a geologic force, humans are speeding up a natural process, increasing carbon dioxide levels will affect the atmosphere, species going extinct will affect predator/prey relationships, extinction of plants will affect animals, humans are over-using all natural resources. | The assessment will be revised. It will include new and more challenging questions. |

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| | | Overall the responses were consistent with what the students learned in the Geology 2 class. Their responses reflect an understanding of the relationship between humans and what is occurring today on planet Earth. | |
| **Geol-2** | **#3** | The data demonstrate that at the end of the course some students were better able to identify and distinguish between the different elements of the scientific method. Initially 82.8% of students' scores fell in the range from 20% to 80%. By the end of the semester, 47% of students' scores fell in the range from 40% to 100%, close to the goal of 80% of the students achieving 50% or better on the assessment. However, only about 24% of students achieved an 80% of above on the post-assessment, so there is some way to go to meet this part of the standard (50% of students scoring an 80% or above). | Simply practicing distinguishing between the elements of the scientific method and getting feedback – would probably help improve student outcomes. We will create an online practice quiz. The online assessment could be a homework assignment. Students could take it again and again to improve their score, encouraging them to work on the concepts. The online assessment might be used to identify the students who are struggling most and the topics that cause them the most confusion. |
| **Geol-3** | **#1** | 56 % of the students scored overall 50 % or better on the Basic Knowledge assessment. 71 % of the questions were answered at a 50 % success rate or better by the students. Large-scale concepts regarding plate tectonics, San Andreas fault, relative age dating, rivers and contour maps appear to be well-understood by the students based upon the high number of correct answers (50% to 82 %) for questions related to these topics. Concepts regarding rocks, minerals and elements continue to be elusive for the students based upon very low scores for correct answers (in some cases, 0 % correct). However, it is unusual that students know about basalt, granite and sandstone, while struggling with limestone and quartzite. Perhaps it is necessary to emphasize the rocks and minerals | The faculty who teach this lab course are spending more time on identification of minerals and rocks, including using additional samples beyond the samples in the boxes. There is additional emphasis on the industrial and household uses for the rocks and minerals, because student are learning them better if they know their importance in our lives. |

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| | | more. Or, it is more likely that these are not popular topics with the students so maybe some new teaching strategies are necessary to make the material more accessible | |
| **Geol-4** | **#1** | The standard for the Geology 4 laboratory class is much lower in comparison to the Geology 2 lecture class. Overall, 84 % of the students answered 60 % or more of the questions correctly. However, only 14 % of the students answered 85 % or more of the questions correctly. No students answered all of the questions correctly. The grades achieved in the Geology 4 laboratory class are equivalent to, and often times better, than the grades that these same students achieve in the Geology 2 lecture class. However, the performance on the Basic Knowledge SLO was the inverse of what I thought may occur. The students performed much better on the lecture material. It may be that there was simply too much detailed, very geologic-specific material for the students to master and remember in the Geology 4 laboratory class. The lecture class was much more about concepts and themes - perhaps these are easier for the students to master. Although the Geology 4 laboratory class is constructed as a series of activities to explore and master some basic techniques used by geologists, perhaps a more thematic approach might be considered. | Construct a more theme-based approach to the material in the Geology 4 laboratory. |
| **Geol-6** | **#1** | 91 % of the students in the Geology 6 class answered 60 % of the questions correctly. Questions 1 through 8 were answered correctly by 60 % or more of the students. Question 9 regarding volcanoes was answered correctly by only 40 % of the students - perhaps this topic | It may be necessary to provide more detail descriptions in the curricula regarding the specific roles that carbon dioxide plays in the environment. |

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| | | requires better explanation in class, or the question was poorly worded. Questions 10-13 were answered correctly by more than 70 % of the students. Question # 14 was answered correctly by less than 50 % of the students - this concept requires more detailed explanation in class. Question 15 was answered by more than 90 % of the students. Overall, the students' performance was remarkable considering that 74 % of them reported that this is the first Earth Science class. Overall the SLO activity is a success. | |
| **Geol-6** | **#2** | Standard Met. 78 % of the students answered 71 % of the questions correctly. This is a good result for this SLO activity. All questions were answered individually by 50 % or more of the students correctly with the exception of question # 3. This is a difficult question and the success rate was very low, only 12 % of the students answered this question correctly. The classroom instruction for this material must be enhanced in the future. In the essay response 50 % or more of the students correctly answered the prompt by mentioning the following: increasing carbon dioxide levels, a warmer Earth, caused by human activities, the polar regions will be most affected, and the result will be habitat changes and extinction. 84 % of the students answered 60 % of the topics correctly. | In the future, more details will be integrated into the curriculum regarding the specific relationship between carbon dioxide, the environment, and human activities. It may also be a good idea to be more explicit over the course of the entire semester regarding carbon dioxide, instead of only during the beginning and the very end of the semester. |
| **Geol-6** | **#3** | Standard Met. The results of the assessment indicate that 63 % of the students answered 53 % of the questions correctly on the SLO. 73 % of the questions were answered by 50 % or more of the students correctly. Questions where students struggled involved understanding the definition of a theory. | The scientific method is taught and emphasized as a part of the curriculum only during the first two to three weeks of the semester. After this time, the scientific method is not explicitly taught during the remainder of the semester. Because the SLO was given to the students at the end of the semester, long after the material was taught, the results of this SLO indicate that the |

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| | | | scientific method should be integrated throughout the curricula over the course of the entire semester. However, all things considered in how little was mentioned about the scientific method and so early on in the semester, the students performed well. |
| **Geol-15** | **#1** | Students met the standard: 95% got a score of 13 or higher (more than 50% of the 25 questions.) | |
| **Geol-15** | **#2** | Students did not meet the standard. However, when students selected incorrect answers, they typically chose partially incorrect answers (not the best answers) that suggest they do have some knowledge of the important impacts that geology has on their lives and on the climate. For example:<br>* Bolt your home to its foundation to prepare for an earthquake.<br>* The appearance and disappearance of animals impacts our climate | Students designed a climate hazard map of Los Angeles, drawing on course content and applying it to our community. |
| **Geol-15** | **#3** | At the end of the course students were better able to identify and distinguish between the different elements of the scientific method. Initially 80% of students' scores fell in the range from 20% to 80%. By the end of the semester, 80% of students' scores fell in the range from 40% to 100%. However, only 31% of students achieved an 80% or above on the post-assessment, so there is some way to go to meet the standard (80% of students scoring an 80% or above). | In our teaching of the scientific method, we now emphasize word use, so that students can recognize ambivalent or bold statements and better infer if they are theories or hypotheses. Also, the teaching of theory is looked at and applied more widely throughout the semester. Also, Tests are an integral part of our field, and are now presented more consistently throughout the semester, so that students can appreciate the creative applications of science to understanding Natural Disasters. We have revised our questions, paying special attention to use of language. |

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| **Geol-30** | **#1** | Students did not meet the standard. However, when students selected incorrect answers, they typically chose partially incorrect answers (not the best answers) that suggest they do have some knowledge of the important impacts that geology has on their lives and on the climate. For example:<br>* Bolt your home to its foundation to prepare for an earthquake.<br>* The appearance and disappearance of animals impacts our climate | Students designed a climate hazard map of Los Angeles, drawing on course content and applying it to our community. |
| **Geol-32** | **#1** | The data from the pre-test and post-test scores show a improvement in student performance on the test of their basic knowledge of the subject. At the beginning of the semester, about 50% of the students did not have "considerable" knowledge of the subject matter (a score of 70% or more). At the end of the semester, about 39% of the students had "extensive" knowledge of the subject matter (a score of 85% or more) and about 44% had "considerable" knowledge (score of 70% or more). Even though the remaining 17% of the students did not achieve "considerable" knowledge as we might have hoped, about half went from the "little or no" knowledge category (below 55%) to the "some" knowledge category (more than 60%), showing improved knowledge of the subject matter." There wasn't as much improvement overall as observed in other SLO assessments of other general education Geology classes because half of the students in this class were geology majors, who brought a well-developed knowledge base into the field laboratory class. | Questions 7, 8 and 17 are the questions that students got wrong most often on the post test: (these questions were about contour maps, geologic time, and sedimentary rocks). One strategy would be to spend more time on the topics in order to clarify the complex vocabulary of geology. Other strategies will also be to provide more hands-on examples, and perhaps add the SLO assessment questions to the laboratory manual. |
| **Geol-** | **#1** | The data from the pre-test and post- | Questions 7, 8 and 17 are the |

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| **34** | | test scores show a significant improvement in student performance on the test of their basic knowledge of the subject. At the beginning of the semester, about 68% of the students did not have "considerable" knowledge of the subject matter (a score of 70% or more). At the end of the semester, about 16% of the students had "extensive" knowledge of the subject matter (a score of 85% or more) and about 53% had "considerable" knowledge (score of 70% or more). Even though the remaining 48% of the students did not achieve "considerable" knowledge as we might have hoped, most of them (about 1/3) went from the "little or no" knowledge category (below 55%) to the "some" knowledge category (more than 60%), showing improved knowledge of the subject matter." There wasn't as much improvement overall as observed in other SLO assessments of other general education Geology classes because half of the students in this class were geology majors, who brought a well-developed knowledge base into the field laboratory class. | questions that students got wrong most often on the post test: (these questions were about contour maps, geologic time, and sedimentary rocks). I have thought of strategies for conveying this material better in the future. For example, one strategy would be to spend more time on the topics in order to clarify the complex vocabulary of geology. Other strategies will also be to provide more hands-on examples, and perhaps add the SLO assessment questions to the laboratory manual. Some new questions will be added so that the assessment covers additional course material and/or probes students' understanding in more depth: (additional topics for the new questions include climate change and details from the field trip). |
| **Geol-36** | **#1** | The data from the pre-test and post-test scores show a significant improvement in student performance on the test of their basic knowledge of the subject. At the beginning of the semester, about 63% of the students did not have "considerable" knowledge of the subject matter (a score of 70% or more). At the end of the semester, about 26% of the students had "extensive" knowledge of the subject matter (a score of 85% or more) and about 47% had "considerable" knowledge (score of 70% or more). Even though the remaining 26% of the students did | Questions 9 and 12 are the questions that students got wrong most often on the post test: (these questions were about contour maps and igneous rocks). Perhaps it is because these concepts are not stressed too much in Geology 36, because it is a field class that doesn't emphasize contours and the trip goes to places without igneous rocks. One strategy would be to spend more time on the topics in order to clarify the complex vocabulary of geology. Other strategies will also be to provide more hands-on examples, and |

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| | | not achieve "considerable" knowledge as we might have hoped, most of them (about 2/3) went from the "little or no" knowledge category (below 55%) to the "some" knowledge category (more than 60%), showing improved knowledge of the subject matter." There wasn't as much improvement overall as I have seen in other SLO assessments of other classes because this class was half geology majors, so there was not as much general ignorance of the subject matter during the pre-test. | perhaps add the SLO assessment questions to the laboratory manual. |
| **Ocea-10** | **#1** | Standard Not Met. Students did not (quite) meet the standard: 47% got a score of 7 or higher, not 50%. However, 80% of students did achieve a score of 5 or higher. | Faculty met to discuss SLOs. We discussed how we teach about water in the universe, and why we do so. We also worked on revising the plankton question. The lab manual was modified in several places to better address the concepts underlying questions #4, #5, #8, and #9. |
| **Ocea-10** | **#2** | Students did not meet the standard. However, when students selected incorrect answers, they typically chose partially incorrect answers that suggest they do have some knowledge of the important impacts that the ocean has on their lives. For example:<br>* untreated sewage can potentially be a cause of "dead zones", but farming practices are typically more important (in developed countries)<br>* bacteria in sewage could cause a beach closure – but sewage is treated to kill the bacteria | Develop a worksheet in which students contrast and compare the causes and effects of harmful blooms (beach closures, "red tides", "dead zones"). The activity could also be part of the Primary Productivity (phytoplankton) lab. |
| **Ocea-10** | **#3** | The data demonstrate that at the end of the course students were better able to identify and distinguish between the different elements of the scientific method. Initially 85% of students' scores fell in the range from 20% to 80%. By the end of the | Simply practicing distinguishing between the elements of the scientific method and getting feedback – would probably help improve student outcomes. We created an online practice assessment that randomly draws |

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| | | semester, 85% of students' scores fell in the range from 40% to 100%, close to the goal of 80% of the students achieving 50% or better on the assessment. However, only about 25% of students achieved an 80% of above on the post-assessment, so there is some way to go to meet this part of the standard (50% of students scoring an 80% or above). | from a question pool. Students can use the assessment to check their understanding and get feedback. The online assessment can be used to identify the students who are struggling most and the topics that cause them the most |

Below, we discuss some of the results from assessment of the PLOs.

PLO #1 "Basic Knowledge"

Students can identify the salient features of the basic concepts of earth science and geography. This includes the ability to recall the definitions of the specialized vocabulary of earth science and geography.

*Results*

About 64% of the questions assessed were answered satisfactorily. (The standards is 70%). It is noteworthy that the lowest performance tended to come from courses in which some or all of the sections were taught by less-experienced part-time faculty. We have had difficulty recruiting experienced part-time faculty. It is likely that we would easily have met the standard had more sections been taught by more experienced part-time faculty or full-time faculty.

*Actions*

We are requesting a new full-time faculty member.

PLO #2 "Relationship with Environment"

Students recognize and can accurately articulate how their environment (including the Earth, the atmosphere, ocean, and biosophere) affects humans' lives and how human activities affect their environment.

*Results*

Student data was broken into 3 categories describing the amount of experience students have in our programs: students who are taking an earth science or geography class for the first time, students who have taken 2 or more of our classes, and majors. The oceanography (80% first timers), geology (70% first timers), physical geography (80% first timers), and cultural geography (60% first timers) programs were examined individually. Overall, more experienced students got a higher overall score on the assessments, by about 1 point on average, across all

programs. More experienced students showed little or no improvement on some individual questions.

Questions where improvement is possible and particularly desirable include:
Sources of drinking water: Oceanography, question #3, and Geology, question #3
Causes of harmful blooms of algae and bacteria: Oceanography, questions #4 and #5
Urban heat island effect: Physical Geography, question #2
Replenishment of aquifers: Physical Geography, question #3
Causes of human migration: Cultural Geography, question

*Actions*

New activities were developed to address the issues identified. For example, a worksheet to contrast and compare the causes and effects of different kinds of harmful blooms, and having students use IR thermometers outside to show the temperature contrast between different surfaces (e.g., grass and pavement).

PLO #3 "Scientific Method"

Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc.

*Results*

The standard/target that "80% of students who are taking one of our courses for the first time will achieve a score of 50% or higher on the assessment." was met.

The standard/target that "80% of students who have passed 1 or more of our courses before and are now taking another course will achieve a score of 65% or higher on the assessment." was not met.

The standard/target that "80% of majors will achieve a score of 80% or higher on the assessment." was not met.

The data demonstrate that at the end of the courses students were better able to identify and distinguish between the different elements of the scientific method. Initially 82% of students' scores fell in the range from 20% to 80%. By the end of the semester, 82% of students' scores fell in the range from 40% to 100%. The average gain was 6% and the average potential gain was 22%.

The post-assessment included a question about the amount of experience students had in our courses. Students who have taken two or more of our courses – but are not majors – (≈100 students) fared little better that students taking the course for the first time (≈370 students), including not doing substantially better on the pre-assessment or doing better on the post-assessment. However, majors (≈30 students) performed better than all other categories of students on the pre-assessment and post assessment (by over 10% on average). In fact, over 1/3 of majors scored in the highest category (80% or above) on the pre-assessment. Even though only 2/3 of majors had much room for improvement, the scores of almost 45% of majors showed

improvement so that 87% of majors were in the two highest categories of achievement (60% to 79.9%, and 80% or above) at the end of the semester. 43% of majors were in the highest category. Thus, as a group, majors did not achieve our goal for them, but they are within striking distance of it.

The data suggest that students struggle the most with:

- distinguishing between hypotheses and theories/conclusions
- distinguishing between observations and the conclusion supported by the observations
- distinguishing between tests and hypotheses

We could have collected more data (and thus more accurate data) about responses to individual questions if we had the time and/or technology to examine more of the assessments in detail. (This is particularly true for students who are earth science or geography majors, a key group for PLO assessment.) For example, the potential gain calculations show that about 55% of students had little or no gain. Identifying and targeting the misconceptions of these students would probably produce the largest improvements in student outcomes.

We attempted to study the degree to which reading comprehension may be affecting student performance. For PLO #3, student data was also broken into 3 categories describing students' proficiency in reading and writing: students who have not passed English 84 or English A yet, students who have passed English 84 or English A, and students who have passed English 1A. We used this data as a proxy for students' reading comprehension. The oceanography (80% passed English 1A), geology (85% passed English 1A), physical geography (80% passed English 1A), and cultural geography (80% passed English 1A) programs were examined individually. In the oceanography and geology programs, students who have passed English 1A did not show significantly better overall performance on the assessments or on individual questions. In the geography programs, students who have passed English 1A did perform better overall (by 2 points on the physical geography assessments). Performance on individual questions did not help us identify questions where the wording of questions and answers could be improved (e.g., confusing language or jargon). The improved performance may be related mainly to students having spent more time at El Camino College (e.g., better study habits) and/or more experience in our programs (about 90% of students who have taken two or more earth science or geography classes have also passed English 1A).

*Actions*

Simply practicing distinguishing between the elements of the scientific method and getting feedback – would probably help improve student outcomes. We created an online practice assessment that randomly draws from a question pool. Students can use the assessment to check their understanding and get feedback. The online assessment can be used to identify the students who are struggling most and the topics that cause them the most difficulties.

**E) Describe how you have improved your SLO/PLO assessment process and engaged in dialogue about assessment results.**

We have begun to record data about student experience in our program. We split the students into 3 categories: students who are taking an earth science or geography class for the first time,

students who have taken 2 or more of our classes, and majors. This will help us determine if students show greater improvement as they take more of our courses.

We held meetings to discuss the assessment data and which actions to take in the future.

We developed new PLO assessments for all three PLOs.

We contacted Institutional Research, and they been helping us make assessments that can be optically scanned. We learned to code in Java to process the data. This has made it much easier to get data on student's performance on specific questions and identify common misconceptions. The next major task is to figure out a practical way to track each student's performance on both a pre-assessment and a post-assessment, so that individual "gains" can be calculated. Doing this by hand was done once during the past 4 years. It was a major undertaking, and there were numerous errors because it could not be automated.

**F) List any related recommendations.**

(1) Hire a new full-time faculty member to insure consistent implementation and analysis of SLO's across all the curriculum. Part-time faculty are not required to analyze the results of the SLO's – potentially losing valuable insights into improving the SLO experience for our students.

(2) Incorporate updated computer hardware and digital visualization software into the curriculum in order to create SLO's that more accurately reflect current trends in the Earth Sciences. By creating SLO's that are meaninful for transfer and job placement – we can better prepare our students for their future success in the Earth Sciences.

(3) Learn to use the new Qualtrics survey software being deployed on campus, and assess whether it can be used for paperless assessment of SLOs.

(4) Determine how to link each student's answers on a pre-assessment with their answers on a post-assessment, perhaps using Qualtrics.

## SECTION 5
## Analysis of Student Feedback

Provide a copy of any feedback reports generated by Institutional Research and Planning or your program. Review and discuss student feedback collected during the past four years including any surveys, focus groups, and/or interviews.

**A) Describe the results of the student survey in each of the following areas:**

A questionnaire was distributed to students at the end of the Fall 2017 and Spring 2018 semesters. This is a standard questionnaire generated by Institutional Research that asks 15 questions regarding student support, curriculum, facilities, and program objectives.

Student surveys Fall 2017-Spring 2018
Fall = 449 Spring = 376 (total = 825)
Results are in %

| Questions | Strongly agree | Agree | Neither agree/ disagree | Disagree |
|---|---|---|---|---|
| (1) Instructors helped me achieve my academic goals | 52 | 38 | 8 | 1 |
| (2) Instructors provide opportunities to actively participate in classes | 59 | 35 | 5 | 1 |
| (3) My contributions have been valued by instructors in this program | 52 | 38 | 9 | 1 |
| (4) Course scheduling is convenient for me | 45 | 44 | 7 | 1 |
| (5) Instructors helped me stay on track | 53 | 36 | 9 | 2 |
| (6) Felt sense of community | 45 | 34 | 17 | 2 |
| (7) Appropriate range of courses | 42 | 45 | 12 | 2 |
| (8) Able to register for classes | 49 | 40 | 9 | 2 |
| (9) The courses helped me meet my academic goals | 46 | 37 | 13 | 2 |
| (10) Library has resources | 32 | 32 | 32 | 2 |
| (11) Satisfied with equipment | 43 | 42 | 8 | 2 |
| (12) Aware of course outcomes and skills | 54 | 40 | 6 | 1 |
| (13) Variety of extra-curricular activities on campus | 28 | 32 | 34 | 3 |
| (14) Buildings & classrooms are satisfactory | 41 | 47 | 8 | 2 |
| (15) Satisfied with computers and software | 38 | 37 | 17 | 3 |
| Overall Average | 45 | 39 | 13 | 3 |
| | 84 | | 13 | 3 |

## 1. Student Support

Questions 1, 2, 3, 5, and 6 are asking students to respond about how they feel whether the instructors in the Earth Sciences classes are supporting their success. Questions 1, 2, 3, and 5, except for #6 (felt sense of community), have a combined average of 91 % of the students that agree or strongly agree that instructors in the Earth Sciences Department support their success. This high value certainly reflects the dedication of the faculty in the Earth Sciences to students at ECC being successful in their classrooms. Question # 6, regarding whether the students felt a sense of community in the classroom has a 79 % return for agree or strongly agree. 17 % of the students were neutral on this question – which may suggest that a sense of community was not emphasized much in some classes, or did not resonate with some students in the classes.

## 2. Curriculum

Questions 4, 7, 8, and 9 ask students about their satisfaction with the curriculum offered within the Earth Sciences Department. A combined average of 87 % of the students agree or strongly agree that the Earth Sciences class offerings are meeting their needs. A slightly greater number of students (13%) were neutral about whether there are enough courses and do these courses help them to meet their academic goals. This higher neutral response rate may indicate that the questions were not relevant to their program, or perhaps they want more variety of courses in the Earth Sciences.

## 3. Facilities, Equipment, and technology

Questions 10, 11, 13, 14, and 15 are about students' satisfaction with facilities, equipment, and technology. The overall combined average for these questions is 74 % of students that agree or strongly agree that facilities are good. However, this is a much lower average in comparison to student satisfaction with support and the curriculum. Although the percentage of students that disagree was small, there was a much larger percentage of students that were neutral in their responses. The greater percentage of neutral responses to question 10 (library resources) and question 13 (extra-curricular activities) may indicate that students do not know about resources in the library or extra-curricular activities, or perhaps such things are not important to them. However, it is important to increase students' awareness of such resources and activities because they might increase student success in the classroom.

The response to question 15 (computers and software) show that 75 % of the students agree/strongly agree that computers and software are adequate. This seems like a fairly low agreement rate for our students in 2017-2018. Students these days love their technology and most likely want more technology within the classrooms. In addition, there may be an expectation that the Earth Sciences Department would be using more computers and software in their curriculum. Perhaps faculty should consider this to be an important issue moving into the future.

### 4. Program Objectives

Question 12 asks: "I am aware of the course outcomes - what I should be able to learn and what skills I should possess after completing courses in the program. " 94 % of the students agreed or strongly agreed with this question. Such a high percentage for agreement indicates that the instructors, curriculum, and implementation are currently achieving a very high rate of success with our students. Overall, this high percentage again indicates the dedication of a passionate faculty to student success at El Camino College

**B) Discuss the implications of the survey results for the program.**

Student support, curriculum, and program objectives are driven by faculty. A very high student satisfaction rate for these areas indicates that Earth Sciences faculty are doing a very good job in meeting the needs of students at ECC (from the point of view of the students). It is important to again emphasize that only a passionate and dedicated faculty will achieve such high satisfaction rates. The faculty in the Earth Sciences will endeavor to continue into the future their strong commitment to student success at El Camino College.

**C) Discuss the results of other relevant surveys.**

There are no other relevant surveys to discuss.

**D) List any related recommendations.**

(1) Increase student awareness of outside resources (such as the library) and activities related to classes in the Earth Sciences. It is likely that more explicitly connecting the library and extra-curricular activities to our classroom will enhance student success.

(2) Continue and more explicitly emphasize the ongoing collaboration with the Learning Resources Center (LRC) to inform students about the adequacy of the library resources.

(3) Increase the use of technology in the classroom using computers, software, or other available technology. Students today demand such technology, and we should provide more of it – especially since we are a science-driven department.

## SECTION 6
## Facilities and Equipment

**A) Describe and assess the existing program facilities and equipment.**

The Earth Science Department at El Camino College is one of the best equipped programs in comparison to other community colleges in the state of California for the following reasons:

(a) thousands of geological samples, maps, demonstration materials

(b) adequate equipment for successful implementation of lecture and laboratory activities

(c) dedicated computer laboratory (16 computer workstations)

At this time (Fall, 2018) the existing program facilities and equipment are adequate to meet the needs of the Earth Sciences Department. The exception is the needs of the Geographic Information Systems (GIS) class. Current facilities are woefully inadequate to successfully teach this class. This issue is discussed within the Technology section.

**B) Explain the immediate (1-2 years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.**

**Geography:** Instructional supplements for Geography classes (e.g. weather equipment, maps, and other tools) are requested on an as-needed basis. Typically the smaller, individual requests are purchased using the department budget. More expensive wall maps are placed into the department plan; however, large relief map are becoming more difficult to find, so we continually look for them throughout the academic year. Estimated cost: $100.00 - $3,000.00 per year

**Geology and Oceanography and Environmental Science**: Similarly to the Geography program, instructional supplements are requested on an as-needed basis. Items may include fossils, rock and mineral samples, laboratory apparatus for the laboratory classes in Geology and Oceanography. Estimated cost: $100.00 - $3000.00 per year.

**C) Explain the long-range (2-4+ years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.**

**Geography:** Long-term needs related to facilities and equipment are essentially replenishing and updating current supplies and materials to maintain the integrity of the program. Estimated cost: $100.00 - $3000.00 per year.

**Geology and Oceanography and Environmental Science**:

Long-term needs related to facilities and equipment are essentially replenishing and updating current supplies and materials to maintain the integrity of the program. Estimated cost: $100.00 - $3000.00 per year.

**D) List any related recommendations.**

(1) It is necessary to provide funds to create and maintain a cycle for replacing instructional materials and equipment.

## SECTION 7
## Technology and Software

**A) Describe and assess the adequacy and currency of the technology and software used by the program.**

There are two computer labs (16 workstations) dedicated to the Earth Sciences Department. Software preloaded and maintained by Technical Support at ECC includes a web browser, Google Earth, word processing and data evaluation software, and a variety of specialized programs used by faculty. All of the classrooms are equipped with Wi-Fi. All classrooms have a projector for slide and video presentations.

**B) Explain the immediate (1-2 years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.**

**Geography 8** (Introduction to Geographic Information Systems-GIS) is taught every Spring semester. Although a specialized course with annual enrollment no greater than 22, it is a class critical for Earth Science majors to be successful in today's job market. The GIS class provides a computer-based skillset that adds great value to the resume for any major. The currently utilized computers, which are refurbished machines (and perhaps the server as well) in the LS-134 computer lab are unbearably slow, causing students stress and disappointment. Many large data files are unusable and sophisticated functions are not possible because of the poor quality of the computers for this technical class. Enrollment suffers as a result. Faster computers and/or a designated server that would allow for more efficient processing is needed. Estimated cost: $50,000

**Geology and Oceanography and Environmental Science**:

In order to effectively teach Earth Science today for a technologically driven cohort of students, adequate computer and software facilities are important. Classes in Geology, Oceanography, and Environmental Science require software and computers that can adequately run and display digital visualizations for students to understand how the Earth works. Cost = $50,000.00 for digital visualization software and computers.

**C) Explain the long-range (2-4+ years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.**

**Geography:** Geographic Information Systems (GIS) is recognized as a class critical for students intending to major in the Earth Sciences today. Facilities and equipment at this time are woefully and somewhat embarrassingly, inadequate at El Camino College to successfully teach

this class. An upgrade to current facilities is long past due. Cost = $50,000.00 for computer work stations and a dedicated server.

**Geology and Oceanography and Environmental Science**:

In order to effectively teach Earth Science today for a technologically driven cohort of students, adequate computer and software facilities are important. Classes in Geology, Oceanography, and Environmental Science require software and computers that can adequately run and display digital visualizations for students to understand how the Earth works. Specialized programs used in the Earth Sciences are important because digital science visualization is the representation of data graphically as a means of gaining understanding and insight into the data. Such visualizations are the current trend in the Earth Sciences and are applied to:

- Data Analysis in the Earth and Environmental Sciences
- Geobiology
- Geosystems including geology, the oceans, and environmental science
- The Global Environment

Cost = $50,000.00 for digital visualization software and computers and maintenance. The following is a list of software that is both in the public domain, and must be purchased, or licensed, for digital scientific visualization in the Earth Sciences. Some of the software already exists at ECC.

Adobe Director, MATLAB, IDL, VTK, ParaView, OpenGL, Autodesk Maya, Adobe Photoshop, Adobe Premiere.

Other software is available in the public domain at NASA, NOAA, and USGS. However, using this software requires modern computers that do not currently exist within the Earth Sciences Department at ECC. Our computers, and most likely a dedicated server, must be purchased in order to fully utilize the software packages listed above.

**D) List any related recommendations.**

(1) Purchase software titles, or licenses, mentioned above for digital visualization.

(2) Purchase modern, faster computers to implement new software titles.

(3) Purchase a dedicated server for the GIS course.

## SECTION 8
## Staffing

**A) Describe the program's current staffing, including faculty, administration, and classified staff.**

Current staffing (Fall 2018) within the Earth Sciences Department consists of:

(i) Geography: 3 full-time instructors, 2 part-time instructors

(ii) Geology and Oceanography: 4 full-time instructors, 5 part-time instructors

(iii) Classified Staff: 1 full-time laboratory technician

**B) Explain and justify the program's staffing needs in the immediate (1-2 years) and long-term (2-4+ years). Provide cost estimates and explain how the position/s will help the program better meet its goals.**

**Geography:** As of the Fall 2018 semester, there are two new adjunct instructors. One teaches a lecture and the other teaches a laboratory class. Ideally, we would like to add an adjunct instructor who is both experienced and comfortable teaching a short summer field course (Geography 20). Estimated cost: $4,000 per year

Geography 20 (Field Studies) has not been taught in four years. This class is usually taught during the summer intersession. However current full-time faculty who would usually teach the course have been, and will be unable to, teach the class because of other summer commitments. Our 2-4 year plan is to hire an adjunct instructor familiar with leading field courses so we can offer Geography 20 once every summer. Estimated cost: $4,000 per year

**Geology and Oceanography and Environmental Science:**

The Geology and Oceanography program continually seeks to hire a full-time instructor (cost = $100,000.00 per year). The enrollment trends indicate that Geology is in a growth cycle at this time. Although Oceanography is in decline, we believe that the increasing enrollment in Geology classes, plus anticipated strong demand for the new course in Environmental Science, justifies hiring a Full-time instructor to teach Geology classes and the Environmental Science classes. Ongoing issues about the Earth are in the headlines that our students view everyday. As a result, there will be more students seeking to major in the Earth Sciences and we want to meet that demand at El Camino College, as well as position ourselves as a program that supports student success in choosing a career path in the Earth Sciences.

**C) List any related recommendations.**

(1) Hire a full-time Instructor in Geology and Oceanography, and/or Environmental Science. A full-time instructor will provide the means to continue our growth in the field of Geology. We would seek to hire an instructor with a demonstrated ability in using digital visualizations in the classroom. A full-time instructor will be better able to implement and change SLO/PLO's that implement modern digital visualization techniques – positioning our students to be competitive in the current job market.

(2) There are ongoing challenges with staffing the laboratory classes with part-time instructors because of the lack of parity regarding lecture-lab class pay. Part-timers have stated that it is not worth the drive to El Camino College in order to teach a lab class due to the low pay for teaching the 1-unit lab class. Lecture-lab class parity in pay would help us to attract high quality adjunct instructors.

## SECTION 9
## Direction and Vision

**A) Describe relevant changes within the academic field/industry. How will these changes impact the program in the next four years?**

Faculty within the Earth Sciences Department teach a curriculum that is relevant to the lives of students who takes our classes. Everyone encounters headlines about the Earth on the internet, television, or newspapers that impact our lives practically every day. Students want to understand how the Earth works in order to take care of themselves and their family and have a successful future. The Earth Science curriculum both supports, but is also changing, to meet this need.

Many Geology and Geoscience Programs at colleges and universities are recasting themselves as Earth System Science. The goal is to present a more integrated approach to how the Earth works, designing new classes that make connections between the varied systems of our planet. A key component to success of these classes is technology, i.e., better computers and software that facilitate digital visualization of the Earth's systems. Computer skills are a necessary requisite for studying the Earth Sciences.

Industrial aspects of the Earth Sciences are also relying more on computer applications and visualizations. The oil and gas industry almost exclusively relies on computer techniques for exploration today. Environmental consulting and geotechnical firms use Geographic Information Systems (GIS) technology to be successful.

Thus there are two clear trends in the Earth Sciences today: integrated Earth systems analysis and computer visualization. Although we are tasked with teaching introductory level classes that emphasize basic aspects of the Earth in order to meet the transfer needs of our students at El Camino College, we will integrate more systems analysis and implement more computer skills into our courses. Two examples of how this will occur:

Geographic Information Systems (GIS) has been taught for several years. The class is absolutely critical for majors in Earth Science for growing their digital visualization skills. The Geography faculty seek to increase the impact of this class with the program.

Faculty within the Geology and Oceanography program recognize that the study of the Earth is becoming more integrated between disciplines, so have created a new class, Environmental Science I (Geology 7) that will be offered for the first time during Spring 2019. Environmental issues are constantly in the headlines today, and Environmental Science is a fantastic class to integrate the study of Earth systems into a format that is relevant to our students' lives. The Environmental Science class, along with the Geology and Oceanography classes, will see more success and retention with the integration of modern digital visualization software and computers into the curriculum.

**B) Explain the direction and vision of the program and how you plan to achieve it.**

The desire of the Earth Sciences Department at El Camino College is to teach classes that are relevant to our student's lives in the 21st Century. Toward this goal we will continue to teach fundamental topics, and emphasize the importance of the scientific method, in our introductory lecture and laboratory classes so that students will understand how the Earth works. Of course we want students to be successful in our classes, but we also desire them to become good citizens of the planet. Thus our direction and vision moving forward is to teach more integrated systems science about the Earth to make our classes relevant to the daily lives of our students. The goal is for students to understand how the Earth works so that they will secure a safe future for themselves and their families. We will achieve success by using more computer technology and digital visualization software, especially GIS technology, in the classroom. Our current population of students demand more technology and our goal is to be on the leading edge of providing our students a satisfying experience using such technology.

We also seek to implement a strategy to collaborate with local industries to identify their needs in order to better prepare our students for their futures in the Earth Sciences. We want feedback from industry and technology in order to create more relevant SLO activities, modify the curriculum in our classes, and discover the best ways to implement GIS technology and other digital technologies into our classes to better prepare our students for their future career. Because much of the laboratory activities in our classes are "hands-on," a collaboration with local industry and technology will guide our creation of activities that may better prepare our students for jobs and a career in the Earth Sciences..

**C) List any related recommendations.**

(1) Insure institutional support for ongoing and modernization of existing computer and software technologies.

(2) Insure institutional support for new and emerging technologies.

(3) Explore new relationships with local industries and technologies to integrate their needs into classroom, and provide new opportunities for our students (jobs, internships).

(4) Modify "hands-on" laboratory activities that are consistent with the needs of local industry and technology.

## SECTION 10
## Prioritized Recommendations

**A) Provide a single, prioritized list of recommendations and needs for your program/ department (drawn from your recommendations in sections 2-8). Include cost estimates and list the college strategic initiative that supports each recommendation. Use the following chart format to organize your recommendations.**

| | Recommendations | Cost Estimate | Strategic Initiatives |
|---|---|---|---|
| 1. | Hire a FT Geology Instructor | $100,000 | A |
| 2. | Designate/hire a Geography Instructor to teach Geography 20 | $4000 | A |
| 3. | Improve GIS lab facilities and software (dedicated server) | $50,000 | F |
| 4. | Purchase materials to support Environmental Science curriculum | $3000 | A, F |
| 5. | Purchase digital visualization software for Geology classes | $50,000 | F |
| 6. | Add an online Geography course | No cost | A |
| 7. | Create a field kit for Oceanography alternate site activities | $500 | F |
| 8. | bromothymol pH kits for oceanography labs | $100 | F |
| 9. | Parts to be used to create a sediment corer, including lead weights and metal shaft | $200 | F |
| 10. | Additional benches in the hallway. | $1000 | F |
| 11. | Update hallway displays | No cost | F |
| 12. | Purchase more fossils | $2000 | F |
| 13. | | | |
| 14. | | | |

**B) Explain why the list is prioritized in this way.**

The list has been prioritized with the hiring of the Full-time Geology instructor as #1 because we believe that there is growth and adequate demand for more classes in the Earth Sciences. A Full-time instructor will teach Geology, Oceanography, and/or Environmental Science classes. The Geography 20 class, a field lab class, has not been taught for 4 years. It is important to find someone to teach this class because field studies is an important component of the Geography curriculum. Computer hardware and software must be updated in order to stay current with modern trends in teaching Earth Sciences classes. The remainder of items on the list are services to be completed, and miscellaneous supplies to be purchased.

# Appendix A
# ALIGNMENT GRIDS

**NATURAL SCIENCES**
**Institutional (ILO), Program (PLO), and Course (SLO) Alignment**

| Program: **Earth Sciences** (Geography, Geology, Oceanography) | **Number of Courses:** 19 | **Date Updated:** 09.10.2014 | **Submitted by:** T. Jim Noyes, ext. 3356 |
|---|---|---|---|

| **ILOs** | **1. Critical Thinking** *Students apply critical, creative and analytical skills to identify and solve problems, analyze information, synthesize and evaluate ideas, and transform existing ideas into new forms.* | **2. Communication** *Students effectively communicate with and respond to varied audiences in written, spoken or signed, and artistic forms.* | **3. Community and Personal Development** *Students are productive and engaged members of society, demonstrating personal responsibility, and community and social awareness through their engagement in campus programs and services.* | **4. Information Literacy** *Students determine an information need and use various media and formats to develop a research strategy and locate, evaluate, document, and use information to accomplish a specific purpose. Students demonstrate an understanding of the legal, social, and ethical aspects related to information use.* |
|---|---|---|---|---|

**SLO-PLO-ILO ALIGNMENT NOTES:**

*Mark boxes with an 'X' if: SLO/PLO is a major focus or an important part of the course/program; direct instruction or some direct instruction is provided; students are evaluated multiple times (and possibly in various ways) throughout the course or are evaluated on the concepts once or twice within the course.*

*DO NOT mark with an 'X' if: SLO/PLO is a minor focus of the course/program and some instruction is given in the area but students are not formally evaluated on the concepts; or if the SLO/PLO is minimally or not at all part of the course/program.*

| **PLOs** | **PLO to ILO Alignment** *(Mark with an X)* | | | |
|---|---|---|---|---|
| | **1** | **2** | **3** | **4** |
| **PLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of earth science and geography. This includes the ability to recall the definitions of the specialized vocabulary of earth science and geography. | X | | | |
| **PLO #2 Relationship with Environment** Students recognize and can accurately articulate how their environment (including the Earth, the atmosphere, ocean, and biosophere) affects humans' lives and how human activities affect their environment. | X | X | | |
| **PLO #3 Scientific Method** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | X | | | |

| SLOs | SLO to PLO Alignment (Mark with an X) | | | COURSE to ILO Alignment (Mark with an X) | | | |
|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | 1 | 2 | 3 | 4 |
| **GEOG 1 Physical Elements: SLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of physical geography.) | X | | | | | | |
| **GEOG 1 Physical Elements: SLO #2 Relationship with Their Environment** Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment. | | X | | X | X | | |
| **GEOG 1 Physical Elements: SLO #3 Nature of Science** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOG 2 Cultural Geography: SLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of cultural geography. (This includes the ability to recall the definitions of the specialized vocabulary of cultural geography.) | X | | | | | | |
| **GEOG 2 Cultural Geography: SLO #2 Relationship with Their Environment** Students recognize and can accurately articulate how their cultural environment affects humans' lives and how human activities affect their cultural environment. | | X | | X | X | | |
| **GEOG 2 Cultural Geography: SLO #3 Nature of Science** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/ interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOG 20 Geography Field Studies: SLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of geography. (This includes the ability to recall the definitions of the specialized vocabulary of geography.) | X | | | X | | | |
| **GEOG 5 World Regional Geography: SLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of cultural geography.) | X | | | | | | |
| **GEOG 5 World Regional Geography: SLO #2 Relationship with Their Environment** Students recognize and can accurately articulate how their cultural environment affects humans' lives and how human activities affect their cultural environment. | | X | | X | X | | |
| **GEOG 5 World Regional Geography: SLO #3 Nature of Science** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |

| SLOs | SLO to PLO Alignment (Mark with an X) | | | COURSE to ILO Alignment (Mark with an X) | | | |
|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | 1 | 2 | 3 | 4 |
| **GEOG 6 Physical Geography Laboratory: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of physical geography.) | X | | | | | | |
| **GEOG 6 Physical Geography Laboratory: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment. | | X | | X | X | | |
| **GEOG 6 Physical Geography Laboratory: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOG 7 Geography of California: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of physical geography.) | X | | | | | | |
| **GEOG 7 Geography of California: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment. | | X | | X | X | | |
| **GEOG 7 Geography of California: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOG 8 Introduction to Geographic Information Systems: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of mapping and Geographic Information Systems (GIS). This includes the ability to recall the definitions of the specialized vocabulary of maps and GIS. | X | | | | | | |
| **GEOG 8 Introduction to Geographic Information Systems: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate the manner in which maps and GIS are used to show both how human activities affect their environment and how human lives are affected by their environment. | | X | | X | X | | |
| **GEOG 8 Introduction to Geographic Information Systems: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/ interpretation of observations) when using maps and GIS to analyze and manipulate geographic data. | | | X | | | | |

| SLOs | SLO to PLO Alignment (Mark with an X) | | | COURSE to ILO Alignment (Mark with an X) | | | |
|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | 1 | 2 | 3 | 4 |
| **GEOG 9 Weather and Climate: SLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of meteorology and climate science. (This includes the ability to recall the definitions of the specialized vocabulary of meteorology and climate science.) | X | | | | | | |
| **GEOG 9 Weather and Climate: SLO #2 Relationship with Their Environment** Students recognize and can accurately articulate how weather and climate affect humans' lives and how human activities affect weather and climate. | | X | | X | X | | |
| **GEOG 9 Weather and Climate: SLO #3 Nature of Science** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOL 1 Physical Geology: SLO #1 Basic Knowledge** Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. | X | | | | | | |
| **GEOL 1 Physical Geology: SLO #2 Relationship with Their Environment** Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | | X | | X | X | | |
| **GEOL 1 Physical Geology: SLO #3 Nature of Science** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOL 15 Natural Disasters: SLO #1 Basic Knowledge** Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | | | | |
| **GEOL 15 Natural Disasters: SLO #2 Relationship with Their Environment** Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. | | X | | X | X | | |
| **GEOL 15 Natural Disasters: SLO #3 Nature of Science** Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |

| SLOs | SLO to PLO Alignment (Mark with an X) | | | COURSE to ILO Alignment (Mark with an X) | | | |
|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | 1 | 2 | 3 | 4 |
| **GEOL 2 History of Planet Earth: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | | X | | |
| **GEOL 2 History of Planet Earth: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. | | X | | X | | | |
| **GEOL 2 History of Planet Earth: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | X | X | | |
| **GEOL 3 Physical Geology Laboratory: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | | | | |
| **GEOL 3 Physical Geology Laboratory: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. | | X | | X | X | | |
| **GEOL 3 Physical Geology Laboratory: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **GEOL 30 Geology Laboratory of Death Valley: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | X | | | |
| **GEOL 32 Geology Laboratory of Owens Valley and Sierra Nevada: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | X | | | |
| **GEOL 34 Geology Laboratory of Southeastern California: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | X | | | |
| **GEOL 36 Geology Laboratory of Coastal California: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | X | | | |

| SLOs | SLO to PLO Alignment (Mark with an X) | | | COURSE to ILO Alignment (Mark with an X) | | | |
|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | 1 | 2 | 3 | 4 |
| **GEOL 4 History of Planet Earth Laboratory: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | X | | | |
| **GEOL 4 History of Planet Earth Laboratory: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. | | X | | | X | | |
| **GEOL 4 History of Planet Earth Laboratory: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | X | X | | |
| **GEOL 6 Earth Science in Education: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) | X | | | | | | |
| **GEOL 6 Earth Science in Education: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. | | X | | X | X | | |
| **GEOL 6 Earth Science in Education: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |
| **OCEA 10 Introduction to Oceanography: SLO #1 Basic Knowledge**<br>Students can identify the salient features of the basic concepts of oceanography. This includes the ability to recall the definitions of the specialized vocabulary of oceanography. | X | | | | | | |
| **OCEA 10 Introduction to Oceanography: SLO #2 Relationship with Their Environment**<br>Students recognize and can accurately articulate how the ocean affects humans' lives and how human activities affect the ocean. | | X | | X | X | | |
| **OCEA 10 Introduction to Oceanography: SLO #3 Nature of Science**<br>Students can identify the key elements of the scientific method in popular accounts of scientific research in magazines, newspapers, etc. | | | X | | | | |

## Appendix B
## SLO/PLO TIMELINES

# COURSE SLO ASSESSMENT 4-YEAR TIMELINE REPORT (ECC)

NATURAL SCIENCES DIVISION - EARTH SCIENCES

| Course SLO Assessment Cycle | Course ID | Course Name | Course SLO Title | Course SLO Statement |
|---|---|---|---|---|
| 2013-14 (Spring 2014) | ECC: GEOG 1 | Physical Elements | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOG 2 | Cultural Geography | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOG 5 | World Regional Geography | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOG 6 | Physical Geography Lab | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOG 7 | Geography of California | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOG 8 | Introduction to GIS | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions /interpretation of observations) when using maps and GIS to analyze and manipulate geographic data. |
| 2013-14 (Spring 2014) | ECC: GEOL 1 | Physical Geology | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOL 15 | Natural Disasters | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOL 3 | Physical Geology Laboratory | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: GEOL 34 | Geology Laboratory of Southeastern California | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |

| Course SLO Assessment Cycle | Course ID | Course Name | Course SLO Title | Course SLO Statement |
|---|---|---|---|---|
| 2013-14 (Spring 2014) | ECC: GEOL 6 | Earth Science in Education | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Spring 2014) | ECC: OCEA 10 | Intro to Oceanography | SLO #3 Nature of Science | Students can identify the key elements of the scientific method in popular accounts of scientific research in magazines, newspapers, etc. |
| 2013-14 (Summer 2014) | ECC: GEOG 20 | Geography Field Studies | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geography. (This includes the ability to recall the definitions of the specialized vocabulary of geography.) |
| 2014-15 (Fall 2014) | ECC: GEOG 9 | Weather and Climate | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2014-15 (Fall 2014) | ECC: GEOL 2 | History of Planet Earth | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2014-15 (Fall 2014) | ECC: GEOL 32 | Geology Laboratory of Owens Valley and Sierra Nevada | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2014-15 (Fall 2014) | ECC: GEOL 4 | History of Planet Earth Laboratory | SLO #3 Nature of Science | Students can identify the key elements of the scientific method (hypotheses, tests, observations, conclusions/interpretation of observations) in popular accounts of scientific research in magazines, newspapers, etc. |
| 2014-15 (Spring 2015) | ECC: GEOG 1 | Physical Elements | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment. |
| 2014-15 (Spring 2015) | ECC: GEOG 2 | Cultural Geography | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how their cultural environment affects humans' lives and how human activities affect their cultural environment. |
| 2014-15 (Spring 2015) | ECC: GEOG 5 | World Regional Geography | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how their cultural environment affects humans' lives and how human activities affect their cultural environment. |
| 2014-15 (Spring 2015) | ECC: GEOG 6 | Physical Geography Lab | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment. |
| 2014-15 (Spring 2015) | ECC: GEOG 7 | Geography of California | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment. |
| 2014-15 (Spring 2015) | ECC: GEOG 8 | Introduction to GIS | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate the manner in which maps and GIS are used to show both how human activities affect |

| Course SLO Assessment Cycle | Course ID | Course Name | Course SLO Title | Course SLO Statement |
|---|---|---|---|---|
| | | | | their environment and how human lives are affected by their environment. |
| 2014-15 (Spring 2015) | ECC: GEOL 1 | Physical Geology | SLO #2 Relationship with Their Environment | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2014-15 (Spring 2015) | ECC: GEOL 15 | Natural Disasters | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. |
| 2014-15 (Spring 2015) | ECC: GEOL 3 | Physical Geology Laboratory | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. |
| 2014-15 (Spring 2015) | ECC: GEOL 30 | Geology Laboratory of Death Valley | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2014-15 (Spring 2015) | ECC: GEOL 6 | Earth Science in Education | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. |
| 2014-15 (Spring 2015) | ECC: OCEA 10 | Intro to Oceanography | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how the ocean affects humans' lives and how human activities affect the ocean. |
| 2015-16 (Fall 2015) | ECC: GEOG 9 | Weather and Climate | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how weather and climate affect humans' lives and how human activities affect weather and climate. |
| 2015-16 (Fall 2015) | ECC: GEOL 2 | History of Planet Earth | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. |
| 2015-16 (Fall 2015) | ECC: GEOL 36 | Geology Laboratory of Coastal California | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2015-16 (Fall 2015) | ECC: GEOL 4 | History of Planet Earth Laboratory | SLO #2 Relationship with Their Environment | Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. |
| 2015-16 (Spring 2016) | ECC: GEOG 1 | Physical Elements | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of physical geography.) |
| 2015-16 (Spring 2016) | ECC: GEOG 2 | Cultural Geography | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of cultural geography. (This includes the ability to recall the definitions of the specialized vocabulary of cultural geography.) |
| 2015-16 (Spring 2016) | ECC: GEOG 5 | World Regional Geography | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of cultural geography.) |
| 2015-16 (Spring 2016) | ECC: GEOG 6 | Physical Geography Lab | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions of the specialized vocabulary of physical geography.) |
| 2015-16 (Spring 2016) | ECC: GEOG 7 | Geography of California | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of physical geography. (This includes the ability to recall the definitions |

| Course SLO Assessment Cycle | Course ID | Course Name | Course SLO Title | Course SLO Statement |
|---|---|---|---|---|
| | | | | of the specialized vocabulary of physical geography.) |
| 2015-16 (Spring 2016) | ECC: GEOG 8 | Introduction to GIS | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of mapping and Geographic Information Systems (GIS). This includes the ability to recall the definitions of the specialized vocabulary of maps and GIS. |
| 2015-16 (Spring 2016) | ECC: GEOL 1 | Physical Geology | SLO #1 Basic Knowledge | Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth. |
| 2015-16 (Spring 2016) | ECC: GEOL 15 | Natural Disasters | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2015-16 (Spring 2016) | ECC: GEOL 3 | Physical Geology Laboratory | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2015-16 (Spring 2016) | ECC: GEOL 6 | Earth Science in Education | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2015-16 (Spring 2016) | ECC: OCEA 10 | Intro to Oceanography | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of oceanography. This includes the ability to recall the definitions of the specialized vocabulary of oceanography. |
| 2016-17 (Fall 2016) | ECC: GEOG 9 | Weather and Climate | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of meteorology and climate science. (This includes the ability to recall the definitions of the specialized vocabulary of meteorology and climate science.) |
| 2016-17 (Fall 2016) | ECC: GEOL 2 | History of Planet Earth | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |
| 2016-17 (Fall 2016) | ECC: GEOL 4 | History of Planet Earth Laboratory | SLO #1 Basic Knowledge | Students can identify the salient features of the basic concepts of geology. (This includes the ability to recall the definitions of the specialized vocabulary of geology.) |



# Appendix C
# 6-YEAR CURRICULUM COURSE REVIEW TIMELINE