Program Review – Earth Sciences – 2013

Primary Author: Julienne Gard
Co-authors: Sara Di Fiori, Matthew Ebiner, Joseph Holliday, Thomas J. Noyes

I. Overview of the Program

In keeping with El Camino College's mission statement, the Earth Sciences Department provides comprehensive, quality educational programs in the areas of Geography, Geology, and Oceanography. More specifically, the department's mission reads:

> *"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 goals of the program are listed below. The list shows how the goals align with the College's seven strategic initiatives. The connections between the goals and the initiatives will be discussed in greater detail thereafter:

- Utilizing a variety of innovative teaching methods and technologies to enhance the quality of education, which include but are not limited to integrating multimedia, models, instruments, Alternative Site Activities, obtaining tutors, organizing information sessions for majors, and mentoring new instructors (**Strategic Initiatives A and B**)

- Engaging in campus life and extracurricular activities to foster student-instructor collaboration and develop a sense of community (**Strategic Initiative C**)

- Developing partnerships with professional- and community-based organizations such as the South Bay Lapidary and Mineral Society, Los Angeles Geographical Society, and Madrona Marsh to prepare students for life after degree attainment and to connect with potential employers (**Strategic Initiative D**)

- Enhancing our program through *collaborative* annual department planning and program review, careful and complete SLO assessment, and linking with College services (e.g. Counseling, the Foundation, Honors Transfer Center) (**Strategic Initiative E**)

- Continually improving educational infrastructure and technology by working closely with El Camino College ITS, Facilities, and the Department Plan to ensure proper maintenance and updates of software, hardware, applications, classroom furnishings, modern scientific equipment, etc. (**Strategic Initiative F**)

- Integrating concepts and practices of sustainability into all Earth Science curriculum and events (e.g. Joe Holliday's numerous open lectures on his climate change research) is recognized as critical by all faculty. As earth scientists, we view it as our responsibility to inform students and the broader community of the human-environment interface and the ensuing changes to the planet (**Strategic Initiative G**)

The Earth Sciences program consists of six full-time faculty and approximately seven adjunct instructors. Although this is a relatively small number of instructors, the program offers roughly 70 sections, serves 3,100 students, and awards between 2 and 6 degrees per year.

The students served by this department range from Geography and Geology majors, other science majors, and students fulfilling their general science requirements. Because the department serves such a diverse student body, the curriculum (as well as extracurricular activities) are tailored to appeal to many backgrounds, which is a key objective of El Camino College's mission statement. Introductory general education courses such as Physical Geography, Geology, and Oceanography lectures and labs fill to capacity quickly. Higher level courses such as Natural Hazards, Weather and Climate, Geographic Information Systems, and geology field classes also fill, primarily drawing students that are pursuing degrees in the earth sciences.

One of the most notable aspects of this department is its large, cohesive, engaged group of majors, estimated between 30 and 40 for all disciplines. Each year, a number of these students are recognized for their academic achievement (e.g. Wally Ford Scholarship, Garrison Scholarship, and division/college awards). Just as noteworthy is their extracurricular commitment. Earth science majors comprise the bulk of Science Club membership and leadership. Five to ten earth science majors volunteer every spring at the mineral show hosted by the South Bay Lapidary and Mineral Society. Additionally, they attend and present original research at conferences of professional organizations such as the National Association of Geoscience Teachers, Los Angeles Geographical Society, and California Geographic Society. Another advantage to having so many exceptional earth science majors is the ability to assign tutors and SI coaches to the introductory courses each semester. In short, this high level of student involvement is a key aspect of department life that generates a vibrant sense of community on the Earth Sciences floor.

Alternate Site Activities and field trips are unique and popular experiences that complement and supplement classroom instruction in an exciting way. Day trips (i.e. ASAs) and longer weekend trips lead students to the desert, ocean, mountains, canyons, museums, tide pools, sewage treatment facilities, wetlands, among other destinations, in an effort to teach them firsthand about geologic, coastal, and geographic processes. Because earth science courses of all levels (i.e. introductory and advanced) integrate off-site instruction into the curriculum, students from many disciplines benefit from these fun and informative field experiences.

The faculty members in Earth Sciences actively engage with the department, division, college, and beyond. A Geology/Oceanography instructor is the primary Science Club advisor and current Honors Program Director. Nearly all of the geographers actively engage as officers and/or members of the Los Angeles Geographical Society; in turn, this involvement leads to student research and scholarships through this organization. The geologists foster a similar relationship with the South Bay Lapidary and Mineral Society, presenting lectures to the society, which then generates scholarships for our program. A number of Earth Science instructors (both full-time and adjunct) participate in the annual National Association of Geoscience Teachers conference, which was hosted by El Camino College in March 2012. At least half of the Earth Sciences faculty also volunteer at the annual Onizuka Space Science Day hosted by the College. In August 2013 Sara Di Fiori organized and guided a workshop in Northern California on integrating field studies into curriculum for science instructors from El Camino College, Mt. St. Mary's College, and Los Angeles area high schools.

The Earth Sciences Department inactivated an old degree and currently offers an AS-T (Associate's degree for transfer) in Geology. This degree requires students to complete 28 units. The AA-T degree for Geography was first submitted in late 2012 and received state approval in mid-August 2013.

Being a close-knit department, we openly discuss our goals and needs both informally and also during department meetings. Nearly all of the 7 recommendations were met since the 2009 Earth Sciences program review:

(1) The first recommendation cited the need for "a full-time faculty hire…for Geography." Julienne Gard was hired in Geography and began work in August 2011.

(2) A second recommendation requested that "History of Planet Earth (Geology 2) and supporting History of Planet Earth laboratory class (Geology 4) [be] offered every academic year." These courses have been offered consistently since 2009.

(3) A third recommendation for "a budget to purchase and update software and any hardware needs for the GIS program [and] full-time instructor in Geography that would be able to teach the GIS curriculum" was met. Julienne Gard now teaches the course using a site license for the Esri ArcGIS software.

(4) The recommendation for "a kiosk in the central hallway in order for students and the general public to access seismic, meteorological and oceanographic data" was met. The kiosk stands in between our four classrooms and is loaded with links, images, and data.

(5) A fifth request for "a globe of the Earth that presents the Earth's surface in detailed relief" was fulfilled in April 2013. The globe is now used for instruction in NS-219.

(6) A request for "new binocular microscopes to update old ones" was met to the degree that we now have a sufficient supply. New stereoscopes and four functional microscopes meet our needs.

(7) A final recommendation for "five more hallway display cases" was partially met. Late in 2012 we received three new display cases – one dedicated to Physical Geography,

another for Geology, and a third for Oceanography. Faculty and staff worked hard to fill them with materials that supplement classroom instruction.

II. Analysis of Institutional Research Data

Data are analyzed broadly at the department level and also specifically at the course level. Furthermore, examining Geography, Geology, and Oceanography separately offers a more nuanced view of individual successes that can then be extrapolated to the department. Comparisons are drawn with the College's success rate standard as well as the College standard to bring better understanding to the Earth Sciences Department's rates. The following data from Institutional Research reports for Fall 2008 to Fall 2012.

Annual Program Participation

Figures 1-3 depict the 4-year trend for program participation by discipline.

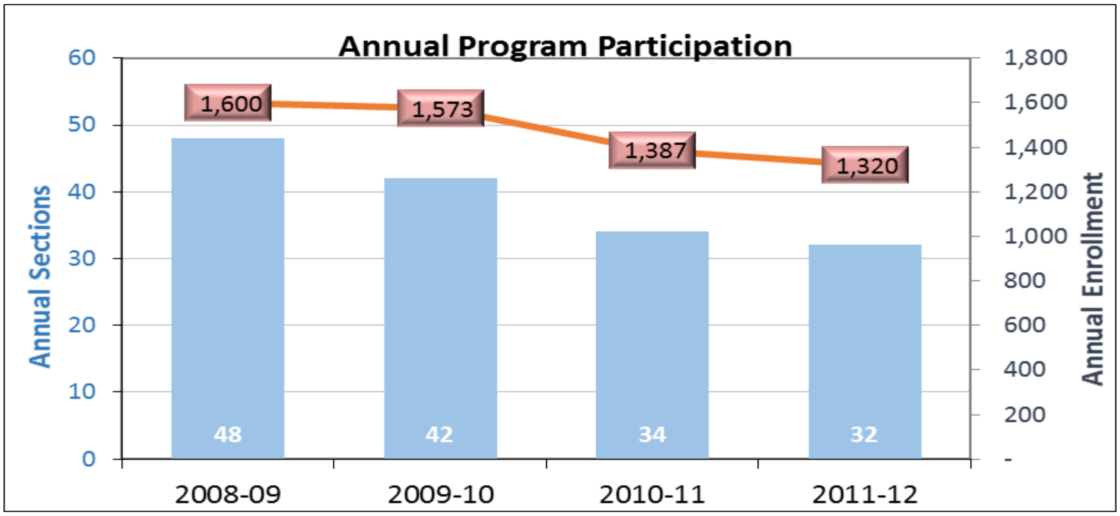

Table 1. Participation for Geography

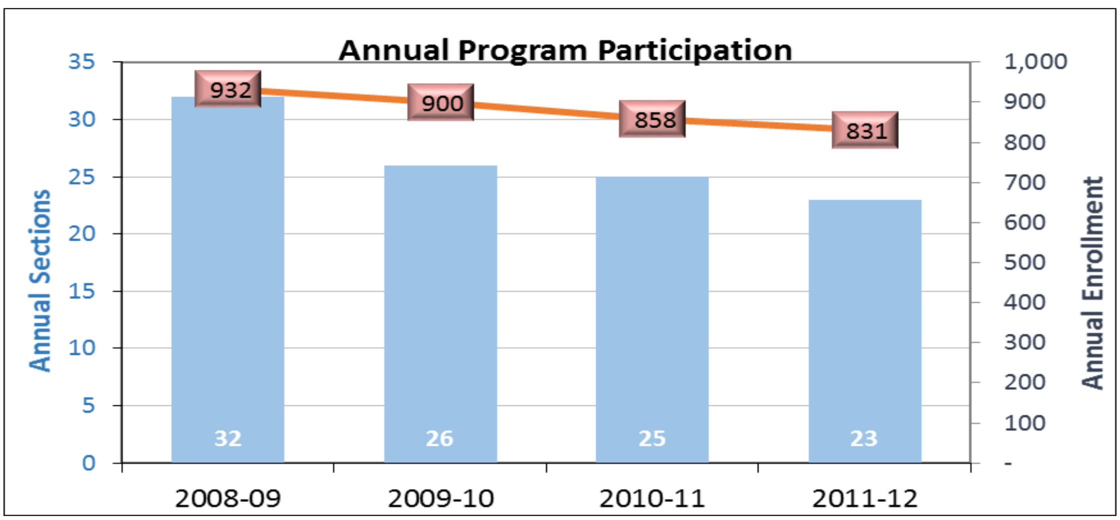

Table 2. Participation for Geology

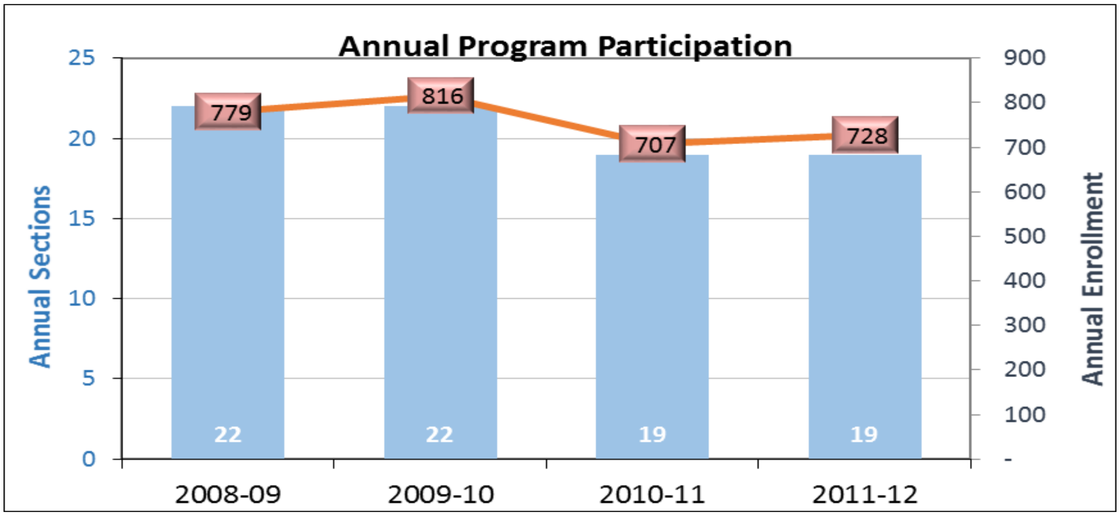

Table 3. Participation for Oceanography

Course Grade Distribution

The data show letter grade (A-F) totals and percentage by course for the years 2008-2012:

	A	B	C	D	F
Geog 1	332 (22%)	405 (27%)	495 (33%)	172 (11%)	105 (7%)
Geog 2	127 (29%)	127 (29%)	131 (30%)	28 (6%)	29 (7%)
Geog 5	306 (28%)	313 (29%)	340 (31%)	67 (6%)	59 (5%)
Geog 6	78 (25%)	122 (38%)	81 (25%)	21 (7%)	16 (5%)
Geog 7	26 (25%)	35 (34%)	32 (31%)	7 (7%)	4 (4%)
Geog 8	13 (33%)	12 (30%)	3 (8%)	2 (5%)	10 (25%)
Geog 9	28 (16%)	36 (20%)	69 (38%)	36 (20%)	11 (6%)

Geol 1	251 (18%)	337 (24%)	480 (34%)	159 (11%)	205 (14%)
Geol 2	9 (10%)	23 (25%)	34 (37%)	11 (12%)	16 (17%)
Geol 3	216 (40%)	205 (38%)	79 (15%)	13 (2%)	21 (4%)
Geol 4	11 (20%)	27 (49%)	11 (20%)	2 (4%)	4 (7%)
Geol 6	32 (23%)	53 (39%)	39 (28%)	9 (7%)	4 (3%)
Geol 15	28 (42%)	19 (29%)	13 (20%)	3 (5%)	3 (5%)
Geol 30	11 (31%)	15 (42%)	7 (19%)	2 (6%)	1 (3%)
Geol 32	4 (20%)	9 (45%)	4 (20%)	1 (5%)	2 (10%)
Geol 34	22 (37%)	16 (27%)	16 (27%)	0	5 (8%)
Geol 36	16 (33%)	21 (44%)	11 (23%)	0	0
Geol 99abc	8 (89%)	1 (11%)	0	0	0

Ocea 10	585 (25%)	838 (36%)	619 (27%)	120 (5%)	152 (7%)

Success and Retention Rates
The percentages are totaled by discipline for each semester, 2008-2012.

Fall 2008

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	694	67.9	81
Geology	369	66.7	83.2
Oceanography	378	69.8	81

Spring 2009

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	680	63.2	77.8
Geology	420	67.4	83.6
Oceanography	340	79.7	87.4

Fall 2009

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	649	65.6	80.3
Geology	402	68.4	86.3
Oceanography	390	76.4	87.9

Spring 2010

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	661	63.8	76.4
Geology	407	68.3	81.3
Oceanography	353	80.7	87

Fall 2010

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	628	68.5	81.5
Geology	351	63	75.8
Oceanography	333	68.5	77.2

Spring 2011

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	620	72.1	81.8
Geology	388	65.2	78.9
Oceanography	310	69.4	82.9

Fall 2011

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	619	69.5	81.1
Geology	355	60.6	76.1
Oceanography	351	73.8	84.9

Spring 2012

Discipline	Total # of Grades	Success Rate (%)	Retention Rate (%)
Geography	612	73.7	84.3
Geology	364	71.2	86.8
Oceanography	304	73.4	83.6

Earth Sciences Annual Enrollment Totals

2008-09	2009-10	2010-11	2011-12	4 Yr. Average
3311	3289	2952	2879	3108

Geography Enrollment Statistics

	08-09	09-10	10-11	11-12
Fall Fill Rates (%)	93	98	106.8	105.3
Spring Fill Rates (%)	96.9	106.1	107.3	106.1
Students	1367	1374	1235	1213
Enrollment/Students*	1.17	1.14	1.12	1.09

Geology Enrollment Statistics

	08-09	09-10	10-11	11-12
Fall Fill Rates (%)	96.1	103.2	109.6	114.1
Spring Fill Rates (%)	104.7	105	106.3	109
Students	730	732	696	665
Enrollment/Students	1.28	1.23	1.23	1.25

Oceanography Enrollment Statistics

	08-09	09-10	10-11	11-12
Fall Fill Rates (%)	105	108.3	113.3	119.4
Spring Fill Rates (%)	115.6	120.1	118.8	116.5
Students	766	805	699	713
Enrollment/Students	1.02	1.01	1.01	1.02

*Enrollment/Students: Ratio showing the average number of sections each student attempts in the program for the given academic year.

Scheduling of Courses
These data show the distribution of course offerings, by time of day and week:

Geography

FA	2008	2009	2010	2011
Day (%)	73.6	72.1	80.4	74.2
Night (%)	26.4	27.9	19.6	25.8
Weekend	0	0	0	0

SP	2009	2010	2011	2012
Day (%)	65.9	75	74.5	74.2
Night (%)	30	25	25.5	25.8
Weekend	4.1	0	0	0

Geology

FA	2008	2009	2010	2011
Day (%)	73.4	84.2	75.6	72.9
Night (%)	19.8	15.8	19	27.1
Weekend	6.8	0	5.4	0

SP	2009	2010	2011	2012
Day (%)	78.6	79.5	74.6	73.6
Night (%)	15.7	20.5	25.4	26.4
Weekend	5.7	0	0	0

Oceanography

FA	2008	2009	2010	2011
Day (%)	59.3	69.7	57.7	63.6
Night (%)	27.8	30.3	36.3	36.4
Weekend	13	0	6	0

SP	2008	2009	2010	2011
Day (%)	70.6	74.9	63.9	70.1
Night (%)	21.8	25.1	26.1	29.9
Weekend	7.6	0	10	0

Analysis
The program's standard for success is 65%. This threshold is already being met most semesters. The department's goal is to award more degrees annually, which will soon be possible given Geography's recent degree approval. A goal we aspire to in the next few years is to award 10 earth science degrees per year.

The success and retention rates for the Earth Sciences Department are generally strong, exceeding El Camino College's standard. Success rates range from 61-81% and retention ranges from 76-88%. The majority of these rates tend to concentrate at the higher end of the ranges, although all disciplines (geography, geology, and oceanography) can fluctuate significantly from semester to semester (e.g. Geology's 61% success in Fall 2011 jumped to 71% in Spring 2012). During this time, no new instructors or major program changes were instituted; however, the number of majors increased. Some of the improvement may be attributed to natural variation, but also the fact that majors complete courses more successfully. This is another advantage of the program's student growth.

The rates for face-to-face and distance learning can be compared using our department's one hybrid (combined online/in-class) course, Oceanography 10. Trends show that neither success nor retention are as strong for distance learning courses. Where a traditional Oceanography 10 success rate is 76.8% with retention at 85.2%, the hybrid course is 45.5% and 69.7%, respectively. This pattern appears typical for earth/environmental science courses, as shown by 2012 data on the California Community College's Chancellor's Office (available on the Internet). Distance learning courses are often 10-30 percentage points lower than their face-to-face counterparts.

Enrollment varies by course, but two general patterns pertaining to section counts and class sizes are widespread. Tables 1-3 show that enrollment trends have decreased across all disciplines in the last four years, largely due to section cuts. The fill rates, however, indicate that class sizes have increased dramatically to counteract section count deficiency. Grade distribution varies by course just as much. Some courses appeal most to majors (Geology 32, 34, 99abc), some are more specialized (Geography 8), and some present comparatively difficult material (Geology 4, Geography 9). Success and retention rates thus reflect these tendencies, whereby students are either well-prepared or struggle in a class they take to fulfill credit needs. The most recent data for these courses are as follows:

FA 2011	Success Rate (%)	Retention Rate (%)
Geology 99abc	100	100

SP 2012	Success Rate (%)	Retention Rate (%)
Geology 34	89	96

FA 2012	Success Rate (%)	Retention Rate (%)
Geography 9	64	89
Geology 4	92	96
Geology 32	96	96

SP 2013	Success Rate (%)	Retention Rate (%)
Geography 8	80	84

Recommendations

General recommendations for improving success and retention rates include attracting more majors, graduating approximately 10 majors per year, avoid enrollments of 114% and 119% as it was in the 2011-12 academic year, and meeting the program's success standard of 65% for each course every semester.

III. Curriculum

Geology 2 and Geology 4 (History of Planet Earth and History of Planet Earth Lab, respectively) are related courses. The former is a lecture class that examines the physical earth from its formation to present day, while the latter is a supporting lab class that analyzes the planet's development using rock and fossil analysis. The department plans to combine these two courses into a single 4-unit course in order to facilitate student success in those two related courses. Most students already enroll in both courses, but those that do not are lower achieving with respect to their peers.

The geographers agreed that Geography 20abcd will be revised to Geography 20 to address recent changes to course repeatability. In future, new field courses (e.g. Geography 21, 22) may be added to the curriculum. The geologists are similarly apprised of the same situation for Geology 99abc and are discussing ways to address this.

The department is on schedule with regard to curriculum review. Our department does not have any course deletions, but it recently inactivated a course (History of Science) as it has not been offered for at least five years. At the Earth Sciences department meeting for February 2013, the following assignments were accepted by faculty members for reviewing the following courses (listed below). Revised Course Outlines were submitted and will be reviewed by the Natural Sciences Division Curriculum Committee during Spring and Summer 2013. Geography 7 and Geology 30 were last reviewed in May 2009. Geography 20abcd, Geology 32, and Geology 36 were last reviewed in July 2009. Thus, Earth Science is up to date with its course reviews.

Sara Di Fiori: Geology 30
Joe Holliday: Geology 32 and 36
Matt Ebiner: Geography 20abcd
Julienne Gard: Geography 7

The department offers one hybrid (online/in-class) course, Oceanography 10. Jim Noyes teaches one section each semester.

The department's geology degree was one of the first transfer degrees offered at El Camino College. Geography's potential transfer degree is being reviewed and edited. The AA-T degree has already helped students to transfer into the geology program at California State University, Long Beach. Most of the units earn General Education and major credits, which is extremely beneficial to students. Approximately 2 geology majors earn this degree every academic year. We do not offer certificates or licensure exams in our department.

The following table summarizes articulation between El Camino College and the UC and CSU systems for various courses, as well as course applicability to ECC degrees.

Course	Transfers to:	IGETC Area	CSU Area	El Camino College Degree Applicability
GEOGRAPHY 1	CSU, UC	5A	B1	Associate Degree Credit, AA-T Geography
GEOGRAPHY 2	CSU, UC	4E	D5	Associate Degree Credit, AA-T Geography
GEOGRAPHY 5	CSU, UC	4E	D5	Associate Degree Credit, AA-T Geography
GEOGRAPHY 6	CSU, UC	5C	B3	Associate Degree Credit, AA-T Geography
GEOGRAPHY 7	CSU, UC	4E	D5	Associate Degree Credit, AA-T Geography
GEOGRAPHY 8	CSU, UC			Associate Degree Credit, AA-T Geography
GEOGRAPHY 9	CSU, UC	5A	B1	Associate Degree Credit, AA-T Geography
GEOGRAPHY 20abcd	CSU, UC			Associate Degree Credit, AA-T Geography
GEOGRAPHY 50	no			credit status determined by individual course
GEOLOGY 1	CSU, UC	5A	B1	Associate Degree Credit, AS-T Geology
GEOLOGY 2	CSU, UC	5A	B1	Associate Degree Credit, AS-T Geology
GEOLOGY 3	CSU, UC	5C	B3	Associate Degree Credit, AS-T Geology
GEOLOGY 4	CSU, UC	5C	B3	Associate Degree Credit, AS-T Geology
GEOLOGY 6	CSU, UC		B1, B3	Associate Degree Credit, AS-T Geology
GEOLOGY 15	CSU, UC	5A	B1	Associate Degree Credit, AS-T Geology
GEOLOGY 30	CSU, UC	5C	B3	Associate Degree Credit, AS-T Geology
GEOLOGY 32	CSU, UC	5C	B3	Associate Degree Credit, AS-T Geology
GEOLOGY 34	CSU, UC	5C	B3	Associate Degree Credit, AS-T Geology
GEOLOGY 36	CSU, UC	5C	B3	Associate Degree Credit, AS-T Geology
GEOLOGY 50	no			credit status determined by individual course
GEOLOGY 99abc	CSU, UC			Associate Degree Credit, AS-T Geology
OCEANOGRAPHY 10	CSU, UC	5A, 5C	B1, B3	Associate Degree Credit, AS-T Geology
OCEANOGRAPHY 50	no			credit status determined by individual course

All of the courses required for the geology transfer degree have been offered in the last two years, as have those that will be required for the geography transfer degree once it is approved.

Recommendations
One immediate (1-2 years) need is funding for the geography field studies course (Geography 20), which takes students on a multi-day trip to experience science in the field. The geographers hope to offer this course in Summer 2014 but require the funds to support student transportation (annual cost estimate = $2,000.00).

IV. Assessment and Student Learning Outcomes (SLOs)

Earth Sciences program level SLOs are as follows:

- 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 geography.)
- Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment.

- 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.

Earth Sciences course level SLOs are listed in the tables below. The grid also shows how the Institutional Learning Outcomes, Program Learning Outcomes, and Course Learning Outcomes align.

Natural Sciences Institutional (ILO), Program (PLO), and Course (SLO) Alignment						
Program: Earth Sciences (Geography, Geology, Oceanography)		**Number of Courses:** 19		**Date Updated** 2.15.13	**Submitted by** T. James Noyes Ext. 3356	
Institutional SLOs	I. Content Knowledge	II. Critical, Creative, and Analytical Thinking	III. Communication and Comprehension	IV. Professional and Personal Growth	V. Community and Collaboration	VI. Information and Technology Literacy
Program Rating	4	4	4	2	2	2

Program Level SLOS	I	II	III	IV	V	VI
	ILOs to PLOs Alignment (Rate 1-4)					
1. 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.	4	2	2	2	2	2
2. Students recognize and can accurately articulate how their environment (including the Earth, the atmosphere, ocean, and biosphere) affects humans' lives and how human activities affect their environment.	4	4	4	2	2	2
3. 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.	4	4	2	2	2	2

Course Level SLOs	Course to Program SLO Alignment Mark with an X			ILOs to Course SLOs Alignment (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOG 1 Physical Elements: SLO#1 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			4	2	2	2	2	2
GEOG 1 Physical Elements: SLO #2 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	4	4	2	2	2	2

Course Level SLOs	Course to Program SLO Alignment Mark with an X			ILOs to Course SLOs Alignment (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOG 1 Physical Elements: SLO #3 Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment.		X		4	4	4	2	2	2
GEOG 2 Cultural Geography: SLO #1 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			4	2	2	2	2	2
GEOG 2 Cultural Geography: SLO #2 Students recognize and can accurately articulate how their cultural environment affects humans' lives and how human activities affect their cultural environment.		X		4	4	4	2	2	2
GEOG 2 Cultural Geography: SLO #3 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	4	4	2	2	2	2
GEOG 5 World Religion Geography: SLO #1 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			4	2	2	2	2	2
GEOG 5 World Religion Geography: SLO #2 Students recognize and can accurately articulate how their cultural environment affects humans' lives and how human activities affect their cultural environment.		X		4	4	4	3	2	2
GEOG 5 World Religion Geography: SLO #3 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	4	4	2	2	2	2

Course Level SLOs	Course to Program SLO Alignment Mark with an X			ILOs to Course SLOs Alignment (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOG 6 Physical Geography Laboratory: SLO #1 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			4	4	4	2	2	2
GEOG 6 Physical Geography Laboratory: SLO #2 Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment.		X		4	4	4	2	2	2
GEOG 6 Physical Geography Laboratory: SLO #3 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	4	3	2	2	2	3
GEOG 7 Geography of California: SLO #1 Students recognize and can accurately articulate how their physical environment affects humans' lives and how human activities affect their physical environment		X		4	4	4	2	2	2
GEOG 7 Geography of California: SLO #2 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			4	2	2	2	2	2
GEOG 7 Geography of California: SLO #3 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		4	4	2	2	2	2
GEOG 8 Introduction of Geographic Information Systems: SLO #1 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			4	2	4	2	2	4
GEOG 8 Introduction of Geographic Information Systems: SLO #2 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		4	4	3	2	2	4
GEOG 8 Introduction of Geographic Information Systems: SLO #3 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	4	4	2	2	2	4

Course Level SLOs	Course to Program SLO Alignment Mark with an X			ILOs to Course SLOs Alignment (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOG 9 Weather and Climate: SLO #1 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			4	2	2	2	2	2
GEOG 9 Weather and Climate: SLO #2 Students recognize and can accurately articulate how weather and climate affect humans' lives and how human activities affect weather and climate.		X		4	4	3	2	2	2
GEOG 9 Weather and Climate: SLO #3 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	4	4	2	2	2	2
GEOG 20abcd Geography Field Studies: SLO #1 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			4	2	2	2	2	2
GEOG 20abcd Geography Field Studies: SLO #2 Students recognize and can accurately articulate how their physical and cultural environment affects humans' lives and how human activities affect their physical and cultural environment.		X		4	4	4	3	4	2
GEOG 20abcd Geography Field Studies: SLO #3 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	4	4	2	2	2	2
GEOL 1 Physical Geology: SLO #1 Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth.	X			4	4	4	2	2	2
GEOL 1 Physical Geology: SLO #2 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		4	2	2	2	2	2
GEOL 1 Physical Geology: SLO #3 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		4	4	2	2	2	2

Course Level SLOs	**Course to Program SLO Alignment** Mark with an X			**ILOs to Course SLOs Alignment** (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOL 2 History of Planet Earth: SLO #1 Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth.		X		4	4	4	2	2	2
GEOL 2 History of Planet Earth SLO #2 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			4	2	2	2	2	2
GEOL 2 History of Planet Earth SLO #3 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		4	4	2	2	2	2
GEOL 3 Physical Geology Laboratory: SLO #1 Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth.		X		4	4	4	2	2	2
GEOL 3 Physical Geology Laboratory: SLO #2 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			4	2	2	2	2	2
GEOL 3 Physical Geology Laboratory: SLO #3 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	4	4	2	2	2	2
GEOL 4 History of Planet Earth Laboratory: SLO #1 Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth.		X		4	4	4	2	2	2
GEOL 4 History of Planet Earth Laboratory: SLO #2 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			4	2	2	2	2	2
GEOL 4 History of Planet Earth Laboratory: SLO #3 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		4	4	2	2	2	2

Course Level SLOs	**Course to Program SLO Alignment** Mark with an X			**ILOs to Course SLOs Alignment** (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOL 6 Earth Science in Education: SLO #1 Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth.		X		4	4	4	2	2	2
GEOL 6 Earth Science in Education SLO #2 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			4	2	2	2	2	2
GEOL 6 Earth Science in Education SLO #3 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	4	4	2	2	2	2
GEOL 15 Natural Disasters: SLO #1 Students recognize and can accurately articulate how the Earth affects humans' lives and how human activities affect the Earth.		X		4	4	4	2	2	2
GEOL 15 Natural Disasters: SLO #2 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			4	2	2	2	2	2
GEOL 15 Natural Disasters: SLO #3 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	4	4	2	2	2	2
GEOL 30 Geology Laboratory of Death Valley: 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			4	2	2	2	2	2
GEOL 32 Geology Laboratory of Owens Valley and Sierra Nevada: 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			4	2	2	2	2	2
GEOL 34 Geology Laboratory of Southeaster California: 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			4	2	4	2	2	2

Course Level SLOs	Course to Program SLO Alignment Mark with an X			ILOs to Course SLOs Alignment (Rate 1-4)					
	P1	P2	P3	I	II	III	IV	V	VI
GEOL 36 Geology Laboratory of Coastal California: 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			4	2	2	2	2	2
OCEA 10 Introduction to Oceanography: SLO #1 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			4	2	2	2	2	2
OCEA 10 Introduction to Oceanography: SLO #2 Students recognize and can accurately articulate how the ocean affects humans' lives and how human activities affect the ocean.		X		4	4	4	2	2	2
OCEA 10 Introduction to Oceanography: SLO #3 Students can identify the key elements of the scientific method in popular accounts of scientific research in magazines, newspapers, etc.			X	4	4	2	2	2	2

91% of courses that were scheduled to be assessed over the last 2 years have been assessed. Two out of 3 of the unassessed SLOs are from field classes that have not been offered since the semester that their SLO was scheduled to be assessed on the timeline. When a course is not offered during the semester that it is scheduled for assessment on the timeline, we assess the course the next time that it is offered.

Basic Knowledge PLO (PLO #1)
The data generated from pre- and post-tests show significant improvement in student performance on the test of their basic knowledge of the subject. At the beginning of the semester, about 90% 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 15% of the students had “extensive” knowledge of the subject matter (a score of 85% or more) and about 34% had “considerable” knowledge. Even though the remaining 51% of the students did not achieve “considerable” knowledge as we might have hoped, most of them went from the “little or no” knowledge category (below 55%) to the “some” knowledge category (more than 55%), showing improved knowledge of the subject matter.

Since some students cannot improve by 20% or more (e.g., because they achieved a score of 80% or more on the pre-test), their “potential gain” defined as (Post Test Score – Pre-Test Score) / (100% – Pre-Test Score) might be a better measure of student improvement than their gain. In other words, the “potential gain” shows the percentage of “wrong answers” on the pre-test that became “right answers” on the post test. By this measure, only 18% of students showed no improvement (a potential gain of less than 10%).

In general, we were pleased by the results, and think that they are good for a student population with a wide range of reading and test-taking skills and backgrounds in science who are taking an introductory, general education science course. Individual instructors may be able to improve their instruction on specific topics (see some specific examples below), but the results do not indicate a major need for changes. Students may not have been especially motivated to think carefully before answering the questions because post-assessment scores had no bearing on their course grades. Therefore, these results should be viewed as a lower bound on student knowledge.

We re-opened the discussion on when the SLO assessment should be given and what kind of credit should be given to students to motivate them to "do their best" on the assessment while also assessing what they know and are likely to take away from the course at the end of the semester. We decided that the questions on the assessment should be included as part of final exams to make sure that students make a serious effort to answer the questions. (Instructors do not need to make these questions as valuable as other questions on their exams. Therefore, instructors do not have to replace much of their final exams with SLO assessment questions.) While there is some risk that students will be able to prepare for these questions (e.g., because they took the pre-test at the beginning of the semester or obtain a copy of an old final), the consensus was that the risk is minimal and unlikely to significantly bias the overall results.

We discussed how some instructors do not cover some of the topics on the assessments and whether we should modify the assessments to reduce the topics covered or instructors should expand the topics that they cover. Instructors could also use different assessments so long as the same rubric is used to evaluate the results. We decide that we should be able to settle on a set of key concepts that every instructor teaching a course should cover. Therefore, it will be department policy that all instructors teaching a course will use the same "basic knowledge" SLO assessment for that course.

Below are a few of the many reflections by the members of the department about what they learned from the SLO process and how it will affect their teaching in the future. To read more, see the complete PLO report and associated SLO reports.

Remarkably few students were able to identify the best moon phase in which to go tide pooling at the end of the semester. I need to review these ideas later in the semester, perhaps during the Sandy Shores ASA. I could add a study guide question on this topic (which means it will be a potential final exam question).

Some of the above missed questions such as Question #28 concerning light penetration into the ocean were missed because I didn't directly cover that information. To remedy this, I can add the information to my lectures, but last semester it would have been at the expense of something else. As a result of this SLO, I will reevaluate where I want to add and subtract information and what topics to accentuate in the future.

Post-test: Questions 5, 17, 23, which interestingly had almost the same number wrong on the pre-test. These low scores and lack of any change indicates that these concepts were not stressed as much in my class as much as other professors' classes.

Students' Relationship with Their Environment PLO (PLO #2)
Based on the data we collected the last time that we assessed the SLOs related to this PLO, we revised and streamlined the rubric. We also compiled student work to use as examples when applying the rubric so that our data might be somewhat more consistent. Unlike last time, different professors used different assessments to assess the SLO and administered them differently. All instructors used the same rubric to evaluate student work.

This was the first time that part-time instructors were required to participate in the SLO assessment process, and there was resistance to assessing the SLOs related to this PLO.

One major problem was in the communication of the idea that faculty do not have to use the example assessment provided to them: they can apply the rubric to an existing assessment that they already use in their course. In other words, faculty do not have to do much additional work to participate in the collection of SLO data. This concept needs to be emphasized again and again, especially to any faculty who have never assessed this SLO before.

The data must be interpreted cautiously. In addition to the small sample size for some courses, one must bear in mind the variety of assessments that were used and how the assessments were administered. The consensus in the department was that it is better for assessment of this SLO to become an organic part of our existing courses than to insist on uniform implementation. We think that requiring uniformity will make assessment of this SLO much more onerous but only marginally improve the usefulness of the data for improving instruction and student learning.

The data suggests that most students could identify significant and valid relationships between humans and their environment. Most students are at the “developing” level of being able to accurately describe and explain these connections at the end of the semester. In the past “pre-assessments” in a few classes demonstrated that almost all students start the semester at the “beginner” level, so most students progressed to the next level of the rubric.

In general, we were pleased by the results, and think that they are good for a student population with a wide range of writing skills and backgrounds in science who are taking an introductory, general education science course. The results do not indicate a major need for changes, but do demonstrate the need for us to continue helping our students practice their writing skills by demanding that our students do written work in our classes (e.g., homework, essay questions on exams, lab reports).

In general, there appears to be a weak correlation between students’ grades and their performance on this SLO. This is not particularly surprising since grades take into account many things that this SLO does not (scores on multiple-choice exams, participation), and assessments of this SLO put a premium on writing and critical thinking skills.

Lab students (e.g., geology 3 and geography 6) tended to do better on the assessment than students in the lecture courses, presumably because ideas shared between the lecture course and lab are reinforcing one another. An implication may be that we should consider changing curriculum so that that students who take a lecture course must take the associated lab course at the same time when possible.

Geology students tended to perform worse than geography and oceanography students. This may result in part because geology instructors tended to favor assessing the SLO on exams and in-class activities (with little or no preparation for the assessment) while geography instructors tended to favor take-home assessments. Unlike geology students, all oceanography students must take the oceanography lab course as well as the oceanography lecture course; as noted in the previous paragraph, this appears to improve their performance on the assessments.

Some faculty felt that it is an inappropriate SLO for particular courses. For example, instructors suggested that the primary purpose of their courses is developing skills (e.g. in labs, GIS). There are already program- and course-level SLOs that address students' mastery of course material. Perhaps the best way to think about these issues is that the "basic knowledge" SLOs are the "primary" SLOs in lab courses and other courses that emphasize skills. One beneficial thing that came from this discussion is that we should revise the "basic knowledge" SLO statement to reflect "skill" mastery as well. It should probably be called the "basic knowledge and skills" SLO.

Below are a few of the many reflections by the members of the department about what they learned from the SLO process and how it will affect their teaching in the future. To read more, see the complete PLO report and associated SLO reports.

For me, the greater value in doing the SLO assessment was focusing on what students seem to be taking away from the class. It was instructive to see which examples of human–environment interaction that students chose. There was a very wide variety of choice available because Geography 1 covers such a broad expanse of topics. Some of the topics covered in class clearly resonated more with students than others. I expected many student responses to include global climate change and ozone depletion as an example of human action affecting the environment. I did get a lot of those. I was surprised though by how many students explained how human activity influences soil and how it contributes to mass wasting. Similarly surprising was how many mentioned soil creep and the damage it does as their example of the physical environment affecting human lives. Either the lessons on soil and mass wasting made a big impact or that material provided a simpler, more obvious, and shorter answer to the question.

In the student responses, approximately 50% of the students who wrote about natural disasters tended to lump them altogether as affecting humans but did not address where or how each type of disaster occurs. Of the student answers on global warming, approximately 35% of the answers suggested that the destruction of the ozone layer and global warming are synonymous and that increasing CO_2 *is causing the hole in the ozone layer. Although there are connections between the two phenomena, only 15 students related the differences. This was a surprise to me because I thought we covered this topic well in class. Of the students who wrote about pollution, approximately 50% didn't distinguish between different types of pollution. They wrote that pollution leads to global warming without really elaborating how. (In retrospect, this and my other observations herein indicate that more time should be spent making sure the students understand the scientific linkage of cause and effect.)*

This SLO assessment has given me a lot of ideas of how to change my lecture and assignments. For example I have decided to spread the discussion of environmental issues more evenly throughout the semester instead of covering most of it in the last month of the class. I think this will be better because I can refer back to these issues, repeatedly throughout the remainder of a semester instead of just covering it just one time. I already do this with global warming, but I think it needs to be done with other issues and topics.

I do not think I will give this assessment in the same format the next time, because it was a little too open-ended. Since the assessment had no prompts, some of the students misunderstood what I was trying to get from them, so I think I will use several short prompts (products, pollution, global warming, climate, food) in the directions, so that the students are clear about the sub-topics I want them to reflect on. On the other hand, I will keep the same open-ended format since that allowed the students to write a paragraph (with or without diagrams) about each of the topics they chose. These essays were the best way for me to judge how well they learned the most important topics of the semester. As I have now given this assessment to students over several semesters, I am happy that it addresses the critical thinking skills and demonstration of basic earth science principals that I wish them to have a command of upon completing my course. Overall, students perform quite well, and surpass my expectation. This encourages me to employ the teaching strategies I find effective. I am already doing something new, which I feel better prepared the students. This "something" is assigning scientific articles and news items for analysis to the students throughout the semester. I will continue to do this.

Nature of Science PLO (PLO #3)
The data show a significant improvement in students' ability to identify the elements of the scientific method in a popular science article. At the beginning of the semester, over 60% of the students were "beginners" and 7% of students were "accomplished" at this task. At the end of the semester, over 60% of the students were beyond the "beginner" category, and almost 20% were "accomplished."

Two groups of sections had somewhat better student outcomes, oceanography sections and cultural geography sections. In addition to any instructor effects, this difference could be related to the quality of the students who enrolled in the sections or differences in the difficulty of the assessments (both physical geography and geology used the same assessments), because the data show that students in these sections performed substantially better on the pre-test. Nonetheless, student gains were substantially the same throughout the program. Unless both the pre-test and post-test in these sections were less difficult than those given to other sections, this evidence favors the "student quality hypothesis." In the future, we could try to better understand these results in a couple of ways. For example, we could use the physical geography and geology assessments in oceanography and cultural geography sections. We could also reverse the order in which we administer the assessments (i.e., use the pre-test as the post test, and vice versa).

We were pleased to see this improvement, and think that the results are "not bad" for a student population with a wide range of writing skills and backgrounds in science who are taking an introductory, general education science course. However, a substantial number of students were still performing in the "beginner" category at the end of the semester indicating the need for more practice and application of the concepts of the scientific method (e.g., in-class tasks, homework, labs).

Next time we need to record and analyze data on which elements of the scientific method are confusing students, or which elements are commonly mistaken for other elements. This data will guide our changes to instruction.

We are concerned that the assessments may be measuring students' reading comprehension, not just their knowledge of the scientific method. This is a particular problem since the assessments are discipline specific, so greater familiarity with the subject matter may inflate post test scores relative to pre-test scores. In the future, it would be useful to group the students into 2 categories for the data analysis: those with good reading comprehension of the article and those without both for the pre-test and the post test. To try to determine which category each student falls into, we could add a statement or two that contains information that is NOT in the article. If students do not mark these statements correctly (perhaps we need a third category: E = "not discussed in the article"), then we would put them in the "possibly poor reading comprehension" category.

Other possibilities include:

(1) using non-discipline-specific assessments so that greater familiarity with the subject matter does not lead to improved reading comprehension of the assessments and inflate student gains

(2) using the physical geography and geology assessments in oceanography and cultural geography sections

(3) reversing the order in which we administer the assessments (i.e., use the pre-test as the post test, and vice versa)

The department has at least achieved "proficiency" according to the standards in the ACCJC SLO rubric and is well on its way to "sustainable continuous quality improvement."

SLOs and assessment tools for them all exist and can be provided. A list of student learning outcomes is included as part of this program review, and the assessments can be found in the department's SLO assessment reports. The department developed a 4-year timeline for assessment of all SLOs in 2011 and has been assessing courses and programs offered each semester in accordance with the timeline since 2011.

Faculty members endeavor to inform students about the goals and purposes of their courses and this program. One can hear this everyday in the department's classrooms. The most easily accessible physical evidence from outside the classroom are syllabi: they clearly declare the course objectives and student learning outcomes, and the course outlines show when they will be addressed during the semester.

Discussion of SLOs is part of our regular department meetings and has dominated the meeting before the beginning of each semester on "flex day." Please refer to the department's meeting agendas and minutes (available on the department's webpage).

Probably the primary result of the department's assessments of student learning thus far has been identification of areas of success and areas that can be improved. For example, the data gathered from the assessments related to PLO#2 (students' articulation of their relationship with their environment) showed that at the end of semester our students can easily identify relationships between humans and their environment but need help describing the relationship in detail and making the relationship explicit. This led to a streamlining of the rubric so that it focuses more on these goals, and several instructors intend to make their assessment questions less open ended. The data gathered from the assessments related to PLO#1 (basic concepts and vocabulary of Earth Science) has helped individual instructors identify areas of their courses where some basic ideas were not retained as well as other ideas. For example, one instructor was surprised that the students could not determine the best time to go tide pooling based on the phase of the moon. Another realized that they needed to discuss the penetration of light into the ocean in more detail. The SLO and PLO assessment reports contain many more specific examples.

The main resource that faculty have utilized to improve student learning is their time. As before the institution of the SLO process, faculty continue to examine and reflect on the data that result from their assessments and use this information to modify their teaching and their courses to improve student learning. A major difference now is that faculty spend a lot more time making this evident to others and spend more time in formal dialogue with one another about these issues (as opposed to primarily discussing them ad hoc “around the water cooler” as in the past).

In a few cases, assessment data gathered and reported as part of the SLO process has helped the department argue for additional resources. For example, Geography 9 would benefit from a new sling psychrometer and barometer for exercises that demonstrate foundational meteorological concepts like humidity and atmospheric pressure.

More generally, faculty used the assessment results to fine tune instruction. Instructors elaborated on concepts that were universally low scoring, and decreased time spent on topics well understood by students. In Earth Science, common ways that faculty elaborate on a concept are drawing more diagrams on the whiteboard, incorporating videos and animations into the lecture, using models to demonstrate, and developing a lab or class activity.

V. Facilities and Equipment

Equipment requests that were fulfilled in 2012-13 include a second 3D relief globe on a stand that can be shared between classrooms for physical science and cultural courses alike. A large wall map that was requested in 2011 arrived in fall 2012 semester to be used for instruction in NS-205, the primary geography classroom. Finally, a class set of sling psychrometers was obtained (with department budget) in 2012 to address results from Geography 9’s Basic Knowledge SLO assessment.

Recommendations
The Earth Sciences Department also requested the following in our 2013-14 Annual Plan and/or the Division Unit Plan:

(1) One immediate (1-2 years) technology need is a class set of GPS receivers used in Geography 6 and Geography 8. Obtaining this equipment will accomplish three goals: help to integrate hands-on activities into curriculum, illustrate aspects of the scientific method for course SLO #3, and adhere to Geography 8’s course outline of record. The current set is incomplete and more than ten years old (estimated cost for 25 GPS units = $5,000.00).

(2) Models (e.g. posters of products from the earth, digital meteorology apparatuses, groundwater models, El Niño demonstrations, etc.) to fill our new display cases and use for classroom instruction are needed. Being able to rotate through a variety of such models benefit curriculum and also attract potential students and visitors to the department. This immediate (1-2 years) request will benefit all earth science courses as well as visitors to the department (cost estimate = $2,000.00).

(3) Twenty Ryobi Non-Contact Infrared Thermometers to measure the temperature of different surfaces is a long-range request (2-4 years) to be used for Geography 9, Geology 30, and Geology 34. Hands-on learning complements in-class instruction, and in this case, the equipment can be used across all disciplines (cost estimate = $600.00).

VI. Technology and Software

Technology is a key component to all Earth Science curriculum. The department's current computer hardware and software needs have been met. A minor, albeit recurring, issue many instructors encounter is overdue computer updates that no one except ITS has permission to resolve. As a result, in-class video clips and animations are sometimes not functional until a work order is complete.

Recommendations
One very important recommendation is for four new multimedia ceiling projectors in the department's four classrooms. Three of the projectors (in NS-206, NS-218, NS-219) have dimming bulbs. The fourth, in NS-205, is in such poor condition that it projects a green tinge onto the screen. The lights must frequently be turned off completely so that students can see shapes and colors better. This request is immediate (1-2 years) because the ability to deliver quality education depends largely on providing students with clearly visible slides, the focal point of most lecture courses (estimated cost for four projectors and ceiling mounts = $10,000.00).

VII. Staffing

The Earth Sciences Department hired a full-time Geography instructor beginning in Fall 2011. Julienne Gard replaced a retiring Geography instructor, Gerald Brothen. Approximately one-third of Geography classes are still taught by part-timers (2.950 FTE in Fall 2012, 3.30 FTE in Fall 2009, with 2 full-time instructors).

Geology and Oceanography have 4 full-time instructors for classes equivalent to 4.50 FTE in Fall 2012, and 5.50 FTE in Fall 2009. The Earth Sciences faculty strongly believe that students will have a more successful experience with Earth Science curriculum when a full-time instructor is present. Full-time positions are, by their nature, more conducive to devoting time and energy to a single program and college.

The Earth Sciences Department is fortunate to have a full-time staff Laboratory Technician dedicated to the maintenance of equipment and classroom concerns. Changwoo Cha was hired in July 2010 after Sim Yoe retired. Cha handles all equipment, lab prep, cataloguing, requisitions, safety reports, and maintenance issues very professionally. Faculty members appreciate his ongoing dedication and service, and agree that the technician should always remain a 100% position.

Recommendations
Although hiring full-time instructors may not occur in the near future due to budget constraints, we recommend hiring one Geology/Oceanography and one Geography full-time faculty to cover the many sections currently taught by part-time instructors. This long-range (2-4 years) staffing need will help the department meet its goals for ensuring continued growth of the program while also improving success and retention rates in the courses (annual cost for two full-time instructors = $200,000.00).

VIII. Direction and Vision

For the next four years, the Earth Sciences Department plans to direct its attention and energy toward three overarching goals: <u>evolving relative to the field and industry</u>, <u>recruiting and transferring earth science majors</u>, and <u>increasing success and retention</u>. This vision will be achieved using the strong aspects of our current model combined with the guidance of the College Mission and Strategic Initiatives.

At this time the Earth Sciences Department at El Camino College is well positioned to continue to offer a quality program that reflects what is happening in the field of earth sciences. Careers in the earth sciences are valuable to the younger generations because there is great demand, most of the jobs in the field are high paying, and they cannot be outsourced. Nationwide the field has proliferated due to the high prices of petroleum and other raw materials, creating great opportunities for people educated in the geologic sciences. For the past few years the Department of Labor has identified “geospatial technologies” as one of the three most important emerging industries, one that requires education in spatial thinking vis-à-vis a degree in geography coupled with GIS training. These trends will only increase as the nation eventually enters another boom cycle. Evolving with respective fields is critical to maintaining relevance and competitiveness, which is why our courses, alternate site activities, seminars, conferences, and extracurricular activities will use contemporary issues as a guide for what the department emphasizes. In the last year, issues surrounding climate change, waste management, renewable energy, ocean contamination, groundwater management, among others, were presented to students.

The department will continue to be a source of future majors transferring to four-year colleges and universities. In order to guarantee this trend, we will provide and encourage participation in the aforementioned activities. Three specific activities/functions are outlined below:

(1) Offer multiple field experiences (i.e. excursions to Owens Valley, Death Valley, Anza Borrego, and the Central Coast), which engage students of all learning styles. Furthermore, the Science Club will continue to attract potential majors by sponsoring local day trips as well as overnight trips to northern California, Arizona, and Utah. The success of the latter was recognized by the ICC in May 2013 when the council identified the spring break trip to the Grand Canyon as the “Best Club Event of the Year” during the annual banquet. Both curriculum-based and extracurricular trips align with **Strategic Initiative C** because there is no better way to “foster a positive learning environment and

sense of community and cooperation" than by bringing students together to learn in a new and exciting place. Our majors and devoted trip-goers view each other as family and operate as a learning cohort.

(2) Offer a monthly seminar to prepare majors for a career in the Earth Sciences. Each meeting in this unique series highlights different experiences and recommendations for their future. Such "support services to promote student success" (**Strategic Initiative B**) rely primarily on local experts in geology, oceanography, geography, and counseling to inform about potential careers and career paths. A CSULB geology graduate student presented most recently in May 2013.

(3) In keeping with **Strategic Initiative D**, the department continually works to "develop and enhance partnerships with schools, colleges, universities, business, and community-based organizations to respond to the workforce training." The summer 2013 STEM workshop organized by a full-time geology faculty member will bring teachers from El Camino College, Mt. St. Mary's College, and a number of Los Angeles area high schools together in Monterey, CA to learn techniques for incorporating field studies into science classes. On a more long-term basis, our close relationships with The South Bay Lapidary and Mineral Society and Los Angeles Geographical Society not only ensure scholarship funds but also persuade the students to develop professional partnerships beyond the college. Roughly fifteen geology majors volunteer at the former's annual rock and mineral show in March, and approximately half a dozen geography majors present research at the latter's annual student presentation night in May. Faculty also guest lecture at the societies' monthly meetings, leading the students by example.

Increasing success and retention is an ongoing effort in Earth Sciences. To achieve this goal, the department employs a number of common strategies. A large emphasis is placed on using a "variety of instructional methods" (**Strategic Initiative A**). The faculty pride themselves on the array of models, equipment, class activities, Alternate Site Activities, and multimedia that are regularly integrated into lectures and labs. Faculty mentors strongly encourage all new adjunct and full-time instructors to embrace these methods. We gauge our success and retention improvement by monitoring our past rates. Specifically, we rely on success and retention data (by course and instructor) as well as results from course and program level SLOs, all of which is in keeping with "the effective use of assessment, program review, planning, and resource allocation" (**Strategic Initiative E**). Also critical to department development and student success is the addition of cutting-edge educational materials, which speaks directly to **Strategic Initiative F**'s "facility and technology improvements." The department takes the Annual Plan very seriously, discussing and prioritizing everyone's needs at department meetings before making equipment and technology requests. No plan is ever submitted without numerous supplements for bolstering instruction.

Using the College Mission Statement as a framework, we endeavor to continue providing a "quality, comprehensive educational program and service to ensure the educational success of students in our diverse community" in alignment with the Strategic Initiatives of the college. The next four years will use data generated from student learning outcomes and success/retention rates to indicate where and how we must improve. At the same time, we will continue unchanged with most aspects of our program, given its success. The department educates high numbers of students on how to live and work through “sustainable, environmentally sensitive practices” (**Strategic Initiative G**), the foremost goal of any earth scientist.

IX. Prioritized Recommendations

Below is our list of prioritized needs and recommendations. We placed greatest priority on the material needs that are most outdated and critical to instruction, followed by the long-range recommendations that will best assist our program growth.

(1) 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).

(2) Twenty-five Garmin eTrex handheld GPS Navigator receivers to enhance teaching, as identified by **Strategic Initiative A** (cost estimate = $5,000.00).

(3) Models for the new display cases and classroom instruction will help the department to align with **Strategic Initiative A** (cost estimate = $2,000.00).

(4) 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).

(5) 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).

(6) One full-time instructor in Geography will maintain and strengthen quality education, as stated in **Strategic Initiative B** (cost estimate = $100,000.00).

(7) One full-time instructor in Geology/Oceanography will maintain and strengthen quality education, as stated in **Strategic Initiative B** (cost estimate = $100,000.00).