Program Overview	
Program	EARTH SCIENCE
Does this program have a CTE component?	Yes
Academic Year	2016/2017
Review Period	6 Year
Service Areas	

A. Program Description and Goals

This section addresses the big picture. Prompts should help you describe your program and goals and the relationship to the institutional mission, vision and goals, and how the program is funded.

1. Describe the program and/or service area under review and how the program supports the mission of Santa Monica College.

There are four diversified and yet, integrated, academic programs within the Earth Science department: Anthropology, Astronomy, Geography and Geology. We also have Career Technical Education (CTE) programs housed within the Earth Science Department under the over-arching umbrella of the Sustainable Technologies Programs: Solar Photovoltaic Installation; Recycling and Resource Management; and Energy Efficiency. Although we are a diversified academic department, housing four separate academic disciplines and our CTE programs, we have many common goals that support the mission of Santa Monica College through the fostering of the following behaviors and attitudes in our students as they participate in our courses:

- Promote intellectual inquiry using the Scientific Method
- Recognition of environmental and cultural diversity
- Intellectual curiosity about the evolution of humankind, the Earth and the Universe
- Develop basic discipline-specific literacy and currency in Anthropology, Astronomy, Geology & Geography
- Prepare students for career opportunities in Solar Photovoltaic Installation, Energy Efficiency, or Recycling and Resource Management

These behaviors and attitudes are clearly in line with the SMC Mission statement…*"encourages personal and intellectual exploration, and challenges and supports students in achieving their educational goals"; "…students learn to contribute to the global community as they develop an understanding of their relationship to diverse social, cultural, political, economic, technological, and natural environments";* "*…programs … assist students in the development of skills needed to succeed in college, prepare students for careers and transfer".*

The Earth Science Department has 13 full-time faculty and approximately 25-30 part-time faculty. The Earth Science Department has accomplished a great deal in terms of active involvement in college communities, engagement with the business community through our Advisory Boards and internship partnerships, and development of programs that are beneficial to our students.

We offer two state-approved Certificates in Achievement: 18-unit Recycling and Resource Management and 19-unit Solar Photovoltaic Installation. We also offer three departmental certificates: 12 unit Solar Photovoltaic Installation; 13-unit Energy Efficiency Specialist; and 12-unit Recycling and Resource Management. We are in the process of developing a state-approved 19-unit Energy Efficiency Specialist. There are also two Associate Degrees offered: AA/AS in Solar Photovoltaic Installation, and AA/AS in Recycling and Resource Management.

We have also participated in creating two AA-T degrees in Spring 2014: Geography and Anthropology. We are in the process of developing a Geology AS-T degree. **(The investigation of a possible AS-T degree in Astronomy found no transfer model curriculum template at the California Community Colleges Chancellor's office website.)**

2. Identify the overarching goal(s) or charge/responsibilities of the program or service area. If appropriate, include ensuring/monitoring compliance with state, federal or other mandates.

The Earth Science Department's programs have many common objectives: to help our students discover the origin and development of the universe, our planet and humans, to learn how our planet functions and the limits of the Earth's resources, and to realize the

capacity of humans to alter many global processes. One of our department Student Learning Outcomes specifically addresses this objective: "Earth Science students will acquire and develop knowledge and skills that will equip them to be informed, engaged, and productive global citizens, capable of leading humanity toward a more sustainable and adaptable future."

Students in the Sustainable Technologies Programs Certificate or AA programs will have practical, hands-on experience using state-of-the-art technology. The goal of the program is to create a cohesive and robust academic program that builds an academic and industry-based community around emerging environmental fields including renewable energy production, solar installation, energy efficiency and weatherization, water efficiency, resource and recycling management, and green business. These are new, emerging fields and with industry growth and advances in technology, new products and processes appear for which students need to be prepared. Students in these programs attain not only technological skills in Waste Management, Energy Systems, and Solar Photovoltaic Design and Installation, but also familiarize themselves with the analytic tools for properly assessing the resources, designing the solutions, and preparing the reports and will be able to present their findings in written, visual and verbal formats upon completion of the entire program.

The Solar Photovoltaic Installation program, The Energy Efficiency program, and the Recycling and Resource Management track are each and all intended to give Santa Monica College students a pathway into the growing field of sustainability and to give an opportunity for them to obtain industry-recognized credentials.

3. If applicable, describe how the Institutional Learning Outcomes (ILOs), Supporting Goals, and/or Strategic Initiatives of the institution are integrated into the goals of the program or service area.

The Earth Science Department is clearly integrated with the college's ILOS, Supporting Goals, and Strategic Initiative I³(Institutional Imagination Initiative) in multiple ways. First, our three departmental SLOs:

1. Earth Science students will recognize Earth as (1) the natural and cultural home of human beings, a continually evolving species; and (2) as a four-and-a-half billion-year-old planet within an equally evolving and ever-changing universe.
2. Earth Science students will acquire and develop knowledge and skills that will equip them to be informed, engaged, and productive global citizens, capable of leading humanity toward a more sustainable and adaptable future.
3. Students will demonstrate this knowledge through presentation of research via oral and written papers, through field work and other means of assessment.

address all of SMC's ILOs of "acquiring self-confidence and self-discipline" in the pursuit of their academic and personal lives (ILO #1; SLO #2), "obtaining knowledge and academic skills..." (ILO #2; SLO #2 & #3), "respecting inter-relatedness of the global environment" and diversity (ILO #3; SLO #1), "...living a sustainable and ethical life style" (ILO #4; SLO #2), and engagement of the subject matter that "motivates the integration of knowledge and skills beyond the classroom" (ILO #5; SLO #1, #2, & #3).

Second, our department's faculty participation in varied Academic Senate committees over the past six years including serving as Chairs of the Global Council, Program Review, Distance Education, and Environmental Affairs Committees, including faculty serving as voting members of the Curriculum Committee, Career Technical Education, Distance Education, and Sabbaticals Committees, not only increases connections of the Earth Science Department to the wider SMC community, but also acts as a conduit in the "...exploration of intriguing new pedagogical ideas and structural models...to guide the process of preparing students for accelerating change, careers that are yet to exist, and access to educational opportunity." (I³)

Third, the Earth Science Department through its development over the past six years of new curriculum in anthropology, astronomy, geology, and Sustainable Technologies, AA-Ts in anthropology, geography, and geology, Certificates of Achievement and Department Certificates in Sustainable Technologies meets the Supporting Goal of *Innovative and Responsive Academic Environment* to "continuously develop curricular programs, learning strategies, and services to meet the evolving needs of students and the community." We also clearly achieve this with our faculty's continued, active participation in STEM and Global Citizenship since the initiation of these programs. The Supporting Goal of *Supportive Collegial Environment* is demonstrated with our faculty advising Associated Student Clubs including the Astronomy Club and the Anthropology Club.

Other varied methods that the Earth Science Department integrates ILOs, Supporting Goals, and Strategic Initiatives of the college includes: 1) the development of Study Abroad programs in Belize, Guatemala, Mexico, Italy, and South Africa; 2) out-of-the-classroom field outings in anthropology, astronomy, geography, geology, and Sustainable Technology courses; 3) our faculty giving guest presentations in Global Studies courses, and AS Clubs advised by faculty members outside the Earth Science Department; 4)

developing and presenting workshops for Professional Development FLEX Days, and the Center for Teaching Excellence; 5) our faculty's on-going participation in Professional Development activities at SMC including the Faculty Summer Institute, CORA, CANVAS; and 6) presenting at international academic conferences (both in the United States and abroad).

4. If your program receives operating funding from any source other than District funds identify the funding source. If applicable, note the start and end dates of the funding (generally a grant), the percentage of the program budget supported by non-District funding, and list any staff positions funded wholly or in part by non-District funds. Do not include awards for non-operational items such as equipment (ex. VTEA) or value added activities (ex. Margin of Excellence).

The Sustainable Technologies Program has secured a three-year, $198.000 grant from the National Science Foundation that began in Fall 2014. The grant supports interdepartmental faculty participation by a co-PI Physics Professor for development of instructional modules and a part-time staff position in Career Counseling to assist in outreach and internship development. The PI receives funding for program management outside of Fall and Spring term teaching.

B. Populations Served

In this section you will provide information that describes who your program or service area serves. When comparing data from different periods, use a consistent time frame (ex. Compare one fall term to another fall term)

B. Saved Information For Populations Served

Area/Discipline Information Pertains To

All Disciplines (answered once)

1. Describe your students in terms of ethnicity, race, gender, age, residency status, citizenship, educational goal, enrollment status, and full/part-time status. Note any changes in student or enrollment data since the last six-year program review and the possible reasons for the changes.

As culled from the data tables below, a few trends can be noted in reference to the Earth Science student population vs. the overall student population of SMC from 2011-2015. These trends include the following:

1. Earth Science students are slightly more Hispanic or white, male, and/or California residents.
2. Earth Science students are slightly less black, foreign, and/or undecided upon a major.
3. What appears to be significantly different is that Earth Science students are younger (especially in the 20-24 age demographic), *more* continuing students, and/or more full-time students.
4. Also what appears to be significantly different is that Earth Science students are *less* Asian, less seeking an Associate Degree or have a Career Objective (?), and/or much less 1st time students or returning students

ETHNICITY	Am Indian		Asian/PI		Black		Hispanic		Multi-Races		White	
	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC
2011	0.3%	0.2%	15.4%	18.5%	7.8%	9.8%	33.3%	33.8%	3.9%	3.4%	35.1%	30.5%
2012	0.2%	0.3%	13.9%	15.5%	7.0%	9.6%	37.2%	35.8%	4.5%	3.6%	33.2%	28.2%
2013	0.2%	0.2%	11.0%	13.8%	7.9%	9.2%	40.0%	37.4%	4.3%	3.9%	29.8%	26.6%
2014	0.3%	0.2%	10.7%	14.4%	7.9%	9.1%	39.8%	38.6%	5.0%	3.9%	29.4%	26.6%
2015	0.2%	0.2%	11.4%	15.8%	9.2%	9.2%	42.4%	39.0%	4.5%	3.9%	28.1%	27.5%

GENDER	Female		Male	
	Earth Sci.	SMC	Earth Sci.	SMC
2011	50.9%	54.0%	49.1%	46.0%
2012	50.9%	52.9%	49.1%	47.1%
2013	50.3%	52.3%	49.7%	47.7%
2014	52.0%	52.5%	48.0%	47.5%
2015	52.1%	52.8%	47.9%	47.2%

AGE	0-19		20-24		25-29		30-39		40-49		>49	
	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC
2011	34.7%	31.8%	47.2%	39.4%	9.1%	12.3%	4.6%	9.4%	2.5%	4.1%	2.0%	3.0%
2012	33.2%	30.6%	47.8%	40.6%	8.9%	12.5%	5.6%	9.3%	2.8%	3.9%	1.7%	3.0%
2013	30.7%	30.5%	50.9%	41.6%	9.6%	12.4%	5.1%	8.9%	1.9%	3.6%	1.9%	3.0%
2014	31.2%	30.0%	52.7%	42.7%	9.1%	12.4%	3.7%	8.3%	1.6%	3.5%	1.6%	3.1%
2015	33.2%	30.7%	49.4%	41.2%	10.0%	12.8%	4.7%	8.7%	1.4%	3.5%	1.3%	3.1%

FULL vs. PART TIME	Full Time	
	Earth Sci.	SMC
2011	59.8%	37.9%
2012	56.1%	35.3%
2013	54.4%	35.7%
2014	54.7%	36.1%
2015	54.8%	37.4%

RESIDENCY	CA		Out State		Foreign	
	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC
2011	84.6%	83.5%	6.2%	5.9%	9.2%	10.7%
2012	85.7%	83.2%	5.9%	6.0%	8.4%	10.8%
2013	85.3%	82.5%	6.7%	6.3%	8.1%	11.2%
2014	83.4%	82.3%	7.2%	6.4%	9.4%	11.4%
2015	83.8%	82.2%	7.3%	6.5%	8.9%	11.2%

EDUCATIONAL GOAL	Associate	Degree	Career	Objective	Certificate		Ed. Dev.		Basic Skills		Undecided	
	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC
2011	2.3%	5.7%	2.8%	6.1%	0.6%	1.4%	2.3%	5.3%	NA	0.3%	4.8%	5.6%
2012	2.7%	6.3%	2.8%	5.6%	1.1%	1.6%	2.0%	4.8%	0.1%	0.3%	4.0%	4.7%
2013	3.3%	6.5%	2.0%	5.1%	0.7%	1.5%	1.9%	4.4%	0.1%	0.3%	3.2%	4.5%
2014	4.0%	6.7%	1.5%	4.9%	0.7%	1.4%	2.0%	4.3%	0.1%	0.3%	3.1%	4.4%
2015	1.4%	2.2%	1.5%	5.2%	0.5%	1.6%	1.5%	4.5%	NA	0.3%	4.8%	9.0%

ENROLLMENT STATUS	Continuing		1st Time		1st Time	Transfer	HS		Returning	
	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC	Earth Sci.	SMC
2011	68.5%	57.3%	16.0%	20.7%	9.5%	11.0%	0.0%	0.5%	5.9%	10.4%
2012	72.2%	58.0%	12.4%	19.3%	9.5%	11.8%	0.0%	0.6%	5.9%	10.4%
2013	69.8%	58.4%	12.6%	19.5%	11.3%	11.2%	0.2%	0.7%	6.1%	10.2%
2014	70.4%	58.8%	13.4%	19.1%	9.5%	11.1%	0.2%	0.8%	6.5%	10.1%
2015	68.4%	57.0%	14.7%	19.2%	10.6%	11.7%	0.2%	1.9%	6.2%	10.2%

Notable differences in student enrollment data within the Earth Science Department since the previous 6-year Program

Review (2005-2009) include the following:

- Increased percentage of Hispanic students enrolling in ES courses. This change has brought the numbers of Hispanic students in ES courses from slightly below the college-wide percentages from 2005-2009, to slightly above the college-wide averages over the past six years.
- Increased percentages of younger students enrolling in ES courses. (Other age groups are similar to the previous 6-year Program Review.)

Consistent over the past two 6-year Program Review cycles for student enrollment in Earth Science classes are the following:

- What appears to be significantly higher percentage of full-time students than college-wide.
- What appears to be significantly lower percentage of basic skills students than college-wide.
- Slightly more male students than college-wide.

Some of these continuing trends may be explained by the fact that 1) a majority of ES students enroll in our courses with the goal of transferring to a 4-year university, and 2) as a science-based department, ES courses require a general level of math preparation that limits the success of basic skills students. A continuing challenge has been in attracting black and Asian students to enroll in Earth Science classes, though our department ***has successfully attracted greater percentages of Hispanic students to our courses over the last six year period.***

2. Compare your student population with the college demographic. Are your students different from the college population?

As culled from the data tables in question #1, a few trends can be noted in reference to the Earth Science student population vs. the overall student population of SMC from 2011-2015. These trends include the following:

1. Earth Science students are slightly more Hispanic or white, male, and/or California residents.
2. Earth Science students are slightly less black, foreign, and/or undecided upon a major.
3. What appears to be significantly different is that Earth Science students are younger (especially in the 20-24 age demographic), *more* continuing students, and/or more full-time students.
4. Also what appears to be significantly different is that Earth Science students are *less* Asian, less seeking an Associate Degree or have a Career Objective (?), and/or much less 1st time students or returning students.

3. What percentage of students in your program place in basic skills and, if applicable, how does this impact your program goals and/or curriculum.

Student status identified as Basic Skills in Earth Science classes (10-11%) is about one-half as compared to college wide (18-21%) from 2011-2015. This is probably a result of students' necessity of having achieved basic mathematic competencies prior to enrolling in the science-based courses of the Earth Science Department.

BASIC SKILLS	Earth Sci.	SMC
2011	11.6%	21.3%
2012	11.1%	20.2%
2013	10.1%	19.5%
2014	10.6%	18.6%
2015	11.1%	17.9%

C. Program Evaluation

In this section programs/units are to identify how, using what tools, and when program evaluation takes place. Evaluation must include outcomes assessment as well as any other measures used by the program. Please use Section D to address program responses to the findings described in this section.

Programs/units with multiple disciplines or functions may choose to answer the following questions for each area. If this is your preferred method of responding, begin by selecting a discipline/function from the drop down, answer the set of questions and click "Save", your answers will be added to the bottom of page. Do this for each discipline/function. If you would like to answer the questions once, choose "Answer Once" from the drop down.

How would you like to answer these questions? *By discipline and CTE programs: Anthropology, Astronomy, Geography, Geology, and Sustainable Technologies (STP)*

C. Information For Program Evaluation

Area/Discipline Information Pertains To

ANTHRO: ANTHROPOLOGY

1. List the specific SLOs your program or discipline has chosen to focus on this year for discussion of program improvement.

SLOs are specific, measurable statements of 'what a student should know, be able to do, or value when they complete a course. An SLO focuses on specific knowledge, attitudes, or behaviors that students will demonstrate or possess as a result of instruction.

We have chosen to focus on the SLOs for Anthropology 1 (Physical Anthropology) and Anthropology 5 (Physical Anthropology with Lab).

SLO 1: The student will be able to demonstrate an understanding of human heredity and assess this information and its relationship to the social issues we face as a society as a result of our genetic technology.

SLO 2: The student will be able to assess the role of heredity in the process of evolution along with the mechanisms of natural selection, genetic drift and gene flow, and will be able to recognize and identify the relationships between primates, the natural world and the processes of evolution.

SLO 3: The student will be capable of judging the consequences of evolution through the appraisal of human variation, human osteology, primatology and the primate fossil record.

2. Describe how the program assesses SLOs and uses the results for program improvement including:

- **how outcomes are assessed and how often**
- **how and when the program or discipline reviews the results and engages program/discipline faculty in the process**

Over the last six years, the Anthropology Program has regularly reviewed and revised our courses' Student Learning Outcomes (SLOs). Anthropology course SLOs all map to one or more of the Institutional Learning Outcomes and the Anthropology Program's Learning Outcomes (PLOs). Anthropology PLOs are as follows:

1. Students will organize the cultural, historical, and biological aspects of humanness into an integrated perspective of humans as unique and adapted bio-cultural animals.
2. Students will use key concepts, methodologies and developments in anthropology to recognize, describe, evaluate and analyze various aspects of human behavior.

The Anthropology Program's PLOs and each of our course SLOs are representative of the overall goals of the Earth Science Department and the vision, mission, and goals of the college, as a whole.

All course-level Student Learning Outcomes are assessed in every anthropology course, every semester. These SLOs are assessed in several ways including questions on midterm or final exams (most common), or take home written assignments. The essay and test questions are standardized for each course. At the end of every semester, instructors complete an SLO assessment for each student, submitted electronically with the end of semester grade report. Three mutually exclusive criteria are selected to assess each SLO: "Meets Standard" if the student has successfully met the requirements of an SLO, "Does Not Meet Standard" if the student has not met the requirements of an SLO, or "Not Assessed" used for students that did not complete enough of the required assignments, problems or activities for an instructor to make a fair assessment of their SLO achievement (this most frequently occurs when students withdrawal from a course, or simply stop attending the course without officially withdrawing from the course). All instructors are encouraged to review their SLO achievement rates and summaries at their mProfessor site on a regular basis.

3. If your program or discipline issues a degree or certificate list each degree or certificate and the core competencies students are expected to achieve on completion.

Core competencies focus on the body of knowledge, attitudes, and behaviors a student will have acquired upon completion of a program or certificate and are assessed by either a capstone course or success rates on SLOs for core courses.

The Anthropology Program offers an Associate of Arts Degree in Anthropology for Transfer (AA-T Anthropology). This degree fulfills the lower division anthropology course requirements for students wanting to transfer and complete a Bachelor of Arts in Anthropology for both the University of California and California State University systems.

Upon completion of Anthropology classes:

1. Students will organize the cultural, historical, and biological aspects of humanness into an integrated perspective of humans as unique and adapted bio-cultural animals.

2. Students will use key concepts, methodologies and developments in anthropology to recognize, describe, evaluate and analyze various aspects of human behavior.

4. What other evaluation measures does your program or discipline use to inform planning? (For example, student surveys, enrollment trends, student success, retention, degrees/certificates awarded, job placement, transfer rates, TIMS report, tutor usage etc.) Note trends and differences in performance by group (ethnicity, gender, age) or enrollment type (day/evening, on-ground/on-line).

The Anthropology Program utilizes varied evaluation measurements as a means to guide planning. Among the most important measurements we have is access to quantifiable data which includes student success and retention rates.

Based on the data tables below, for *student success* a few trends since the past 6-year Program Review are noted including:

- Women have slightly higher success rates than do men - which is consistent with college-wide trends. (There is an unexplainable sharp decrease in student success for both women and men in anthropology classes in 2015.)
- Student success measured by age for all age groups is similar for anthropology students as it is for all SMC students. (*Note: the sample size for anthropology students in the 40-49 and >49 ages groups is very small making comparisons to the overall SMC student body inappropriate.)
- In terms of ethnicity, anthropology students' success is consistent with SMC trends except for white students which are lower than college-wide success. This is especially apparent for the years 2011 and 2015.

STUDENT SUCCESS												
ETHNICITY	**Am Indian**		**Asian**		**Black**		**Hispanic**		**Multi-Races**		**White**	
	Anthro	SMC	**Anthro**	SMC	**Anthro**	SMC	**Anthro**	SMC	**Anthro**	SMC	**Anthro**	SMC
2011	50.0%	52.3%	78.0%	75.1%	45.7%	53.6%	59.5%	63.4%	65.3%	82.0%	69.2%	86.8%
2012	100.0%	54.9%	73.1%	75.1%	55.8%	53.6%	61.0%	62.7%	61.7%	79.5%	80.7%	85.0%
2013	75.0%	60.4%	70.9%	75.0%	53.3%	54.4%	60.2%	61.1%	66.0%	80.4%	79.0%	85.4%
2014	66.7%	61.0%	73.4%	74.4%	55.2%	55.0%	58.1%	61.2%	60.0%	78.5%	78.6%	85.9%
2015	NA	58.7%	75.8%	75.5%	46.4%	54.5%	50.6%	60.6%	63.8%	79.1%	69.8%	85.4%
GENDER	**Female**		**Male**									
	Anthro	SMC	**Anthro**	SMC								
2011	68.8%	70.5%	61.4%	66.8%								
2012	71.8%	70.3%	66.0%	66.1%								
2013	67.2%	70.1%	67.7%	65.8%								
2014	68.5%	69.9%	62.7%	66.0%								
2015	62.2%	69.5%	56.7%	65.7%								
AGE	**0-19**		**20-24**		**25-29**		**30-39**		**40-49**		**>49**	
	Anthro	SMC	**Anthro**	SMC	**Anthro**	SMC	**Anthro**	SMC	**Anthro**	SMC	**Anthro**	SMC
2011	66.4%	68.4%	64.5%	67.7%	71.3%	70.6%	62.9%	71.7%	66.7%	72.1%	71.4%	72.4%
2012	66.1%	67.6%	70.2%	67.3%	74.7%	70.4%	81.8%	72.0%	76.9%	71.3%	50.0%	72.9%
2013	67.3%	67.8%	67.7%	67.1%	67.7%	70.0%	62.1%	71.3%	80.0%	70.7%	50.0%	69.6%
2014	70.8%	68.6%	61.9%	66.6%	69.4%	68.9%	66.7%	70.9%	75.0%	71.0%	62.5%	71.2%
2015	61.9%	67.4%	58.3%	66.8%	61.2%	69.0%	52.4%	69.6%	41.7%	73.4%	80.0%	70.3%

Based on the data tables below, for *course retention* rates a few trends since the past 6-year Program Review are noted including:

- Retention rates for women are slightly higher than those of men - which is consistent with SMC trends.
- For the younger age demographics (0-19 years, 20-24, and 25-29), anthropology students have slightly higher retention rates than does the overall SMC student body. For the older age demographics (30-39 years, 40-49, >49) there is significantly lower success for anthropology students in comparison to the overall SMC student body. (*Note: the sample size in these older demographics is very low making it difficult to make appropriate comparisons with the SMC student body.)
- Retention rates for all ethnic groups are slightly higher for anthropology students (with the exception of the mixed race category = slightly lower - yet once again the sample size is very low) in comparison with general SMC trends.

RETENTION												
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	Anthro	SMC	Anthro	SMC	Anthro	SMC	Anthro	SMC	Anthro	SMC	Anthro	SMC
2011	75.0%	74.8%	90.7%	88.8%	85.7%	79.3%	89.3%	84.1%	89.8%	82.0%	86.5%	86.8%
2012	100.0%	75.3%	86.9%	86.7%	78.8%	75.2%	85.3%	81.0%	74.5%	79.5%	91.6%	85.0%
2013	75.0%	80.5%	82.1%	86.6%	80.0%	76.2%	84.4%	79.8%	78.0%	80.4%	89.3%	85.4%
2014	83.3%	75.2%	85.6%	87.3%	83.6%	76.4%	78.5%	79.6%	71.0%	78.5%	87.7%	85.9%
2015	NA	76.2%	87.1%	88.4%	79.8%	74.9%	76.8%	78.5%	77.6%	79.1%	82.1%	85.4%
GENDER	Female		Male									
	Anthro	SMC	Anthro	SMC								
2011	90.4%	85.8%	85.6%	85.0%								
2012	88.0%	84.0%	85.5%	82.2%								
2013	83.7%	83.9%	86.5%	82.7%								
2014	84.2%	83.6%	80.3%	82.7%								
2015	80.7%	82.9%	78.5%	82.0%								
AGE	0-19		20-24		25-29		30-39		40-49		>49	
	Anthro	SMC	Anthro	SMC	Anthro	SMC	Anthro	SMC	Anthro	SMC	Anthro	SMC
2011	89.0%	87.0%	89.4%	85.2%	84.0%	83.8%	82.9%	83.6%	71.4%	83.1%	71.4%	82.1%
2012	86.5%	84.6%	86.7%	82.6%	89.3%	82.2%	90.9%	82.0%	50.0%	81.2%	70.0%	81.9%
2013	85.6%	84.8%	85.3%	82.7%	82.8%	82.6%	79.3%	81.8%	50.0%	82.8%	62.5%	81.3%
2014	86.0%	84.9%	80.5%	82.7%	80.2%	81.8%	85.7%	81.1%	62.5%	80.6%	87.5%	82.3%
2015	83.0%	83.9%	78.6%	82.3%	76.7%	80.7%	66.7%	79.7%	80.0%	82.8%	80.0%	79.9%

5. If applicable, discuss achievement rates on state licensure exams.

NA.

6. Career Technical Education (CTE) programs are required to have active industry advisory boards which meet at least once a year. (Attach minutes from each meeting since the last program review report). List advisory board membership, how often it meets, and indicate involvement with the program.

NA.

7. Describe any program response to advisory board recommendations. Give specific examples.

NA.

ASTRON: ASTRONOMY

1. List the specific SLOs your program or discipline has chosen to focus on this year for discussion of program improvement.

SLOs are specific, measurable statements of 'what a student should know, be able to do, or value when they complete

a course'. An SLO focuses on specific knowledge, attitudes, or behaviors that students will demonstrate or possess as a result of instruction.

We have chosen to focus on the SLOs for Astronomy 2 (Planetary Astronomy) and Astronomy 4 (Planetary Astronomy with Laboratory).

SLO 1: Identify the various phenomena seen in the sky, including the rising and setting of the sun, moon, planets and stars, the seasons, constellation patterns, precession, the phases of the moon, lunar tides, eclipses, and define the basic principles of celestial navigation.

SLO 2: Describe our current theories and evidence for the formation of the solar system.

2. Describe how the program assesses SLOs and uses the results for program improvement including:

- **how outcomes are assessed and how often**
- **how and when the program or discipline reviews the results and engages program/discipline faculty in the process**

Over the last six years, the Astronomy Program has regularly reviewed and updated our courses' Student Learning Outcomes. Many of them were changed to be broader and more reflective of overall course goals instead of specific skill-oriented outcomes. These new SLOs all map to one or more of the Institutional Learning Outcomes and the Astronomy Program's Learning Outcomes (PLO) and, we feel, are representative of the overall goals of the Earth Science Department and the vision, mission, and goals of the college, as a whole.

Student Learning Outcomes are assessed every semester. With a few exceptions, most of the SLOs are assessed by questions on midterm or final exams. The Astronomy Program has developed suggested essay questions for the midterm or final exams. Instructors may also choose to develop their own questions for SLO assessment. At the end of every semester, instructors complete an SLO assessment for each student. These assessments are submitted electronically with the end of semester grade report. Instructors select "Meets Standard" if the student has successfully met the requirements of an SLO and either "Does Not Meet Standard" or "Not Assessed" for all other students. "Not Assessed" is used for students that did not complete enough of the required assignments, problems or activities for an instructor to make a fair assessment of their SLO achievement. All instructors are encouraged to review their SLO achievement rates and summaries at their mProfessor site on a regular basis.

3. If your program or discipline issues a degree or certificate list each degree or certificate and the core competencies students are expected to achieve on completion. ***Core competencies focus on the body of knowledge, attitudes, and behaviors a student will have acquired upon completion of a program or certificate and are assessed by either a capstone course or success rates on SLOs for core courses.***

NA.

4. What other evaluation measures does your program or discipline use to inform planning? (For example, student surveys, enrollment trends, student success, retention, degrees/certificates awarded, job placement, transfer rates, TIMS report, tutor usage etc.) Note trends and differences in performance by group (ethnicity, gender, age) or enrollment type (day/evening, on-ground/on-line).

The Astronomy Program utilizes varied evaluation measurements as a means to guide planning. Among the most important measurements we have is access to quantifiable data which includes student success and retention rates (in comparison to SMC college-wide data). Based on the data tables below, for *student success* a few trends since the past 6-year Program Review are noted including:

- Student success is higher for all ethnic groups except for white students which is slightly lower than SMC trends.
- Substantially higher for men than SMC trends, and slightly higher for women than SMC trends.
- By age, substantially higher for all age demographics except for the 40-49 year old group which is lower than

SMC trends (but, the sample size of this age group is very small).

STUDENT SUCCESS												
ETHNICITY	**Am Indian**		**Asian**		**Black**		**Hispanic**		**Multi-Races**		**White**	
	Astronomy	SMC	**Astronomy**	SMC	**Astronomy**	SMC	**Astronomy**	SMC	**Astronomy**	SMC	**Astronomy**	SMC
2011	65.0%	52.3%	80.7%	75.1%	65.9%	53.6%	77.7%	63.4%	70.4%	82.0%	80.4%	86.8%
2012	64.8%	54.9%	77.5%	75.1%	53.6%	53.6%	65.0%	62.7%	62.5%	79.5%	79.1%	85.0%
2013	74.2%	60.4%	83.6%	75.0%	65.6%	54.4%	64.8%	61.1%	68.0%	80.4%	76.2%	85.4%
2014	69.9%	61.0%	78.5%	74.4%	58.7%	55.0%	74.2%	61.2%	82.1%	78.5%	84.7%	85.9%
2015	NA	58.7%	85.1%	75.5%	68.1%	54.5%	69.9%	60.6%	66.7%	79.1%	84.0%	85.4%
GENDER	**Female**		**Male**									
	Astronomy	SMC	**Astronomy**	SMC								
2011	75.0%	70.5%	81.0%	66.8%								
2012	71.0%	70.3%	72.0%	66.1%								
2013	68.8%	70.1%	73.6%	65.8%								
2014	76.2%	69.9%	80.2%	66.0%								
2015	75.2%	69.5%	77.5%	65.7%								
AGE	**0-19**		**20-24**		**25-29**		**30-39**		**40-49**		**>49**	
	Astronomy	SMC	**Astronomy**	SMC	**Astronomy**	SMC	**Astronomy**	SMC	**Astronomy**	SMC	**Astronomy**	SMC
2011	78.1%	68.4%	78.7%	67.7%	79.5%	70.6%	78.6%	71.7%	70.0%	72.1%	60.0%	72.4%
2012	75.9%	67.6%	69.8%	67.3%	66.7%	70.4%	78.3%	72.0%	37.5%	71.3%	75.0%	72.9%
2013	68.3%	67.8%	73.4%	67.1%	74.5%	70.0%	64.7%	71.3%	57.1%	70.7%	100.0%	69.6%
2014	83.3%	68.6%	75.0%	66.6%	79.7%	68.9%	87.0%	70.9%	60.0%	71.0%	100.0%	71.2%
2015	76.4%	67.4%	77.2%	66.8%	74.1%	69.0%	84.6%	69.6%	70.0%	73.4%	50.0%	70.3%

Based on the data tables below, for *course retention* rates a few trends since the past 6-year Program Review are noted including:

- Slightly higher for all but white ethnic groups in comparison to SMC trends. The white astronomy students' percentages are similar to college-wide percentages for white students.
- Slightly higher for both women and men in comparison to SMC percentages. There is a slightly higher retention rate for male astronomy students than there is for female astronomy students.
- Slightly higher retention rate for all but the oldest age groups (40-49 years and >49) - which is substantially lower for astronomy students than the campus wide trends (though, once again the astronomy sample size is very low for these oldest age groups).

RETENTION												
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	Astron	SMC	Astron	SMC	Astron	SMC	Astron	SMC	Astron	SMC	Astron	SMC
2011	0.0%	74.8%	89.8%	88.8%	86.4%	79.3%	89.1%	84.1%	88.9%	82.0%	80.4%	86.8%
2012	100.0%	75.3%	90.1%	86.7%	85.7%	75.2%	83.9%	81.0%	83.3%	79.5%	79.1%	85.0%
2013	100.0%	80.5%	85.5%	86.6%	96.9%	76.2%	82.4%	79.8%	84.0%	80.4%	76.2%	85.4%
2014	100.0%	75.2%	86.2%	87.3%	78.3%	76.4%	85.3%	79.6%	89.3%	78.5%	84.7%	85.9%
2015	NA	76.2%	89.2%	88.4%	83.0%	74.9%	82.9%	78.5%	70.8%	79.1%	84.0%	85.4%
GENDER	Female		Male									
	Astron	SMC	Astron	SMC								
2011	89.8%	85.8%	89.8%	85.0%								
2012	84.8%	84.0%	87.7%	82.2%								
2013	82.5%	83.9%	87.1%	82.7%								
2014	85.9%	83.6%	88.7%	82.7%								
2015	85.0%	82.9%	84.3%	82.0%								
AGE	0-19		20-24		25-29		30-39		40-49		>49	
	Astron	SMC	Astron	SMC	Astron	SMC	Astron	SMC	Astron	SMC	Astron	SMC
2011	89.2%	87.0%	92.1%	85.2%	84.6%	83.8%	78.6%	83.6%	70.0%	83.1%	60.0%	82.1%
2012	91.3%	84.6%	84.3%	82.6%	83.3%	82.2%	78.3%	82.0%	37.5%	81.2%	75.0%	81.9%
2013	84.7%	84.8%	86.0%	82.7%	85.1%	82.6%	64.7%	81.8%	57.1%	82.8%	100.0%	81.3%
2014	89.1%	84.9%	86.0%	82.7%	89.8%	81.8%	87.0%	81.1%	60.0%	80.6%	100.0%	82.3%
2015	86.7%	83.9%	86.1%	82.3%	76.5%	80.7%	84.6%	79.7%	70.0%	82.8%	50.0%	79.9%

5. If applicable, discuss achievement rates on state licensure exams.

NA.

6. Career Technical Education (CTE) programs are required to have active industry advisory boards which meet at least once a year. (Attach minutes from each meeting since the last program review report). List advisory board membership, how often it meets, and indicate involvement with the program.

NA.

7. Describe any program response to advisory board recommendations. Give specific examples.

NA.

GEOG: GEOGRAPHY

1. List the specific SLOs your program or discipline has chosen to focus on this year for discussion of program improvement. ***SLOs are specific, measurable statements of 'what a student should know, be able to do, or value when they complete a course. An SLO focuses on specific knowledge, attitudes, or behaviors that students will demonstrate or possess as a result of instruction.***

Student Learning Outcomes in the Geography courses are designed to assess students' knowledge and skills in

Geography, as applied in solving the types of real world problems they will encounter in coursework outside of the Earth Science Department. Although all Geography course SLOs are assessed every semester - for 2015-2016, the Geography Program focused on SLO # 2 for the Geography 1 and Geography 5 classes.

Geography 1 (Introduction to the Natural Environment) and Geography 5 (Physical Geography with Lab) are pedagogically the same class, except that Geography 5 also includes a lab section. The lab section of Geography 5 includes experiential learning as the students solve real-life problems, develop mapping skills, and learn to apply the geographical principles presented in lecture.

SLO # 2: (Geography 1 and Geography 5)

Students will identify the processes and forces that are changing our atmosphere, lithosphere, hydrosphere, and biosphere and will realize that powerful connections exist

2. Describe how the program assesses SLOs and uses the results for program improvement including:

- **how outcomes are assessed and how often**
- **how and when the program or discipline reviews the results and engages program/discipline faculty in the process**

Over the last six years, the Geography Program has regularly reviewed and updated our courses' Student Learning Outcomes. Many of them were changed to be broader and more reflective of overall course goals instead of specific skill-oriented outcomes. These new SLOs all map to one or more of the Institutional Learning Outcomes and the Geography Program's Learning Outcomes (PLO) and, we feel, are representative of the overall goals of the Earth Science Department and the vision, mission, and goals of the college, as a whole.

Student Learning Outcomes are assessed every semester. With a few exceptions, most of the SLOs are assessed by questions on midterm or final exams. The Geography Program has developed suggested essay questions for the midterm or final exams. Instructors may also choose to develop their own questions for SLO assessment. At the end of every semester, instructors complete an SLO assessment for each student. These assessments are submitted electronically with the end of semester grade report. Instructors select "Meets Standard" if the student has successfully met the requirements of an SLO and either "Does Not Meet Standard" or "Not Assessed" for all other students. "Not Assessed" is used for students that did not complete enough of the required assignments, problems or activities for an instructor to make a fair assessment of their SLO achievement. All instructors are encouraged to review their SLO achievement rates and summaries at their mProfessor site on a regular basis.

3. If your program or discipline issues a degree or certificate list each degree or certificate and the core competencies students are expected to achieve on completion. ***Core competencies focus on the body of knowledge, attitudes, and behaviors a student will have acquired upon completion of a program or certificate and are assessed by either a capstone course or success rates on SLOs for core courses.***

The Geography Program in the Earth Science department offers an Associate of Arts Degree in Geography for Transfer (AA-T Geography). This degree fulfills the lower division geography course requirements for students wanting to transfer and complete a Bachelor of Arts in Geography for both the University of California and California State University systems.

1. Students will identify spatial patterns and relationships between systems and cycles that affect life and shape landscapes.

2. Students will demonstrate cartographic literacy, including map interpretation and, using spatial analysis skills, analyze, recognize and evaluate spatial distributions on all scales from local to global to become better global citizens.

3. Students will demonstrate this knowledge through presentation of research via oral and written papers, through field

work and other means of assessment.

4. What other evaluation measures does your program or discipline use to inform planning? (For example, student surveys, enrollment trends, student success, retention, degrees/certificates awarded, job placement, transfer rates, TIMS report, tutor usage etc.) Note trends and differences in performance by group (ethnicity, gender, age) or enrollment type (day/evening, on-ground/on-line).

The Geography Program utilizes varied evaluation measurements as a means to guide planning. Among the most important measurements we have is access to quantifiable data which includes student success and retention rates (in comparison to SMC college-wide data). Based on the data tables below, for *student success* a few trends since the past 6-year Program Review are noted including:

- Slightly lower for female and male geography students in comparison with college-wide trends.
- Slightly lover for all age groups for geography students.
- Substantially lower for all ethnic groups.

STUDENT SUCCESS												
ETHNICITY	**Am Indian**		**Asian**		**Black**		**Hispanic**		**Multi-Races**		**White**	
	Geog	SMC	**Geog**	SMC	**Geog**	SMC	**Geog**	SMC	**Geog**	SMC	**Geog**	SMC
2011	100.0%	52.3%	72.2%	75.1%	43.4%	53.6%	55.1%	63.4%	76.5%	82.0%	72.2%	86.8%
2012	0.0%	54.9%	65.2%	75.1%	38.0%	53.6%	59.4%	62.7%	55.2%	79.5%	72.2%	85.0%
2013	66.7%	60.4%	77.6%	75.0%	36.2%	54.4%	55.5%	61.1%	68.2%	80.4%	72.2%	85.4%
2014	NA	61.0%	60.3%	74.4%	50.0%	55.0%	59.1%	61.2%	58.1%	78.5%	69.8%	85.9%
2015	0.0%	58.7%	73.1%	75.5%	42.9%	54.5%	54.1%	60.6%	78.6%	79.1%	71.7%	85.4%
GENDER	**Female**		**Male**									
	Geography	SMC	**Geography**	SMC								
2011	66.2%	70.5%	65.1%	66.8%								
2012	65.1%	70.3%	61.5%	66.1%								
2013	59.5%	70.1%	66.7%	65.8%								
2014	61.3%	69.9%	65.7%	66.0%								
2015	63.1%	69.5%	62.6%	65.7%								
AGE	**0-19**		**20-24**		**25-29**		**30-39**		**40-49**		**>49**	
	Geography	SMC	**Geography**	SMC	**Geog**	SMC	**Geog**	SMC	**Geog**	SMC	**Geog**	SMC
2011	71.0%	68.4%	60.4%	67.7%	65.6%	70.6%	69.7%	71.7%	83.3%	72.1%	81.8%	72.4%
2012	65.0%	67.6%	59.3%	67.3%	73.6%	70.4%	68.4%	72.0%	56.3%	71.3%	62.5%	72.9%
2013	58.5%	67.8%	63.5%	67.1%	72.5%	70.0%	61.0%	71.3%	80.0%	70.7%	61.5%	69.6%
2014	62.5%	68.6%	65.9%	66.6%	59.2%	68.9%	66.7%	70.9%	20.0%	71.0%	33.3%	71.2%
2015	59.4%	67.4%	63.9%	66.8%	67.3%	69.0%	62.1%	69.6%	66.7%	73.4%	71.4%	70.3%

Based on the data tables below, for *course retention* rates a few trends since the past 6-year Program Review are noted including:

- Slightly higher for male geography students than SMC trends, and slightly lower for female geography students than SMC trends.

- Slightly higher for black geography students than SMC, and slightly lower for all other ethnic groups.
- Slightly higher for the 25-29 age group geography students, while slightly lower for all other age groups

RETENTION												
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	Geog	SMC	Geog	SMC	Geog	SMC	Geog	SMC	Geog	SMC	Geog	SMC
2011	100.0%	74.8%	87.8%	88.8%	71.7%	79.3%	78.9%	84.1%	82.4%	82.0%	84.1%	86.8%
2012	100.0%	75.3%	80.9%	86.7%	60.0%	75.2%	79.7%	81.0%	75.9%	79.5%	81.5%	85.0%
2013	100.0%	80.5%	83.6%	86.6%	68.1%	76.2%	74.2%	79.8%	77.3%	80.4%	82.3%	85.4%
2014	NA	75.2%	79.4%	87.3%	78.6%	76.4%	78.6%	79.6%	74.2%	78.5%	81.2%	85.9%
2015	0.0%	76.2%	87.2%	88.4%	78.6%	74.9%	80.2%	78.5%	92.9%	79.1%	81.9%	85.4%
GENDER	Female		Male									
	Geog	SMC	Geog	SMC								
2011	83.6%	85.8%	81.7%	85.0%								
2012	80.0%	84.0%	77.9%	82.2%								
2013	72.0%	83.9%	85.2%	82.7%								
2014	77.8%	83.6%	82.3%	82.7%								
2015	80.7%	82.9%	84.5%	82.0%								
AGE	0-19		20-24		25-29		30-39		40-49		>49	
	Geog	SMC	Geog	SMC	Geog	SMC	Geog	SMC	Geo	SMC	Geog	SMC
2011	84.4%	87.0%	80.9%	85.2%	83.6%	83.8%	78.8%	83.6%	94.4%	83.1%	90.9%	82.1%
2012	82.0%	84.6%	74.8%	82.6%	88.9%	82.2%	84.2%	82.0%	68.8%	81.2%	62.5%	81.9%
2013	76.0%	84.8%	79.5%	82.7%	87.0%	82.6%	75.6%	81.8%	86.7%	82.8%	69.2%	81.3%
2014	78.8%	84.9%	83.0%	82.7%	79.6%	81.8%	76.2%	81.1%	20.0%	80.6%	44.4%	82.3%
2015	80.2%	83.9%	84.0%	82.3%	86.5%	80.7%	75.9%	79.7%	83.3%	82.8%	85.7%	79.9%

5. If applicable, discuss achievement rates on state licensure exams.

NA.

6. Career Technical Education (CTE) programs are required to have active industry advisory boards which meet at least once a year. (Attach minutes from each meeting since the last program review report). List advisory board membership, how often it meets, and indicate involvement with the program.

NA.

7. Describe any program response to advisory board recommendations. Give specific examples.

NA.

GEOL: GEOLOGY

1. List the specific SLOs your program or discipline has chosen to focus on this year for discussion of program improvement.

SLOs are specific, measurable statements of 'what a student should know, be able to do, or value when they complete a course'. An SLO focuses on specific knowledge, attitudes, or behaviors that students will demonstrate or possess as a result of instruction.

The Geology Program will focus on the SLOs for Geology 1 (Physical Geology without Lab) and Geology 4 (Physical Geology with Lab).

Geology 1:

SLO 1: Demonstrate an understanding of the fundamentals of the plate tectonic theory by identifying tectonic setting based on major features (including, but not limited to mid-ocean ridges, mountain ranges, volcanic arcs, ocean trenches).

SLO 2: Recognize regions that are prone to specific geologic hazards and/or hazards associated with use of geologic resources. Examples include, but are not limited to, soil liquefaction, slope failure, pyroclastic flows, lahars, flooding, groundwater contamination, subsidence, acid mine drainage, and climate change.

Geology 4:

SLO 1: Students will identify the major features on the Earth and understand the geological processes that formed them.

SLO 2: Students will recognize the Earth is a dynamic planet shaped by physical agents of change.

These SLOs all map to one or more of the Institutional Learning Outcomes and, we feel, are representative of the overall goals of the Earth Science Department and the vision, mission, and goals of the college, as a whole

2. Describe how the program assesses SLOs and uses the results for program improvement including:

- **how outcomes are assessed and how often**
- **how and when the program or discipline reviews the results and engages program/discipline faculty in the process**

Spanning the academic years 2011-2012 through 2015-2016, the student learning outcomes demonstrate that students in the lab-based physical geology courses, in general, achieved the desired learning outcomes at higher success rates than those in the non-lab physical geology courses. Of note, during the 2011 – 2012 through 2013 – 2014 academic years, the lab-based physical geology students met the student learning outcomes at a 93.5% and above success rate, in one year achieving a 100% success rate. In comparison, the success rate of those students enrolled in the non-lab physical geology courses hovers predominantly in the mid 70% to high 80% range. This suggests that those students that were afforded an opportunity to engage in extended hands-on experiences were able to meet the student learning outcomes more successfully.

Cognizant of the fact that hands-on activities and experiences help solidify concepts, the non-lab physical geology courses that are currently being taught include in-class activities that expose students to relevant materials and concepts, as well as homework assignments that allow for independent learning opportunities. When comparing which student group more successfully met the student learning outcomes since the 2011 – 2012 academic year, those students enrolled in the lab-based sections scored approximately 3% points higher than those students in the physical geology course without a lab component; although, both scored in the 80% range. The comparable success rates likely reflect the incorporation of experiential learning techniques into the lecture based courses by past faculty.

3. If your program or discipline issues a degree or certificate list each degree or certificate and the core

competencies students are expected to achieve on completion.

Core competencies focus on the body of knowledge, attitudes, and behaviors a student will have acquired upon completion of a program or certificate and are assessed by either a capstone course or success rates on SLOs for core courses.

The Geology Program is working towards offering an Associate in Science for Transfer (AS-T) in Geology.

4. What other evaluation measures does your program or discipline use to inform planning? (For example, student surveys, enrollment trends, student success, retention, degrees/certificates awarded, job placement, transfer rates, TIMS report, tutor usage etc.) Note trends and differences in performance by group (ethnicity, gender, age) or enrollment type (day/evening, on-ground/on-line).

The 2016-2017 academic year welcomes two new full-time geology faculty (replacing the previous, one full-time faculty). With student learning in mind, the incoming faculty chose a text that emphasizes critical and scientific thinking over memorization, while still infusing fundamental concepts into the text. This text supports the current student learning outcomes by encouraging students to adopt an inquiry-based learning approach that teaches students to evaluate geologic problems by employing a critical thinking process rather than memorizing specific terms or images.

The new full-time faculty incorporate experiential learning opportunities into the lecture-based courses in the following ways: mineral and rock identification activities, regular independent homework assignments, lectures that focus on local examples of concepts discussed in class, in-class videos and relevant films highlighting the relevance of geology in modern society, and extracurricular field trip opportunities. Understanding that learning is a personal choice motivated by student buy-in, these activities not only reinforce course concepts, but also provide students with an array of experiences designed to elicit engagement, which can only help students meet the student learning outcomes.

In the upcoming years, the new geology faculty plan to reevaluate existing student learning outcomes to ensure that they are appropriate indicators of student success. The faculty will also continue to compliment traditional lectures with experiential learning experiences to help ensure that student learning outcomes are met successfully.

The Geology Program utilizes varied evaluation measurements as a means to guide planning. Among the most important measurements we have is access to quantifiable data which includes student success and retention rates (in comparison to SMC college-wide data). Based on the data tables below, for *student success* a few trends since the past 6-year Program Review are noted including:

- Slightly higher for black geology students than the SMC student body, and slightly lower for all other ethnic groups. (There is a large drop-off in black and Hispanic success from the years 2011-2012 compared to 2013-2015.)
- Slightly higher success for female and male geology students than SMC trends for the years 2011-2012, falling back to college-wide trends in 2014-2015.
- Slightly higher success in all age groups except the 30-39 year old group (= slightly lower success.)

STUDENT SUCCESS												
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC
2011	100.0%	52.3%	74.4%	75.1%	66.7%	53.6%	72.0%	63.4%	50.0%	82.0%	77.1%	86.8%
2012	NA	54.9%	66.7%	75.1%	72.7%	53.6%	73.6%	62.7%	84.6%	79.5%	77.4%	85.0%
2013	100.0%	60.4%	84.8%	75.0%	61.5%	54.4%	60.3%	61.1%	69.2%	80.4%	78.5%	85.4%
2014	NA	61.0%	76.0%	74.4%	48.1%	55.0%	65.8%	61.2%	58.3%	78.5%	82.2%	85.9%
2015	NA	58.7%	58.3%	75.5%	59.1%	54.5%	59.6%	60.6%	90.0%	79.1%	72.2%	85.4%

GENDER	Female		Male									
	Geology	SMC	Geology	SMC								
2011	73.9%	70.5%	73.0%	66.8%								
2012	73.7%	70.3%	74.5%	66.1%								
2013	73.6%	70.1%	67.4%	65.8%								
2014	69.9%	69.9%	67.6%	66.0%								
2015	65.5%	69.5%	63.9%	65.7%								
AGE	0-19		20-24		25-29		30-39		40-49		>49	
	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC
2011	70.5%	68.4%	73.8%	67.7%	84.6%	70.6%	70.6%	71.7%	100.0%	72.1%	100.0%	72.4%
2012	70.8%	67.6%	74.8%	67.3%	83.3%	70.4%	55.6%	72.0%	100.0%	71.3%	100.0%	72.9%
2013	69.1%	67.8%	71.1%	67.1%	78.6%	70.0%	60.0%	71.3%	100.0%	70.7%	100.0%	69.6%
2014	63.8%	68.6%	69.6%	66.6%	63.6%	68.9%	75.0%	70.9%	100.0%	71.0%	100.0%	71.2%
2015	53.8%	67.4%	68.2%	66.8%	73.1%	69.0%	65.0%	69.6%	40.0%	73.4%	100.0%	70.3%

Based on the data tables below, for *course retention* rates a few trends since the past 6-year Program Review are noted including:

- Slightly higher retention percentages for men than SMC trends while similar percentages for female geology students as with SMC trends.
- Slightly higher for Hispanic geology students, both up and down for black students, while slightly lower for other ethnic groups.
- Slightly higher for younger age demographics (0-19 years, 20-24, and 25-29) and slightly lower for older age groups (30-39 years, 40-49, >49) - though, sample sizes are very small.

RETENTION												
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC	Geology	SMC
2011	100.0%	74.8%	84.6%	88.8%	100.0%	79.3%	86.6%	84.1%	70.0%	82.0%	85.7%	86.8%
2012	NA	75.3%	87.2%	86.7%	81.8%	75.2%	87.3%	81.0%	84.6%	79.5%	83.3%	85.0%
2013	100.0%	80.5%	97.0%	86.6%	61.5%	76.2%	82.4%	79.8%	76.9%	80.4%	82.8%	85.4%
2014	NA	75.2%	80.0%	87.3%	70.4%	76.4%	78.6%	79.6%	58.3%	78.5%	90.4%	85.9%
2015	NA	76.2%	75.0%	88.4%	84.1%	74.9%	84.4%	78.5%	95.0%	79.1%	81.9%	85.4%
GENDER	Female		Male									
	Geology	SMC	Geology	SMC								
2011	90.1%	85.8%	83.6%	85.0%								
2012	86.5%	84.0%	85.1%	82.2%								
2013	82.8%	83.9%	84.4%	82.7%								
2014	83.1%	83.6%	76.8%	82.7%								
2015	82.1%	82.9%	85.0%	82.0%								

AGE	**0-19**		**20-24**		**25-29**		**30-39**		**40-49**		**>49**	
	Geology	SMC	**Geology**	SMC	**Geology**	SMC	**Geology**	SMC	**Geology**	SMC	**Geology**	SMC
2011	88.5%	87.0%	86.9%	85.2%	92.3%	83.8%	70.6%	83.6%	100.0%	83.1%	100.0%	82.1%
2012	85.4%	84.6%	85.7%	82.6%	87.5%	82.2%	77.8%	82.0%	100.0%	81.2%	100.0%	81.9%
2013	81.5%	84.8%	86.1%	82.7%	82.1%	82.6%	70.0%	81.8%	100.0%	82.8%	100.0%	81.3%
2014	75.4%	84.9%	81.9%	82.7%	72.7%	81.8%	75.0%	81.1%	100.0%	80.6%	100.0%	82.3%
2015	76.3%	83.9%	87.2%	82.3%	92.3%	80.7%	65.0%	79.7%	80.0%	82.8%	100.0%	79.9%

5. If applicable, discuss achievement rates on state licensure exams.

NA.

6. Career Technical Education (CTE) programs are required to have active industry advisory boards which meet at least once a year. (Attach minutes from each meeting since the last program review report). List advisory board membership, how often it meets, and indicate involvement with the program.

NA.

7. Describe any program response to advisory board recommendations. Give specific examples.

NA.

PV: PHOTOVOLTAIC SYSTEMS

1. List the specific SLOs your program or discipline has chosen to focus on this year for discussion of program improvement.

SLOs are specific, measurable statements of 'what a student should know, be able to do, or value when they complete a course'. An SLO focuses on specific knowledge, attitudes, or behaviors that students will demonstrate or possess as a result of instruction.

The Photovoltaic Systems Program is analyzing SLOs for PV 1 (Introduction to Solar Energy Systems) and PV 2 (Intermediate Solar Photovoltaic System Installation). PV 1 is a Prerequisite for PV 2.

PV 1:

SLO 1: Students will demonstrate a basic understanding of the introductory scientific and environmental concepts by applying alternative energy solutions, focusing on solar photovoltaic systems.

SLO 2: Students will demonstrate a basic understanding of earth-sun relationships, scientific principles of solar photovoltaic systems, and introductory understanding of solar photovoltaic installation through applied problem solving and lab exercises.

PV 2:

SLO 1: Using their understanding of solar photovoltaic and thermal systems, students will be able to solve photovoltaic installation and design challenges.

SLO 2: Students will describe environmental, economic, social benefits of solar photovoltaic systems as well as political and regulatory infrastructure that affect photovoltaic system installation.

2. Describe how the program assesses SLOs and uses the results for program improvement including:

- **how outcomes are assessed and how often**

- **how and when the program or discipline reviews the results and engages program/discipline faculty in the process**

Over the last six years, the Solar Photovoltaic Program (PV) has regularly reviewed and updated our courses' Student Learning Outcomes. These new SLOs all map to one or more of the Institutional Learning Outcomes and the Solar PV Program's Learning Outcomes (PLO) and, we feel, are representative of the overall goals of the Earth Science Department and the vision, mission, and goals of the college, as a whole

Student Learning Outcomes are assessed every semester. With a few exceptions, most of the SLOs are assessed by questions on midterm or final exams. The PV Program has developed suggested essay questions for the midterm or final exams. Instructors may also choose to develop their own questions for SLO assessment. At the end of every semester, instructors complete an SLO assessment for each student. These assessments are submitted electronically with the end of semester grade report. Instructors select "Meets Standard" if the student has successfully met the requirements of an SLO and either "Does Not Meet Standard" or "Not Assessed" for all other students. "Not Assessed" is used for students that did not complete enough of the required assignments, problems or activities for an instructor to make a fair assessment of their SLO achievement. All instructors are encouraged to review their SLO achievement rates and summaries at their mProfessor site on a regular basis.

3. If your program or discipline issues a degree or certificate list each degree or certificate and the core competencies students are expected to achieve on completion.

Core competencies focus on the body of knowledge, attitudes, and behaviors a student will have acquired upon completion of a program or certificate and are assessed by either a capstone course or success rates on SLOs for core courses.

The Sustainable Technologies Program (STP) offers two Certificates of Achievement: a 19-unit Certificate of Achievement in Solar Photovoltaic Installation and a 18-unit Certificate of Achievement in Recycling and Resource Management (RRM). The STP also offers three Department Certificates: a 13-unit Energy Efficiency Specialist Department Certificate, a 12-unit Department Certificate in Solar Photovoltaic Installation, and a 12-unit Department Certificate in Recycling and Resource Management.

The Solar Photovoltaic Installation Degrees provide students with the practical skills and knowledge needed to successfully pass the entry level NABCEP exam. The RRM Program provides formal training for individuals interested in working in the green jobs sector. The Energy Efficiency Degree provides students with training in residential and commercial energy use including alternative energy sources, as well as unconventional lighting, cooling, space heating, and resource management procedures.

Upon completion of Energy Efficiency classes:

1. Students will demonstrate knowledge of basic safety and health concerns in building management activities;
2. Students will perform analysis of residences and businesses starting with utility bills and focusing on reducing energy usage;
3. Students will suggest efficiency measures and estimate energy consumption in electrical, mechanical, and heat energy units; and
4. Students will make recommendations for alternative energy production and storage methods to reduce utility costs and provide sustainable substitutes to fossil fuel energy use and non-renewable resource use.

Upon completion of Solar Photovoltaic Installation classes:

1. Students will demonstrate a basic understanding of the introductory scientific and environmental concepts by applying alternative energy solutions, focusing on solar photovoltaic systems.
2. Students will be able to solve photovoltaic installation and design challenges, using their understanding of solar photovoltaic and thermal systems.

3. Students will describe environmental, economic, and social benefits of solar photovoltaic systems as well as political and regulatory infrastructure that affect photovoltaic system installation.
4. Students will remain current on advanced concepts in solar photovoltaic installation, troubleshooting, net metering laws, local codes, and National Electrical Code (NEC) PV requirements. Successful participants will be qualified to take the North America Board of Certified Energy Practitioners (NABCEP) Photovoltaic Installer Entry Level exam.

Upon completion of Recycling and Resource Management classes:

1. Students will identify how Zero Waste principles can be a key part of community and business sustainability plans and help contribute to reducing greenhouse gases which affect global climate change.
2. Students will identify key government agencies and policies and how to collaborate and obtain funding for outreach. Environmental educational skills, programs, and methods will be reviewed.
3. Students will have the tools to design and develop community plans to eliminate waste and use resources efficiently through examining resource management and recovery in communities.
4. Students will recognize and identify sustainable practices and resource management principles to provide implementation of those principles for businesses to work towards Zero Waste.
5. Students will assess how companies have resolved issues that arise in implementing successful waste diversion and resource recovery programs.

4. What other evaluation measures does your program or discipline use to inform planning? (For example, student surveys, enrollment trends, student success, retention, degrees/certificates awarded, job placement, transfer rates, TIMS report, tutor usage etc.) Note trends and differences in performance by group (ethnicity, gender, age) or enrollment type (day/evening, on-ground/on-line).

The Solar Photovoltaic Systems Program utilizes varied evaluation measurements as a means to guide planning. Among the most important measurements we have is access to quantifiable data which includes student success and retention rates (in comparison to SMC college-wide data). Based on the data tables below, for *student success*, a few trends since the past 6-year Program Review are noted including:

- Higher success for all ethnic groups in PV classes except white students' success rate which is lower, except for 2015. White students' success rate has consistently trended upward over the past 5 year period. There are substantially higher success rate for Asian, Black, Hispanic PV students compared to SMC trends as seen in the 2013-2015 data.
- Substantially higher success rates for both female and male PV students. The PV student success rate has continually increased for both men and women over the past 5 year period.
- Substantially higher success in all age groups except the 0-19 year old group which is substantially lower than SMC trends (though the sample size is extremely small).

STUDENT SUCCESS													
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC
2011	NA	52.3%	56.3%	75.1%	38.9%	53.6%	70.6%	63.4%	75.0%	82.0%	67.5%	86.8%
2012	NA	54.9%	80.0%	75.1%	33.3%	53.6%	60.0%	62.7%	0.0%	79.5%	68.0%	85.0%
2013	NA	60.4%	NA	75.0%	68.4%	54.4%	69.2%	61.1%	100.0%	80.4%	76.5%	85.4%
2014	NA	61.0%	100.0%	74.4%	50.0%	55.0%	82.6%	61.2%	100.0%	78.5%	72.4%	85.9%
2015	NA	58.7%	100.0%	75.5%	71.4%	54.5%	80.8%	60.6%	100.0%	79.1%	93.3%	85.4%

GENDER	Female		Male									
	PV	SMC	PV	SMC								
2011	55.0%	70.5%	61.2%	66.8%								
2012	33.3%	70.3%	68.2%	66.1%								
2013	100.0%	70.1%	71.9%	65.8%								
2014	75.0%	69.9%	80.4%	66.0%								
2015	85.7%	69.5%	83.0%	65.7%								
AGE	0-19		20-24		25-29		30-39		40-49		>49	
	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC
2011	47.4%	68.4%	57.6%	67.7%	57.9%	70.6%	68.4%	71.7%	73.3%	72.1%	61.5%	72.4%
2012	33.3%	67.6%	50.0%	67.3%	76.9%	70.4%	73.3%	72.0%	37.5%	71.3%	62.5%	72.9%
2013	40.0%	67.8%	92.9%	67.1%	66.7%	70.0%	100.0%	71.3%	63.6%	70.7%	69.2%	69.6%
2014	50.0%	68.6%	78.9%	66.6%	100.0%	68.9%	72.7%	70.9%	72.7%	71.0%	88.9%	71.2%
2015	66.7%	67.4%	82.6%	66.8%	100.0%	69.0%	90.0%	69.6%	100.0%	73.4%	66.7%	70.3%

Based on the data tables below, for *course retention* rates a few trends since the past 6-year Program Review are noted including:

- Substantially higher retention rates for all ethnic groups in PV classes.
- Substantially higher retention rates for male PV students; slightly higher for female PV students.
- Substantially higher in all age groups for PV students.

RETENTION												
ETHNICITY	Am Indian		Asian		Black		Hispanic		Multi-Races		White	
	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC
2011	NA	74.8%	100.0%	88.8%	72.2%	79.3%	91.2%	84.1%	75.0%	82.0%	82.5%	86.8%
2012	NA	75.3%	80.0%	86.7%	66.7%	75.2%	60.0%	81.0%	0.0%	79.5%	80.0%	85.0%
2013	NA	80.5%	NA	86.6%	89.5%	76.2%	92.3%	79.8%	100.0%	80.4%	88.2%	85.4%
2014	NA	75.2%	100.0%	87.3%	100.0%	76.4%	87.0%	79.6%	100.0%	78.5%	93.1%	85.9%
2015	NA	76.2%	100.0%	88.4%	71.4%	74.9%	96.2%	78.5%	100.0%	79.1%	93.3%	85.4%
GENDER	Female		Male									
	PV	SMC	PV	SMC								
2011	75.0%	85.8%	86.7%	85.0%								
2012	55.6%	84.0%	72.7%	82.2%								
2013	100.0%	83.9%	90.6%	82.7%								
2014	83.3%	83.6%	94.1%	82.7%								
2015	85.7%	82.9%	91.5%	82.0%								

AGE	0-19		20-24		25-29		30-39		40-49		>49	
	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC	PV	SMC
2011	73.7%	87.0%	87.9%	85.2%	84.2%	83.8%	100.0%	83.6%	80.0%	83.1%	76.9%	82.1%
2012	33.3%	84.6%	50.0%	82.6%	84.6%	82.2%	86.7%	82.0%	50.0%	81.2%	62.5%	81.9%
2013	80.0%	84.8%	100.0%	82.7%	88.9%	82.6%	100.0%	81.8%	90.9%	82.8%	84.6%	81.3%
2014	75.0%	84.9%	89.5%	82.7%	100.0%	81.8%	90.9%	81.1%	90.9%	80.6%	100.0%	82.3%
2015	100.0%	83.9%	91.3%	82.3%	100.0%	80.7%	90.0%	79.7%	100.0%	82.8%	66.7%	79.9%

5. If applicable, discuss achievement rates on state licensure exams.

Student pass rates for the NABCEP (solar) Entry Level Exam peaked in December 2015 at 96%, although the preceding years ranged in the 60% to 85% range (yet, still above national averages).

6. Career Technical Education (CTE) programs are required to have active industry advisory boards which meet at least once a year. (Attach minutes from each meeting since the last program review report). List advisory board membership, how often it meets, and indicate involvement with the program.

The Industry Advisory Board (IAB) for the Sustainable Technologies Program was created in 2014. IAB membership for the STP includes professionals from the three topic areas: solar photovoltaics, energy efficiency and recycling and resource management. The board meets two-three times per year and many of the board members are actively engaged in the progress of the program, have contributed time, effort, internships, and advice throughout its existence.

SOLAR PV/ENERGY EFFICIENCY INDUSTRY ADVISORY BOARD (IAB) MEMBERS

Name	Organization	Type of Partner
Anna Bautista	Grid Alternatives	Non-profit installer
Daniel Beattie	Enviro Pro Tech	Solar thermal vendor
Rod Bergen	Santa Monica College	Faculty
Genevieve Bertone	Santa Monica College	Director, Sustainability
Daniel Burt	California Green Designs	Solar installer
Joel Davidson	Self-employed	Solar consultant
Vicki Drake	Santa Monica College	Faculty Chair, Earth Sciences
Steve Factor	Solar City	Solar installer
Phillippe Hartley	Phat Energy	Solar installer
David Jones	Martifier Solar	Commercial installer
Jesse Marez	Eco Point Energy	Solar consultant
Jesse Medina	Association of U.S. Army	Workforce partner
Dustin Stevenson	SouthBay Workforce Investment Board	Workforce partner
Michael Ware	Eco Motion	Municipal program
Brian Hurd	Hands on Solar	Educational advisor
Robert Mejia	SouthBayWorkforce Investment Board	Workforce partner
Stuart Cooley	Santa Monica College	Faculty
Peter Parrish	California Solar Engineering	Solar consultant

RECYCLING AND RESOURCE MANAGEMENT IAB MEMBERS

Name	Company	County
Richard Anthony	Richard Anthony & Associates	San Diego & Nationally
Francisco Arzu	LAANE	Los Angeles County
Dave Baldwin	Community Recycling	Los Angeles County

Peter Bares	Goodwill Orange County Document Destruction	Orange County
Dan Bauer	Waxie Sanitary Supply Company	Los Angeles & Orange County
Sue Beets	SBM Management	National
Nichole Bernson	Councilman Greg Smith	Los Angeles County
Tom Brady	City of Glendale	Los Angeles County
Mike Carey	Orange Coast College Recycling	Orange County
Doreen Chesebro	St. Joseph Health Systems	Orange County
Suk Chong	Smart Business Recycling Program	Los Angeles County
James Conway	City of Santa Monica	Los Angeles County
Rick Crandall	Albertsons, Southern California Division	Orange County
Greg Good	LAANE (Alternate)	Los Angeles County
Sue Gordon	Rainbow Disposal	Orange County
Rochelle Groh	Rainbow Disposal (Alternate)	Orange County
Stephen Groner	SGA, Inc.	Los Angeles County
Kreigh Hampel	City of Burbank	Los Angeles County
Vicky Herrera	Interior Removal Specialist, Inc.	Los Angeles County
Ricardo Hidalgo	Intl. Brotherhood of Teamsters	Los Angeles & Orange County
Timonie Hood	U.S. EPA Region 9	Los Angeles County
Rich Hubbard	Allan Company	Los Angeles County
Lizette Jimenez	Allan Company	Los Angeles County
Christine Knapp	Orange County Waste & Recycling	Orange County
Cathy Lam	Our 1 World	Orange County
Michelle Leonard	HDR, Inc.	Los Angeles County
Richard Ludt	IRS Demo	Los Angeles County
Myles McGray	Destruction & Reuse Network	Orange County
Brad Nelson	Southern California Edison	Los Angeles County
Susanne Passentino	Consolidated Disposal Allied Waste	Los Angeles County
Marialyce Pedersen	Disney	Orange County
Andrew Rea	Andrew Rea Design	Orange County
Laura Rea	Andrew Rea Design	Orange County
Eiko Risch	Ricoh Electronics (Alternate)	Orange County
John Sabol	Ricoh Electronics	Orange County
Coby Skye	DPW	Los Angeles County
Curt Smith	Vons A Safeway Company	Los Angeles County
Wes Thompson	City of Santa Monica	Los Angeles County
Karen Thomas	Habitat for Humanity	Los Angeles & Orange County
Cynthia Van Thul	GHG Climate Team	Los Angeles County
Andrew Villasenor	U.S. EPA Region 9 (Alternate)	Los Angeles County
Paula Wise	Destruction & Reuse Network	Orange County

Solar Trade Advisory Board Recommendations

- Consider offering group industry tracks, or compressed contract education offerings based on the same curriculum.
- Consider students that are in career transition from another technical field or military service and may have existing knowledge.
- Partner with Workforce Investment Boards and Veterans groups to be the "qualified institution" for accessing additional training dollars.
- Bring the current community education course offering in Energy Efficiency over to the for credit side through the curriculum approval process.
- Consider making Energy Efficiency a prerequisite.

- Encourage students to utilize the SMC Math Lab and / or take the non-credit Math course.
- Consider expanding the program to address the program administration aspect of the solar industry.
- Consider expanding the program to provide a concentration on Operations and Maintenance of solar systems.
- Consider developing a Math course specific to energy and solar (Energy Math).
- Consider making Math a prerequisite and utilizing the existing placement test to determine eligibility.
- Create a subcommittee to investigate the math content and requirement.
- Suggest that safety models be built into the program and set up an OSHA 10 course.
- Develop stronger outreach program with Vets, CalSeia, Community Solar Initiatives, Solar Santa Monica, ABC (Association of Builders and Contractors), Grid Alternatives, and other organizations.
- Encourage field trip opportunities for students, such as local utilities, Helio Power, or Solar City for Solar PV students, or to local landfills or recycling centers for our RRM students.

(Please see Appendix for IAB meeting minutes.)

7. Describe any program response to advisory board recommendations. Give specific examples.

1. Setting up internships with Grid Alternatives and other IAB Partners.
2. Developing Math/Physics Modules for students to employ.
3. Developing and submitting curriculum for Solar PV Technical Sales courses – offered spring 2015.
4. Developing and submitting curriculum for 13-unit Energy Efficiency Department Certificate.
5. Participating in field trips for RRM students to perform Waste Audits at local schools and businesses (ex. Hilton).

D1. Looking Back Objectives

As part of the planning process, programs are expected to establish annual objectives that support the program's goals. Please document the status of the program/function's previous year's objectives. Add comments if you feel further explanation is needed.

Objectives

Objective: #1. Help students succeed in obtaining their Student Learning Outcomes. Status: Completed Comments: As is noted in section D2. Moving Forward, the data clearly shows greater student SLO mastery in lab-based courses than in lecture only classes for all of our Earth Science disciplines. As a result, Earth Science faculty have committed to include hands-on, experimental activities and experiences in lecture only classes.	
Objective: #2. Attract increasing numbers of students to a quality astronomy program. Status: Completed Comments: The Astronomy program has successfully written, submitted for Curriculum Committee approval, and is currently offering three new more advanced Astronomy courses: Astronomy 7(Cosmology), Astronomy 8 (Introduction to Astrophysics), and Astronomy 9 (Astrophysics with Calculus). Two of the core courses of the Astronomy Program (Astronomy 1 and 2) are now also offered as online courses. Astronomy course retention rates over the past six year period range annually from 85.4%-91.2%.	

D1. Looking Back

In this section, please document what you did last year as a result of what you described in Section C.

1. Describe any accomplishments, achievements, activities, initiatives undertaken, and any other positives the program wishes to note and document.

Current grants include the MUREP MC31 NASA Grant (with Lisa Collins as proposed PI); and the NSF S-STEM Scholarship Grant (2016-2020) with Vicki Drake as PI. The MUREP MC31 NASA Grant is similar to the CI-PAIR grant, with student and faculty internships, plus a major project development aspect for students to participate in. The NSF S-STEM Scholarship Grant will provide scholarships to qualified students over a four-year period, 2016-2020.

CI-PAIR grant funds were used to obtain more equipment for instructional purposes, providing the students with more "hands-on" learning experiences. Additionally, we had faculty and students participating in summer internships at JPL as a result of the CI-PAIR grant. Faculty engaged in research projects at JPL, resulting in new course materials to use in their courses, as well as presenting their findings at local, regional and national discipline-specific conferences. Students in the Geology lab course have used a Thermal Camera, purchased using CI-PAIR funds, on the Center for Environmental and Urban Studies as part of the "energy study" in conjunction with Energy Efficiency students.

We are also continuing participants in the HSI-UCLA/SMC STEM grant and have received funds for new equipment and lab materials. Using STEM funds, we purchased an online server (CITRIX) to deliver our GIS software to the Distance Education course "Introduction to GIS." This server allows all students enrolled in the class to access the software, without having to purchase or install individual software programs on their personal laptops. This eliminates the necessity of students needing to purchase new equipment to run the software – the software can be accessed from any device – including mobile phones!

Additionally, a Total Station with Tripod, and Measuring Rod (Laser Surveying equipment) were purchased to be used by the Geography, Geology and Archaeology programs, including field classes. Recent use of the Total Station included a survey of an archaeological site in Belize, Central America, during the Summer 2016 session (Brandon Lewis).

For the Sustainable Technologies Program, a number of small grants were received in 2014-2015 from the Department of Energy's Sunshot program, and were used for several disparate purposes:

1. To develop specific curriculum in PV Technical Sales and Marketing, offered initially as a pilot scale non-credit course, but submitted to the curriculum committee now as a for-credit course.
2. To develop curriculum in PV for Spanish speakers, a non-credit course designed to meet a local demographic need, and to expose potential new students to the program and to the field.
3. To further the partnership with the non-profit Grid Alternatives to ensure that solar PV students get a real-world roof installation experience (money goes to Grid Alternatives, but SMC students benefit from the experience gained)
4. To pay for materials and non-volunteer labor to build a mock roof and wall for presentation at an upcoming DOE Sunshot conference, providing another opportunity for select students to present their skills.

Grants of $5000.00 each were awarded to a number of Earth Science professors from the SMC Foundation President's Circle Margin of Excellence grants. The Anthropology program was awarded $5000 to purchase new osteological remains and casts for the Anthropology lab course. Our osteological collection is one of the best at a community college as a result. Astronomy and Geology have each been awarded $5000 for specialized equipment that is used in their respective labs, and the Solar Photovoltaic Installation Certificate program received $5000 in to purchase new lab tables.

The Department has submitted new courses through Curriculum and is currently offering several new courses: Astronomy 7, 8, and 9, Energy Efficiency 3, Geology 10/Astronomy 10. Astronomy 7 and 8 were developed to provide potential Astronomy majors more mathematically rigorous courses. On-line courses Astronomy 1 & 2 were also added to the curriculum. The third course in Energy Efficiency completes our Energy series and will be part of the newly approved 12-unit Energy Efficiency Certificate and the soon-to-be submitted, state-approved 19-unit Certificate of Achievement.

Geographic Information Systems (GIS) 20/Geography 20 (cross-listed courses) were successfully submitted and approved for Distance Education and were first offered Fall 2013. This course utilizes CITRIX as the course delivery system, purchased through

the HSI-UCLA/SMC STEM grant funds. An online version of **California Geography (Geography 14)** was successfully submitted, approved, and offered for the first time in Fall 2016. This distance education offering of Geography 14 is in addition to the on-ground course. The new distance education course for California Geography will continue to be offered each full semester and possibly during either the winter or summer sessions, as well.

Since 2010, Simon Balm, supported by three Margin of Excellence grants, he has been working with the National Park Service on a research project which has been monitoring light pollution in the National Parks. In particular, along with students he has made the first light pollution measurements from Channel Islands National Park as well as the Santa Monica Mountains State Recreation Area. Several conference proceedings and papers have included his work. He is currently in the process of submitting a proposal to build a light pollution monitoring camera for the McDonald Observatory in Texas.

Gary Fouts is a Full Member of the American Astronomical Society and of the Astronomical Society of the Pacific. He is the SMC liaison officer (one of many co-principle investigators) to the CAMPARE program of Cal Poly, Pomona. Prof. Fouts continues to operate the school's CIMEL sun photometer for collecting data that is used in the Goddard Space Flight Center's AERONET Program. See the following link: http://aeronet.gsfc.nasa.gov/cgi-bin/type_one_station_opera_v2_new?site=Santa_Monica_Colg&nachal=2&level=1

The Digistar Planetarium is a high-tech facility, and has been extremely beneficial to the Astronomy Program. Our SMC students are able to see and visualize complex concepts that have been discussed in the classroom. Programs, other than Astronomy, have also made use of the planetarium facility. English used it for poetry readings and as a video room. Geography has also used it extensively in the past. Public outreach is frequently conducted during the week, along with weekly Friday night programs. The Astronomy Club uses it quite often to prepare themselves for weekend observing sessions. Please see more under Section G2.

The Learning Resource Center has been able to provide “free-to-the-students” small group tutoring in anthropology, astronomy, geography and geology. The tutors come from a pool of students that have passed our Earth Science courses with excellent grades.

2. Summarize how the program or service area addressed the recommendations for program strengthening from the executive summary of the previous six-year program review.

The recommendations of the Program Review Committee from the previous 6-year Program Review of the Earth Science Department include the following:

"The committee suggests Earth Science consider the following to further strengthen department programs:

1. Documenting responses to SLO assessment such as revisions to courses, programs, or SLOs.
2. Following through on evidence suggesting the incorporation of more hands-on activities in non-lab classes improves student success.
3. Ensuring that departmental CTE programs form an industry advisory board and that meetings are documented.
4. Further refining data presentation to ensure that comparisons are clear and relevant as well as documenting how data analysis informs decision-making."

Over the past six years, the Earth Science Department responded to these recommendations in the following ways.

First, as stated previously in this document, all students in all Earth Science courses are assessed on all course SLOs in every semester (fall & spring, and winter & summer semesters). As a result of reviewing student understanding of SLO assessment questions, the need to more accurately match the SLO question statement with the SLO statement as it is written, and student mastery of SLOs, SLOs have been revised or rewritten in a number of Earth Science courses and disciplines. Additionally in regards to SLO assessment, a portion of each Earth Science Department meetings in the fall and spring semesters is dedicated to faculty discussion of how to better assess our course level SLOs, and methods to revise course content or teaching strategies as appropriate.

Second, as it is demonstrated from student course SLO mastery, our department has noted there is a higher percentage of SLO mastery in courses that contain a lab component as opposed to the same course that is lecture based only (ex. Anthropology 1 (Physical Anthropology) vs. Anthropology 5 (Physical Anthropology with Lab)), as well as Geography 1 (Introduction to Natural Environment) vs. Geography 5 (Physical Geography with Lab). (Please see section *D2. Moving Forward* for the analysis of this data.) For example, during the 2011 – 2012 through 2013 – 2014 academic years, the lab-based physical geology students (Geology 4: Physical Geology

with Lab) met the student learning outcomes at a 93.5% and above success rate, in one year achieving a 100% success rate. In comparison, the success rate of those students enrolled in the non-lab physical geology courses (Geology 1: Physical Geology without Lab) hovers predominantly in the mid 70% to high 80% range. Cognizant of the fact that hands-on activities and experiences help solidify concepts, the non-lab physical geology courses that are currently being taught include in-class activities that expose students to relevant materials and concepts, as well as homework assignments that allow for independent learning opportunities. These experiential learning opportunities are incorporated into the lecture-based courses in the following ways: mineral and rock identification activities, regular independent homework assignments, lectures that focus on local examples of concepts discussed in class, in-class videos and relevant films highlighting the relevance of geology in modern society, and extracurricular field trip opportunities.

Third, an industry advisory board was updated for the Sustainable Technology Program (STP) in 2014 to accommodate the separate certificates: Solar PV, Energy Efficiency, and RRM. SMC STP faculty meet with their industry advisory boards 2-3 times per year.

Finally in response to recommendation 4, as a science department, quantitative data is at the core of everything we do in the Earth Science Department. Initially this is reflected in the academic content of our Earth Science courses. Earth Science course level SLOs are based on assessing student mastery of scientific principles. For example, this is clearly demonstrated in SLO #1 from Anthropology 9 (Paleoanthropology): "Students will have a thorough grasp of modern evolutionary theory and how it forms a comprehensive explanatory framework underlying all biological process." SLO #4 from Astronomy 5 (Life in the Universe) states: "Students will recognize how the science of astronomy has progressed because of the development of the scientific method." Additionally, our faculty's research is brought into the classroom environment - in the form of continually updating our courses to reflect new scientific discoveries and understanding, or presenting our own work as examples of how science is practiced in each of our disciplines. Just a few notable examples of this include geographer Vicki Drake's research with JPL on the relationship between ground water withdrawal and land subsidence in southern California, anthropologist Brandon Lewis' research with ancient Mayan ruins in Belize, or astronomer Simon Balm's research in the South Pole. Furthermore, as stated above, data analyzed from student SLO assessments in Earth Science courses is continually used to refine course content, teaching methods and strategies as appropriate.

3. Describe any changes or activities your program or service area has made that are not addressed in the objectives, identify the factors (e.g., licensure requirements, state or federal requirements, CCCO mandates, regulations, etc.) that triggered the changes, and indicate the expected or anticipated outcomes.

NA.

4. If your program received one time funding of any kind indicate the source, how the funds were spent and the impact on the program (benefits or challenges).

The Solar PV Installation program within the STP successfully applied for and received a number of Department of Energy mini-grants. Using these funds, we successfully wrote and delivered several non-credit courses through Community Ed. Additionally, one of the non-credit courses, "Solar PV Technical Sales," was successfully submitted and approved and was taught as a for-credit course in Spring 2015.

Prop 39 provided a small grant for several initiatives related to Sustainability training and the Sustainable Technologies Program. Seminars open to all departments were offered for LEED Green Associate certification training (a credential offered through the U.S. Green Building Council) and for training on the Living Building Challenge, a more stringent criteria-based methodology for designing and building a “regenerative” building – one that actually improves on the existing state of the development site. We have applied for and expect to receive additional grants from this source.

5. Describe departmental efforts to improve the teaching and learning environment.

Several Earth Science faculty have participated in the Faculty Summer Institute including full-timers Eric Minzenberg (2016), Jing Liu (2015), and Ciaran Brewster (2015), and adjunct Ariane Del Dalla (2016). Eric Minzenberg and adjunct Gillian Grebler completed CORA training in 2016.

Eric Minzenberg served as Chair of the Global Council from 2013-2015.

Simon Balm has served as Chair of the Information Services and Technology Planning Committees, and served on the committee which prepared the technology section of the recent accreditation self-study report. He is also currently one of the senior faculty

mentors working on the transition of our campus from the old eCollege/eCompanion platform to the new Canvas platform.

Michael Schwartz maintains research and development relationships with colleagues in the UCLA Physics & Astronomy Departments as well as Caltech, NASA/JPL, UC Berkeley, Arizona State, SF State, NASA Ames, Harvard University, Keck, Lick, and USRA SOFIA Astronomical Observatories. He participates in UCLA departmental colloquia, research symposia, and has attended National STEM teaching workshops to develop skills in differentiation for physical science education in a variety of contexts and demographics. His former students have gone on to enroll in Ph.D. programs in world-renowned institutions such as Caltech, MIT, and the University of Tokyo.

6. If there is a tutoring component or other learning support service associated with the program, describe the relationship between the service(s) and the instructional program. If applicable, discuss any data you have compiled regarding student participation and the impact on student success.

Earth Science students have participated in Supplemental Instruction since it has been offered in coordination with the STEM program and other tutoring resources on campus.

A student tutor has been put in place for the different sections of Anthropology 1 and 5 as well as Astronomy 1 and 2 in coordination with the Science Learning Resource Center.

7. Describe any grants, VTEA, or other funding received since the last review [in the past year] and how it was used to improve the program.

FUNDS - 2015-2016 (Most recent)

The Sustainable Technologies Program received approximately **$48,000** in VTEA monies to support the following activities: stipend/benefits, field trips, guest speakers, equipment, Sustainable Works programs at local high schools, university partnerships, Grid Alternatives partnerships, etc. ***For details on this budget, please see the attached document: "VTEA Funding".***

Solar PV Installation and Energy Efficiency:

$14,000 in equipment and supplies
$5000 to Grid Alternatives Partnership
$6000 Faculty Stipends for developing curriculum and certificate programs: *(2 at $3000 each)*.

Recycling and Resource Management:

$5,000 for Industry Speakers
$500 for Field Trip Transportation
$6,000 for Sustainable Works Partnership *(K-12 Pathways)*
$3,000 for University Partnerships
$2,500 for Advertising in local papers
$6000 for Developing Distance Education Curriculum ($1500 per course)

8. Describe faculty engagement in activities, training, or professional development to remain current with industry trends.

Vicki Drake earned a Graduate Certificate in GIS from University of North Dakota. Vicki Drake also participated in a Faculty Internship at Jet Propulsion Lab (JPL), Pasadena, CA, completing a research project titled "**A Study of the Water Budget for Metropolitan Los Angeles, California".** This research was presented at a number of regional and national conferences, as well as at JPL.

Eric Minzenberg completed CORA training in 2016 and completed the 2016 Faculty Summer Institute.

Ciaran Brewster completed the 2015 Faculty Summer Institute. He also attended the 2016 West Coast Training Conference for death investigators, where he also gave a presentation on Forensic Anthropology.

Jing Liu completed the 2015 Faculty Summer Institute and has been applying the teaching strategies in her classes. She also completed the Reading Apprenticeship, an online and on-ground hybrid course offered in Spring 2016 (SMC faculty only).

Adjunct Gillian Grebler completed the CORA workshop in 2016. Adjunct Ariane Del Dalla completed the 2016 Faculty Summer Institute.

D 2. Moving Forward

Discuss and summarize conclusions drawn from data, assessments (SLO, UO) or other evaluation measures identified in Section C and indicate responses or programmatic changes planned for the coming year(s) including:

- **how the assessment results are informing program goals and objectives, program planning, and decision-making**
- **specific changes planned or made to the program based on the assessment results**

The vast majority of the students enrolled in Earth Science department courses have transfer as their stated goal. Since the completion of one college-level physical or social science course is a transfer admissions requirement, our courses at all levels are in high demand and success in our courses is important for the completion of educational plans for many students of varied majors. In this section the Earth Science Department examined some of the factors that contribute to success in our courses. The department was particularly interested in those factors over which we can have some control of or which would help in developing a department success plan. We reviewed not only SLO assessment data, but also success and retention data by various factors. In combination, all three were indicators of student success.

SLO Assessment Data:

The main aspect of our SLO assessment data that our department decided would be pertinent to analyze is the SLO student success rate of a class that consists of only a lecture portion vs. the SLO student success rate of that same class that has a laboratory portion attached to the lecture portion of the class. The data we analyze below compares SLO student success in Anthropology 1 (Physical Anthropology) with Anthropology 5 (Physical Anthropology with Lab), Astronomy 2 (Planetary Astronomy) with Astronomy 4 (Planetary Astronomy with Laboratory), Geography 1 (Introduction to the Natural Environment) with Geography 5 (Physical Geography with Lab), Geology 1 (Physical Geology without Lab) with Geology 4 (Physical Geology with Lab), and PV 1 (Introduction to Solar Energy Systems) with PV 2 (Intermediate Solar Photovoltaic System Installation). Our hypothesis is that SLO success would be greater in the lab-based classes in comparison to the non-lab classes.

SLO Comparison of Anthropology 1 (Physical Anthropology) and Anthropology 5 (Physical Anthropology with Lab)

ANTHROPOLOGY 1	SLO 1	SLO 2		ANTHROPOLOGY 5	SLO 1	SLO 2
2010	NA	76.1%		2010	NA	88.3%
2011	88.7%	91.0%		2011	81.1%	81.1%
2012	83.2%	82.9%		2012	87.9%	87.9%
2013	81.5%	81.5%		2013	87.7%	87.7%
2014	86.9%	86.9%		2014	94.1%	94.1%
2015	91.5%	92.0%		2015	94.9%	94.9%
Average	85.8%	84.1%		Average	89.2%	89.1%

The data above clearly demonstrates greater student SLO success (for both SLO #1 and SLO #2) in the Anthropology 5 lab-based class than in the Anthropology 1 class that is purely lecture based. The 6-year average success rate for SLO #1 is 3.4% higher in Anthro 5 (89.2% vs. 85.8%) and 5% higher for SLO #2 (89.1% vs. 84.1%).

SLO Comparison of Astronomy 2 (Planetary Astronomy) and Astronomy 4 (Planetary Astronomy with Laboratory)

ASTRONOMY 2	SLO 1	SLO 2		ASTRONOMY 4	SLO 1	SLO 2
2010	NA	NA		2010	NA	NA
2011	NA	NA		2011	NA	NA
2012	76.5%	84.9%		2012	90.0%	98.0%
2013	75.7%	73.9%		2013	88.3%	91.7%
2014	74.2%	75.0%		2014	86.8%	94.3%
2015	92.7%	93.6%		2015	83.3%	87.0%
Average	79.5%	81.6%		Average	87.1%	92.6%

The data above clearly demonstrates greater student SLO success (for both SLO #1 and SLO #2) in the Astronomy 4 lab-based class than in the Astronomy 2 class that is purely lecture based. The 6-year average success rate for SLO #1 is 7.6% higher in Anthro 4 (87.1% vs. 79.5%) and 11% higher for SLO #2 (92.6% vs. 81.6%).

SLO Comparison of Geography 1 (Introduction to the Natural Environment) and Geography 5 (Physical Geography with Lab)

GEOGRAPHY 1	SLO 1	SLO 2		GEOGRAPHY 5	SLO 1	SLO 2
2010	59.1%	33.3%		2010	92.9%	83.3%
2011	0.0%	0.0%		2011	96.4%	96.4%
2012	60.0%	74.2%		2012	92.5%	91.2%
2013	69.9%	69.9%		2013	94.2%	89.1%
2014	75.0%	75.0%		2014	91.7%	91.7%
2015	85.7%	84.7%		2015	86.0%	86.0%
Average	70.3%	69.9%		Average	91.7%	88.7%

The data above clearly demonstrates greater student SLO success (for both SLO #1 and SLO #2) in the Geography 5 lab-based class than in the Geography 1 class that is purely lecture based. The 6-year average success rate for SLO #1 is 21.4% higher in Geography 5 (91.7% vs. 70.3%) and 18.8% higher for SLO #2 (88.7% vs. 69.9%).

SLO Comparison of Geology 1 (Physical Geology without Lab) and Geology 4 (Physical Geology with Lab)

GEOLOGY 1	SLO 1	SLO 2		GEOLOGY 4	SLO 1	SLO 2
2010	NA	NA		2010	100.0%	NA
2011	NA	NA		2011	96.8%	96.8%
2012	87.3%	95.3%		2012	82.9%	97.6%
2013	81.4%	88.4%		2013	87.1%	93.5%
2014	77.3%	77.3%		2014	93.8%	61.2%
2015	72.0%	72.0%		2015	86.4%	83.0%
Average	79.7%	83.9%		Average	89.5%	80.0%

Spanning the academic years 2010-2015, the student learning outcomes demonstrate that students in the lab-based physical geology courses (Geology 4), in general, achieved the desired learning outcomes at higher success rates than those in the non-lab physical geology courses (Geology 1). Of note, for SLO #1 the 6 year average SLO success rate was 89.5% in the lab-based course and only 79.7% in the non-lab course. The success rate of those students enrolled in the non-lab physical geology courses hovers predominantly in the mid 70% to high 80% range. The 6-year average data is skewed for SLO #2 for Geology 4 due to an

unexplained, sudden drop in SLO success in 2014 (61.2% success). These results suggest that those students that were afforded an opportunity to engage in extended hands-on experiences were able to meet the student learning outcomes more successfully.

Cognizant of the fact that hands-on activities and experiences help solidify concepts, the non-lab physical geology courses that are currently being taught include in-class activities that expose students to relevant materials and concepts, as well as homework assignments that allow for independent learning opportunities. When comparing which student group more successfully met the student learning outcomes since the 2011 – 2012 academic year, those students enrolled in the lab-based sections scored approximately 3% points higher than those students in the physical geology course without a lab component; although, both scored in the 80% range. The comparable success rates likely reflect the incorporation of experiential learning techniques into the lecture based courses by past faculty.

The newly hired two full-time faculty (hired in fall 2016) incorporate experiential learning opportunities into the lecture-based courses in the following ways: mineral and rock identification activities, regular independent homework assignments, lectures that focus on local examples of concepts discussed in class, in-class videos and relevant films highlighting the relevance of geology in modern society, and extracurricular field trip opportunities. Understanding that learning is a personal choice motivated by student buy-in, these activities not only reinforce course concepts, but also provide students with an array of experiences designed to elicit engagement, which can only help students meet the student learning outcomes.

In the upcoming years, the new geology faculty plan to reevaluate existing student learning outcomes to ensure that they are appropriate indicators of student success. The faculty will also continue to compliment traditional lectures with experiential learning experiences to help ensure that student learning outcomes are met successfully.

SLO Comparison of PV 1 (Introduction to Solar Energy Systems) and PV 2 (Intermediate Solar Photovoltaic System Installation)

PV 1	SLO 1	SLO 2		PV 2	SLO 1	SLO 2
2010	NA	NA		2010	NA	NA
2011	NA	NA		2011	NA	NA
2012	81.0%	84.2%		2012	100.0%	100.0%
2013	80.6%	80.6%		2013	95.5%	95.5%
2014	NA	NA		2014	96.0%	96.0%
2015	100.0%	100.0%		2015	100.0%	100.0%
Average	85.9%	87.0%		Average	97.5%	97.5%

Although PV 1 and PV 2 are different courses, PV 1 is a feeder class to the increasing complexity and knowledge required to perform successfully in PV 2. PV 2 provides more in-depth lab exercises than does PV 1. As is consistent with the other Earth Science disciplines SLO results demonstrated in the above data tables, student SLO success is much greater in PV 2 in comparison with PV 1. The 4-year average (2012-2015) success rate for SLO #1 is 11.6% higher in PV 1 (97.5% vs. 85.9%) and 10.5% higher for SLO #2 (97.5% vs. 87%).

The SLO data clearly demonstrates that students in lab-based classes perform much better than students enrolled purely in lecture-based classes. Doing science requires hands-on application of concepts and methodologies; it's difficult to get this practice in a purely lecture based classroom setting. As a result, Earth Science faculty have incorporated more hands-on practice for students in our lecture only classes. Examples include bringing in skeletal casts into the classroom in Anthropology 1 (Physical Anthropology), whereas previously these materials were only used in lab-based physical anthropology classes (Anthropology 5: Physical Anthropology with Laboratory). As stated above, geology professors have brought such activities as mineral and rock identification into non-lab classes. Geography 1 students are exposed to more experiential learning opportunities through the use of materials and equipment usually employed only in Geography 5 classes. Astronomy 1 and Astronomy 2 students also benefit from the use of lab equipment and other materials from the Astronomy 3 and Astronomy 4 courses, respectively.

Student Success and Retention Data:

Student Success and Student Retention data is previously analyzed by Earth Science discipline in section *C. Program Evaluation, question #4*.

F2. Objectives (Moving Forward)

Objective #1: Create a 12-unit Department Certificate in Geospatial Technologies.

Area/ Discipline/ Function Responsible: GEOG: GEOGRAPHY

Assessment Data and Other Observations:

External Factors:
Other Factors
Revenues from the public sector lead geospatial market growth and account for more than one-third of total revenue. While federal governments were among the early adopters of GIS technology, recent trends toward devolving more responsibilities to states and localities have spurred those entities to become important consumers of GIS. While industries in the regulated sector, such as utilities, telecommunications, transportation and education, are the largest consumers of GIS/geospatial solutions, private-sector growth remains dependent upon business adoption based on the added-value these technologies provide. (Datatech, GIS/Geospatial Markets and Opportunities)

Geospatial products and specialists are expected to play a large role in homeland security activities. Information gathering needs to protect critical infrastructure have resulted in an enormous increase in the demand for such skills and jobs. (Lorraine Castro, NIMA Human Resources Department)

Because the uses for geospatial technology are so widespread and diverse, the market is growing at an annual rate of almost 35 percent, with the commercial subsection of the market expanding at the rate of 100 percent each year. (Geospatial Information & Technology Association)

Timeline and activities to accomplish the objective: Department Certificate completion: Fall 2017

Describe how objective will be assessed/measured: Certificate approved by Curriculum Committee

Comments: Geospatial Technologies is a rapidly expanding and high-demand field, consisting of not just GIS (Geographic Information Systems), but also of Homeland Security, GPS (Geographic Positioning Systems), Spatial Analysis, and Remote Sensing, among others.

Objective #2: Develop online sections of Astronomy 5, Astronomy 6, (and perhaps Astronomy 7).

Area/ Discipline/ Function Responsible: ASTRON: ASTRONOMY

Assessment Data and Other Observations:
SLO Assessment Data

External Factors:

Timeline and activities to accomplish the objective: Submission of courses to Curriculum Committee, Fall 2017

Describe how objective will be assessed/measured: Successful approval of the online courses. Students enrolled in each of these

courses, in every section of every semester these courses are taught, will be assessed to determine if they meet each of the SLOs for each class.

Comments: The most recent year of Astronomy 2 and the last two years of the Astronomy 1 courses have seen a large increase from the 75% mastery to 90% due largely to the offering of several online sections which typically enjoy very high rates of completion and mastery.

Objective #3: Create a Pathway Model in Anthropology.

Area/ Discipline/ Function Responsible: ANTHRO: ANTHROPOLOGY

Assessment Data and Other Observations:
Other data or observed trends

External Factors:
Other Factors
Data from the Career Ladders Project (www.careerladdersproject.org) and Institutional Research at SMC demonstrates that community college students frequently spend 6 or more years to complete degrees or transfer requirements. Pathways give students guided structure and support as they navigate through institutions of higher education.

Timeline and activities to accomplish the objective: Submission to Curriculum Committee by end of spring 2018.

Describe how objective will be assessed/measured: Ratification of Pathway Model by Curriculum Committee and Academic Senate.

Comments: A Pathway "is a series of structured and connected education programs and support services that enable students to advance over time to better jobs and higher levels of education and training (Career Ladders Project 2017).

E. Curriculum Review

To comply with accreditation standards, programs are required to update their curriculum outlines of record (CORs) every six years. Be sure to submit your updated outlines to the Academic Senate Joint Curriculum Committee in time for them to be reviewed prior to or at the Curriculum Committee's last scheduled meeting of the year (check the committee's submittal deadlines at (click here for dates and deadlines). The Program Review annual report will note whether course outlines are up to date.

1. Discuss how the department reviews, revises, and creates new curriculum. Include the following information:

- **The process by which department members participate in the review and revision of curriculum.**
- **How program goals and SLOS are integrated into course design and curriculum planning.**
- **The relationship of program courses to other college programs (cross-listing, overlapping content**
- **The rationale for any changes to pre-requisites, co-requisites and advisories.**
- **How the department ensures course syllabi are aligned with the course outline of record.**

New Earth Science courses are written by the faculty from their specific discipline and subsequently reviewed by all full-time Earth Science Department faculty and some adjuncts before submission to the Curriculum Committee. In the case when Earth Science courses are interdisciplinary (e.g., Geology 10/Astronomy 10: Exploration of the Solar System) faculty from both disciplines are consulted during the initial stages of course development.

The basis of all Earth Science courses is the application of the scientific method including critically, evolutionary theory. This fact is clearly represented in Earth Science Program Level SLO #1: "Earth Science students will recognize Earth as (1) the natural and cultural home of human beings, a continually evolving species; and (2) as a four-and-a-half billion-year-old planet within an equally evolving and ever-changing universe." Earth Science classes require that students possess basic math skills to facilitate student success. Earth Science courses have elements of, and applications to, various outside SMC disciplines including biology, chemistry, physics, mathematics, sociology, environment science, political science, global studies, and others.

The Earth Science Department currently has several courses that are cross-listed with outside SMC departments. These include:

Geography 7/Environment Studies 7 (Introduction to Environmental Studies), Geography 8/Urban Studies 8 (Introduction to Urban Studies), Geography 11/Global Studies 11 (World Geography: Introduction to Global Studies), Geography 19/GIS 19 (Geographic Information Systems for Business), Geography 20/GIS 20 (Introduction to Geographic Information Systems), and Geography 23/GIS 23 (Intermediate Geographical Information Systems). Within the Earth Science Department, there are two classes that are cross-listed: Astronomy 10/Geology 10 (Exploration of the Solar System) and Geography 94/Geology 94 (Introduction to Geoscience Field Methods). In conjunction with a requirement of the STEM Grant, Earth Science faculty co-authored Science 10: Principles and Practice of Scientific Research, with faculty from the Life Science Department and Physical Science Department. Furthermore, Anthropology 19 (The Culture of Food) has been co-taught by anthropologists Eric Minzenberg and Gillian Grebler since its inception in spring 2012. Over the past 6-years, Earth Science faculty including Brandon Lewis, Eric Minzenberg, Pete Morris, Ciaran Brewster, and Bill Selby have guest-lectured in many classes in outside departments, and in Associated Student clubs advised by faculty in outside departments.

All current Earth Science courses have at least two SLOs that are part of the permanent Course Outline of Record. All SLOs from all Earth Science courses are assessed every semester, in every section for every student. SLOs are developed for all new Earth Science courses, reviewed by all full-time Earth Science faculty and adjuncts who participate in the new course preparation process, and then submitted to the Curriculum Committee for review.

The Earth Science Department requires submission of all course syllabi from all sections at the start of each academic semester. Department Chair, Eric Minzenberg, in tandem with Jing Liu, Curriculum Committee representative from the Earth Science Department, review course syllabi to check for consistency with the Official Course Outline of Record.

2. Discuss the role of the advisory board and other industry bodies or input in updating curriculum to meet industry standards and the needs of students.

The Industry Advisory Board for the STP meets with Earth Science faculty two-three times/year. The IAB copartners with our department's STP faculty in the curriculum process including revising existing courses and developing new courses to meet industry standards. Below are a list of the STP IAB recommendations that specifically address curriculum:

- Consider offering group industry tracks, or compressed contract ed offerings based on the same curriculum.
- Bring the current community education course offering in Energy Efficiency over to the for credit side through the curriculum approval process.
- Consider making Energy Efficiency a prerequisite.
- Encourage students to utilize the SMC Math Lab and / or take the non-credit Math course.
- Consider expanding the program to address the program administration aspect of the solar industry.
- Consider expanding the program to provide a concentration on Operations and Maintenance of solar systems.
- Consider developing a Math course specific to energy and solar (Energy Math).
- Consider making Math a prerequisite and utilizing the existing placement test to determine eligibility.
- Create a subcommittee to investigate the math content and requirement.
- Suggest that safety models be built into the program and set up an OSHA 10 course.
- Encourage field trip opportunities for students, such as local utilities, Helio Power, or Solar City for Solar PV students, or to local landfills or recycling centers for our RRM students.

The STP has responded to these IAB suggestions in the following ways:

1. Setting up internships with Grid Alternatives and other IAB Partners.
2. Developing Math/Physics Modules for STP students.
3. Developing and submitting curriculum for Solar PV Technical Sales courses – offered spring 2015.
4. Developing and submitting curriculum for 13-unit Energy Efficiency Department Certificate.
5. Participating in field trips for RRM students to perform Waste Audits at local schools and businesses (ex. Hilton.).

F. Community Engagement

In the prompts that follow, please delineate the partnerships you have with the rest of the SMC community as well as those you have with external organizations.

1. If applicable, describe how your department staff members engage in institutional efforts such as committees and presentations, and departmental activities.

The fundamental strength of the Earth Science Department is its exceptional faculty and the ability of the faculty to not only function, but even excel, without adequate funding for facilities, supplies and equipment. Many of our instructors, fulltime and adjunct, have continued with their research and publishing, even while teaching full loads.

The success of the Astronomy Club, the Anthropology Club, the Geography Club, and the former "Ozone" Club is directly related to the dedication of our instructors. Our instructors involve their students directly with research opportunities, such as Professor Fouts and the students he has included in his atmospheric research; Professor Vicki Drake and the students she has included in her research using Remote Sensing and GIS in fire-mapping.

Field courses have been emphasized in the Earth Science Department curriculum. Field courses in Geography, Geology, and Archaeology are offered every semester. The Geography and Geology field classes generally travel within the state of California, while the Archaeology field class is offered in the winter and summer semesters as students travel to Belize and Guatemala, to participate in international archaeological projects. The Latin American Program provides field experiences currently in Mexico and Central America.

The Earth Science Department has active members who are participants on many committees on campus, including Curriculum Committee, STEM, ISC, EAC, and Scholars Advisory.

Pete Morris currently serves as the Chair of Distance Education Joint Senate Committee. Vicki Drake currently serves as Chair of the Program Review Joint Senate Committee. Jing Liu serves as the Earth Science Representative on the Curriculum Committee. Eric Minzenberg was past Chair of the Global Council (2013-2015). Our faculty have been featured as "Distinguished Scientist" lecturers as well.

We have student clubs as part of our department: Astronomy Club, Geography Club, and Anthropology Club. These clubs have enthusiastic students and faculty sponsors. Members participate in a number of events, both on and off campus, including "Beach Clean-Up" Day and other civic activities.

Vicki Drake was honored as the 2013 Eco-Hero for her work in developing the Recycling and Resource Management Program. She has also advised the Geography Club for several years. The Club members participated in numerous activities, including a one-day excursion to Catalina Island; field trip to Natural History Museums in San Diego and Santa Barbara. Geography Club members have also acted as "Greeting Ambassadors" to the new full-time instructor candidates invited to interview. Club members greeted the candidates, escorted them to the waiting area, and generally made the candidates feel welcome.

Gary Fouts and Vicki Drake have both been past recipients of the Chair of Excellence Award in Earth Science. Brandon Lewis is the current recipient of the Chair of Excellence Award in Earth Science.

Our Department also participates in many SMC campus events, including every fall "Welcome Day" for new incoming SMC students. We also present Astronomy programs through our Planetarium to local school children – at least two shows per day during the school year. We also offer the very popular Friday night Planetarium show to the local community.

2. If applicable, discuss the engagement of program members with the local community, industry, professional groups, etc.)

In cooperation with local non-profit organizations (e.g., The Carbon Underground (https://thecarbonunderground.org/) and Kiss the Ground (https://www.kisstheground.com)) Dr. Jenney Hall (geology adjunct) and student Natalie Flores have been working to design projects for soil remediation in urban agriculture. The development of community gardens is an essential component to this project. This work has been submitted to the 7th Annual Global Citizenship Symposium at SMC

(https://www.youtube.com/watch?v=dnO2XkJtlYo).

Geology professor Cara Thompson co-authored an Ocean Sustainability teaching module that was published during Fall 2016 by Carleton College's InTeGrate Program. This module is provided as a free resource for high school, college, and university educators who want to teach Ocean Sustainability-themed topics by using student-led, active learning activities. Many of our instructors, on their own time, speak at a variety of community groups, acting as ambassadors for Santa Monica College. Additionally, our Planetarium Lecturer, James Mahon, takes our more portable telescopes to various groups to give lectures and demonstrations.

Stuart Cooley is a member of GRID Alternatives Greater Los Angeles Workforce Development Committee. He also participates as a LEED GA group leader, coordinating workshops for interested students and faculty. LEED GA student group training is offered through the US Green Building Council utilizing SMC faculty and guest lecturers with the goal of passing an exam giving the students another stackable credential.

Stuart also participated in NSF's Mentor Connect program, along with our grants administrator and a Physical Science faculty member, leading to a future grant opportunity from the NSF for interdisciplinary science module development and increased participation with industry through internships.

Jing Liu is a member of Los Angeles Geographical Society. She has been closely working with other members in the group to offer guest lectures in her class. She has also established a long-term partnership with NOAA Oxnard Office for field trip to the office.

Vicki Drake has served for many years on the Executive Council for APCG (Association of Pacific Coast Geographers), a subset of the Association of American Geographers (AAG).

3. Discuss the relationship among and between full and part-time faculty, involvement of part-time faculty in departmental activities, and part-time faculty access to resources and support.

Earth Science adjuncts are welcomed and valued participants in all Earth Science department meetings, the planning and developing new curriculum, writing and updating SLOs, co-advising Associated Student Clubs, teaching Study Abroad programs, as well as serving on Academic Senate and Faculty Association Committees.

Jing Liu (full-time) and Joan Hackeling (part-time) have established a regular meeting every semester to discuss teaching strategies in physical geography. Jing also attended Joan's 2016 summer class and gave a guest talk on the application of WebGIS in Physical Geography.

Jeremy Patrich (part-time) and Vicki Drake (full-time) have worked to organize and catalogue materials in the Geography Preproom (HSS 250) to make them more accessible and functional in all Geography classes.

Eric Minzenberg (full-time) has been co-teaching Anthropology 19 (The Culture of Food) with adjunct Gillian Grebler every spring and fall semester from 2012-present.

Geology adjunct, Alessandro Grippo, invited two lecturers, Dr. Weissert from ETH Zurich and Dr. Bottjer from USC to give talks as part of SMC's Distinguished Scientist Series.

In cooperation with local non-profit organizations (e.g., The Carbon Underground (https://thecarbonunderground.org/) and Kiss the Ground (https://www.kisstheground.com)), Dr. Jenney Hall (geology adjunct) and student Natalie Flores worked on designing projects for soil remediation in urban agriculture. The development of community gardens is an essential component to this project. This work has been submitted to the 7th Annual Global Citizenship Symposium at SMC (https://www.youtube.com/watch?v=dnO2XkJtlYo).

Full-time and adjunct anthropology professors have presented a 'career day/educational pathway' discussion with student members of the Anthropology Club, generally in the fall semester, since 2012.

G 1.Current Planning and Recommendations

The following items are intended to help programs identify, track, and document unit planning and actions and to assist the institution in broad planning efforts.

1. Identify any issues or needs impacting program effectiveness or efficiency for which institutional support or resources will be requested in the coming year. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request support or resources through established channels and processes].

As the department as grown, it has been forced to offer an ever increasing percentage of its courses outside of its dedicated room allocation. The space difficulties experienced by the Earth Science Department are clearly a pattern that many departments are facing, however it is inappropriate for a science department to be teaching outside of its allocated space. Science classes must extensively utilize equipment, hands-on material, and various demonstration materials in lab and lecture courses. Transporting these materials to various locations on campus presents a burden for the instructors, a terrible toll on the equipment and a diminishment of the quality of the class for the students

If the amount of dedicated room space is compared among the science departments on campus, it is extensively clear that Earth Science space is not even close to the standards of Life and Physical Science departments (see Table 1 below). Earth Science has a massive 54 WTH per dedicated teaching space whereas 32–34 WTH per teaching space is the norm in the other sciences. Additionally, course enrollment in the Earth Science Department has increased over the past five years. Examining *Table 2. On-ground Course Enrollment per Department (fall 2015)*, indicates clearly that over the past five years, the Earth Science Department has instructed a large number of the students in our limited lab and lecture space. Our enrollment numbers are significantly higher than the Physical Science Department, and slightly less than the Life Science Department. Furthermore, Earth Science courses have greater numbers of students enrolled/section than the other two science departments at SMC.

Table 1. WTH/dedicated room by departments *Data from SMC Website-Fall 2012*

Department	WTH	Dedicated Rooms	WTH/Room
Life Science	405	12	34
Physical Science	383	12	32
Earth Science	269	5	54

Table 2. On-Ground Course Enrollment by Department (Fall 2015)

Department	# Students	#Sections	#Students/Section	Dedicated Rooms
Life Science	3,061	99	30.9	12
Physical Sci.	2,572	98	26.2	12
Earth Science	2,998	91	32.9	5

The Earth Science Department is enthusiastically awaiting our move to the new Science/Math Complex ("Phase 2"). We hope to centralize the elements of Earth Science, teaching labs, prep room, GIS lab, lecture rooms, planetarium, observatory, environmental center, elements of the Sustainable Technologies Program (such as specific courses in Recycling and Resource Management and Energy Efficiency) and faculty/staff offices into one location that will unite us with our science colleagues on campus. However, the department faces an immense dilemma waiting for the expected facility expansion for the Science Complex.

The central problem is laboratory space. We currently have two teaching labs on the first floor of Drescher Hall, the Geography lab/lecture room in HSS, and our shared GIS classroom in the Business Building (B250). The teaching labs are engaged with laboratory classes or lab related classes from 8 am to 10 pm throughout the week. The shared GIS classroom in Business is small, only 24 seats, and only classes using the computers are scheduled there. Moreover, the dedicated lecture rooms are also entirely occupied from morning to night leaving some Earth Science classes to wander the campus. Transporting these materials to various locations on campus presents a burden for the instructors, a terrible toll on the equipment and the hands-on material (i.e., the osteological remains in Anthropology 1), and a diminishment of the quality of the class for the students. Even lecture classes in Physical Anthropology

need to be taught in either the Drescher lab rooms or lecture rooms – the materials cannot be transported across campus.

The utilization percentages for classrooms range from 100% in higher demand time slots to 86.7% at lower demand time slots. In order to teach science classes effectively, equipment, demonstration materials and laboratory space are essential. This limitation in space effectively stops the Earth Science Department from expansion, diversification and healthy growth. We, indeed, recognize that we are not the only department across the campus to experience this impaction in facilities and space. However, we are probably the only *science* department with this critical space problem.

In the interim while we wait for the extension and completion of the Science Complex, the Geography program moved their lectures and labs into new rooms in HSS building. The Geography Lab is fully functional, with hot plates, instead of gas, for experiments. Students and faculty alike appreciate the additional lab space which means the Geography program can offer four lab sections per semester, in addition to all the other geography courses. The moving of almost all the Geography program courses has opened up the labs in Drescher Hall, allowing Anthropology to expand its lab offerings to four sections per semester. Additionally, both the labs in Drescher Hall have undergone renovation in terms of installing overhead projection systems and teacher stations. These new teaching devices have enabled Anthropology, Astronomy and Geology professors to enhance their lectures and labs by accessing and employing a variety of media to present course material to the students. However, we are still needing to juggle lab classes between the disciplines.

Planetarium needs:

The Digistar 2 projector in the Drescher Planetarium was installed in 1998, and uses a 1990's-generation computer for operation. It is already experiencing fatigue and failure, and finding replacement parts is becoming more difficult. The eventual retirement of this system is inevitable. Whether we decide to purchase upgraded digital equipment or revert to a more durable opto-mechanical planetarium, using multiple low-cost digital projectors, is an expenditure that needs to be planned for in the future.

Sustainable Technologies Program

In terms of space requirements, the STP is given a dedicated classroom and one storage closet for learning materials and construction materials. When the program was created in 2009, the STP was allocated two dedicated classrooms and a storage room. Subsequently, one of these classrooms was removed from use of the STP by administration, which has had negative impacts on the program through limiting potential course offerings. As the program has matured, demonstration models and display materials have been created and have started to impact an already overcrowded classroom situation. An expected expansion or accommodation is necessary to continue to provide high quality programming in a safe and engaging manner.

Programmatically, Sustainable Technologies Program brings together a number of training programs under one umbrella and provides an overarching structure by which students can pursue educational and career opportunities in the various green fields. By including these programs under one umbrella, SMC is recognizing and embracing the interconnectedness of these various fields, and encouraging students to think of green careers as outside the traditional silos of STEM programming. Each of these program tracks will prepare students for immediate employment upon graduation, as well as provide them with the resources and support that they need to transfer to a baccalaureate institution. For entry-level work, there are nine tracks in the Sustainable Technologies Initiative:

1. **Recycling and Resource Management** (12-UNIT AND 18-UNIT EXISTING, **SUSTAINABILITY PROGRAM**)
2. **Photovoltaic Installation, Design and Sales** (12- UNIT AND 19-UNIT EXISTING, **RENEWABLE ENERGY PROGRAM**)
3. Energy Efficiency Specialist (13-UNIT EXISTING, 19-UNIT IN DEVELOPMENT)
4. Wind Energy Technician
5. **Solar Thermal Energy Technician**, **RENEWABLE ENERGY PROGRAM**)
6. **Geothermal Energy Technician**, **RENEWABLE ENERGY. PROGRAM**)
7. Sustainable Building Consultant (PLANNED for SUSTAINABILITY PROGRAM)
8. Business Applications – Entrepreneurship and Logistics (PLANNED for SUSTAINABILITY PROGRAM)
9. Landscape (Water) Efficiency Technician (PLANNED for SUSTAINABILITY PROGRAM)

The first two tracks are in place. A 13-unit Energy Efficiency Specialist was approved in Spring 2014. A 19-unit Energy Efficiency

Specialist Certificate is in the process of being developed. The fourth track, Wind Energy Technician, along with the fifth and sixth tracks, Solar Thermal Energy Technician and Geothermal Energy Technician, respectively, will be developed to address the anticipated growth markets in the energy sector. Along with tracks two and three (Photovoltaic Installation, Design and Sales, and Energy Efficiency Specialist), five tracks comprise the new Renewable Energies Program, and require a substantially larger investment in equipment and curriculum materials, which has delayed its launch and for which we are now seeking funding. Tracks seven, eight, and nine round out the Sustainability Initiative's long-range goals, and are planned for development and implementation at some time in the future.

Weekly teaching hours put CTE and Transfer classes in competition: As noted, in the program review above, the STP program faculty, administrators and Industry Advisory Board are interested in offering more classes and growing the sustainable technologies program. However, the Earth Science department is limited in the number of WTH provided. Not only does this make it difficult to offer the entire sequence in a timely manner, it also is a disadvantage for growing institutional support for the program as faculty are reluctant to give up transfer courses for CTE.

2. If applicable, list additional capital resources (facilities, technology, equipment) that are needed to support the program as it currently exists. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

Storage for STP – specifically Solar PV and Energy Efficiency classes

The Solar PV and Energy Efficiency courses are currently offered at the SMC Airport Campus. We have experienced a reduction in classrooms and storage space since the Airport Campus is being used as a "swing campus" while various buildings are being remodeled. Currently, AET has been moved to Airport Campus. Renovations to create office space, more classrooms, etc. all resulted in the STP program losing space. In order to provide state-of-the-art training that is industry-standardized, we need very large pieces of equipment (i.e., mock roofs, inverters, solar panels, door blowers, etc.) all of which require secure storage space.

Adequate storage: We need space for the very large pieces of equipment necessary for the program and area in the parking lot or elsewhere outdoors to perform lab exercises. Although the storage space issue has been somewhat ameliorated by allowing the PV program access to space carved out of space during the AET renovation and subsequent move to Airport Campus, this is a temporary measure. Finding adequate funding for shelving and bins for organizing equipment was another challenge. We were able to secure monies and, as a result, shelves and bins were installed over the winter 2011 intersession. The tools, equipment and other supplies are now out of their packing boxes and stored in labeled bins. Limited storage hinders faculty from developing and offering classroom-ready lab setups.

Funding of CTE

We require continued administrative support to purchase and replace the high quality equipment, tools and materials necessary to sustain the Solar PV Installation and Energy Efficiency programs. VTEA/Perkins funds are designed to grow and expand CTE programs. We use those funds to purchase new equipment to support new courses within and beyond Solar PV Installation and Energy Efficiency. The funds are not to be used for maintaining programs – such as replacing equipment and tools that are worn out or broken.

3. If applicable, list additional human resources (staffing, professional development, staff training) needed to support the program as it currently exists. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

Full-time Physical Anthropology Instructor

Since 1999, Anthropology has maintained a staff of four contract anthropologists (two physical anthropologists, one archaeologist, and one cultural anthropologist). This year, one of our physical anthropologists, Dr. Suellen Gauld, has announced she will be retiring at the end of the Spring 2017 semester. Dr. Gauld has, for many years, shepherded the development of physical anthropology and served as an exceptional instructor and mentor to hundreds of SMC anthropology students. Her retirement will greatly impact our program, especially if she is not replaced with another full-time hire. When full-time physical anthropologist Dr. Jan Austin retired in 2015, her position was replaced as the college acknowledged the importance of this program. If Dr. Gauld's position is not replaced, this will leave the Physical Anthropology progam with only one full-time faculty. This will obviously make it difficult to maintain the high quality Physical Anthropology program that is currently in place at Santa Monica College, a program that has taken decades to

develop.

Physical Anthropology is a highly specialized subfield of anthropology that addresses the evolutionary biology and adaptive characteristics of our species. Our curriculum, which currently represents almost half (49%) of all Anthropology course offerings, is successful and strong (Fig. 1). Introductory lecture (ANTHRO 1) and lecture/lab (ANTHRO 5) survey courses comprise the largest components of the program (48 WTH/semester). In addition to these flagship courses, we offer two content-focused classes: ANTHRO 9 (Paleoanthropology) and ANTHRO 10 (Forensic Anthropology). Our classes display strong enrollment (sections fill early in the enrollment period), high retention rates (>80% - and consistently higher than SMC college-wide percentages), and excellent student success (high mastery of SLO assessment criteria. ex. Anthropology 1 averages 2010-2015: SLO 1 = 85.8%; SLO 2 = 84.1%; Anthropology 2 averages 2010-2015: SLO 1 = 89.2%; SLO 2 = 89.1%).

Physical Anthropology courses, in particular ANTHRO 1, 5, 9 and 10, are structured around specialized content that requires extensive knowledge of the primate and hominin fossil record, skeletal anatomy, and methods of skeletal analysis. Although the percentage of physical anthropology classes taught by adjunct instructors traditionally has been kept at or below 40%, the number of WTH allotted to part-time faculty will increase to 75% if Dr. Gauld's position is not replaced. Furthermore, given the paucity of hourly anthropology instructors who possess the training necessary to teach ANTHRO 1, 5, 9 and 10, we would likely end up having to reduce the number of sections we offer.

We expect a new hire to be able to teach all Physical Anthropology courses, but we are particularly concerned that this individual has the requisite skills to teach multiple sections of ANTHRO 5 and ANTHRO 9. We also expect a new instructor to share the responsibilities of maintaining, curating, and improving our extensive and impressive collection of human and primate skeletons and hominin fossil casts, as well as to be an active participant in our department's association with the STEM program. To accomplish these tasks, direct the program's development, and mentor its students will require the efforts of more than one contract faculty member. If the College wants programs like ours to remain a robust component of the SMC academic curriculum, it must support them with sufficient full-time faculty.

Full-time Planetarium Administrator/Director

Previous Program Reviews suggested the department should investigate training for the maintenance of the Digistar, and identify a potential trainee. We request a position of Earth Science Lab Technician be created. Such a person would be trained to help maintain the Digistar, as well as expand the public program to more time periods, possibly including Saturday shows, and assist in the setup and take down of Geology, Astronomy, Geography and Anthropology labs. The Planetarium is reaching a point where it needs someone dedicated to maintaining the Digistar and investigating new equipment options.

The Drescher Planetarium is an integral part of the Earth Science Department serving three basic groups: SMC faculty and students; Santa Monica and surrounding Los Angeles community residents; and school groups – both public and private from pre-school through college level. Additionally, Earth Science faculty and staff have worked with planning committees from other colleges interested in building their own planetarium who want to see how SMC's Planetarium works.

The Earth Science Department had a full-time Planetarium Director who unfortunately passed away. Subsequent requests to replace the Planetarium Director were unsuccessful due to budgetary constraints. The position "Planetarium Staff Administrator" was re-established in 2006 and revised in 2008 (see attached SMC Classified Specification Bulletin). Although this Classification Specification Bulletin will need to be updated to accommodate changes in the technology (for example, we no longer use 'slides' in presentations), it is an excellent tool for illustrating the type of works that are NOT being performed for the Planetarium, and certainly highlights the urgency we feel for preserving the generous gift from the Drescher family in establishing the Planetarium and providing the funding for its initial development.

The request for a Planetarium Director/Lab Technician has become a pressing matter for a number of reasons. First, the new Science Complex addition will include a new Planetarium, as well as an observatory. SMC is committed to provide a first-rate Planetarium and a dedicated Planetarium Staff Administrator is crucial to assure the new Planetarium is optimized, and to ensure quality control in all areas: equipment, design, function, marketing, programming, maintenance, utilization, scheduling, and more.

Second, the Drescher Planetarium is currently using 1990's computers to run the Digistar 2 projector: the oldest of this type of system

still operating and, as a result, is now showing significant signs of aging. There are very few spare parts still available for this projector. SMC has already spent large sums of money shoring up this projector, but without a dedicated Planetarium Director, routine maintenance and monitoring of the equipment is not possible.

Third, our attendance at Planetarium shows, while steady in terms of school programs, is not growing in terms of Friday night public shows. When we had a dedicated Planetarium Director, our public and school show audiences grew significantly through extensive marketing and promotion, with most shows "sold out". Additionally, we were able to attract top-flight scientific lecturers from local institutions including Cal Tech, JPL, and UCLA. These guest lecturers would draw crowds too large to fit in the Planetarium, and would be held in the Science Building lecture halls. Without a full-time Planetarium Staff Administrator, our Planetarium shows are limited in scope, dependent upon an hourly lecturer who is only compensated for the time he is presenting the shows. There is no allowance for him to perform maintenance or monitoring of the Planetarium, beyond his contracted shows. He is constrained in his ability to expand the program, to develop new shows, to provide adequate marketing of the Planetarium, or even to having access to the Planetarium outside his scheduled presentations.

Lab Technician

Qualified and trained lab technicians would be a great asset for the class room and lab sessions. It is very difficult to monitor 30-35 students who are working on a variety of lab exercises both inside and outside the classroom. Having a lab technician would greatly benefit the overall safety of the lab classes, as well as providing another resource for students who are working through their assigned tasks. It is critical that a fulltime Earth Science Lab Technician be hired in the immediate future.

Additionally, we are the only science department on campus that does not have a lab technician to help set up and take down labs. Anthropology labs set up and take down require a minimum of 25 minutes. This cuts into the overall time faculty have to prep for each lab class. Having a full-time technician who is trained in setting up and taking down the lab materials will allow faculty more time to meet with students, prepare lectures and labs, and increase efficiency of the lab.

If one surveys the other science departments at this college, it becomes exceedingly clear that the classified support in the Earth Science Department is not in accordance with the general college pattern of support in the sciences. Additional classified staff, specifically a technician is critically necessary in order for the department to maintain its academic standards with current equipment, technical applications, software, and laboratory applications.

In addition to our pressing need for a Planetarium Staff Administrator, we are also requesting a lab technician. A lab technician is critically necessary in order for the department to maintain its academic standards with current equipment, technical applications, software, and laboratory applications. Between the years 1990-2000 we increased the number of lab sections by 120%. Even with the downturn in the economy from 2008-2012, we still increased the number lab sections by 64% from 2000-2016 (see attached Planetarium Director document).

A quick poll of the Earth Science lab instructors indicates that it can take an hour to set up and take down labs each week. Not every lab class meeting requires this much time; however, in our Geology 4 lab courses, for example, there are 5-6 specific labs that require this time for set up/take down. The Physical Anthropology labs have similar time requirements for set up/take down; for example, the labs using the Skeletal, bones or cast collections need extra time. This is especially true for setting up and taking down Lab Practicums. However, given that the lab classrooms are also scheduled for lecture classes and are therefore in constant demand, instructors find that they are spending vast amounts of time outside their normal teaching hours to prepare and organize their labs for their classes. They are also working on limited timeframes – setting up and taking down labs between classes, for example. Since the lab sections are scheduled in between lecture classes, it is not possible to leave a lab set-up between classes. All lab equipment, materials, bones, casts, etc. must be replaced after each lab section is finished, so the next class coming in will have full use of the classroom. Moreover, our lab classrooms are not dedicated to single disciplines; for example, a Physical Anthropology lab may be followed by a Geology or Astronomy lab/lecture class. This provides more impetus to make sure all lab materials and equipment have been removed and returned to their proper location in our Earth Science Preproom, DH 134.

Instructors are responsible for the ordering, organizing, maintaining, and repairing all materials (i.e., skeletal, bone, and cast collections, rocks, minerals and sediment samples) and equipment (i.e., microscopes, infrared/thermal camera, dissolved oxygen meters, etc.) used in the labs. Our labs are often taught by adjuncts that are not financially compensated for the time they invest in

keeping our lab materials and equipment in good working order, as well as the time setting up/taking down the labs. As a result, we are finding our Earth Science Preproom becoming disorganized with many different instructors attempting to access, set up, take down and put away lab materials between classes. Moreover, the equipment is not being properly monitored or curated. We have an impressive set of bones and casts that are used in all the Physical Anthropology classes (lecture and lab). These are very fragile and, without a proper lab technician to curate them, the bones and casts are rapidly disintegrating. We wrote a number of grants to obtain these materials, which makes them irreplaceable using our normal Earth Science budget funds.

Because of time-commitment issues in offering our existing labs, creating new challenging, robust and rigorous labs for existing lab courses is not being pursued as vigorously as we would prefer. Additionally, we would like to offer new courses that would be lab-based, such as Oceanography with Lab and Introduction to Weather with Lab. These are standard lab courses offered at other community colleges, and are fully-transferable to UCs and CSUs, yet, without additional support, we cannot offer them.

As an alternative to hiring a lab technician, the Earth Science Department was offered more 'student help' monies. While this was initially welcome, it has become quite problematic in terms of hiring competent students to act as 'lab technicians.' Student help workers are hired semester-to-semester with little to no continuity between semesters. Faculty spend the semester training a student to set up/take down labs and handle sensitive equipment, only to find that student is not available for the next semester. Training a student takes a great deal of time – the same time commitment required for the instructor to set up and take down labs themselves. We have not gained anything using student help and, as a result, many faculty have declined using student workers to substitute for a trained lab technician. In addition, a number of faculty have commented that careless student helpers have actually resulted in damaged equipment and a loss of resources - which costs the college money to repair and/or replace this specialized equipment. As stated earlier, much of our expensive equipment and materials were purchased using specialized grant funds and are not replaceable using our limited Earth Science lottery or equipment budgets. A student worker is a poor substitute for a trained, professional lab technician, and furthermore, is a potential safety hazard for faculty and students alike while concurrently being a liability for the college.

The additional costs incurred would be the salary and benefits for the individual (40 hours/week) for 11 months. Historically, the salary and benefits were shared between the Earth Science Department and Events. The Earth Science Department does not receive any of the revenue generated by the school or public shows in the Planetarium: all revenue from the Planetarium is allocated to the Events. Hiring a full-time Planetarium Staff Administrator will most likely result in an increase in the revenue generated by offering more public shows. The increase in revenue can be utilized to offset some of the salary.

We have office space in the Earth Science Department office that is available for the Planetarium Staff Administrator/Lab Technician. A computer and phone will be necessary to assist the Planetarium Staff Administrator in scheduling school shows, designing new Planetarium shows, accessing and updating the Planetarium webpage, accessing and responding to the Planetarium voicemail system and other administrative duties.

The following items are intended to help programs identify, track, and document unit planning and actions and to assist the institution in broad planning efforts.

1. Projecting toward the future, what trends could potentially impact the program? What changes does the program anticipate in 5 years; 10 years? Where does the program want to be? How is the program planning for these changes?

A new planetarium and observatory are planned for the future.

The Geography program is exploring an 18- or 24-unit state-approved Certificate of Achievement in Geospatial Technologies. Our new tenure-track Geography instructor will be instrumental in this endeavor.

The Geography program is also exploring the development of more online courses, such as GIS 23/Geography 23, Geography 1, and Geography 7/Environmental Studies 7.

The Geology program is exploring a Geoscience Technician AS degree to determine industry demand and need.

The Anthropology Program would like to develop an online cultural anthropology course, and possibly an online archaeology

course, within the next few years.

The Astronomy Program will develop online Astronomy 5 and 6 courses in the next academic year.

Earth Science Department Plans and Trends:

We expect to see major growth in areas of technology – specifically in GeoSpatial Technologies and all forms of Sustainable Technologies (renewable energy, energy efficiency, water efficiency, and more). Geospatial studies and related technologies consistently rank among the top ten growth industries of this century (U.S. Bureau of Labor Statistics). Modern Earth Scientists around the nation and the world are helping to solve problems ranging from natural resource distribution and use to urban planning, and from identifying and preparing for natural hazards to analysis of human population and migration patterns.

Another significant trend is the integration of our individual disciplines into more interdisciplinary modes as our department interweaves Sustainable Technologies concepts would into our Geography, Geology, Astronomy, and Geology curriculum. This requires continued coordination and collaboration amongst our varied disciplines. Yet, this process has proceeded, for example, in the Anthropology 19 class (The Culture of Food) where Professors' Eric Minzenberg and Gillian Grebler teach sustainable use of natural resources and the emerging technologies that accompany these strategies (drought tolerant landscapes, drip irrigation etc.).

We also expect to see the lines between CTE programs and academic programs to be more blurred. More of our Earth Science academic students will discover that including Sustainability courses – such as Recycling and Resource Management, Energy Efficiency, or Renewable Energy – into their overall lower division coursework, will not only provide them with more critically needed information for living sustainable lives, but will also provide them with real-world skills and tools they can take into the workplace once they've completed their undergraduate, or even graduate, coursework.

The Earth Science is already on the leading edge of this trend – many of our current transfer-oriented students are enrolling in, and completing, certificates of achievement programs, Recycling and Resource Management; and including courses such as Energy Efficiency, Solar PV into their regular semester course load.

2. If applicable, list additional capital resources (facilities, technology, equipment) that will be needed to support proposed changes. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

As outlined in the previous sections, we will need institutional and financial support to make our future dreams a reality. The completion of the Science Building will be a major step towards fulfilling our needs to support the changes we anticipate are coming. Unfortunately, even though most of the Earth Science programs will move into the new Science Building, two of our Sustainable Technologies Program will not: Solar PV (renewable energy) and Energy Efficiency. Recycling and Resource Management does not require the extensive lab space of Solar PV and Energy Efficiency, so we will have sufficient classroom space for these courses.

There is insufficient space to house this program in the plans for the new Science Building. This continued artificial separation of our department personnel, courses, and students, will make our integrated and inter-disciplinary vision of the future more difficult to fulfill.

We will need continued support for new technological advances expected in the Earth Sciences – both in the form of software licensing and hardware support. To move the Earth Science Department into the future, the college must be willing to support developments in areas such as geospatial technologies, global studies, interdisciplinary studies and environmental studies.

3. If applicable, list additional human resources (staffing, professional development, staff training) that will be needed to support proposed changes. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

OUR FUTURE NEEDS IN TERMS OF STAFFING ARE THE SAME AS OUR CURRENT NEEDS (SEE "*CURRENT PLANNNG, SECT 3"* FOR DETAILS)

Full-time Physical Anthropology Instructor

Full-time Planetarium Administrator/Director

Lab Technician

4. If applicable, note particular challenges the program faces including those relating to categorical funding, budget, and staffing.

WTH

The Earth Science Department, like many departments on campus, experienced a significant decline in course offerings during the most recent state budget crisis. One of our programs, Geology, was hit especially hard since there was only one full-time instructor in that program until this past fall 2016 semester. We expect the Geology Program to grow now that we have two contract geologists on staff.

STAFF

We need to have a full-time Lab Technician/Planetarium Director to fulfill a number of major duties (1) maintain and trouble-shoot our aging Digi-Star projection system in the Planetarium (2) deliver excellent and well-researched Planetarium Shows for the community (Friday nights) and for local school children (twice daily shows) (3) Set up and take down Anthropology labs (bones, casts, etc.) (4) aintain our seismic sensor housed in DH 134.

FACILITIES

The Planetarium itself needs to be updated. The new Science Building is designed with both a Planetarium and an Observatory. The Observatory was part of the original "Technology Building" design (now named "Drescher Hall"), but renovations happened and the observatory was not completed.

FUNDING

Since the CTE programs, Solar PV Installation, Energy Efficiency, and Recycling and Resource Management were integrated into the Earth Science Department, we have been forced to seek even more outside funding. As was initially promised, our department's overall department budget was ***not*** increased to accommodate the additional costs of running these types of programs and course (equipment, classroom materials, licensing for online materials, etc.). Additionally, many times, grants come with severe restrictions as to use, which prevents funds from being used to maintain programs – such as replacing equipment and tools that are worn out or broken.

Overall, there is little to no college support for the CTE programs – we are expected to write grants for monies to purchase equipment, course materials, etc. We even had to write a grant to obtain tables and chairs for the Solar PV classroom.

5. Summarize any conclusions and long term recommendations for the program resulting from the self-evaluation process.

The number one effort will be to reassess course SLOs over the next year. Developing new curriculum and reviewing existing curriculum in Geology is another goal – to be accomplished over the next several years.

For our CTE programs within the Sustainable Technologies Program, we are working to have more students complete our STP degree programs.

The solar industry is still a nascent industry in a broader, historical context. Solar photovoltaic technology will likely dominate the renewable energy sector of energy production as developing nations transition away from fossil fuel mining, production, and use, and move towards a distributed generation (DG) networked system that includes geo-energy for heating and cooling, wind energy, small hydro, as well as solar energy and is networked with energy storage elements such as home and car battery, ultracapacitor and flywheel systems serving an electric transportation fleet of vehicles. Furthermore the construction industry will adapt green building and sustainable practices as a functioning norm, rather than a marginalized specialty. It is clear that an energy and environmental literacy will be required of all educated persons, and that this education will require technical knowledge and facility, and a respect and

understanding for science and technology in addition to basic skills in math and English.

Since many of these basic skills are not present in some (nor required of all) community college students, it is also a challenge set forth for the program to be able to educate all students regardless of their basic language and math abilities, technical skill level, or capacity for physical work. The program, while training students for a useful, marketable skill in the job world, is equally compelling as a technical basis for encouragement of further studies in the math and sciences to prepare students for transfer to a four year degree in sustainable technologies-related fields as diverse as global politics, environmental philosophy, medical sciences, or electrical or mechanical engineering.

6. Please use this field to share any information the program feels is not covered under any other questions.

STP: The Earth Science Department has embraced the Sustainable Technologies Program (STP) - a bold new initiative to address the educational and workforce needs of California's new and emerging green industry - as well as committing to environmental sustainability. The goal of the STP is to bring together an array of training programs under one umbrella; recognizing and embracing the interconnectedness of these fields and encouraging all our Earth Science students to think of green careers.

This interdisciplinary program builds upon an institutional and regional desire to foster sustainability through the development and delivery of instructional programs that prepare students for immediate employment in high demand, high paying careers in the green economy, while providing them with the resources and support they need to transfer to an array of baccalaureate programs. To that end, faculty within the department work rigorously to establish a strong academic component within the courses within the STP.

As stated earlier, we anticipate that the lines between CTE programs and academic programs to be more blurred in the future. More of our Earth Science academic students will discover that including Sustainability courses – such as Recycling and Resource Management, Energy Efficiency, or Renewable Energy – into their overall lower division coursework, will not only provide them with more critically needed information for living sustainable lives, but will also provide them with real-world skills and tools they can take into the workplace once they've completed their undergraduate, or even graduate, coursework.

The Earth Science is already on the leading edge of this trend – many of our current transfer-oriented students are enrolling in, and completing, certificates of achievement programs, Recycling and Resource Management; and including courses such as Energy Efficiency, Solar PV into their regular semester course load.

PLANETARIUM: The Astronomy Program desperately needs a new planetarium and observatory. The planetarium has always played a vital and highly visible role in community outreach. It is used during the week and on Friday nights, serving local schools and the public by presenting the spectacle of the Universe and the adventure of space exploration to explorers of all ages. Because of its high usage, the Planetarium is starting to have problems. It is in dire need of maintenance! The Events Office and the Earth Science Department have been trying to keep the planetarium in operation on a shoe-string budget. Many hours of donated time have been input into this machine.

Events is currently paying about $6000 for a new cathode ray for the planetarium. The Astronomy Program would really appreciate more Institutional Support to keep this facility operational. A new planetarium and new observatory are included in a new bond issue. However, it will be a long time before this comes to fruition. We need to keep the current planetarium working or we run the risk of losing our patrons.

A recent report of the Commission on the Future of the Community College League of California, entitled "A Vision for Student Success," quoted:

"Early outreach should be made to students in middle school and throughout high school about effective preparation for community colleges. Students should understand the economic benefits of higher education and the contributionshigher education makes to America's democracy."

This is the goal of the planetarium. When the students leave the planetarium in awe, hopefully, they also leave with an understanding that their own success in school/education can lead to jobs in the sciences. To put a price tag on such an outreach program is hard to do. We would appreciate if the Institution would reevaluate the planetarium's priority. It is a vital educational and outreach tool.

The Department has been successful at getting plans for a new Observatory into a bond issue that was passed a few years

back. We close this section with the language below from the previous Program Review, to emphasize the continued importance of getting this goal accomplished. The Observatory mentioned below, is to replace the old one, which was removed from the roof during the Technology building refit around 1994.

"We cannot over-emphasize the importance of this facility to our astronomy program. An observatory would not only give our students "hands-on" experience, but would permit them to get views of celestial objects they have been studying. Whether viewing objects within the solar system or millions of light-years away, the observatory would help give the student inspiration and motivation to learn their subject matter. The observing sessions the Astronomy Club holds are proof of this. The students who voluntarily attend the astronomical field trips talk about their experience for weeks after. By having an observatory on campus, more students can benefit from the experience. Students could learn telescope setup procedures, how to use coordinate systems for locating celestial objects, and participate in labs where data is collected and sent to organizations like the International Occultation Timing Association, where an asteroid's shape can be determined. Such work could actually attract national attention to our college and its astronomy program. Most of our students are taking astronomy for GE requirements only, but after taking an astronomy class many of them realize how fun astronomy can be, and make astronomy a hobby. The techniques learned with an observatory facility can give them the knowledge they need that will be with them in their hobby for the rest of their lives. The observatory could also be incorporated into the Digistar Planetarium's public program. The Department feels the observatory is needed to maintain the quality of astronomy instruction at SMC, and should become a priority for the College. The "Program Review Committee – Executive Summary" of November 1998 agrees, and it states: "The Vice President of Academic Affairs should find a good place for the observatory, to take advantage of a good telescope, should one be donated." The famous Hollywood late-night talk-show host Johnny Carson donated such a telescope many years ago. Also, many smaller telescopes have been donated to the school that would make it possible to hold an entire lab class session, if permanent piers could be supplied. If a main observatory facility is in the planning, but many years away, we would then like to request that a temporary site be built."

Evaluation of Process

Please comment on the effectiveness of the Program Review process in focusing program planning.

The Program Review process has been a useful tool for our department. It is a mechanism for frequent and structured assessment of the Earth Sciences programs, certificates and individual courses. The process of reflecting on what we do and how well we do it helps us to identify our strengths and weaknesses.
Importantly, this helps us to be more intentional as we look ahead and identify short- and long-term goals for our department. Additionally, it provides the opportunity to involve the entire Earth Science Department in discussions about the improvement of our program and also to applaud the things that we do well.

These fields to be filled out by the Program Review committee. Reports will be sent to the program and will be available on-line to populate relevant fields in the annual report and the next 6 year report.

Narrative

Program Evaluation

Commendations

Recommendations for Program Strengthening

Recommendations for Institutional Support

Attached Files	
Planetarium Director	
Planetarium Staff document	
STP IAB Minutes 6-24-2016	
STP Joint IAB Minutes 6-22-2015	
STP VTEA Funding 2015-2016	