Program Review
General Science

2015-2016

SOLANO
COMMUNITY COLLEGE

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General Science

1.1 Introduction. The General Science Program is designed to provide students with a basic science background, preparing them to transfer to a four-year institution leading to a degree in fields such as biology, chemistry, geology, health sciences, or physics. This program is a path for immediate entry into science-based technology careers.

Established on January 30, 1980, the General Science Program has been serving students at Solano Community College (SCC) for the past 36 years. The Associate in Arts Degree can be obtained by completing at least 18 units in the major plus general education requirements and electives for a total of 60 units. Courses must be selected from both Biological and Physical Sciences. A broad range of Biological Science and Physical Science courses are available to satisfy the required courses. Specific courses are listed in section 2.8 of this program review.

In academic year 2014-15, the General Science faculty included the following:

- ***Anthropology***
  - *Full-time Faculty:* Lauren Taylor-Hill
  - *Adjunct Faculty:* Lauren Cross and Steve Gravely
- ***Astronomy***
  - *Full-time Faculty:* Michael Gregg and Philip Peterson (Retired)
  - *Adjunct Faculty:* Katie Berryhill and Randy Smith
- ***Biology***
  - *Full-Time Faculty*: Jim Dekloe, Patsy Itaya, Margherita Molnar, Rennee Moore, Brad Paschal, Ed Re, Michelle Smith, Phil Summers (Retiring), Gene Thomas, James Word, and Cristina Young
  - *Adjunct Faculty:* Rachel Aptekar, Erwin Bautista, Robert Cattolica, Kathy Clark, Francis Farahnak, Francisco Goesdasilva, Ann Hefner-Gravink, Margaret Kenrick, James Long, Pam Muick, Lily Nosce, Bruce Riddell, Linda Staffero, and Alysia Thomas
  - *Staff:* Angela Eason and Jennifer Low (Fairfield), Chris Kucala (Vacaville), and Irene Camins (Vallejo)
- ***Chemistry***
  - *Full-time Faculty:* Kathy Conrad, Christine Ducoing (Retired), John Higashi, Kiran Kaur, Oanh Lam, Maria Santiago, and Charles Spillner (Retiring)
  - *Adjunct Faculty:* Damian Arnaiz, Victor Asemota, Sam Balsley, Vasfi Basaran, Daniel Calef, Vahid Eskandari, Volodymyr Gelfand, Patrick Grant, Poupak Khazaeli Parsa, George Kulasingam, Wayne Hawkes, Robert Montanez, Neeta Sharma, Mani Subramanian, and Dmitry Yandulov
  - *Staff:* Christie Green (Fairfield), Chris Kucala (Vacaville), and Irene Camins (Vallejo)
- ***Geography***
  - *Full-Time Faculty:* George Daugavietis (Retired) and Danielle Widemann
  - *Adjunct Faculty:* John “Jack” Knettle and Joanne Strickland
- ***Geology***
  - *Full-time Faculty:* Mark Feighner and Danielle Widemann
  - *Adjunct Faculty:* John McQuire and Cari Roughley
  - *Staff:* Richard Crapuchettes
- ***Physical Science***
  - *Full-Time Faculty:* Mark Feighner
  - *Staff:* Richard Crapuchettes

- ***Physics***
  - *Full-Time Faculty:* Michael Gregg, Zachary Hannan, Melanie Lutz, Philip Peterson (Retired)
  - *Adjunct Faculty:* Darwin Ho and Tom MacMullen
  - *Staff:* Richard Crapuchettes (Fairfield)

1.2 Relationship to College Mission and Strategic Goals. The mission of the General Science Program is in accordance with that of the college. Through the broad range of Biological and Physical Science courses which students take, faculty and staff help an ethnically and academically diverse population of students reach their educational goals. The General Science Program offers a variety of courses that are required for many Science, Technology, Engineering, Math (STEM) majors that transfer to many 4-year institutions. It also offers courses that required for programs with certificates such as Industrial Biotechnology and Nursing.

Table 1. SCC's Strategic Directions and Goals

Goal 1: Foster Excellence in Learning
Obj. 1.1 Create an environment that is conducive to student learning *Program Evidence*: In the courses included in the General Science Program, faculty utilize Smart classroom technology including internet, videos, and PowerPoint, to demonstrate concepts and techniques. Course lecture notes and relevant websites are shared with students at a course website, formerly through e-Companion and now by Canvas platforms, these serve as a valuable resource. The Canvas website provides the ability of the instructor to communicate with the students enrolled in the courses as well as the ability of students to know their current standing in the course.
Obj. 1.2 Create an environment that supports quality teaching *Program Evidence*: Planning, interacting, and exchanging of ideas among faculty takes place at the divisional meetings as well as informally in the hallway of the Science Building. Additionally, senior-level faculty members invest in the mentoring of the younger faculty in order to provide for the continuation of high-quality instruction in the courses of the General Science program. It is crucial, for example, to mentor new Anatomy instructors in laboratory dissection and anatomical relationships of muscles, nerves, and blood vessels in situ. Teaching methods and tips for managing the classroom are generously shared among the faculty and staff. Thirdly, Flex activities support the professional development of the faculty and staff.
Obj. 1.3 Optimize student performance on Institutional Core Competencies *Program Evidence*: The specific assessment of student performance on Institutional Core Competencies varies for each department of the General Science Program. Please refer to the respective Program Reviews for more details related to these departments.
Goal 2: Maximize Student Access & Success
Obj. 2.1 Identify and provide appropriate support for underprepared students *Program Evidence*: Many students begin these courses unprepared for the challenge. We actively work to support our students. For example, some faculty members provide lists of student services and/or study techniques in the course syllabi. Students may be referred to specific services (e.g. Tutoring Center or the English Lab) for additional support as necessary. For many years, General Science faculty members presented

Student Success workshops on a variety of general topics including time management as well as course-specific topics such as an Overview of the Skeletal System. In addition, the college has free tutoring, testing centers, and support of Counselors from Academics to Disabilities and to Veterans. We also have the great support of programs such as MESA, Umoja, Puente, and First-Year experience designed to support our community.

For example, to support CHEM 160 students, who have very little Chemistry background, embedded tutors, open labs, and drop-in tutoring are intended to help these underprepared students succeed.

Smart lab rooms, student computers with tutorials and electronic data-gathering software and equipment probes are used to enhance student learning.
In addition to traditional methods of instruction, online homework and links to helpful websites allow students' access to class materials outside the classroom giving them extra interactive practice with concepts and problems.

Obj. 2.2 Update and strengthen career/technical curricula
Program Evidence: One example of a career/tech offering is the series of GIS courses by the Geography department. While the courses are academic electives, they increase a student's marketability. Students with a GIS background can succeed in career and technical fields while moving toward their academic goals. GIS gives students usable skills for immediate career development while possibly funding their education.

Another example is the Chemistry department which offers courses CHEM 010, 011, and 051, which prepare students for several Health Science careers as well as Biotechnology. Chemistry and Biology faculty participate in a committee with Nursing faculty to identify relevant material for the relevant curriculum.

Obj. 2.3 Identify and provide appropriate support for transfer students
Program Evidence: For example, the non-majors biology courses can be used to meet IGETC requirements in Biological Science (Area 5B) and/or Laboratory Requirement (Area 5C). For CSU, non-majors biology courses meet Life Science (Area B2) and/or Laboratory Courses (Area B3).

Another example is the Geology classes fulfill the physical sciences requirement for the Certificate of Achievement and A.S. degree and are fully transferable to CSU and UC systems (AA/AS Area A, IGETC Area 5 Physical, CSU GE Area B1). In addition, our classes are part of these discipline's certificates or degrees: Anthropology, Drafting, Interdisciplinary Studies, Physics, General Science and University Studies.

Obj. 2.4 Improve student access to college facilities and services to students
Program Evidence: Student access to the college courses is strengthened by the offering of a variety of online courses. For example, both BIO 016 (Introduction to Human Biology), and BIO 012 (Environmental Science) are offered online. The geology curriculum includes GEOL 001 offered in an online format. This format increases the number of course offerings as well as student access to courses.

Additionally, by Fall 2017, BIO 004, Human Anatomy, will be offered at the VVC campus as well as at the Main campus; this will open the door to students who need to use VVC.

Obj. 2.5 Develop and implement an effective Enrollment Management Plan
Program Evidence: Courses are offered at various times (e.g., day and evening), at multiple locations (e.g., main campus and centers), and in different formats (e.g. lecture/lab or online). The variety of course offerings helps students plan their schedules according to their individual needs.

Goal 3: Strengthen Community Connections

Obj. 3.1 Respond to community needs
Program Evidence: For example, BIO 016 prepares students interested in healthcare careers for local programs in nursing, radiology, and sonography. BIO 004, Anatomy, BIO 005, Physiology, and BIO 014, Microbiology, form the core of the pre-Allied Health and Health Sciences cluster of courses along with the Chemistry courses, CHEM 010, CHEM 011, and CHEM 051.

The Geology department mainly supports opportunity for transfer. However, over two dozen past students have gone on to major in geology. GIS is also applicable to many disciplines such as business, geography, forestry and regional planning.

Obj. 3.2 Expand ties to the community
Program Evidence: Faculty members encourage students to participate in campus events such as blood drives, Coastal Cleanup Day, and Earth Day. Contributions to these events help students connect with the college as well as the greater community. Many of the Biology, Chemistry, and Geology courses schedule field trips to local parks, chemical factories, and other sites in the community such as Rush Ranch, FSSD, Portrero Landfill, Rockville Park, Jelly Belly Factory, Mt. Diablo Park, Pt. Reyes, Marin Headlands, Suisun Wildlife Center, and several Suisun Valley farms. These field trips help introduce our students to the resources in our area as well as introduce members of our larger community to the students and mission of SCC. Additionally, members of BIO 004 participate in an annually held, "Anatomical Demonstration for Regional High School Anat./Phys. Students &Instructors". This activity is held each spring and provides a great way to supplement anatomical instruction at the high school level and provide ways for our BIO 004 students to increase their connection with the local high schools.

Goal 4: Optimize Resources

Obj. 4.1 Develop and manage resources to support institutional effectiveness
Program Evidence: Lab Technicians order supplies, repair equipment, and prepare materials for labs for the various departments of the General Science Program:

- Geology Program: Richard Crapuchettes (FF) and Chris Kucala (VV);
- Biological Sciences courses: Angela Eason, Jennifer Low (FF), Chris Kucala (VV), & Irene Camins (VJO); An additional PT lab technician, Adam Bailey, has provided support of Anatomy/Physiology courses at the FF campus beginning in January, 2016;
- Chemistry Program: Christie Green (FF), Chris Kucala (VV), & Irene Camins (VJO);
- Physics, Physical Science, & Astronomy: Richard Crapuchettes (FF)

Support of supplies and materials for the General Science Program generally comes from the respective department budgets (DB).

Obj. 4.2 Maximize organization efficiency and effectiveness
Program Evidence: The science departments work with each other as well as with nursing and biotechnology to enhance organizational effectiveness. We continuously assess the use of laboratory space to improve the efficiency of the lab program. It is essential that classroom space for lectures be in close proximity to the laboratories to allow faculty easy access to resources and materials stored in the laboratory (models and other demonstration materials), and to provide a quick and efficient transition from lecture to laboratory for both faculty and students.

Obj. 4.3 Maintain up-to-date technology to support the curriculum and business functions
Program Evidence: Faculty teaching courses in the General Science Program maintain up-to-date technology in a variety of ways. For example, anatomy instructors are training in exercises from the Online Guided Gross Anatomy Dissector. Geology labs include the latest technology in GIS and GPS. Physiology instructors update the BioPac modules regularly. Faculty from all departments continue to maintain and improve classroom technologies and equipment through Instructional Equipment requests or Strategic Proposals.

1.3 Enrollment. Data on the number of sections offered, enrollments, headcounts, and declared majors for the General Science Program are based on student-level data for all of the courses that fulfill requirements of this program. During this time period, enrollments and headcounts decreased college-wide whereas enrollments and headcounts in the General Science Program increased substantially. Data on the FTES and WSCH are based on enrollment-level data for all of the courses that fulfill requirements of this program. During this same time period, total FTES and WSCH decreased college-wide; however, FTES and WSCH increased in the General Science Program. Reasons for increases in this program are numerous including the promotion of STEM programs at the college. Please see the program reviews of the respective departments (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed analysis of enrollment trends.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Sections	307	358	368	367	398	415	382	387	383	444	494	516	532
Enrollments	404	492	468	477	532	579	547	565	636	703	830	913	956
Headcount	144	170	152	162	190	197	192	190	213	227	285	318	341
Majors	144	170	156	162	192	197	193	192	213	227	285	319	341
FTES	392	420	516	498	516	496	536	486	495	493	495	507	508
WSCH	11,754	12,610	15,490	14,929	15,491	14,872	16,076	14,588	14,840	14,801	14,858	15,215	15,250

1.4 Population Served. Data on gender are based on student-level data for all of the courses that fulfill requirements of the General Science program. Students in this program are predominantly female as is true college-wide. However, this distribution is even more pronounced in the General Science Program with up to 70% of students identifying as female. Reasons for the unequal distribution of genders in science include the promotion of STEM careers to female students at colleges and universities nationwide.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Female	60.42%	61.18%	57.24%	64.81%	57.37%	59.90%	67.19%	69.42%	67.61%	64.76%	67.02%	67.30%	70.09%
Male	37.50%	37.06%	40.79%	32.10%	40.00%	38.07%	30.73%	30.00%	31.92%	34.80%	31.58%	31.76%	28.74%
Not Reported	2.08%	1.76%	1.97%	3.09%	2.63%	2.63%	2.03%	1.58%	0.47%	0.44%	1.40%	0.94%	1.17%

Data on age are based on student-level data for all of the courses that fulfill requirements of the General Science program. Students in this program are mostly "college age" (17-25); however, the program attracts many "non-traditional" students as well. Interestingly, up to 35% of the students in the General Science Program are age 26 or over. Reasons for this include students returning to complete their degrees or students changing careers.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Less than 17	4.17%	1.76%	1.32%	0.62%	2.11%	2.03%	2.60%	2.11%	0.94%	1.32%	1.40%	1.57%	1.47%
17-20	38.19%	37.65%	39.47%	37.65%	30.53%	31.47%	36.98%	39.47%	38.97%	39.21%	36.49%	36.16%	34.02%
21-25	22.22%	26.47%	28.95%	30.86%	31.05%	28.43%	27.08%	26.84%	27.23%	31.72%	30.18%	29.25%	31.67%
26-30	12.50%	12.35%	13.82%	12.96%	19.47%	21.83%	16.67%	13.68%	14.55%	11.89%	12.28%	15.09%	16.42%
31-40	12.50%	11.76%	10.53%	7.41%	8.42%	9.14%	9.90%	10.53%	11.74%	10.13%	12.98%	12.89%	10.85%
41-50	7.64%	5.29%	2.63%	7.41%	5.26%	5.08%	5.21%	5.26%	4.23%	4.41%	3.86%	3.77%	3.81%
51-55	2.08%	2.94%	1.32%	1.23%	1.58%	0.51%	1.04%	1.58%	1.88%	0.88%	2.11%	0.63%	0.88%

56-60	0.69%	0.59%	1.97%	1.85%	1.58%	1.02%	0.52%	0.53%	0.47%	0.44%	0.35%	0.63%	0.29%
61-65	0.00%	1.18%	0.00%	0.00%	0.00%	0.51%	0.00%	0.00%	0.00%	0.00%	0.35%	0.00%	0.29%
66-70	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
71+	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.29%

Data on ethnicity are based on student-level data for all of the courses that fulfill requirements of the General Science program. Students in this program are predominantly white, non-Hispanic or Asian/Pacific Islander. This is similar to the distribution of students by ethnicity for the college.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Am. Indian or AK Native	0.69%	0.59%	0.66%	0.62%	2.63%	1.02%	2.60%	1.05%	2.82%	2.64%	2.11%	2.83%	2.05%
Asian or Pacific Islander	21.53%	17.65%	16.45%	18.52%	13.68%	12.18%	11.98%	14.74%	20.66%	20.26%	19.30%	16.98%	22.29%
Black Non-Hispanic	11.81%	14.71%	14.47%	16.05%	16.32%	13.20%	15.10%	12.63%	11.27%	10.13%	14.39%	14.47%	11.73%
Hispanic	13.19%	12.35%	14.47%	17.90%	16.32%	14.72%	14.58%	17.89%	20.19%	24.23%	23.51%	24.84%	28.15%
Other	15.97%	13.53%	21.05%	14.20%	16.32%	28.93%	16.15%	13.68%	9.39%	7.49%	4.91%	5.35%	1.76%
White Non-Hispanic	36.81%	41.18%	32.89%	32.72%	34.74%	29.95%	39.58%	40.00%	35.68%	35.24%	35.79%	35.22%	34.02%

The distribution of students by ethnicity reflects that of Solano County with the exception of a slightly higher proportion of individuals identifying as Asian/Pacific Islander. The promotion of STEM careers to a diverse population by colleges and universities seems to enhance inclusiveness in the General Science Program.

People QuickFacts	Solano County	California
White alone, percent, 2014 (a)	60.6%	73.2%
Black or African American alone, percent, 2014 (a)	14.8%	6.5%
American Indian and Alaska Native alone, percent, 2014 (a)	1.3%	1.7%
Asian alone, percent, 2014 (a)	15.6%	14.4%
Native Hawaiian and Other Pacific Islander alone, percent, 2014 (a)	1.0%	0.5%
Two or More Races, percent, 2014	6.7%	3.7%
Hispanic or Latino, percent, 2014 (b)	25.6%	38.6%
White alone, not Hispanic or Latino, percent, 2014	39.6%	38.5%

http://quickfacts.census.gov/qfd/states/06/06095.html

1.5 Status of Progress toward Goals and Recommendations. The Associate in Arts Degree in General Science does not have goals or recommendations specific to the General Science Program. Rather, the departments that offer courses to fulfill the requirements of the A.A. Degree in General Science develop and assess their own goals and recommendations. Please see the respective departments (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) program reviews for detailed information on their goals and recommendations.

1.6 Future Outlook. The future of the General Science Program includes two new Science Buildings:

1. Biotech/Science Building at VV center which includes new Anatomy, Biology, and Chemistry labs as well as a new lecture hall. The projected opening semester is fall 2017; and
2. Science Building at FF campus which includes new Anatomy, Biology, Chemistry, Geography, Geology, and Physical Science (PHSC 012) teaching labs and lecture spaces. This building will not be completed until perhaps 2018.

Faculty, staff, and students alike will benefit from the well-ventilated, safe labs as well as the state-of-the art lecture spaces well into the future. The addition of these two new teaching buildings will have a marked influence on our programs housed in these buildings. We are pinning our hopes for Solano College on these new teaching spaces as students will be attracted to our new teaching buildings. Additional faculty and staff will be needed to support the programs in the new teaching buildings; thus, it is imperative that we begin the process of hiring and training new faculty and staff in order to be prepared for the future needs of the college.

Future space for Physics, Engineering, and Astronomy, that would be part of a future Math / Physical Sciences building, and which would include a digital domed planetarium, is being investigated. Please see the 2016 Astronomy Program Review for more details.

Program Learning Outcomes

2.1 The General Science Program consists of four (4) Program Level Outcomes (PLOs). Each PLO addresses at least one Institutional Learning Outcome (ILO). Of the 36 courses that fulfill the requirements of the General Science A.A., each course addresses at least one PLO. Examples of how these courses assess each PLO are noted (Table 4). Please see the program reviews of the respective departments (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on their assessments of PLOs.

Table 4. Program Learning Outcomes

Program Level Outcomes	ILO (Core 4)	How PLO is assessed
1. Demonstrate analytical and/or conceptual problem solving skills.	IID. Problem Solving	For example, students in CHEM 002 are expected to predict changes in chemical equilibrium. This is assessed by short answer questions on exams.
2. Carry out experiments and critically assess their data.	IIA. Analysis	For example, students in BIO 005 are given a comprehensive final lab exam to determine their ability to analyze data.

3.	Learn the role of hypotheses, measurement and analysis in the development of scientific theory as evidence by laboratory reports.	IIIA. Scientific Complexities	For example, students in ASTR 020 write lab reports to assess their ability to use telescopes and analyze data.
4.	Learn how to write a laboratory report or give an oral presentation.	IB. Write ID. Speak and Converse	For example, students in GEOG 001 are assigned a group presentation to demonstrate their understanding of geological processes.

2.2 The 36 courses of the General Science Program support its Program Learning Outcomes at various levels (introduced (I), developing (D), or mastered (M)).

Table 5. Program Courses and Program Learning Outcomes

Course	PL01	PL02	PL03	PL04
ANTH 001	I			
BIO 002	D	D	D	D
BIO 003	M	M	M	M
BIO 004	D			
BIO 005	M	M	M	M
BIO 012	I			
BIO 012L	I	I	I	I
BIO 014	M	M	M	M
BIO 015	I	I	I	I
BIO 016	I			
BIO 016L	I	I	I	I
BIO 018	I			
BIO 019	I	I	I	I
ASTR 010	I			
ASTR 020	I	I	I	I
ASTR 030	D			
ASTR 040	D			
CHEM 001	D	D	D	D
CHEM 002	M	M	M	M
CHEM 003		M	M	M
CHEM 004		M	M	M
CHEM 010	I	I	I	I
CHEM 011	I	I	I	I

CHEM 051	I	I	I	I
GEOG 001	I			
GEOG 001L	I	I	I	I
GEOL 001	I			
GEOL 002	I	I	I	I
GEOL 005	I			
PHSC 012	I	I	I	I
PHYS 002	I	I	I	I
PHYS 004	D	D	D	D
PHYS 006	I	I	I	I
PHYS 007	D	D	D	D
PHYS 008	M	M	M	M
PHYS 010	I			I

2.3

The General Science Program consists of four (4) Program Level Outcomes (PLOs). Each PLO has been assessed at least once since the last program review. Examples of assessment results and action plans are noted (Table 6). Please see the program reviews of the respective departments (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on their assessment results and action plans.

Table 6. Program Level Assessments

Program Level Outcomes		Date(s) Assessed	Results	Action Plan
1.	Demonstrate analytical and/or conceptual problem solving skills.	Spring 2013	Over 70% of students that took the final exam correctly calculated chemical equilibrium in CHEM-002.	Concept to be reviewed at the beginning of the semester as well as at the end of the semester.
2.	Carry out experiments and critically assess their data.	Spring 2012	Approximately 63% of students passed the comprehensive final exam with a score of C or better in BIO-005.	Students to be provided with more practice test problems.
3.	Learn the role of hypotheses, measurement and analysis in the development of scientific theory as evidence by laboratory reports.	Summer 2013	Of the reports completed and submitted, the average was over 96% in ASTR 020.	Emphasize lab attendance and provide more practical “hands on” description of experiments.
4.	Learn how to write a laboratory report or give an oral presentation.	Fall 2011	Students earned 90% or higher on their group presentations in GEO 001.	Require presenters to ask audience a question to promote further discussion.

2.4 The General Science Program includes 36 courses offered by eight different departments. Consequently, numerous changes have been made as a result of program level assessments. For example, the Biology Department recently developed a new course (BIO 101) to help students with time management and study strategies. The Chemistry Department is holding Open Labs to provide students with additional time to practice in the laboratory. The Geology Lab (GEOL 002) ordered new mineral samples as well as flow charts to improve identification of minerals. Physics instructors provide tutoring in the Academic Success Center. Other programs, specifically Anthropology and Geography, are new programs that are evaluating their respective PLOs and SLOs for the first time; thus, these programs cannot report changes to courses based on analysis of PLOs and SLOs. Please see the program reviews of the respective departments (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on their changes associated with program learning outcomes.

Student Learning Outcomes

2.5 Faculty of the School of Science worked diligently to assess SLOs during the most recent program review cycle (2014-2015). The School of Science plans to assess SLOs of even numbered courses every other fall and odd numbered courses every other spring (with the exception of new courses). Consequently, most of the courses that fulfill the requirements of the General Science Program have been assessed recently. A few notable exceptions include BIO 018 (Biology of Sex), ASTR 010 (General Astronomy), and PHYS 004 (General Physics). This oversight may be attributed to a lack of full-time faculty dedicated to these courses. Please see the program reviews of the respective departments (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on their SLO status and updates.

2.6 Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on SLO accuracy and potential changes.

2.7 Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on changes associated with student learning outcomes assessments.

2.8 Students in the General Science Program must complete a total of 60 units including 18 units in the major with at least 12 units in laboratory work and at least one course in each of the areas: Biological Science and Physical Science.

Science, General

BIOLOGICAL SCIENCE

ANTH 001 **3.0 Units**
Physical Anthropology
Course Advisory: ENGL 001 with a minimum grade of C. This course is an introduction to the science of physical anthropology; covering the concepts, methods of inquiry, and scientific explanations of biological evolution and their application to the human species. Topics to be covered will include: the scientific method, genetics, principles and mechanisms of biological evolution, modern human variation and the race concept, biocultural adaptations, primate classification, comparative primate anatomy and behavior, and the fossil evidence for human evolution. *Three hours lecture.*

BIO 002 **5.0 Units**
Principles of Cell and Molecular Biology
Prerequisite: CHEM 001. Course Advisory: Eligibility for English 001. This course introduces biology majors to the basic concepts of cell and molecular biology and to the laboratory techniques used to study cells and biological molecules. Subjects include the structure and function of biological molecules, prokaryotic and eukaryotic cell structure and function, cell physiology and metabolism, Mendelian and molecular genetics, and the techniques used in biotechnology to manipulate DNA. *Three hours lecture, six hours lab.*

BIO 003 **5.0 Units**
Evolution, Ecology & Biodiversity
Prerequisite: MATH 104, BIO 002. Course Advisory: Eligibility for English 001. This course for biology majors covers evolution, ecology, and the diversity of life. The laboratory component includes invertebrate and vertebrate dissection and several weekend and all day field trips. Students must successfully complete both the lecture and the laboratory portions of the course. Field trips may be required. Some field trips may involve a fee. Formerly BIO 001. *Three hours lecture, six hours lab.*

BIO 004 **5.0 Units**
Human Anatomy
Course Advisory: Eligibility for English 001 and SCC minimum Math standard. BIO 016 is strongly recommended. BIO 004 is a study of the structural organization of the human body, from cellular to organismal level. Throughout the course, various types of instruction are used, including microscopic investigation of prepared slides of tissues and organs, gross (macroscopic) anatomical dissection, and examination of prosected human material. Formerly BIO 006. C-ID BIOL 110B. *Three hours lecture, six hours lab.*

BIO 005 **5.0 Units**
Human Physiology
Prerequisite: A minimum grade of C in BIO 004 and CHEM 001 or CHEM 010 or CHEM 051 Course Advisory: SCC minimum English and Math standards. This course describes physiological and homeostatic mechanisms of the body systems in health and disease. The laboratory relates structure to function, uses instrumentation to measure physiological variables, and enables students to critically evaluate functional status. *Three hours lecture, six hours lab.*

BIO 012 **3.0 Units**
Environmental Science
Course Advisory: Eligibility for English 001 and SCC minimum Math standard. This course examines the basic concepts of biology (especially ecology), chemistry, and physics to study: (1) human population growth, (2) short and long-term use of resources (such as soil, food, land, renewable and nonrenewable energy, water, and air), and (3) the production of pollution and other wastes. Field trips may be required. *Three hours lecture.*

BIO 012L **1.5 Units**
Environmental Science Laboratory
Prerequisite: BIO 012 (may be taken concurrently) Course Advisory: Eligibility for English 001 and SCC minimum Math standard. A course that uses laboratory and mandatory field trip techniques to examine the ecological roles of organisms, resource use, and pollution/waste. Field trips may be required. *Three hours lab.*

BIO 014 **4.0 Units**
Principles of Microbiology
Prerequisite: Minimum grade of C in CHEM 051, CHEM 010, or CHEM 001 and a minimum grade of C in MATH 104 or MATH 114 or two years of high school algebra. Course Advisory: SCC minimum English and Math standards. The study of the morphology, physiology, genetics, taxonomy, and ecology of microorganisms. The course also includes principles of immunology, the control of microbes, and their relationship to disease. Laboratory exercises cover microscopy, staining, aseptic techniques, identification, and microbial growth among others. *Three hours lecture, three hours lab.*

BIO 015 **4.0 Units**
Introduction to Biology
Course Advisory: Eligibility for English 001 and SCC minimum Math standard. A non-majors biology course that introduces basic concepts of living organisms including aspects of biological chemistry, cell structure and function, physiology, genetics, evolution, and ecology. Students must successfully complete both the lecture AND lab portions of the course. Off-campus field trips may be required and may involve a fee. NOTE: Not open for credit to students who have completed BIO 001, 002 or 012. *Three hours lecture, three hours lab.*

BIO 016 **3.0 Units**
Introduction to Human Biology
Course Advisory: SCC minimum English and Math standards. An introduction to general biology with emphasis on the human model. Topics include cell structure and function, human evolution, anatomy and physiology, genetics, and the human impact on the environment. This is a course for non-majors. NOTE: Not open for credit to students who have completed BIO 001, 002, 005, 010 or 015. *Three hours lecture.*

BIO 016L **1.5 Units**
Human Biology Laboratory
Prerequisite: BIO 016 with a minimum grade of C (may be taken concurrently). Course Advisory: Eligibility for English 001 and SCC minimum Math standard. A non-majors laboratory course providing an introduction to general biology with an emphasis on the human model. Topics include microscopy, cell structure and function, human anatomy and physiology, genetics and the human impact on the environment. *One half-hour lecture, three hours lab.*

BIO 018 **3.0 Units**
Biology Of Sex
Course Advisory: Eligibility for English 001 and SCC minimum Math standard. The biological bases of human sex and sexuality will be discussed. Emphasis will be placed on the normal and diseased state of the male and female reproductive system. Essay and objective exams as well as written assignments will be used for student evaluations; the final exam will be comprehensive. *Three hours lecture.*

BIO 019 **4.0 Units**
Marine Biology
Course Advisory: Eligibility for ENGL 001 and SCC minimum Math standard. A non-majors course that studies the diversity and natural history of life in the marine environment with an emphasis on the adaptations of organisms to their environment. Students must successfully complete both the lecture and laboratory portions of the course. Field trips may be required. Some field trips may involve a fee. This course is not open for credit to students who have completed BIO 001 or 002. *Three hours lecture, three hours lab.*

Science, General

PHYSICAL SCIENCE

ASTR 010 **3.0 Units**
General Astronomy
Course Advisory: Eligibility for English 001; SCC minimum Math standard. An introductory study of the universe, including the properties and evolution of galaxies, stars, pulsars, black holes, quasars, the sun, planets, and life in the universe. Field trip may be required. *Three hours lecture.*

ASTR 020 **1.0 Unit**
Astronomy Laboratory
Prerequisite: ASTR 010, 030, or 040 (courses may be taken concurrently). Course Advisory: Eligibility for English 001, SCC Minimum Math standard. Students will gain familiarity with the sky, telescopes, and other astronomical equipment. They will do experiments in Physics related to Astronomy. Topics will cover the moon, planets, stars, galaxies, and cosmology. Field trips may be required. *Three hours lab.*

ASTR 030 **3.0 Units**
The Solar System
Course Advisory: Eligibility for English 001; SCC minimum Math standard. An introductory study of solar system astronomy, the physics related to that astronomy, the planets and their moons, the sun, solar system debris, and the possibility of extraterrestrial life. Field trips may be required. *Three hours lecture.*

ASTR 040 **3.0 Units**
Stars, Galaxies, And Cosmology
Course Advisory: Eligibility for English 001; SCC minimum Math standard. An introductory study of stars, galaxies, the universe, and the physics related to these topics. This includes an examination of the facts relating to the sun, stellar lifetimes, supernovae, black holes, and cosmology. Field trip may be required. *Three hours lecture.*

CHEM 001 **5.0 Units**
General Chemistry
Prerequisite: A minimum grade of C in any of the following: MATH 104 or two years of high school algebra AND a minimum grade of C in one of the following: CHEM 160 or one year of high school chemistry. Course Advisory: Eligibility for English 001 and CHEM 010 is strongly recommended for students who need additional preparation in problem solving. Presents principles of general chemistry for students in science, engineering, medical and related professions. Topics include atomic structure and theory, the periodic table, bonding, gas laws, stoichiometry, solutions, ionization, thermochemistry and equilibrium. Field trips may be required. Some online work may be required. *Three hours lecture, six hours lab.*

CHEM 002 **5.0 Units**
General Chemistry
Prerequisite: CHEM 001 with a minimum grade of C. Course Advisory: Eligibility for English 001. A continuation of chemical principles and theory covered in CHEM 001 with emphasis on electrochemistry, chemical equilibrium, and quantitative and qualitative analysis. Field trips may be required. Online work may be required. *Three hours lecture, six hours lab.*

CHEM 003 **5.0 Units**
Organic Chemistry I
Prerequisite: CHEM 002 with a minimum grade of C. Course Advisory: English 001 is strongly recommended. First half of a two semester course (CHEM 003 and CHEM 004) that begins a survey of organic chemistry for students in chemical, biological, health science, and related professions. Topics include analysis of structure and nomenclature, bonding, isomerism, and basic reaction mechanisms of organic chemicals. Functional groups considered include alkanes, alkenes, alkynes, alcohols, and alkyl halides. Basic organic laboratory procedures are introduced along with spectral analysis, simple syntheses, and reactions described in lecture. Field trip may be required. Online homework may be required. *Four hours lecture, four hours lab.*

CHEM 004 **5.0 Units**
Organic Chemistry II
Prerequisite: CHEM 003 with a minimum grade of C. Course Advisory: Eligibility for English 001. A continuation of CHEM 003, topics include analysis of structure, nomenclature, and reaction mechanisms of conjugated systems, aromatics, organometallics, various functional groups, carbohydrates, lipids, amino acids, proteins, and nucleic acids. The laboratory will emphasize more advanced work and the application of instrumentation in organic chemistry. Field trip may be required. Online homework may be required. *Four hours lecture, four hours lab.*

CHEM 010 **4.0 Units**
Intermediate Chemistry
Prerequisite: CHEM 160 with a minimum grade of C, or two semesters of high school chemistry, and a minimum grade of C in MATH 104 or MATH 114 or two years of high school algebra. Course Advisory: Eligibility for English 001. A general chemistry course often required for nursing students and for students majoring in physical therapy, occupational therapy, industrial technology and home economics, it emphasizes the chemistry of inorganic compounds and covers selected topics such as atomic theory, bonding, equations, gas laws, solutions, acid-base theory, and oxidation-reduction. Field trip may be required. Online homework may be required. NOTE: Not open for credit to students who have completed CHEM 001. *Three hours lecture, three hours lab.*

CHEM 011 **4.0 Units**
Basic Organic Chemistry & Biochemistry
Prerequisite: CHEM 010 or CHEM 001 with a minimum grade of C. Course Advisory: Eligibility for English 001. Presents an overview of organic chemistry and biochemistry for majors in nursing, home economics, liberal arts and technical fields. Field trip may be required. Online work may be required. *Three hours lecture, three hours lab.*

CHEM 051 **5.0 Units**
Chemistry for the Health Sciences
Prerequisite: CHEM 160 with a minimum grade of C, or two semesters of high school chemistry, and a minimum grade of C in MATH 104 or MATH 114 or the equivalent or two years of high school algebra. Course Advisory: Eligibility for English 001. This course presents an overview of general, organic chemistry, and biochemistry for majors in nursing and other allied health occupations. Topics covered include chemical bonding, chemical equations, gas laws, solutions, acid-base theory, oxidation-reduction, functional groups and properties of organic compounds, and the structure and function of carbohydrates, lipids, proteins, and nucleic acids. These topics are discussed in the context of cellular metabolism and human health. This course is not a prerequisite for any chemistry course. Field trip may be required. Online homework may be required. NOTE: Not open for credit to students who have completed CHEM 011. *Three hours lecture, three hours lab.*

GEOG 001 **3.0 Units**
Physical Geography
Course Advisory: Eligibility for English 001 and SCC minimum Math standard. This course is a spatial study of the Earth's dynamic physical systems and processes. Topics include: Earth-sun geometry, weather, climate, water, landforms, soil, and the biosphere. Emphasis is on the interrelationships among environmental and human systems and processes and their resulting patterns and distributions. Tools of geographic inquiry are also briefly covered; they may include: maps, remote sensing, Geographic Information Systems (GIS) and Global Positioning Systems (GPS). Field trips may be required. C-ID GEOG 110. *Three hours lecture.*

GEOG 001L **1.0 Unit**
Physical Geography Laboratory
Prerequisite: GEOG 001 with a minimum grade of C (may be taken concurrently). Course Advisory: Eligibility for ENGL 001 and SCC minimum Math standards. This course is designed to provide supplemental exercises in topics covered in Physical Geography lecture. Lab experience will include map analysis and interpretation, weather prognostication, landform processes and evolution, tectonics, biogeography, and habitat analysis. One or more field trips are required and may occur outside of class time. *Three hours lab.*

GEOL 001 **3.0 Units**
Physical Geology
Course Advisory: Eligibility for English 001 and SCC minimum Math standard. An introduction to the principles of geology with emphasis on Earth processes. This course focuses on the internal structure and origin of the Earth and the processes that change and shape it. Online work may be required. C-ID GEOL 100. *Three hours lecture.*

GEOL 002 **1.0 Unit**
Geology Laboratory
Prerequisite: GEOL 001 or 005 (either course may be taken concurrently). Course Advisory: SCC minimum English and Math standards. Topics include the identification of rocks and minerals as hand specimen and the study of geologic maps, landforms, and structures. Field trips will be taken to areas of geologic interest. Laboratory projects, written assignments and reports, and examinations will be used to evaluate student success. C-ID GEOL 100L. *Three hours lab.*

GEOL 005 **3.0 Units**
Geology Of California
Course Advisory: Eligibility for ENGL 001 and SCC minimum math standard. An introductory course on the geology of California covering its geologic provinces, minerals (including gold), rocks, geologic hazards including earthquakes, and the development of scenic landscapes. Field trips will be taken to areas of geologic interest. A field trip report will be required. However, if a student cannot attend the trip, there will be an optional research paper assignment. *Three hours lecture*

PHSC 012 **4.0 Units**
Introduction to the Principles of Physical Science
Course Advisory: Eligibility for ENGL 001; SCC minimum Math standard. An introduction to the physical universe from atomic particles to the stars, with emphasis on the basic principles of physics, chemistry, astronomy, and the geo-sciences. This is a general education course in the physical science area for nonscience majors that satisfies the physical science requirement for most universities and colleges. Field trips may be required. *Three hours lecture, three hours lab.*

PHYS 002 **5.0 Units**
General Physics (Non-Calculus)
Prerequisite: A minimum grade of C in either MATH 051 or MATH 004. Course Advisory: Eligibility for English 001. PHYS 002 & 004, a two-semester sequence in introductory physics using math through trigonometry, is recommended for teachers, technicians, pre-dentistry, pre-medical, and biology majors, and others who need a general physics course. It covers the study of motion, energy, momentum, gravitation, solids, fluids, thermodynamics and the gaseous state, vibration, wave motion, and sound. Experiments relating to the topics covered will be performed and students will analyze the experiments. Field trip may be required. C-ID PHYS 105. *Four hours lecture, three hours lab.*

PHYS 004 **5.0 Units**
General Physics (Non-Calculus)
Prerequisite: PHYS 002 with a minimum grade of C. Course Advisory: Eligibility for English 001. PHYS 002 & 004, a two-semester sequence in introductory physics using math through trigonometry, is recommended for teachers, technicians, pre-dentistry, pre-medical, and biology majors, and others who need a general physics course. A study of electricity, magnetism, light and optics, and modern physics. Students learn to analyze and solve problems appropriate for this level in these topics. Experiments relating to the topics covered will be performed and students will analyze the experiments. Field trip may be required. C-ID PHYS 110. *Four hours lecture, three hours lab.*

PHYS 006 **5.0 Units**

Physics For Science And Engineering

Prerequisite: MATH 021 (may be taken concurrently). Course Advisory: Eligibility for English 001 and High School Physics, or PHYS 002 with a minimum grade of C. The Physics 006, 007, 008 sequence is a three-semester offering in introductory physics requiring math through calculus. This sequence satisfies the lower division physics requirement for majors in physics, chemistry, geology or other physical sciences, and engineering. A study of mechanics, gravitation, vibration and fluids. Students will learn to analyze and solve problems appropriate for this level in these topics. Experiments relating to the topics covered will be performed. C-ID PHYS 205. *Four hours lecture, three hours lab.*

PHYS 007 **5.0 Units**

Physics For Science And Engineering

Prerequisite: A minimum grade of C in both PHYS 006 and MATH 021. Course Advisory: Eligibility for English 001. The PHYS 006, 007, 008 sequence is a three-semester offering in introductory physics requiring math through calculus. This sequence satisfies the lower division physics requirement for majors in physics, chemistry, geology or other physical sciences, and engineering. A continuation of PHYS 006, covering the topics of electricity, magnetism, wave motion, and sound. Students will learn to analyze and solve problems appropriate for this level in these topics. Experiments relating to the topics covered will be performed. C-ID PHYS 210. *Four hours lecture, three hours lab.*

PHYS 008 **5.0 Units**

Physics For Science And Engineering

Prerequisite: A minimum grade of C in both PHYS 006 and MATH 021. Course Advisory: Eligibility for English 001. The Physics 006, 007, 008 sequence is a three-semester offering in introductory physics requiring math through calculus. This sequence satisfies the lower division physics requirement for majors in physics, chemistry, geology or other physical sciences, and engineering. A continuation of PHYS 006 and PHYS 007, covering heat, optics, relativity, and modern physics. Students will learn to analyze and solve problems appropriate for this level in these topics. Experiments relating to the topics covered will be performed and students will analyze the experiments. Field trip may be required. C-ID PHYS 215. *Four hours lecture, three hours lab.*

PHYS 010 **3.0 Units**

Descriptive Physics

Course Advisory: SCC minimum English standard; MATH 330 or MATH 330B. An introductory physics course for both the non-science and the beginning science student. Includes topics such as nuclear physics, relativity, mechanics, properties of matter, quantum physics, heat, light, electricity, and magnetism. Written assignments, tests, and a comprehensive final exam will be used to evaluate student success. Field trip may be required. *Three hours lecture.*

2.9 Fill rates/Class size. Courses in the General Science Program typically fill with an average fill rate greater than 83%. However, fill rates have gradually declined since peaking at 101.6% in Spring 2012. Reasons for decline are numerous and likely depend on many factors. For example, the total number of sections continues to increase despite relatively consistent FTES. Respective programs are encouraged to examine course-level fill rates to identify areas for improvement in department scheduling. Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on course-specific fill rates.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Average Fill Rate	92.6%	91.4%	92.7%	96.9%	97.3%	98.2%	101.4%	101.6%	92.5%	86.5%	87.6%	84.8%	83.3%

2.10 Course sequencing. The General Science Program includes 36 courses from eight academic subjects (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, Physical Science, and Physics) in two schools (Math & Science, Social & Behavioral Science). This interdisciplinary program provides a variety of courses for students to choose. Consequently, students choose the courses that best match their interests as well as their schedule. Therefore, course sequencing does not present an issue for the General Science Program.

2.11 College Preparedness/Basic skills. Of the 36 courses in the General Science Program, only a few courses include pre-requisites. For example, General Chemistry (CHEM 001) requires students to have a background in basic math. Consequently, the Chemistry Department offers an introductory preparatory course for high school students interested in STEM careers. Most general science courses do not have pre-requisites but still provide support to students. For example, most science faculty members provide students with lists of services available through the college and refer students to specific services (e.g. Tutoring Center or the English Lab) for additional support as necessary. Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on student preparation and support.

2.12 Student Survey. Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on the student surveys.

***2.13 Four-year articulation* (if applicable).** Almost all of the courses of the General Science program meet IGETC requirements in Physical Science (Area 5A), Biology Science (Area 5B), and/or Laboratory Requirement (Area 5C). The only exception is CHEM 051, a general chemistry course for students pursuing allied-health occupations. The courses of the General Science program meet all CSU General Education requirements in Physical Science (Area B1), Life Science (Area B2) and/or Laboratory Courses (Area B3) without exception.

***2.14 High school articulation* (if applicable).** The General Science Program does not have articulation agreements with any local high schools.

***2.15 Distance Education* (if applicable).** The General Science Program offers 36 courses in a variety of subjects. Of those courses, only seven are currently offered fully online (ANTH 001, ASTR 010, BIO 012, BIO 016, GEOG 001, GEOL 001, PHYS 010). Other departments offer hybrid sections of courses (e.g. BIO 016L, CHEM 001, CHEM 002, PHSC 012). Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on distance education courses.

***2.16 Advisory Boards/Licensing (CTE)* (if applicable).** The General Science Program does not have advisory boards or licensing.

Student Equity & Success

3.1 Student Success. Data on student success and retention for the General Science Program are based on student-level data for all of the courses that fulfill requirements of this program. Student success (average 69.9%) and retention rates (average 88.5%) are relatively high for the General Science Program.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Success Rate	68.1%	67.5%	66.5%	67.3%	68.8%	71.5%	71.3%	71.3%	71.2%	74.0%	68.0%	73.1%	71.2%
Retention Rate	89.9%	92.3%	88.0%	88.5%	86.5%	90.2%	86.3%	90.4%	88.4%	87.9%	86.3%	87.8%	88.1%

Data on student success rates by gender are based on student-level data for all of the courses that fulfill requirements of the General Science program. Student success rates are relatively high for individuals that identify as female (average 69.8%) and male (average 70.6%).

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Female	62.6%	65.1%	65.2%	66.7%	67.2%	76.9%	68.8%	69.4%	70.2%	77.9%	68.9%	75.7%	72.8%

Male	76.8%	69.9%	68.7%	69.2%	72.5%	65.2%	78.0%	77.3%	73.1%	66.8%	65.1%	67.7%	67.7%
Not Reported	63.6%	100%	55.6%	60.0%	50.0%	41.7%	42.9%	37.5%	100%	66.7%	83.3%	66.7%	66.7%

Data on student success rates by age groups are based on student-level data for all of the courses that fulfill requirements of the General Science program. Success rates vary substantially for ages less than 17 and ages 51+ given the small sample size (10 or fewer individuals per age group). Average success rates were highest in the group of 41-50 year olds (74.4%), followed by 17-20 years olds (70.4%), then 26-30 year olds (69.4%).

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Less than 17	81.8%	50.0%	100%	100%	90.0%	83.3%	100%	83.3%	83.3%	100%	50.0%	75.0%	71.4%
17-20	68.6%	65.3%	69.4%	67.9%	67.1%	71.1%	71.9%	70.7%	73.4%	75.6%	68.8%	73.0%	72.0%
21-25	61.0%	70.1%	60.2%	64.0%	68.8%	76.2%	63.8%	67.8%	76.3%	71.8%	66.2%	76.5%	68.4%
26-30	71.8%	69.0%	66.1%	78.8%	64.0%	61.4%	79.2%	69.6%	56.6%	71.6%	71.9%	73.0%	69.4%
31-40	60.0%	70.0%	57.5%	52.2%	75.7%	70.7%	74.4%	77.8%	58.3%	68.7%	64.9%	59.6%	75.3%
41-50	84.0%	61.9%	87.5%	47.4%	80.0%	80.0%	61.1%	83.3%	78.9%	82.4%	61.1%	83.3%	76.0%
51-55	75.0%	100%	75.0%	100%	100%	100%	100%	100%	100%	100%	85.7%	100%	100%
56-60	100%	100%	100%	80.0%	100%	100%	100%	100%	100%	100%	100%	100%	100%
61-65		33.3%				100%					100%		100%

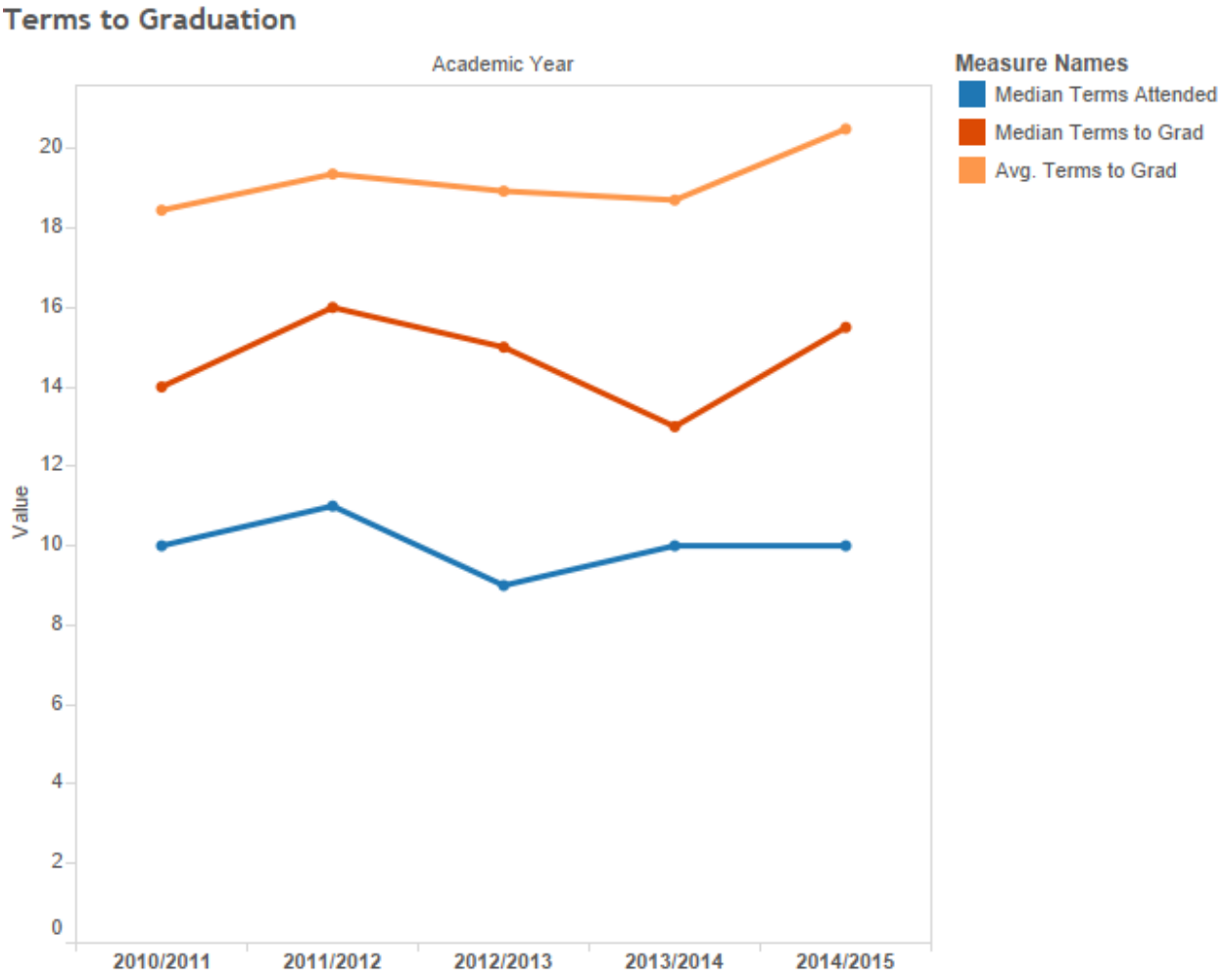
Data on student success rates by ethnicity are based on student-level data for all of the courses that fulfill requirements of the General Science program. Average success rates were relatively high (70-76%) among ethnic groups with the notable exception of Black, Non-Hispanic (49%). This disparity is observed across the institution. Solano Community College may consider further promotion of programs such as Umoja to support more of our African-American students.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
Am. Indian or AK Native	100%	75.0%	100%	100%	50.0%	66.7%	40.0%	50.5%	72.0%	86.4%	77.8%	88.0%	57.2%
Asian or Pacific Islander	62.9%	72.6%	70.9%	70.5%	65.3%	65.2%	72.1%	63.0%	79.5%	78.7%	63.8%	68.8%	74.1%
Black Non-Hispanic	47.9%	44.6%	39.1%	41.7%	45.5%	50.7%	52.4%	61.3%	46.9%	57.4%	47.8%	55.9%	51.5%
Hispanic	74.5%	71.9%	69.1%	61.7%	70.2%	74.4%	75.6%	61.2%	64.2%	72.8%	75.4%	69.2%	77.3%
Other	75.4%	74.6%	62.6%	69.0%	72.8%	71.5%	83.3%	77.1%	75.0%	69.8%	85.7%	88.4%	66.7%
White Non-Hispanic	71.4%	68.4%	78.2%	77.4%	78.6%	80.2%	73.1%	81.3%	76.5%	76.1%	70.5%	81.0%	71.3%

***3.2 Degrees/Certificates Awarded* (if applicable).** Data on awards are based on student-level data for General Science majors that graduated with an Associate in Arts degree.

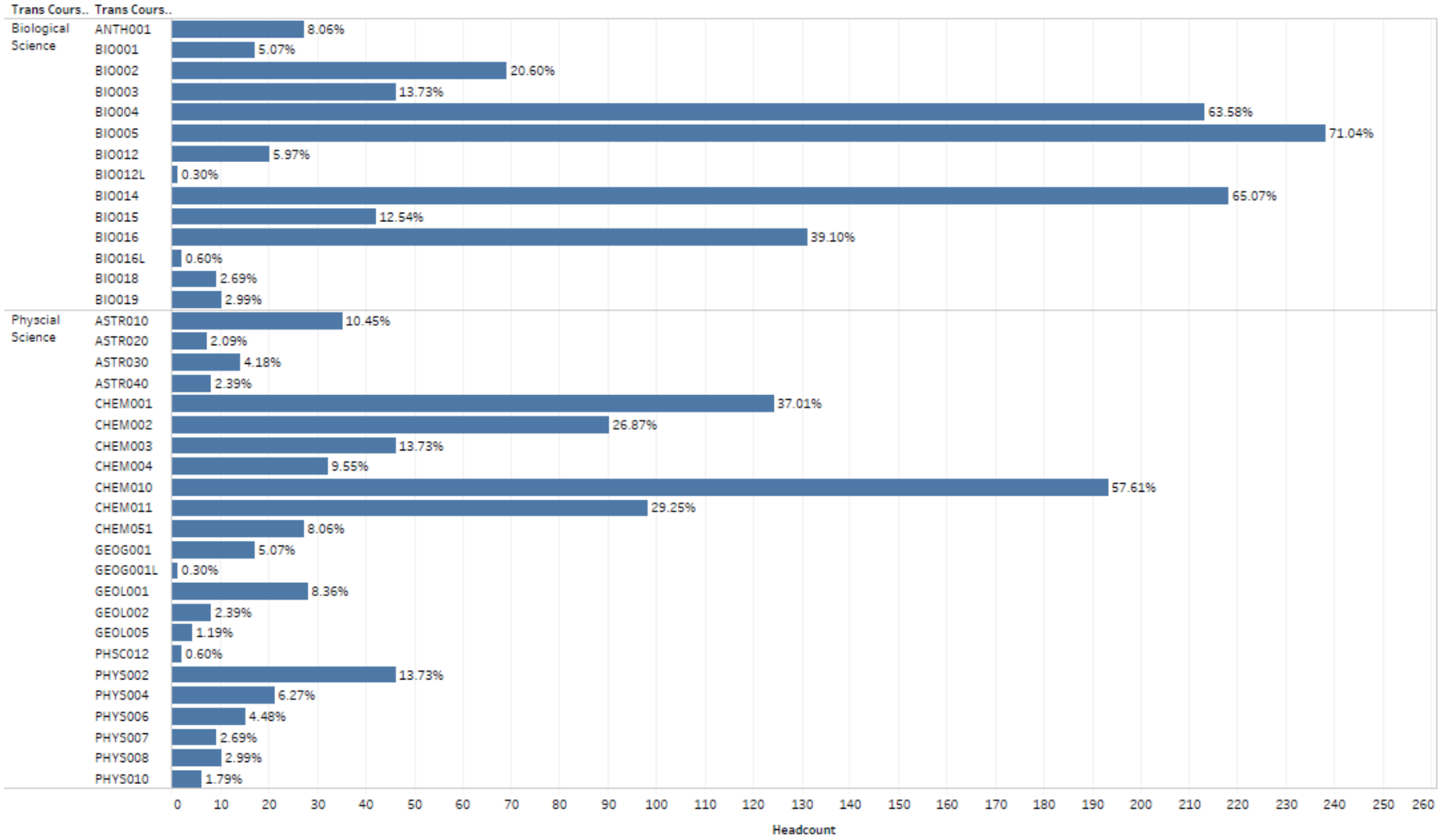
	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015
Associates Degree	136	117	141	192	149

While numerous students declare General Science as their major on their college application, relatively few earn their diploma in this program. Potential explanations are abundant but one key factor may be the number of terms to graduate. On average, it takes students much longer to graduate with an A.A. in General Science (19.2 terms) than students attend the college (10 terms). While students often leave the college before earning their degree, it is likely they are earning degrees at other institutions. Unfortunately, these numbers are not available for the General Science Program.



Graduates earning their A.A. in General Science primarily take biology and chemistry courses for this degree. Specifically, many recent graduates completed Human Physiology (BIO 005 at 71.04%), Microbiology (BIO 014 at 65.07%), and Human Anatomy (BIO 004 at 63.58%). Also, Intermediate Chemistry (CHEM 010) was completed by a majority of recent graduates (57.61%). These four courses serve the allied health sciences such as nursing, dental hygiene, physical therapy. Consequently, these four courses are in high demand so the college offers numerous sections (24-27 unique CRNs per semester) with excellent fill rates (90-117% average). The Pre-Allied Health group continues to improve their courses through collaborations with other groups including the Nursing School. This joint committee may consider discussing whether an Associate's degree in Pre-Allied Health may better serve our students.

Major Courses



Headcount for each Trans Course ID broken down by Trans Course ID(group). The marks are labeled by % of Total Headcount. The view is filtered on Trans Course ID(group), which keeps Biological Science and Physcial Science.

***3.3 Transfer* (if applicable).** The General Science Program provides an overview of the sciences to promote successful transition of students to a 4-year institution. Despite this fact, data on transfer rates are lacking for the General Science Program. However, science students seeking Baccalaureate degrees are supported in a variety of ways. For example, Solano Community College was recently awarded an NSF grant to fund the 2+1 STEM Scholarship program. This scholarship provides services and support to students for two years at Solano then an additional year at their transfer institution. Also, faculty members advertise transfer and career fairs held on campus to inform students of additional opportunities.

***3.4 Career Technical Programs* (if applicable)**. The General Science Program is not a career technical program.

PROGRAM RESOURCES

4.1 Human Resources. The General Science Program courses are primarily taught by full-time faculty (average 60.38% FTEF). However, this is well-below the 75% full-time faculty load ratio mandated by California Assembly Bill 1725. Some full-time science faculty members take on overload to teach unstaffed sections of courses as it is often difficult to find highly qualified adjunct instructors. Furthermore, recent or upcoming retirements will continue to decrease the full-time faculty load ratio for this program.

	Fall 2008	Spring 2009	Fall 2009	Spring 2010	Fall 2010	Spring 2011	Fall 2011	Spring 2012	Fall 2012	Spring 2013	Fall 2013	Spring 2014	Fall 2014
% True FT	NA	NA	58.55%	59.36%	63.74%	54.44%	65.84%	62.21%	59.85%	50.59%	65.65%	59.61%	64.36%

For example, our only full-time Astronomy instructor retired in 2014 yet the position has not been replaced permanently. Most biology courses are taught by adjunct faculty (52% in Fall 2014) and the Biology department conducts interviews for adjunct faculty every semester. The Chemistry department has had two (2) recent retirements (Ducoing and Spillner) and desperately needs another organic chemistry instructor. Both Biology and Chemistry require further support for labs including additional lab technicians. The Physical Sciences, including geography and geology, anticipate growth in FTES as well as an upcoming retirement that will require additional faculty members. Without additional support, faculty and staff will struggle to continue to provide exceptional learning experiences for our students.

4.2 Current Staffing. The General Science Program consists of over 60 faculty members, each contributing to their own departments as well as the college. For example, Anthropology professor Lauren Taylor-Hill developed an Associate in Arts in Anthropology Transfer degree. Rennee Moore, of the Biology Department, developed a new course (BIO 101) to help students

with time managements and study strategies. The Chemistry department was awarded strategic grants to fund various resources to support student learning in labs. Geology/Geography Professor Danielle Widemann continues to offer student-centered workshops through the Academic Success Center. Geology/Physical Science Professor Mark Feighner developed the Geography AA-T degree. Physics/Engineering Instructor Melanie Lutz designed the Physics AS-T degree, which was approved in Spring 2014. Faculty members also support the greater community by encouraging student participation in community events such as Coastal Cleanup Day and Earth Day. The faculty of the General Science Program work diligently to promote the program, college, and community.

4.3 Equipment. Program Reviews from the departments of the General Science Program identify the following equipment needs:

- The Anthropology department is establishing a collection of specimens that was partially fulfilled with an instructional equipment request in 2014.
- Biological Sciences require audio-visual equipment (e.g. microscope camera with software), chemical-resistant leak-proof storage containers, fume hoods, surgical equipment (e.g. overhead lamps, anatomical atlases) as well as wall charts and models.
- The Chemistry department requires proper storage cabinets, replacement of lab equipment (e.g. balances, Bunsen burners, pipette pumps, spot plates, etc.) as well as laptops with updated software.
- Geology classes require replacement of mineral and rock samples and a new rock saw for the thin-section lab.
- The Geography department requires an updated set of laptop computers with GIS software as well as funds for the annual license fee.
- In PHYS 008, there is insufficient equipment in the Modern Physics labs to allow all of the students to do the same experiment on the same date.

Please see the respective department program reviews (Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on required equipment.

4.4 Facilities. The Facilities Master Plan includes new Science buildings on the main campus as well as the Vacaville Center. This represents a tremendous opportunity for expansion in the sciences while updating technology in the classrooms. To make the most of this opportunity, faculty must be able to contribute to the design of these buildings. For example, we are interested in room sizes to ensure quality educational experiences but also to minimize safety issues. Classrooms should include multiple display options (e.g. screens and whiteboards) that faculty may use ***simultaneously*** to provide students with multi-format presentations. Layouts of lecture rooms must be amenable to multiple teaching strategies while laboratories must have layouts that allow for collaborative learning within small groups. Laboratories must be supplied with quality instructional equipment (e.g. laptops, microscopes) as well as required supplies (e.g. gas lines). The furnishings and finishes in science laboratories should be durable and reliable including chemical- and stain-resistant surfaces. Laboratories must be supplied with emergency systems including eyewash stations, showers, fire protection, call boxes, and shut-offs. Science courses also require substantial space for preparation and storage of materials. All classrooms must be designed to be safe and accessible for all students, staff, and faculty. Without faculty input on building design, key considerations for instructional objectives as well as issues unique to the sciences may be overlooked. Please see the respective department program reviews

(Anthropology, Astronomy, Biology, Chemistry, Geography, Geology, and Physics) for detailed information on facilities needs.

4.5 Budget/Fiscal Profile. Since 2008, expenses for the General Science Program ranged from $79K to $28MM. The majority of the budget went towards academic salaries and benefits. Conversely, relatively little funding is provided for classified salaries which may help explain the high turnover. The expenditures for supplies varied substantially by year. Given the data, it is difficult to identify any clear patterns. Regardless, the General Science Program requires substantial resources every year for supplies, equipment replacement, and new equipment for advancing technologies as well as new courses. Additional funding is necessary to maintain and improve the program. In particular, it is crucial to increase the budget to support the upcoming expansion at the main campus as well as the campus centers.

PROGRAMMATIC GOALS & PLANNING

5.1 The General Science Program would benefit from an oversight committee consisting of representative faculty from each of the disciplines encompassed by this program. This committee could help achieve short-term and long-term goals of this program review while addressing pending questions such as the overall goals of this program and its associations with comparable programs. The committee may consider requesting reassign time for a coordinator to direct these efforts.

Currently, the General Science Program is sustained by each of the departments it encompasses. An evident strength of this program is the variety of courses offered at multiple locations including the Vacaville and Vallejo Centers. Several of these courses are available as online or hybrid offerings further increasing student access to classes. Science faculty have developed new courses to support student learning (e.g. BIO 101) and meet student demand (e.g. CHEM 051). These courses are supported by our highly skilled, albeit overworked, laboratory technicians. Science faculty have also developed laboratory manuals as well as customized textbooks to improve student access to resources. Several departments have recently established Associate in Arts (e.g. Anthropology, Geography) or Associate in Science (e.g. Physics) for Transfer Degrees in their respective disciplines. In general, our students benefit greatly from the personalized attention they receive due to our relatively small class sizes. The entire Science Division is supported by two dedicated administrative assistants.

The primary area in need of improvement is that of facilities. Science courses are often filled at or above capacity, yet additional sections cannot be offered without adequate laboratory space. All science courses seem to be limited by available storage. For example, the Anthropology department experienced great difficulty in securing a designated storage area in close proximity to a classroom. As lab equipment shows routine wear due to normal use, it will be necessary to replace such items. Some labs are currently lacking in sufficient equipment. Considering the plans for expansion at the Vacaville campus, it will also be necessary to acquire new equipment to outfit these classrooms. The General Science Program also suffers from a lack of human resources. For example, the current ratio of full-time to part-time faculty necessitates new full-time faculty hires to promote long-term stability of the program and ensure high quality educational experiences for our students. Likewise, additional lab technicians are needed to support our lab-based courses. Lastly, strategic scheduling among science courses as well as general education courses is necessary to ensure high efficiency as well as student success.

5.2 While each department of the General Science Program identified specific goals in their respective program reviews, some overall themes emerged:

Table 7. Program Goals

Short-Term Goals	Planned Action	Responsible	Source
1.	Form General Science Program Committee	Dean	NR
2.	Update Program Level Outcomes	Division	NR
3.	Update Online Brochure	Division	NR
4.	Update Online Catalog	Division	NR

Long-Term Goals	Planned Action	Responsible	Source
1.	Hire additional PT and FT science faculty as necessary	Division	DB
2.	Hire additional laboratory technicians as necessary	Division	DB
3.	Purchase new or replacement equipment and materials as necessary	Division	DB, SP
4.	Improve laboratory spaces including preparatory and storage areas	Division	DB
5.	Develop a Science division packet with information for new faculty (e.g. policies and procedures, safety information, etc.)	Division	DB, SP
6.	Adjust course scheduling based on data to maximize efficiency	Division	NR
7.	Update, modify, and expand curriculum as appropriate	Division	NR
8.	Promote the General Science Program as well as respective science departments and highlight advantages such as 2+1 STEM Scholarship Program	College	SP

SIGNATURE PAGE

6.1 The undersigned faculty in the General Science program have read and concur with the finding and recommendations in the attached program review self-study, dated December 2, 2016.

Patricia Itaya
Faculty Name

Michelle Smith
Faculty Name