

**College of Science and Mathematics**

**BA Natural Sciences (all options)**

**Last updated, September 2014**

**Student Outcomes Assessment Plan (Soap)**

**I. Mission Statement**

The Natural Sciences Degree Program's mission is to prepare students with a broad understanding of science as a way of thinking and as a tool for learning about the world around us. The program seeks to foster an understanding that all of the sciences interface and are not isolated, compartmentalized areas totally unrelated to each other. The program further seeks to provide students with an opportunity to investigate, first hand, the phenomena of nature and to field test effective strategies for sharing this experience with others.

**II. Goals and Student Learning Outcomes for all options**

***Goal 1 – Students will develop a strong foundation in the Sciences and in supporting disciplines (WASC Core Competencies: Critical Thinking & Quantitative Reasoning).***

Graduates from this degree program should be able to:

- A. Synthesize knowledge and skills in the basic components of the Sciences, and develop a familiarity with the scientific methodology.

***Goal 2 – Students will be educated in the basic methods and philosophy used to conduct scientific research in the Sciences (WASC Core Competencies: Critical Thinking & Quantitative Reasoning).***

Graduates from this degree program should be able to:

- B. Students will demonstrate scientific literacy by applying their scientific knowledge and critical thinking skills to evaluate and interpret scientific claims.

***Goal 3 – Students will develop effective oral and written communication skills (WASC Core Competencies: Oral Communication & Written Communication).***

Graduates from this degree should be able to:

- C. Effectively disseminate an understanding of scientific material and conclusions by means of written reports.

**Goal 4 – Students will develop intellectual independence and academic skills that will assist them in continuing to learn after graduation (WASC Core Competency: Information Literacy & Written Communication).**

Graduates from this degree should be able to

- D. Provide students with culminating experiences in the Sciences that allows them to integrate knowledge previously acquired throughout the curriculum.

### III. Curriculum Map (Matrix of Courses and Learning Outcomes)

This table provides information regarding how the outlined student learning outcomes are introduced (I), developed (D), and mastered (M) as students progress through the curriculum.

<b>Earth Science Option, B.A.</b>	Goal 1	Goal 2	Goal3	Goal 4
BIOL 1A, 1B, 101	I	I	I	I
CHEM 1A, 1B	I	I	I	I
EES 1 and 168	I	I	M	D
NSCI 106	D	M	M	M
PSCI 21	I	I	I	I
PHYS 2A, 2B	I	I	I	I
MATH 75	I	I	I	I
EES 12, 30, 100, 101, 102, 105, 112, 155	M	M	D	D

<b>Biology Option, B.A.</b>	Goal 1	Goal 2	Goal3	Goal 4
BIOL 1A, 1B, 1BL, 101	I	I	I	I
CHEM 1A, 1B	I	I	I	I

EES 1 and 168	I	I	M	D
NSCI 106	D	M	M	M
PSCI 21	I	I	I	I
PHYS 2A, 2B	I	I	I	I
MATH 75, 101, PSYCH 42	D	D	I	I
CHEM 8 or 128A	I	I	I	I
BIOL 102, 103, 104, 105, 120	M	M	D	D

<b>Chemistry Option, B.A.</b>	Goal 1	Goal 2	Goal3	Goal 4
BIOL 1A, 1B, 1BL, 101	I	I	I	I
CHEM 1A, 1B	I	I	I	I
EES 1 and 168	I	I	M	D
NSCI 106	D	M	M	M
PSCI 21	I	I	I	I
PHYS 2A, 2B	I	I	I	I
MATH 75, 76	I	I	I	I
CHEM 128A, 102 or 105, 108, 128B, 129A, 150 or 155A	M	M	D	D

<b>Physics Option, B.A.</b>	Goal 1	Goal 2	Goal3	Goal 4
BIOL 1A, 1B, 1BL, 101	I	I	D	I
CHEM 1A, 1B	I	I	I	I
EES 1 and 168	I	I	M	D
NSCI 106	D	M	M	M

PSCI 21	I	I	I	I
CHEM 128A	I	I	I	I
PSCI 168	D	D	D	D
MATH 75, 76, 77, 81	D	D	I	I
PHYS 4A, 4AL, 4B, 4BL, 4C	M	M	D	I
PHYS 102, 105A, 107A	M	M	D	D

#### IV. Assessment Methods

##### Direct Measures

The majority of assessment measures for the degree program take place during EES 168 and NSCI 106, two classes taken by all Natural Science Students in the last 3 semesters of the program. This will be supplemented with student selected work in the form of an e-Portfolio.

1. **Outcome A:** Students will synthesize knowledge and skills in the basic components of the Sciences, and develop a familiarity with the scientific methodology.

**Method: NSCI 106 Science Survey** – the survey comprises 13 scientific themes with 5 questions each. Themes include “Scientific knowledge is built through a complex process that relies, in part, on observations of nature” or “Science and society are intertwined” for instance. This assignment is scored using a rubric including two evaluation lines related to Natural Science Program student learning outcomes. The individual scores on these outcomes are disaggregated and used for program evaluation. The rubric (attached) is calibrated by having three faculty from the Natural Sciences assessment committee score a random sampling of at least 10% or 5 student papers. At least 70% of students who pass the course will score 3 or better on each rubric line.

2. **Outcome B:** Students will demonstrate scientific literacy by applying their scientific knowledge and critical thinking skills to evaluate and interpret scientific claims.

**Method: NSCI 106 Student Lesson** – students will create a science lesson that will develop the cognitive (intellectual), affective (attitude and values-oriented) and skill (for example, listening skills or ability to see more than one side of an issue) of K-12 students. Freely choosing inspirational materials(s) or modes of instruction, the student-teachers will focus on a core activity, around which the lesson will be built. The assignment will be

evaluated based on its link to current science standards and its grade-appropriate material. Also, the faculty will check for possible misconception(s) reinforced during the lesson. At least 70% of students will score 3 or better on each rubric line.

3. **Outcome C:** Students will effectively disseminate an understanding of scientific material and conclusions by means of written reports.

**Method: EES 168 Term Paper** – the assignment consists of reviewing a general science book from a list compiled by Dr. Mathieu Richaud. Books focus on the Earth Sciences and range from water and natural resources to climate change, geology and oceanography. This assignment is scored using a rubric including two evaluation lines related to Natural Science Program student learning outcomes. The individual scores on these outcomes are disaggregated and used for program evaluation. The rubric (attached) is calibrated by having three faculty from the Natural Sciences assessment committee score a random sampling of at least 10% or 5 student papers. At least 70% of students who pass the course will score 3 or better on each rubric line.

4. **Outcome D:** Provide students with culminating experiences in the Sciences that allows them to integrate knowledge previously acquired throughout the curriculum.

**Method: CSET 118 & CSET 119** – a score on the California Subject Examination for Teachers (CSET) in both general sciences (CSET 118 & CSET 119), in addition to the CSET in the subject concentration (i.e. physics, biology, chemistry or earth sciences). Anonymous feedback will be collected on areas in which students tend to be weak in either the general sciences component and/or the subject specific area. These results will serve to inform the degree program concerning areas that perhaps need to be improved or revised to increase student understanding. However, it should be noted that the Science and Mathematics Education Center (SMEC) only receives data if students fail to pass the tests. In case of success, no available data is returned.

#### Indirect Measures

- A. Alumni surveys will be conducted every other year via Survey Monkey to assess the strengths and weaknesses of the degree program as alumni become more seasoned professionals.
- B. Exit interviews will be conducted with all willing students to collect their views on the degree program.
- C. Pending available and workable data, CSET results will be used to assess the areas in which students do and do not do well, and recognize developing patterns that would be useful for

the degree program to be aware of.

## V. Student Learning Outcomes / Assessment Methods Matrix

This table provides information regarding how the outlined student learning outcomes will be assessed.

	Direct measures				Indirect measures		
	EES 168 Term paper	NSCI 106 Science lesson	NSCI 106 Science survey	Portfolio	Alumni interviews	Exit interviews	CSET results
Goal 1			X	X			
Goal 2		X		X			
Goal 3	X			X			
Goal 4							X

## VI. Timeline for Implementation of Assessment Methods and Summary Evaluations

The assessment timeline is based on the program's external program review cycle, repeating each five to seven years beginning with the year following the completion of the department's self-study.

The following timeline outlines the schedule for review of that data by the department assessment committee.

### First Year (AY 2013-2014)

- EES Book Reviews
- Exit interviews
- Alumni survey
- *CSET data (if meaningful and reliable)*

## **Second Year (AY 2014-2015)**

- NCSI 106 Student Lesson
- Exit interviews
- Employer Survey
- NCSI 106 Science Survey
- *CSET data (if meaningful and reliable)*

## **Third Year (AY 2015-2016)**

- EES Book Reviews
- Exit interviews
- Alumni survey
- *CSET data (if meaningful and reliable)*

## **Fourth Year (AY 2016-2017)**

- NCSI 106 Student Lesson
- Exit interviews
- Employer Survey
- NCSI 106 Science Survey
- *CSET data (if meaningful and reliable)*

## **Fifth Year (AY 2017-2018)**

- Program Self Study
- EES Book Reviews
- Exit interviews
- Alumni survey
- *CSET data (if meaningful and reliable)*

## **VII. Process for Closing the Loop**

The Natural Sciences Assessment Committee is composed of the program director and representatives from each of the four disciplines. The committee meets once a year to discuss student learning outcomes and discuss possible curricular changes and revisions resulting from this information. If the students are meeting the learning outcomes, no further action is necessary. If students are not meeting the expected learning outcomes, discussion will center on changes needed to improve student performance. For example, changes could include minor or major modifications to individual or multiple courses or assignments, or proposal of new courses. Faculty teaching the affected courses will be tasked with making agreed upon changes. The committee is responsible for collecting and summarizing assessment data and generating the annual written assessment report.

## **VIII. Appendix and Supporting Documents**

- 1 – EES 168 Book Review Rubric
- 2 – NSCI 106 Science Lesson Rubric
- 3 – NSCI 106 Science Survey