

Science General Education Annual Assessment Report 2010-2011

I. Introduction

The Science General Education Program serves all OIT degree students, who are each required to complete 12 science credits selected by the student or specified by the major department.

II. Program Purpose, Objectives and Student Learning Outcomes

The faculty in the Natural Science Department who are part of the Science General Education Program met in September 2009 to review the Science General Education program purpose, objectives, and student learning outcomes. The faculty affirmed them without changes.

Science General Education Program Purpose

To provide lower division science courses appropriate for science, technology, engineering, health, and liberal arts students.

Program Educational Objectives

1. Understanding of fundamental scientific principles or concepts.
2. The ability to apply fundamental principles or concepts to solve problems.

Student Learning Outcomes

The student learning outcomes and performance criteria for the Science General Education program are as follows:

SLO 1: Students will demonstrate scientific knowledge and skills in scientific reasoning.

Criteria for Assessment: Students will be able to

1. Demonstrate factual knowledge of a science (terminology, organization, classifications, methods, fundamental principles, generalizations, or theories).
2. Use appropriate scientific reasoning skills to interpret and analyze content in the natural sciences.

SLO 2: Students will demonstrate mathematical knowledge and skills.

Criteria for Assessment: Students will be able to

1. Perform the mathematical computations required in the science courses they are taking.

2. Read and comprehend written information relevant to the science courses they are taking.
3. Read and comprehend graphical quantitative information relevant to the science courses they are taking.

SLO 3: Students will be able to demonstrate a fundamental scientific principle.

Criteria for Assessment: Students will be able to

1. Collect data, making appropriate measurements.
2. Precisely record data, including use of appropriate units.
3. Analyze data to determine its relationship to the scientific principle and evaluate the data for errors.

III. Three-Year Cycle for Assessment of Student Learning Outcomes

The faculty agreed on a three-year cycle of assessment for the three program learning outcomes, as shown in Table 1 below.

Learning Outcomes	'08-09	' 09-10	'10-11
SLO 1: Students will demonstrate scientific knowledge and skills in scientific reasoning.	X		
SLO 2: Students will demonstrate mathematical knowledge and skills.		X	
SLO 3: Students will be able to demonstrate a fundamental scientific principle.			X

Table 1. Science General Education Assessment Cycle

IV. Summary of 2010-11 Assessment Activities

During the 2010-11 academic year, the program faculty conducted formal assessment of SLO #3: Students will be able to demonstrate a fundamental scientific principle, using the performance criteria noted above. This learning outcome has been mapped to the science general education curriculum as shown in Appendix A.

Direct Assessment #1

The faculty conducted an assessment of this SLO in CHE 223 during the Spring 2011 term, using final exam clustered around the three performance criteria. There were forty-one students involved in the assessment. The results are shown in Table 2 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Collect data, making appropriate measurements	3 Exam questions	1 = correct 0 = incorrect	80% of students got 2 out of 3 correct	2% got 0 out of 3 correct 2% got 1 out of 3 correct 7% got 2 out of 3 correct 89% got 3 out of 3 correct
Precisely record data, including use of appropriate units	3 Exam questions	1 = correct 0 = incorrect	80% of students got 2 out of 3 correct	5% got 0 out of 3 correct 7% got 1 out of 3 correct 10% got 2 out of 3 correct 78% got 3 out of 3 correct
Analyze data to determine its relationship to the scientific principle and evaluate the data for errors	4 Exam questions	1 = correct 0 = incorrect	80% of students got 3 out of 4 correct	17% got 3 out of 4 correct 83% got 4 out of 4 correct

Table 2. Assessment Results for SLO 3 in CHE 223, Spring 2011.

Discussion:

Overall, the students met instructor's expectation on this assessment. This is the third term students took this series of General Chemistry, and instructor felt students should be more competent in mastering Chemistry. In addition, the instructor provided weekly study sessions and an exercise package for students to study this course, which is another factor leading to the success of students' performance.

Direct Assessment #2

The faculty conducted an assessment of this SLO in CHE104 during the spring 2011 term. Four questions were drawn from the Spectrophotometry laboratory reports. There were 44 students involved in the lab component of this course. The results are shown in Table 3 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Collect data, making appropriate measurements	Lab Report Spectrophotometry Part A - 52 data collections	1= correct 0 = incorrect	75% got correct answer	Part A Question 1 - 100%
Precisely record data, including use of appropriate units	Lab Report Spectrophotometry Part B - 6 data recordings	1= correct 0 = incorrect	75% got correct answer	Part B Question 2 - 95.4% Question 3 - 100%
Analyze data to determine its relationship to the scientific principle and evaluate the data for errors	Lab Report Spectrophotometry Beer's Law Plot - Determine unknown concentration	1= correct 0 = incorrect	75% got correct answer	Beer's Law Plot Question 4 - 90.9%

Table 3. Assessment Results for SLO 3 in CHE104, Spring 2011.

Discussion:

Performance Criteria 1: The CHE 104 laboratory students performed extremely well in collecting data and making appropriate measurements in Part A of the Spectrophotometry laboratory with 100% of the students being proficient! The students were required to collect 13 absorbance readings of four different colored solutions at specific wavelengths ranging from 375 nm to 675 nm. In addition, they were required to blank their spectrophotometer between wavelength changes before recording the absorbance readings.

Performance Criteria 2: The CHE 104 laboratory students performed very well in precisely determining and recording the correct wavelength of 625 nm for their spectrophotometer. The students needed the proper wavelength in order to determine the absorbance of the standards and unknown solution. Two students out of 44 students did not record the correct wavelength in nanometers, but instead recorded the absorbance value. However, in Part B of the Spectrophotometry Laboratory, 100% of the students were proficient at recording the absorbance values for their standards and unknown!.

Performance Criteria 3: Overall, the student's performance was excellent with 90.9% of the students determining the correct concentration of the unknown by constructing and evaluating a Beer's Law Plot. Four students out of 44 students did not determine the correct concentration of the unknown solution. In further analyzing the Beer's Law Plots constructed, it was determined that students did not put a title on their graph or include a data point for the blank (0,0). To help improve this performance criteria, the

laboratory faculty will include a labeled sample graph for the students to examine. In addition, faculty will be adding a space on the laboratory data collection report sheet for the blank. Hopefully this will help remind the students that at 0 concentration there should be 0 absorbance if they blanked their spectrophotometer correctly!

V. Summary of Student Learning

SLO 3: Students will be able to demonstrate a fundamental scientific principle

Strengths: In general, students met the performance for being able to demonstrate a fundamental principle. Students' performance exceeded the expectations in all criteria including data collection, data measurements, data recording, and data analyzing. Both instructors teaching these two courses offer weekly study session which is a key factor in students' success in this course.

Weaknesses: Instructors think students still need to improve their skill in calculations by doing more practices and raising questions.

Actions: N/A

Appendix A: PSLO #3 Mapped to the Science General Education Curriculum Map

SLO 3: Students will be able to demonstrate a fundamental scientific principle.

This is a list of courses that are considered part of the General Science Education program at Oregon Institute of Technology. Courses that are shaded below indicate that PSLO #3 is taught in the course.

	100 Level		200 Level	
FALL	CHE 101	Elementary CHE	CHE 201/CHE 221	General CHE
	BIO 101	General BIO	BIO 207	Medical terminology
	BIO 111	Intro Env. Science	BIO 211	Principles of BIO
	GEOG 115	Climatology	BIO 231	Human A&P I
			PHYS 201	General PHYS
			PHYS 221	General PHYS w/calc
			PHYS 223	General PHYS w/calc
WINTER	CHE101	Elementary CHE	CHE 202/222	General CHE
	CHE 102	Elementary CHE	BIO 212	Principles of BIO
	BIO 102	General BIO	BIO 232	Human A&P II
	BIO 105	Microbiology	PHYS 202	General PHYS
	GEOG 105	Geomorphology	PHYS 221	General PHYS w/calc
			PHYS 222	General PHYS w/calc
SPRING	CHE 101	Elementary CHE	CHE 223	General CHE
	CHE 103	Elementary CHE	CHE 231	Streamwater CHE
	BIO 103	General BIO	CHE 232	Streamwater Sampling
			BIO 213	Principles of BIO
			BIO 216	Intro to Vet. Medicine
			BIO 233	Human A&P III
			PHYS 203	General PHYS
			PHYS 222	General PHYS w/calc
			PHYS 223	General PHYS w/calc