

# Valencia Community College

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## ***Program Learning Outcomes Assessment Plan***

The following plan was developed by Science faculty during Destination 2009 for implementation during the 2009-2010 academic year.

- Program Area: ***General Education***
- Discipline (for plans within General Education): **Science**
- Planning Team Members:
  - **Clay Inman**
  - **George Kenney**
  - **Sonia Suri**
  - **Mary Beck**
- Program Learning Outcome Selected for Assessment: **Quantitative and Scientific Reasoning: Use processes, procedures, data, or evidence to solve problems and make effective decisions.**
  - Performance Indicators:
    - **See attached Rubric**
- Targeted Course(s): **BSC1005**
  - Common Course Outline
    - **The Common Course Outline for Bsc1005 was completed on 5/18/2006 and was due for revision on 5/18/2008.**
    - Common Course outlines are reviewed on a 2-year cycle.
    - Changes to course level outcomes as a result of program outcomes assessment must be reflected in the faculty approved common course outline
  - Targeted Course Level Outcome:
    - **Students will recognize, understand and utilize the methods of the scientific process**

- Description of Proposed Common Assignment: **Final Exam Test Questions**
  - **This assessment will include a series of multiple choice questions (4-5) directed at assessing students' understanding of the method(s) of scientific process. Grading is based on their answers per the attached rubric**
  - **The biology assessment questions will be included in the final exam for every Bio 1005 class on all campuses in Spring, 2010. By including the questions in all Bio 1005 class final exams, this will ensure that there is a significant number of students answering these questions from which to collect data.**
  - **As a result of collecting and processing these data, biology faculty will be able to assess how well students understand process of the scientific method(s). Because there will be several questions included in this assessment, faculty will be able to look at the results for each question and to assess student understanding of each aspect of scientific methodologies. In addition, biology faculty will be able to use these data to implement any revisions in teaching of scientific methodology in introductory biology courses.**
  - **Because some of the introductory science courses do not include labs (where scientific methodologies can be directly applied) and because methodologies can differ for different disciplines within the sciences, a series of questions can be created that best address scientific methodologies for each particular discipline. Included in this plan are questions that can serve as examples of how these types of questions can be adapted for introductory, non-major, non-lab astronomy and earth science classes.**
  - **This plan will need to be approved by science deans and relevant faculty and a plan for implementing inclusion of these questions into all Bio 1005 finals and for sampling student answers will need to be developed.**

➤ Implementation Timeline / Plan:

- **Discipline coordination / preparation in Fall 2009**
- **Collection of student papers work – end of Spring term 2010**
- **Scoring of student work and faculty discussion – May 6, 2011**

➤ Attachments:

- **General Education Student Learning Outcomes**
- **Informed Consent statement to be included in all Syllabi**
- **Rubric**

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## General Education Student Learning Outcomes

*The general education program at Valencia is an integral part of the A.A. Degree program and is designed to contribute to the student's educational growth by providing a basic liberal arts education. A student who completes the general education program should have achieved the following outcomes:*

**Cultural and Historical Understanding:** Demonstrate understanding of the diverse traditions of the world, and an individual's place in it.

**Quantitative and Scientific Reasoning:** Use processes, procedures, data, or evidence to solve problems and make effective decisions.

**Communication Skills:** Engage in effective interpersonal, oral, and written communication.

**Ethical Responsibility:** Demonstrate awareness of personal responsibility in one's civic, social, and academic life.

**Information Literacy:** Locate, evaluate, and effectively use information from diverse sources.

**Critical Thinking:** Effectively analyze, evaluate, synthesize, and apply information and ideas from diverse sources and disciplines.

## Participant Informed Consent Form

*(Informed consent forms to be included in all General Education syllabi starting Spring 2010)*

Research is being conducted to assess General Education Program student learning outcomes. Student work will be collected at random from students enrolled in General Education courses each academic term. Your instructor may be asked to submit an article of work that you have completed during the course of the semester. Your identification will be removed from the work so as to preserve your anonymity and confidentiality. The work will then be scored holistically using a rubric. Those results will be used to improve instruction not to assess you as an individual student. You will not be asked to do anything outside of your normal class assignments and this assessment is completely separate from and will have no effect upon your class average or final course grade. There are no identifiable risks to you. The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify you. Research records will be stored securely and only researchers will have access to the records. All information is subject to the Family Educational Rights and Privacy Act (FERPA) of 1974, which is designed to protect the privacy of educational records.

Your participation in this study is totally voluntary and you may withdraw at any time without negative consequences. To withdraw at any time during the study, simply ask your instructor not to submit any of your work.

Please feel free to contact Roberta Brown (407-582-3421) or Kurt Ewen (407-582-3413) if you have any questions about the study. Or, for other questions, contact the Chair of Valencia's Institutional Review Board at [irb@valenciacc.edu](mailto:irb@valenciacc.edu).

I am at least 18 years of age and not requesting exclusion from the study constitutes my informed consent.

***You will be given a copy of this information to keep for your records.***

## Destination 2009: Biology (BIO 1005C)

### A Form of Assessment

#### Topic: A Scientific method Sample assessment questions with answers

1. The key to a successful scientific investigation is

- A) Developing a correct hypothesis
- B) Developing a variety of hypotheses
- C) Using a complex experiment
- D) Including two or more controls in the experiment
- E) Making careful observations

**Correct answer: D**

2. Which of the following are in the correct order?

- A) Test, make observations, develop a hypothesis, make predictions, and draw conclusions
- B) Make observations, develop a hypothesis, make predictions, test, and draw conclusions
- C) Develop a hypothesis, test, make predictions, make observations, and draw conclusions
- D) Make predictions, develop a hypothesis, test, make observations, and draw conclusions
- E) Either a or b

**Correct answer: B**

3. In an effort to improve crop yield a rancher tries different kinds of fertilizers. She uses an organic fertilizer on one field and a chemical fertilizer on another. A third field is not fertilized. The two fertilizers represent what part of her experiment?

- A) The hypothesis
- B) The control
- C) Variables
- D) Predictions
- E) A theory

Correct answer: C

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4. The unfertilized field in the above experiment represents what part of her experiment?

- A) The hypothesis
- B) The control
- C) Variables
- D) Predictions
- E) A theory

**Correct answer: B**

5. In an experimental test, we attempt to manipulate only one factor at a time. This factor is called the

- A) Hypotheses.
- B) Control.
- C) Variable.
- D) Prediction.

**Correct answer: C**

6. When trying to figure out explanations for observations, you usually construct a series of possible hypotheses. Then you make predictions of what will happen if each hypothesis is true, and

- A) Test each hypothesis, using appropriate controls, to determine the truth.
- B) Test each hypothesis, using appropriate controls, to rule out as many as possible.
- C) Use logic to determine which hypothesis is most likely true.
- D) Use logic to determine which hypotheses are most likely false.

**Correct answer: B**

7. Which of the following statements is correct regarding a hypothesis?

- A) After sufficient testing you can conclude that it is true.
- B) After sufficient testing you can conclude that it is probably true.
- C) After sufficient testing you can accept it as probable, being aware that it may be revised or rejected in the future.
- D) You never have any degree of certainty that it is true, there are too many variables.

**Correct answer: C**

<b>Evaluation Rubric</b>		
<b>Grade</b>	<b>Strategy Task Description</b>	<b>Evaluation</b>
Novice 69 and Below	<ol style="list-style-type: none"> <li>1. No Evidence of Logic Approached used</li> <li>2. No Evidence of Scientific Reasoning</li> <li>3. Task not completed, too many errors</li> </ol>	0-1 correct No Scientific Methods Steps used
Apprentice 70 - 79%	<ol style="list-style-type: none"> <li>1. Used Logic that led to a partial completion of the task</li> <li>2. Some Evidence of Scientific Reasoning</li> <li>3. Attempted task, but could not answer a question, record all data, or state a conclusion</li> </ol>	2-3 correct One Scientific Methods Steps used
Practitioner 80 - 89 %	<ol style="list-style-type: none"> <li>1. Used Logic that led to a completion of the task</li> <li>2. Effectively used Scientific Reasoning</li> <li>3. Answered the question, successfully conducted the experiment, collected data and produced results.</li> </ol>	4-6 correct Two or Three Scientific Methods Steps used
Expert 90 - 100%	<ol style="list-style-type: none"> <li>1. Used a "Sophisticated Strategy", revised it where necessary to complete the task</li> <li>2. Used advanced complex Scientific Reasoning and demonstrated "understanding of cause and effect".</li> <li>3. Accurately applied the Scientific Method for the complete experiment, data collection and produce results</li> </ol>	All 7 correct All Four Scientific Methods Steps used

## Scientific Method Flow chart

