Scientific Ways of Knowing

General Education Skill Competency and Knowledge Objectives

Definition: A person who is competent in scientific reasoning adheres to a self-correcting system of inquiry (the scientific method) and relies on empirical evidence to describe, understand, and predict natural phenomena.

Competency and Knowledge Objectives:
Upon completion of a non-lab course in this category, a student is able to demonstrate competencies i-iv. A student is able to demonstrate all five competencies, i-v, upon completion of a lab course.

1. Apply foundational knowledge and models of a discipline in the physical or natural sciences to analyze and/or predict phenomena.

2. Apply scientific reasoning to critically evaluate assertions.

3. Interpret and communicate scientific information via written, spoken and/or visual representations.

4. Describe the relevance of specific scientific principles to the human experience.

5. Test a hypothesis in the laboratory or field using discipline-specific tools and techniques for observation, data collection and analysis to form a defensible conclusion.

Updated competencies approved by SBOE 10-21-2021

Value Rubric: Scientific Ways of Knowing

Fundamental Criteria	**Exceeds End-of-Course Expectations** *Student has achieved the outcome and makes critical judgments related to relevance and application*	**Meets End-of-Course Expectations** *Student has achieved the outcome and consistently applies it*	**Entry-Level Expectation** *Student has entry-level abilities or knowledge.*
1. Foundational Knowledge: Apply foundational knowledge and models of a discipline in the physical or natural sciences to analyze and/or predict phenomena.	Demonstrates detailed understanding of the facts and theoretical models of a traditional natural or physical science, and employs this to correctly pose and answer questions related to the analysis and prediction of phenomena.	Demonstrates knowledge of the facts and theoretical models of a traditional natural or physical science, and can use this information to correctly solve problems and describe phenomena.	Possesses rudimentary awareness of the bounds and subject matter of a specific natural or physical science, and has basic reasoning skills required for analytical problem solving.
2. Scientific Reasoning: Apply scientific reasoning to critically evaluate assertions.	Demonstrates thorough understanding of all steps of the scientific method, and applies this knowledge to critically evaluate the strengths and weaknesses of scientific assertions.	Demonstrates sound grasp of the scientific method and correctly applies scientific reasoning to assess the validity of assertions.	Is acquainted with the basic outline of the steps composing the scientific method, and aware of the role of evidence in scientific reasoning.
3. Scientific Communication: Interpret and communicate scientific information via written, spoken, and/or visual representations.	Clearly conveys scientific data, reasoning, and conclusions through written, verbal, and graphical presentations. Correctly gathers similar information from figures, technical writing, and spoken communication.	Demonstrates ability to accurately convey and receive scientific information through words and pictures.	Has been introduced to graphical presentations of information and basic scientific terminology.

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4. Relate to Human Experience: Describe the relevance of specific scientific principles to the human experience.	Can use specific scientific principles to predict events within the real-world, everyday experience of the student, and predict outcomes or make judgements related to broader societal issues.	Can explain how specific scientific principles describe events within the real-world, everyday experience of the student, or inform understanding of broader societal issues.	Is aware that scientific principles describe the world around them and have both predictive and explanatory value.
5. Hypothesis Testing: Test a hypothesis in the laboratory or field using discipline-specific tools and techniques for observation, data collection and analysis to form a defensible conclusion.	Independently formulates a hypothesis. Designs and executes an experiment to confirm or refute it. Assesses the quality of the experimental results and draws appropriate conclusions.	Formulates a hypothesis in response to a problem or prompt. Executes an experiment and analyzes data that specifically addresses hypothesis. Draws conclusions based on data.	Understands the role of experimentation in science.