Office of Institutional Research and Assessment

Assessment Criteria - Science

Goal

Students will understand physical and/or life science phenomena and the uses of scientific methods and theories.

Objective A. Students will understand the role, nature and value of scientific inquiry.

- **4 OUTSTANDING**
  Understands in depth the role and limitations of science in addressing contemporary quality of life issues (i.e., improved health, a better environment, increased food production, population control, etc.), articulates multiple aspects of the issues, perceives the relationship of sell to issues and seeks additional scientific understanding as a guide to action.
- **3 EFFECTIVE**
  Understands the role and limitations of science in addressing contemporary quality of life issues, articulates several aspects of the issues, perceives the relationship of self to issues, acts on basis of understanding.
- **2 ADEQUATE**
  Understands in general the role of science in addressing some contemporary quality of life issues; articulates several aspects of at least one issue; perceives the relationship of self to issues, occasionally acts on basis of scientific understanding.
- **1 INEFFECTIVE**
  Understands minimally the role of science in contemporary quality of life issues; does not perceive the relationship of self to issues; does not understand the nature of scientific work.

Objective B. Students will demonstrate their understanding of scientific theories and perspectives

- **4 OUTSTANDING**
  Uses deep understanding of theoretical frameworks, concepts, terms, and important thinkers and ideas from several science disciplines to explain contemporary scientific phenomena; makes connections between science disciplines and identifies separate contributions of disciplines to understanding.
- **3 EFFECTIVE**
  Uses knowledge of theoretical frameworks, concepts, terms, and important thinkers and ideas from two sciences to discuss contemporary scientific phenomena; identifies perspectives of each discipline in explaining a particular process or phenomenon.
- **2 ADEQUATE**
  Uses basic understanding of concepts, descriptive terms, and important thinkers and ideas from at least one of the sciences to explain contemporary scientific phenomena; recognizes perspectives of other disciplines.
- **1 INEFFECTIVE**
  Lacks understanding of relationship of concepts, terms and important ideas to each other or to a science perspective; uses beliefs, applies ideas inaccurately, or uses irrelevant facts to explain scientific phenomena.

Objective C. Students will critically evaluate various approaches to research by Identifying sound and unsound reasoning in scientific and lay contexts.

- **4 OUTSTANDING**
  Is discerning in judging the validity of findings as warranted or not by evidence and research design. Can articulate the basic implications of identified strengths and weaknesses of methods.
- **3 EFFECTIVE**
  Can differentiate sound from flawed research methods and evaluate the validity of inferences based on available evidence.
- **2 ADEQUATE**
  Recognizes major flaws in research. Critical judgement exercised only when pressed, elicited, or when prior (closely held) assumptions are challenged.
- **1 INEFFECTIVE**
  Unable to recognize inappropriate research methods or invalid inferences from evidence. Likely to accept results more on basis of preconceived notions, prejudice or style of presentation than on the basis of a critical assessment of the evidence, concepts, and methods.

Objective D. Students understand the applications of different research designs and approaches.

- **4 OUTSTANDING**
  Clearly appreciates the advantages and disadvantages of various approaches, understands the underlying assumptions of various research methods, and readily matches the appropriate design to the problem at hand.
- **3 EFFECTIVE**
  Able to assess the appropriateness of research designs for a variety of situations, settings, or problems. Can apply or use simple research methods in uncomplicated cases.
- **2 ADEQUATE**
  Recognizes conspicuously inappropriate design applications. Understands that different problems or settings require different approaches, but requires guidance in discerning most appropriate methods for a given situation without considerable guidance.
- **1 INEFFECTIVE**
  Assumes all research is alike or that one method is as good as another. Avoids solving problems, seeks easy answers if possible. Has no interest in or understanding of the advantages and disadvantages of various approaches, the assumptions required, or how the nature of the problem affects the choice of approach.

Objective E. Students will formulate research questions and test hypotheses as part of using the scientific process.

- **4 OUTSTANDING**
  Can generate and appropriately state research questions/hypotheses about simple or complex relationships that are logically consistent with existing information (e.g., literature review).
- **3 EFFECTIVE**
  Can generate research questions/hypotheses for simple relationships. Can appropriately interpret and critique stated hypotheses.
- **2 ADEQUATE**
  Can appropriately interpret and critique stated hypotheses. Has difficulty generating research questions/hypotheses.
- **1 INEFFECTIVE**
  Has difficulty generating hypotheses and interpreting stated hypotheses.

Objective F. Students use systematic, empirical approaches to address questions as part of the scientific process.

- **4 OUTSTANDING**
  For a given research question, the student can correctly identify independent, dependent, and extraneous variables, describe a research design to control the extraneous variable(s), or identify why extraneous variables cannot be controlled for a given research question.
- **3 EFFECTIVE**
  For a given research question, the student can correctly identify independent, dependent, and extraneous variables, and describe a research design to control the extraneous variable(s).
- **2 ADEQUATE**
  For a given research question, the student can correctly identify independent, dependent, and extraneous variables.
- **1 INEFFECTIVE**
  For a given research question, the student cannot correctly identify independent, dependent, and extraneous variables.

Objective G. Students will identify and collect appropriate information as part of the scientific process.

- **4 OUTSTANDING**
  For a given research situation, the student can correctly identify and describe appropriate and realistic measures for the independent, dependent, and extraneous variables, and describe strengths and weaknesses for each measure.
- **3 EFFECTIVE**
  For a given research situation, the student can correctly identify and describe appropriate and realistic measures for the independent, dependent, and extraneous variables.
- **2 ADEQUATE**
  For a given research situation, the student can correctly identify appropriate and realistic measures for the independent, dependent, and extraneous variables.
- **1 INEFFECTIVE**
  For a given research situation, the student cannot correctly identify appropriate measures for the independent, dependent, and extraneous variables.

Objective H. Students will draw appropriate conclusions from empirical results in quantitative and qualitative formats.

- **4 OUTSTANDING**

  Can express empirical findings in "plain English" (own words) and identify the impact of findings on theory development and/or practical application.
- **3 EFFECTIVE**

  Can express most empirical findings but limited in ability to identify practical or theoretical implications.
- **2 ADEQUATE**

  Can express empirical findings reported in simple numerical, graphical or prose but has difficulty identifying implications.
- **1 INEFFECTIVE**

  Has difficulty expressing empirical findings of any form.