Scientific Inquiry and Analysis

Definition

"Inquiry" is a systematic process of exploring issues, objects or works through the collection and analysis of evidence that results in informed conclusions or judgments. "Analysis" is the process of breaking complex topics or issues into parts to gain a better understanding of them (AAC&U Inquiry and Analysis VALUE rubric). *Scientific Inquiry and Analysis* focuses specifically on evidence related to questions about the natural and physical world through an analytical process that involves systematic observation, data collection and interpretation (the scientific method). This process requires a unique set of skills that set it apart from inquiry and analysis into other realms of human experience and endeavor.

Rationale and Intent

Many elements of modern society are built on hundreds of years of scientific advances that have transformed our world. The pace of change and discovery is only increasing and the students of today will face profound impacts from science and technology that are already underway. While it is impossible to prepare students for, or even to fully anticipate all the scientific impacts in the years ahead, it is critical to equip them with the skills to effectively evaluate scientific claims using evidence. The Fitchburg State University Scientific Inquiry and Analysis course requirement and learning outcome teaches students how to collect, analyze and interpret physical evidence, and how to determine whether that evidence can help answer questions about the natural or physical world.

Goal

Fitchburg State University students will engage with and answer questions about the natural, and physical world using scientific practices including collecting, analyzing and interpreting data.

Potential Course Objectives

The objectives below are recommended as models for general education course syllabi. The list is not meant to be complete. Faculty should feel free to adopt these as course objectives, or they may develop their own**.**

- Apply scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- Construct an explanation based on valid and reliable scientific evidence obtained from a variety of sources, including students' own investigations, models, theories, simulations, or peer review.
- Conduct a scientific research project to answer a question or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- Plan and conduct a scientific investigation individually or collaboratively to produce data that serve as the basis for evidence. In the design of the investigation, decide on types, quantity, and accuracy of data needed to produce reliable measurements, and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time); refine the design accordingly.
- Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
- Evaluate the scientific evidence behind currently accepted explanations or solutions to determine the merits of arguments.
- Apply concepts of statistics and probability to scientific and engineering questions and problems, using digital tools when feasible.
- Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.