



CCSU Scientific Reasoning Rubric

Definition: To develop scientific understanding of the natural and social worlds. Relevant outcomes include the ability to: explain how scientists think, work, and evaluate the natural and social world; use techniques such as controlled observation, experiment, mathematical analysis of data, and production and interpretation of graphical and tabular data presentation; and demonstrate knowledge and appreciation of the natural and social world.

Framing Language: This rubric is designed to be used in any course teaching evidence-based decision making. The ability to distinguish between evidence-based claims and pseudoscientific and/or anecdotal evidence is vital for responsible and informed action in society and personal well-being.

This rubric is designed for use on assignments intended to teach scientific reasoning either through creation of or learning to accurately evaluate published work. Example assignments follow:

- students are given a data set and are expected to test hypotheses and produce well-reasoned claims
- find an example of pseudoscience and identify the ways it violates scientific methodology
- design, run, and analyze a research project in the social or natural sciences
- critiquing published work in terms of its methodology and the validity of its conclusions
- taking a published research article and writing an article for general consumption that accurately reflects the findings of the original document

Glossary:

The definitions that follow were developed to clarify terms and concepts used in this document only.

Research question: A question that a study or research project aims to answer. This question often addresses an issue or problem that, through analysis and interpretation of data, is answered in the study's conclusion.

Correlation v. causation: Differentiating between statistical association (correlation) and causality.

Scientific process: Consists of systematic observation, measurement and data collection, and the formulation, testing, and modification of hypotheses.

Pseudoscience: A collection of beliefs or practices mistakenly regarded as being based upon the scientific method.

Hypothesis: A supposition or proposed explanation made on the basis of limited evidence as a starting point for further investigation.

Criteria	Capstone - 4	3	Milestones 2	Benchmark - 1
Scientific Thinking	Identifies the research question or the systematic observations under consideration and understands the theoretical and conceptual framework supporting the work's hypothesis.	Identifies the research question but does not demonstrate an appreciation for the importance of studying the main question. Displays some understanding of the principles supporting the works hypothesis.	Generally acknowledges the focus of the work, but does not understand the theoretical underpinnings and misevaluates the validity of the scientific process used.	Misidentifies the focus of the work, demonstrates only minimal understanding the theoretical underpinnings, and poorly evaluates the validity of the scientific process used.
Techniques and Methods	Can accurately design a study that addresses research question; and/or demonstrates the ability to analyze the data, revealing insightful patterns. OR Can accurately evaluate the process used to explore the research question by interpreting the data provided to reveal insightful patterns, differences, or similarities related to focus.	Organizes data to reveal important patterns, differences, or similarities related to focus and/or chooses appropriate existing data. OR Interprets provided data accurately, to reveal important patterns, differences or similarities related to focus.	Is able to understand their own process but is not effective in analyzing data to reveal important patterns. OR Understands the process outlined but is not effective in revealing important patterns, differences, or similarities in data provided.	Attempts an interpretation of data but it is not organized and/or is unrelated to focus. OR Attempts an interpretation of data but it is not organized and/or is unrelated to focus.
Scientific Literacy	States a conclusion that is a logical extrapolation from the inquiry findings.	States a conclusion focused solely on the inquiry findings.	States a general conclusion that is so general or applies beyond the scope of the inquiry findings.	States an ambiguous, illogical, or unsupportable conclusion from inquiry findings.
Evaluation of Science	Demonstrates advanced ability to distinguish between causal and correlational relationships.	Demonstrates appropriate ability to distinguish between causal and correlational relationships	Conflates causal and correlational relationships.	Demonstrates no ability to distinguish between causal and correlational relationships.

