Fitchburg State University General Education Program: Scientific Inquiry and Analysis Rubric

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.

	Internalizing	Refining	Developing	Emerging
Apply scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text	Consistently applies scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text	Mostly applies scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text	Sometimes applies scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text	Rarely applies scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text
Verify data when possible by corroborating or challenging conclusions with other sources of information	Consistently verifies data when possible by corroborating or challenging conclusions with other sources of information	Mostly verifies data when possible by corroborating or challenging conclusions with other sources of information	Sometimes verifies data when possible by corroborating or challenging conclusions with other sources of information	Rarely verifies data when possible by 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	Consistently constructs 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	Mostly constructs 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	Sometimes constructs 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	Rarely constructs 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	Consistently conducts a scientific research project to answer a question or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple	Mostly conducts a scientific research project to answer a question or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple	Sometimes conducts a scientific research project to answer a question or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple	Rarely conducts a scientific research project to answer a question or solve a problem, narrow or broaden the inquiry when appropriate, and synthesize multiple
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	Consistently analyzes 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	Mostly analyzes 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	Sometimes analyzes 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	Rarely analyzes 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,	Consistently plans and conducts a scientific investigation individually or collaboratively to produce data that serve as the basis for evidence. In the design of the investigation, decides on types, quantity, and accuracy of data needed to produce reliable measurements, and considers limitations on the precision of the data (e.g., number of trials, cost, risk, time); refines the design accordingly	Mostly plans and conducts a scientific investigation individually or collaboratively to produce data that serve as the basis for evidence. In the design of the investigation, decides on types, quantity, and accuracy of data needed to produce reliable measurements, and considers limitations on the precision of the data (e.g., number of trials, cost, risk, time); refines the design accordingly	Sometimes plans and conducts a scientific investigation individually or collaboratively to produce data that serve as the basis for evidence. In the design of the investigation, decides on types, quantity, and accuracy of data needed to produce reliable measurements, and considers limitations on the precision of the data (e.g., number of trials, cost, risk, time); refines the design accordingly	Rarely plans and conducts a scientific investigation individually or collaboratively to produce data that serve as the basis for evidence. In the design of the investigation, decides on types, quantity, and accuracy of data needed to produce reliable measurements, and considers limitations on the precision of the data (e.g., number of trials, cost, risk, time); refines the design accordingly

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	Consistently applies scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion	Mostly applies scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion	Sometimes applies scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion	Rarely applies 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	Consistently evaluates the scientific evidence behind currently accepted explanations or solutions to determine the merits of arguments	Mostly evaluates the scientific evidence behind currently accepted explanations or solutions to determine the merits of arguments	Sometimes evaluates the scientific evidence behind currently accepted explanations or solutions to determine the merits of arguments	Rarely evaluates 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	Consistently applies concepts of statistics and probability to scientific and engineering questions and problems, using digital tools when feasible	Mostly applies concepts of statistics and probability to scientific and engineering questions and problems, using digital tools when feasible	Sometimes applies concepts of statistics and probability to scientific and engineering questions and problems, using digital tools when feasible	Rarely applies 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	Consistently makes and defends a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence	Mostly makes and defends a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence	Sometimes makes and defends a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence	Rarely makes and defends a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence

Scientific Inquiry and Analysis Rubric

Scientific Inquiry and Analysis 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.

Understanding the Rubric

The rubric focuses on ten criteria:

1. Apply scientific reasoning to evaluate hypotheses, data, analysis, and conclusions in a science or technical text.
2. Verify data when possible by corroborating or challenging conclusions with other sources of information.
3. 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.
4. 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.
5. 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.
6. 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.
7. Apply scientific reasoning to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
8. Evaluate the scientific evidence behind currently accepted explanations or solutions to determine the merits of arguments.
9. Apply concepts of statistics and probability to scientific and engineering questions and problems, using digital tools when feasible.
10. Make and defend a claim based on evidence about the natural world that reflects scientific knowledge, and student-generated evidence.

The rubric has four levels of performance with a consistent distinguishing term in each criterion.

Performance Level	**Distinguishing Term**	**Explanation: The student artifact is . . .**
Internalizing	Consistently	nearly perfect in meeting the criteria (~100%).
Refining	Mostly	above average in meeting the criteria (~75%).
Developing	Sometimes	average in meeting the criteria (~50%).
Emerging	Rarely	in the early stages of meeting the criteria (25% or less)