Scientific Inquiry Rubric

1) Identifies and summarizes the **problem/question** to be investigated			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Question identified is too broad or vague to guide an experiment design.	Has identified an appropriate question but be studied, but lacks a clearly stated hypothesis. Research plan is present in a broad outline, but lacks specifics.	Uses prior knowledge to identify a question to be studied. Has a clearly stated hypothesis. Breaks questions down into smaller steps, but has not identified all the complexities and nuances inherent in the question. Has an adequate research plan, although it does not address all the issues that may arise.	Uses prior knowledge to identify a question to be studied. Has a clearly stated hypothesis. Breaks question down into a series of steps that will lead to an answer. Identifies complexities and nuances in the question. Uses these steps to create a thorough plan for the research project.
2) Identifies **existing, relevant knowledge** and views			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Review of relevant knowledge is seriously incomplete. Major issues are ignored.	Uses some appropriate sources to discover what is already known about the system/problem, but discussion omits important aspects of the problem.	Uses appropriate sources to discover what is already known about the system/problem, but does make clear connections between this information and the question to be investigated.	Provides a thorough and relevant literature review. Based on this, considers alternative ways to approach the question and, if necessary, revises the plan.
3) Uses **appropriate equipment and experiments** to collect data			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Research plan provided will not answer the question, does not control relevant variables, or uses other inappropriate methodology. Experiments are carried out without sufficient care, so that the accuracy of the data is in doubt. Serious safety issues are ignored.	Experiments are carried out with appropriate methodology and safety measures. Quantity of data collected is insufficient for statistical significance.	Carries out controlled experiments using equipment to the experiment and using appropriate safety measures. Identifies relevant constraints. Data is collected carefully and with appropriate precision. An appropriate number of trials are carried out.	Carries out controlled experiments using equipment to the experiment and using appropriate safety measures. Identifies relevant constraints. Data is collected carefully and with appropriate precision. Uses initial data to refine the experiment. Considers possible criticisms of the experimental plan and addresses them.

4) Analyzes data in an appropriate manner			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Analysis of data is incomplete. Does not demonstrate an appropriate understanding of the relationship between theory and experiment. Does not identify assumptions made in the analysis.	Analyzes data via graphs, statistics, and curve fitting as appropriate. Does not demonstrate an appropriate understanding of the relationship between theory and experiment. Does not identify assumptions or consider alternative interpretations	Analyzes data via graphs, statistics, and curve fitting as appropriate. Demonstrates understanding of the relationship between experiment and theory. Does not identify assumptions or consider alternative interpretations.	Analyzes data via graphs, statistics, and curve fitting as appropriate. Demonstrates understanding of the relationship between experiment and theory. Identifies assumptions. Considers alternative interpretations of the data and , if possible, carries out additional experiments that will allow distinction between these interpretations.
5) Draws sound **inferences and conclusions** from data			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Draws conclusions which are not justified. Does not recognize the limits or implications of their conclusions.	Draws reasonable conclusions from the data, but does not convincingly connect the conclusions to the data. Considers consequences of the conclusions but only in a narrow regime.	Draws sound conclusions from the data and communicates a logical path from the data to the conclusion. Consideration of the consequences and limits of the conclusions are incomplete.	Draws sound conclusions from the data and communicates a logical path from the data to the conclusion. Recognizes the limits of the conclusion and considers the consequences of the conclusions. Identifies how the assumptions may influence the conclusions.
6) Reflects on own work to assure that conclusions are justified			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Lacks an error analysis. Has not considered alternative approaches to the experiment or alternative conclusions. Has not considered possible criticisms of the methodology used.	Prepares an error analysis as appropriate. Has, otherwise, not considered possible criticisms of their work.	Prepares an error analysis as appropriate. Critiques the process of data gathering and analysis.	Prepares an error analysis as appropriate. Critiques the process of data gathering and analysis. Explains why alternative approaches to the experiment or alternative interpretations of the data were rejected.

7) Suggests steps for **further inquiry**			
Inadequate	*Minimally Developed*	*Moderately Developed*	*Substantially Developed*
Has not considered implications of the current work for future investigations.	Has proposed some logical steps for further investigation, but this is clearly incomplete.	Identifies questions remaining unanswered. Proposes next logical steps for continued inquiry into this system.	Identifies questions remaining unanswered. Proposes next logical steps for continued inquiry into this system. Proposes methods for verifying the consequences identified in Step 5. Identifies how the conclusions might apply to new or different situations.

Prepared by Beverley A. P. Taylor, Faculty Associate for Assessment, Miami University, Spring, 2005