**Final Exam – 2012**

Study Guide

**Scientific Inquiry Goals**

Students will be able to:

* Explain what it is to “do science” and how the idealized steps of the “scientific method” do not do an adequate job of explaining what it is to do science.
* Describe what a generalization is and what it takes to prove and to disprove a generalization or scientific theory.
* Describe the necessity for observations and characterization of patterns to understand the invisible
* Describe differences in the process of scientific discovery as described in Derry.
* Compare and contrast the five examples of scientific pathways presented by Derry: Serendipity and Methodical Work, Detailed Background and Dreamlike Vision, Idealized models and Mathematical Calculations, Exploration and Observation, the Hypothetico deductive method
* Describe the value of a model regardless of whether it models the phenomena exactly.
* Describe how a person becomes an expert.
* Explain the value of categorization and its place in science.
* Explain the limited role of the hypothesis and explain when and where it is appropriate to use a hypothesis.
* Explain how hypotheses are often overused in education and provide examples of how it could be used in a way that is more consistent with authentic science.
* Apply the ideas of pseudoscience to a scientific claim to identify if and specifically why it’s pseudoscience. To be pseudoscience some, not necessarily all of the criteria below are required; however, it must claim to be science to be considered pseudoscience.

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| **Real science** | **Psuedoscience** |
| Ideas change over time and build on prior knowledge – old knowledge is not discarded | Static or randomly changing ideas |
| Goal is to achieve some coherent understanding of our observations. | Vague mechanisms to acquire understanding |
| Rigorous logic, a strict chain of deductive reasoning with no gaps or weak spots. | Loosely connected thoughts |
| A new idea is usually presumed wrong until sufficient evidence shows that it’s right. | Lack of organized skepticism. In fact, it’s forbidden. |
| Evidence virtually always builds on prior work. | Disregard of established results |