Nicholas Merrill - History of Science Lesson Plan

The progression of science is very unclear to most students. Many carry the misconceptions that the principles of science as we know have long been established along with the mathematics to explain it. Students also believe that the ideas of the ancient world are silly or baseless, when in fact most ancient conceptions of "science" are perfectly in line with everyday observations and provide a very coherent model.

The objective of this lesson plan is meant to tackle misconceptions about the nature of science and to give students a more accurate how "science" was done in the past and how it has progressed into more modern understandings of the Universe. I chose to do this history of science lesson plan centered on gravity, because I believed it would be a topic in which students might have a significant amount of prior knowledge regarding its historical characters. It also easily serves as an interesting introduction to Newtonian gravity and provides a taste of modern physics.

Though it is not always applicable it, I think it is beneficial to provide a historical context whenever possible. Students often do not see how the formulas and ideas in physics were first *induced* by brilliant minds willing to challenge the *paradigm*. This lesson focuses on a major *paradigm* shift from Aristotelian gravity to Newtonian gravity. Students can gain an understanding of what science is by better understanding what a *paradigm* is and how it is challenged and eventually changed through experiment and reasoning.

The explore component of the lesson has students reading historical quotes. Students can see that mathematical methods and a scientific process were not available until very recently. Students must interpret what the authors are trying to say to form a mathematical model. This has the students practicing "reading math" which is often difficult. This also required the

students to read very critically as to what the authors are trying to say and to extract evidence from the passages to support their conclusions.

This lesson works better if the history of science is being emphasized throughout the course. A possible extension to this activity is to have students research another paradigm shift in the history of science and to compare and contrast it to this gravitational one. Some paradigm shifts to suggest to students include: wave and particle theories of light, Newtonian and Relativistic gravity, Aristotelian and Newtonian Forces, along with many others. This lesson could also be done with the collaboration of a history teacher or department, because many of the characters in the history of gravity are topics in standard history courses.

Understanding the history of science is far better means to explaining what science is then simply introducing the scientific method. It offers an opportunity to see science as a more lateral exercise in reasoning than a deductive one. It also provides examples as to how the greatest minds struggled with some of our modern views, which allows students to relate their own confusion and misconceptions.