



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2007 Volume III: The Physics, Astronomy and Mathematics of the Solar System

Introduction

Astronomy is a subject that excites everybody. It is one of the few physical sciences that seems to interest even those school students who are normally bored by the mere mention of the word science. As a result, astronomy is a great teaching tool, and it can be used to teach mathematics and physics, in addition of course, to teaching astronomy.

The purpose of this seminar was to develop different types of curriculum units, some to teach astronomy, others to use astronomy as a tool to teach the physical laws that control the solar system and other planetary systems, and yet others to teach the mathematical principles used to describe these systems. The seminar itself dealt with many different aspects of astronomy ? from the Sun, to planets, to how stars evolve and die, though the units are focused mainly on the solar system. Nine units were developed as a result of this seminar and they have been grouped according to subject matter.

The first set consists of units to teach astronomy. Larissa Giordano developed a unit to teach second-graders about the Moon. The emphasis is on learning to read through reading mythology about the Moon, and on science through learning the phases of the Moon and eclipses. Students will also learn about the Apollo missions and what it is like to train to be an astronaut. Huwerl Thornton's unit is about moons, not just Earth's Moon, but also Europa which is one of Jupiter's moons and Titan, one of Saturn's moons. The idea is to compare and contrast the different moons. The third unit in this series is that by Nicholas Perrone. Although nominally for fourth-to-sixth-grade students, it can be used in other grades too. The unit is very different from others in that the basis is a Web-based tool at <http://www.spomonie.com/mrp/voyage/title.htm> that will be used by students to "explore" the solar system. The unit itself contains all the background information a teacher would need to help the students.

Next come two units about teaching physics. Julia Biagiarelli's unit aims to teach the basic laws of physics to eighth-graders. They will first start by learning about Brahe, Kepler and Newton, the three people who observed, characterised and explained motions in the solar system. Then they will go on to learn the basic laws that can be used to explain the motion of the planets. Jennifer Esty's unit is for a higher grade and aims to teach students the nature of light, and the different processes by which astronomical bodies emit light.

The last group consists of units meant to teach mathematics. The first unit is by Maria Stockmal; she aims to use solar-system data to teach students how to graph and compare data, how to calculate slopes, how to use trigonometry to estimate distances and also about arc lengths and sections. Sam Jones' unit deals with teaching conic sections (both their history and what they are) using data solar-system data. The orbits of planets and comets around the Sun can be described by conic sections. Hermine Smikle's unit is meant for AP classes and has multiple aims, one of which is to introduce students to astronomy, and the other to compare

topics in mathematics with those in astronomy. She starts with describing how early astronomers observed and described the solar system, and then goes on to connect mathematics to astronomy through the formulae used to describe the basic laws of physics. The last unit of this series, by Kenneth Spinka, is quite different; it aims to use the principles of astro-navigation to teach algebra, geometry, calculus and trigonometry.

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