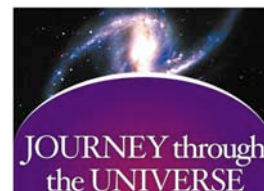


Introduction to the *Journey through the Universe* Program, the *Voyage* Program, and the *Voyage* Grade 9-12 Lessons

1. The Programs

Journey through the Universe (<http://journeythroughtheuniverse.org>) is a national science education initiative that engages *entire* communities—students, teachers, families, and the public—using education programs in space exploration and the space sciences to inspire and captivate. The initiative embraces the notion that—*it takes a community to educate a child*.



Journey through the Universe programming is tailored to a community's strategic needs in science, technology, engineering, and mathematics (STEM) education, and is a framework for partnership between school districts, museums and science centers, colleges and universities, civic and business organizations, and the public. The cornerstone philosophy for all programming is—*inspire... then educate*.

Voyage: a Journey Through Our Solar System (<http://voyagesolarsystem.org>) is a one to ten billion scale model of the Solar System exhibition that was permanently installed on the National Mall in Washington, DC, in October 2001. The greater *Voyage* Program includes the exhibition on the National Mall; replicas of the exhibition available for permanent installation in communities worldwide—designated *Voyage Communities*; and programming in Solar System science and exploration for thousands of students, educators, and families available to each of the *Voyage Communities*. The programming is provided through *Journey through the Universe*, and supported by a grade K-12 compendium of lessons—the *Voyage Education Module*.



2. The Grade K-12 *Voyage* Education Module

The *Voyage* Education Module includes an **Education Unit** at four grade levels: lower elementary (K-2); upper elementary (3-4); middle (5-8); and high school (9-12). Each Unit contains lessons comprised of content overviews, inquiry-based hands-on activities, assessment rubrics, resource listings, student worksheet masters, and answer keys.

The lessons were developed from the ground up from national science education standards and benchmarks, and are comprehensive enough to be adopted by school districts as the space science curriculum. Lessons target core standards and benchmarks through inquiry-based, hands-on activities whose objective is deep conceptual understanding of both content and process. The lessons are also meant to work in concert with a trip to a *Voyage* exhibition, serving as pre- and post-visit activities.

3. The *Voyage* Grade 9-12 Lessons

This document provides a description of each lesson and the embedded inquiry-based activities for the *Voyage* **high school (grade 9-12)** Education Unit. Also provided are connections to National Science Education Standards for grades 9-12, and AAAS Benchmarks for Science Literacy for grades 9-12.

VOYAGE FOR EDUCATION: THE 9-12 UNIT PROGRESSION

Lesson Title	The 9-12 Story	Activities
<p>Lesson 1: A Scale Model Solar System</p>	<p>Physical models are powerful tools of exploration. Even simple models can provide enormous understanding about the real objects they represent. In this lesson, students will investigate the properties of scale models of our Solar System. They will then try to design a conveniently-sized scale model of the Solar System to recognize that the model will likely need to be bigger than they thought.</p>	<p><i>Activity 1: Use a Scale Model to Compare Planet Sizes;</i> Students examine a model of planets in the Solar System to investigate the nature of scale models. They determine what can be learned of the real objects with the help of scale models, and what may be the limitations of models. They use the model to compare the sizes of the planets.</p> <p><i>Activity 2: Draw a Scale Model Solar System;</i> Students attempt to draw a scale model Solar System on one sheet of paper and discover that is impossible to draw the sizes of the planets on the scale that is necessary to portray the distances in the scale model correctly.</p>
<p>Lesson 2: The <i>Voyage</i> Scale Model Solar System</p>	<p>It is challenging to design a scale model of the Solar System where the same scale is used to portray not only the physical sizes of the Sun and planets, but also the distances between them. Planets are tiny worlds in a vast space. In October 2001, the <i>Voyage</i> scale model Solar System opened on the National Mall in Washington, DC, displaying a one to ten billion scale of the sizes of the Sun and planets, and the distances between them. In this lesson, students will replicate the <i>Voyage</i> model to experience the size of the Solar System.</p>	<p><i>Activity: An Outdoor Scale Model Solar System;</i> In this activity, students determine an appropriate scale for a scale model Solar System. Using their scale, the students calculate the sizes and distances of all of the planets in order to create their model.</p>

CONNECTION TO STANDARDS

This Education Unit has been mapped to the National Science Education Standards (National Research Council, National Academy Press, Washington, DC, 1996) and to the Benchmarks for Science Literacy, (American Association for the Advancement of Science, Project 2061, Oxford University Press, New York, 1993). A complete explanation of the Standards can be found at: <http://www.nap.edu/html/nse/html/>. A complete explanation of the Benchmarks can be found at: <http://www.project2061.org/tools/bencho/bolintro.htm>. Core standards for each lesson are indicated by a “√”; related standards are indicated by an “x.”

EDUCATION STANDARDS IN VOYAGE: A JOURNEY THROUGH OUR SOLAR SYSTEM: 9-12 EDUCATION UNIT				
	National Science Education Standards, 9-12	AAAS Benchmarks for Science Literacy, 9-12		
	Standard E: Science and Technology	Benchmark 9: The Mathematical World	Benchmark 11: Common Themes	Benchmark 12: Habits of Mind
	E1: Abilities of technological design	9A: Numbers	11B: Models	12B: Computation and Estimation
A Scale Model Solar System	√	x	√	
The <i>Voyage</i> Scale Model Solar System	√	x	x	√