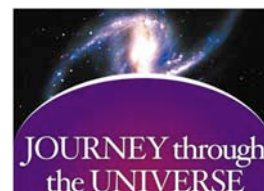


Introduction to the *Journey through the Universe* Program and the *Earth Systems Science* Module's Grade K-4 Lessons



1. The Program

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*.

2. The Grade K-12 *Earth Systems Science* Education Module

Earth Systems Science is one of several Education Modules developed for the *Journey through the Universe* program. The Module contains activities at three grade levels (K-4, 5-8, 9-12). Each grade level package is called an **Education Unit**. Each Unit contains lessons comprised of content overviews, inquiry-based hands-on activities, assessment rubrics, resource listings, student worksheet masters, and answer keys.

The *Earth Systems Science* Education Module focuses on the interactions of Earth's four systems: biosphere, atmosphere, hydrosphere, and geosphere. The biosphere encompasses all life, from complex human beings to single-celled organisms. The atmosphere is the shell of gases surrounding the Earth. We live at the bottom of this dynamic ocean of air, which exhibits meteorological phenomena—weather—on both local and global scales. The gaseous water in the atmosphere—together with all Earth's water in every form: solid, liquid, and gas—comprise the hydrosphere. Finally, the vast rocky and metallic bulk of the Earth is defined as the geosphere.

Each of these systems is remarkably dynamic over both long and short timescales. It is also the case that no one system stands alone. Complex processes that shape and define the Earth we know are the means by which these four systems interact with one another. One cannot, for instance, study weather in the atmosphere, or atmospheric evolution, without understanding the dramatic impact on weather from processes involving the geosphere, hydrosphere, and biosphere.

The lessons contained in this Education Module, at every grade level, explore the nature of Earth's systems, and demonstrate that observed phenomena on Earth are not unique to a particular system but arise from the interaction of these systems. And a true understanding of any phenomenon requires an understanding of all four systems. It is a systems approach to Earth science.

The lessons were developed from the ground up from national science education standards and benchmarks. Lessons target core standards and benchmarks through inquiry-based, hands-on activities whose objective is deep conceptual understanding of both content and process.

3. The *Earth Systems Science* Grade K-4 Lessons

This document provides a description of each lesson and the embedded inquiry-based activities for the *Earth Systems Science* **elementary school (grade K-4)** Education Unit. Also provided are connections to grades K-4 National Science Education Standards.

EARTH SYSTEMS SCIENCE: THE K-4 EDUCATION UNIT PROGRESSION

Lesson Title	Lesson Description	Activities
Lesson 1: The Blue Planet	In this lesson, students use NASA photographs and hands-on activities to compare the amounts of land and water on our planet. They discover that the world has five oceans, and that they cover 70% of Earth's surface. Students learn how this affects the entire Earth system.	<p><i>Activity 1: Earth's Nickname;</i> In this activity, students look at the Earth from space. They observe the Earth as a whole, and compare the amounts of land and water.</p> <p><i>Activity 2: Globe Toss;</i> In this activity, students play a globe toss game to collect data, and use probability to determine if the surface of the Earth is covered with more land or water.</p>
Lesson 2: Good Old Earth Materials	As you look around your community, you may notice that different buildings are constructed of different materials. Some buildings are made of bricks, some of stone, some of wood, and some of steel. However, all of these materials come from the Earth. This lesson allows students to investigate different types of Earth materials and building designs to see how they stand up to earthquakes. The students will discuss why different types of buildings are better equipped to handle earthquakes than others. Parameters include shape, construction material, and height of the building, as well as the magnitude, duration, and direction of shaking.	<p><i>Activity: Building Construction;</i> In this activity, students construct buildings out of different materials. Their goal is to construct a building that will withstand an earthquake.</p>
Lesson 3: Soil, Plants, and Water	The interaction of soil with water and plants can be optimized to produce edible plants, and to protect the Earth's surface from erosion and weathering. In this lesson, students will investigate the interactions among the biosphere, geosphere, and hydrosphere. In the <i>Warm-Up & Pre-Assessment</i> , students will observe three different types of soil, and in Activity 1 they will test each one for its ability to retain water. In Activity 2, students will grow plants in the three types of soil to determine which is best for growing plants.	<p><i>Activity 1: Which Type of Soil Holds the Most Water?;</i> In this activity, students experimentally determine which type of soil can hold the most water.</p> <p><i>Activity 2: Which Type of Soil Is Best for Growing Plants?;</i> In this activity, students will explore the effects of plants on retention of water in soil, and the corresponding impact on plant growth.</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). A complete explanation of the Standards can be found at: <http://www.nap.edu/html/nses/html/>. Core standards for each lesson are indicated by a “√”; related standards are indicated by an “x.”

EDUCATION STANDARDS IN EARTH SYSTEMS SCIENCE K-4 EDUCATION UNIT								
National Science Education Standards								
Standard A: Science as Inquiry		Standard C: Life Sciences		Standard D: Earth and Space Science		Standard F: Science in Personal and Social Perspectives		
A1: Abilities necessary to do scientific inquiry	A2: Understanding about scientific inquiry	C1: The characteristics of organisms	C3: Organisms and environments	D1: Properties of Earth materials	D3: Changes in Earth and sky	F3: Types of resources	F4: Changes in environment	
Lesson 1: The Blue Planet	√	√			√			x
Lesson 2: Good Old Earth Materials	√	√				√		√
Lesson 3: Soil, Plants, and Water	√	√	√	√	√			