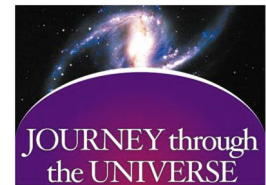


## Lesson Layout and Lesson Elements for the *Journey through the Universe* Program

(<http://journeythroughtheuniverse.org>)



*Journey through the Universe* programming is supported by a curriculum library of Grade K-13 Education Modules—compendia of inquiry-based, hands-on lessons at elementary, middle, and high school levels—that are used as the curriculum for community-wide programming. Five Modules are currently available covering topics such as exploration of the Solar System, galaxy, and Universe; Earth systems science; the search for extraterrestrial life; building a permanent human presence in space; and engineering interplanetary spacecraft.

- Each Module includes an Education Unit at three (K-4, 5-8, 9-13) or four (K-2, 3-4, 5-8, 9-13) grade levels. Each Unit contains lessons comprised of content overviews, inquiry-based hands-on activities, assessment rubrics, resource listings, student worksheet masters, and answer keys.
- Each lesson is developed from the National Science Education Standards with a focus on a specific standard. Two Modules (*Voyage* and *Staying Cool*) also address AAAS Benchmarks for Science Literacy. Lessons are designed to develop conceptual understanding through activities that seamlessly integrate content and process. Lessons are instructionally designed to support facilitation of inquiry-based learning.

This document provides the lesson layout and the lesson elements for lessons comprising *Journey through the Universe* Education Modules.

### Education Modules currently available:

- *Voyage—A Journey Through the Solar System* uses the remarkable power of models to provide an understanding of Earth's place in the Solar System and the Sun's place among the stars. The Module was created as part of the *Voyage Project*, which includes permanent placement of a one to 10-billion scale model of the Solar System on the National Mall in Washington, DC, and sites worldwide (<http://voyagesolarsystem.org>). [Included grade level units: K-2, 3-4, 5-8, 9-13]
- *Earth Systems Science* focuses on the interactions of Earth's four systems: biosphere, atmosphere, hydrosphere, and geosphere. [Included grade level Units: K-4, 5-8, 9-13]
- *Staying Cool* explores the extreme environment of space, the challenges of operating a spacecraft in such an environment, and the engineering solutions that enable the human race to send spacecraft to study other worlds. *Staying Cool* was developed in support of NASA's MESSENGER spacecraft mission to Mercury (<http://messenger.jhuapl.edu>), and in collaboration with the Carnegie Institution of Washington and Project 2061 of the American Association for the Advancement of Science. [Included grade level Units: PreK-1, 2-4, 5-8, 9-13]
- *Building a Permanent Human Presence in Space* explores the nature of the space environment and the challenges it imposes for life; why we would want to put humans in space; and how we would construct a permanent space habitat. [Included grade level Units: K-4, 5-8, 9-13]
- *Are There Other Neighborhoods Like Our Own? Searching for Abodes of Life in the Universe*, explores the essential requirements for life in 'our neighborhood', and uses this case study as a means of searching for other abodes of life. [Grades K-4: Earth-Moon system; Grades 5-8: Solar System; Grades 9-13 Universe]

***Journey through the Universe Education Modules***  
**Lesson Structure: With One Embedded Hands-on Activity**

**I. LESSON AT A GLANCE**

Grade Level  
Lesson Duration  
Lesson Overview  
Education Standards  
Essential Question(s)  
Concepts  
Objectives

**II. SCIENCE OVERVIEW**

**III. CONDUCTING THE LESSON**

Warm-Up & Pre-Assessment  
*Materials*  
*Teacher*  
*Student*  
*Preparation & Procedures*  
Activity: Title  
*Description of Activity*  
*Materials*  
*Teacher*  
*Student*  
*Preparation & Procedures*  
*Reflection & Discussion*  
*Transfer of Knowledge*  
*Assessment Criteria*  
*Extensions (Optional)*

Placing the Activity Within the Lesson  
Lesson Closure

The following are floating components that may be placed throughout the lesson as needed.

Teaching Tips
Lesson Adaptations
Curriculum Connections

**IV. RESOURCES**

Internet Resources & References  
*Student-Friendly Web Sites*  
*Teacher-Oriented Web Sites*  
Acknowledgments  
Student Worksheets  
Teacher Answer Keys

*Journey through the Universe* Education Modules  
**Lesson Structure: With Two Embedded Hands-on Activities**

**I. LESSON AT A GLANCE**

Grade Level  
Lesson Duration  
Lesson Overview  
Education Standards  
Essential Question(s)  
Concepts  
Objectives

**IV. RESOURCES**

Internet Resources & References  
*Student-Friendly Web Sites*  
*Teacher-Oriented Web Sites*  
Acknowledgments  
Student Worksheets  
Teacher Answer Keys

**II. SCIENCE OVERVIEW**

**III. CONDUCTING THE LESSON**

Warm-Up & Pre-Assessment  
*Materials*  
*Teacher*  
*Student*  
*Preparation & Procedures*  
Activity One: Title  
*Description of Activity*  
*Materials*  
*Teacher*  
*Student*  
*Preparation & Procedures*  
*Reflection & Discussion*  
*Transfer of Knowledge*  
*Assessment Criteria*  
*Extensions (Optional)*  
Placing the Activity Within the Lesson  
Activity 2: Title  
*Description of Activity*  
*Materials*  
*Teacher*  
*Student*  
*Preparation & Procedures*  
*Reflection & Discussion*  
*Transfer of Knowledge*  
*Assessment Criteria*  
*Extensions (Optional)*  
Placing the Activity within the Lesson  
Transfer of Knowledge for the Lesson  
Assessment Criteria for the Lesson  
Lesson Closure  
Extensions for the Lesson (Optional)  
The following are floating components that may be placed throughout the lesson as needed.

Teaching Tips

Lesson Adaptations

Curriculum Connections

## DEFINITIONS for the Lesson Layout

**I. LESSON AT A GLANCE** – This section contains the educational background information for the lesson.

**Grade Level** – Provides the grade level range in which the lesson would be cognitively appropriate.

**Lesson Duration** – Gives the approximate time range required for the lesson.

**Lesson Overview** – Provides a short description of the lesson’s goals and activities.

**Education Standards** – Lists the standards addressed in the lesson and identifies the source of the standards (e.g. NRC National Science Education Standards). This section may be divided into Core Education Standards and Related Education Standards, if necessary.

**Essential Question(s)** – The overarching question that provides teachers with the main focus of the lesson. These questions are the starting point of the exploration contained in the lesson.

**Concepts** – States the concepts that students will learn during the course of the lesson. Each concept should begin with, “Students will learn the following concepts . . .”

**Objectives** – Measurable tasks students should be able to do by the completion of the lesson. Each objective should begin with, “Students will be able to do the following...”

**II. SCIENCE OVERVIEW** – Provides the science background information and terminology needed for teachers to deliver the lesson successfully. This section includes common misconceptions to address.

**III. CONDUCTING THE LESSON** – This section provides the information needed to conduct the lesson in the classroom.

**Warm-Up & Pre-Assessment** – Strategies for getting students interested and motivated to participate in the lesson and to determine what students already know, including misconceptions they may have. Pre-assessment is always present and can function as a warm-up, but in some cases separate warm-up and pre-assessment categories may be needed.

*Materials* – States the materials that will be needed by teachers and students during the Warm-up & Pre-assessment.

*Preparation & Procedures* – This section provides detailed procedures that assist teachers in preparing and conducting the Warm-Up & Pre-Assessment.

**Activity One** – The first of possibly two inquiry-based activities embedded in the lesson.

*Description of Activity* – A short description of the activity, the concepts to be addressed, and the connection to the lesson as a whole.

*Materials* – States the materials that will be needed by teachers and/or students during the activity.

*Preparation & Procedures* – This section provides detailed procedures that assist teachers in preparing and conducting the activity.

*Reflection & Discussion – This section allows students to reflect on what they have learned after they complete an activity.*

*Transfer of Knowledge – Tasks designed to allow students to demonstrate conceptual understanding through the construction of new knowledge based on what they have learned in the activity.*

*Assessment Criteria – Provides a rubric for teachers to verify student understanding of learned knowledge and skills throughout the activity.*

*Extensions (Optional) – Suggested activities or discussion points that will allow students to continue to explore the concepts presented within the activity.*

**Placing the Activity Within the Lesson** – Identifies ways in which the teacher can facilitate students' understanding of how the activity fits into the greater context of the lesson.

**Transfer of Knowledge for the Lesson** – Tasks designed to allow students to demonstrate conceptual understanding through the construction of new knowledge based on what they have learned across the entire lesson. This capability empowers students to make sense of, and be able to predict, new phenomena and apply knowledge to new situations.

**Assessment Criteria for the Lesson** – Provides a rubric to verify student understanding of learned knowledge across the entire lesson.

**Lesson Closure** – Provides ways of ending a lesson to include teacher and student reflection on both content and skills learned throughout the lesson, including the warm-up and activities. It provides an opportunity for students to incorporate the knowledge and skills learned into a coherent story.

**Extensions for the Lesson (Optional)** – Suggested activities or discussion points that will allow students to continue to explore the concepts presented within the lesson.

**The following are floating components that may be placed throughout the lesson as needed.**

**Teaching Tips** – Helpful hints for teachers to make the lesson or activity run smoothly.

**Lesson Adaptations for SPED, TAG, ESL, or Learning Styles** – Offers variations on the lesson plan to accommodate the varied needs of students.

**Curriculum Connections** – Describes the nature of the relationship between the science lesson and other traditional subject areas such as mathematics, history, geography, art, music, language arts, physical education, technology, etc.

**IV. RESOURCES** – This section provides teachers with additional materials they may need.

**Internet Resources & References** – Provides web sites for teachers to obtain more information on the topic or view more activities regarding the concepts addressed in the lesson. Also provided are student-friendly sites where students can research the concepts presented in the lesson, if necessary.

**Acknowledgements** – Identified the source(s) from which the lesson was modified if appropriate.

**Student Worksheets** – The worksheets required by the students to complete an activity. The worksheets may contain procedures, data tables, or questions. Additional worksheets may be provided for Extensions, Lesson Adaptations, etc.

**Teacher Answer Keys** – Provides the teacher with answers to student worksheets and additional fact sheets if necessary.