National Aeronautics and Space Administration

# Easy Ways

## To Obtain NASA Educational Materials

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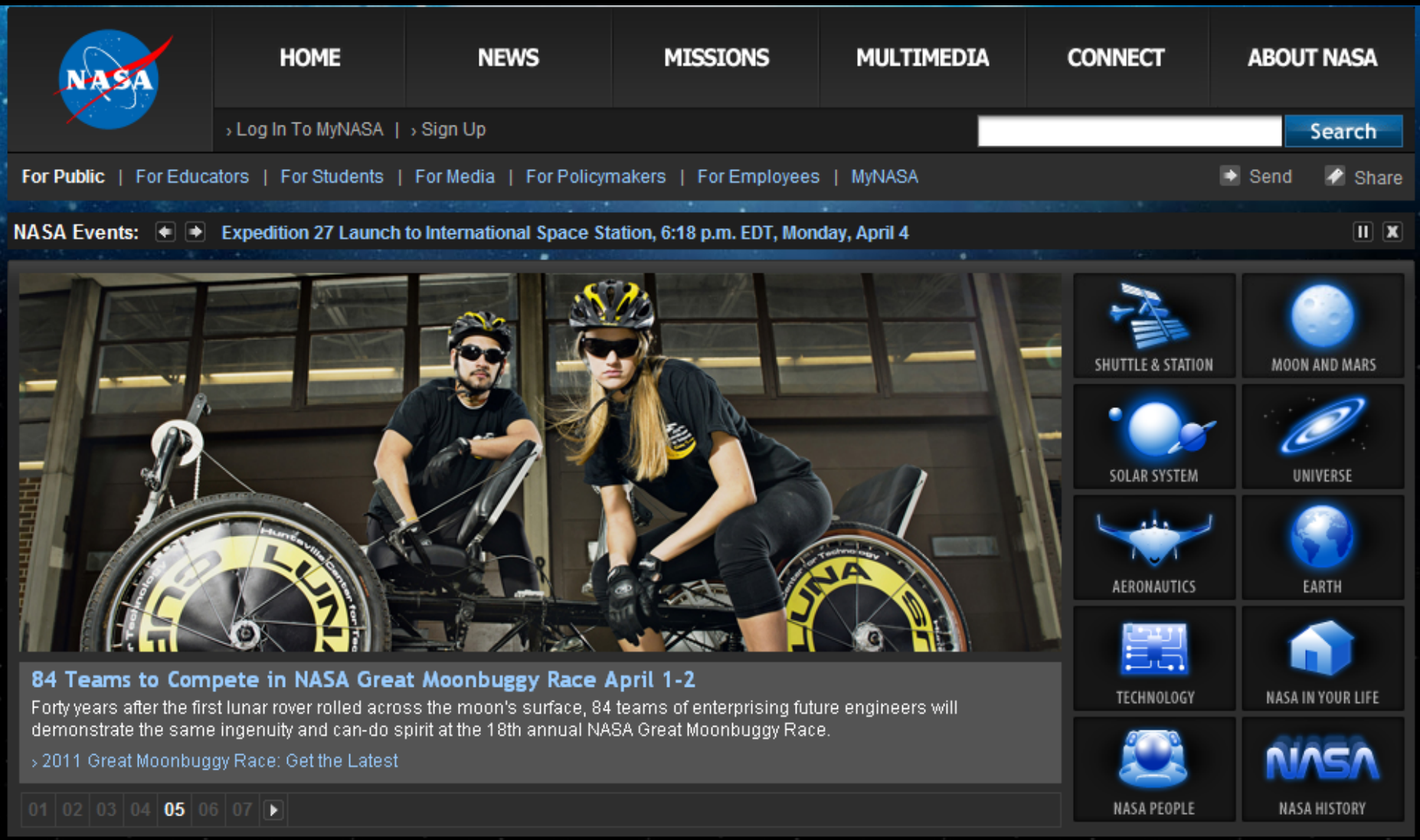
# NASA Website
# www.nasa.gov



# www.nasa.govaudience/foreducators/index.html

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For Educators

For Educators

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Grades 9-12
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Current Opportunities

For Students

NASA Kids' Club

## Education Image Galleries

View image galleries on a wide variety of NASA topics.

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## Career Information


Students can use this page as a starting point to learn about jobs at NASA.

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## Educator Features and Articles

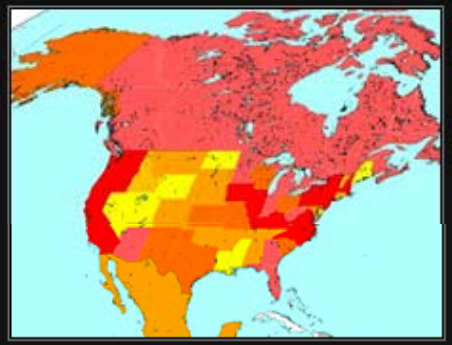
Women@NASA

Space Camp Alum Uses Hubble to Captivate Students

Sun-Earth Day 2011

NASA's Spaceward Bound Goes to the Deserts of the UAE

Observing Clouds for NASA Becomes a Class Tradition



For more than 10 years, seventh graders at Chartiers-Houston Jr./Sr. High School in Houston, Pa., have helped NASA scientists make sure satellites are identifying clouds correctly.

› View

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## Find Teaching Materials

Looking for Classroom Materials?

NASA's Education Materials Finder will help teachers locate resources that can be used in the classroom. Users may search by keywords, grade level, product type

## Education Calendar

March 2011

| | | 01 | 02 | 03 | 04 | 05 |
|---|---|---|---|---|---|---|
| 06 | 07 | 08 | 09 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
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Note: This will take you to the "Listbox Delivers" with further instructions.

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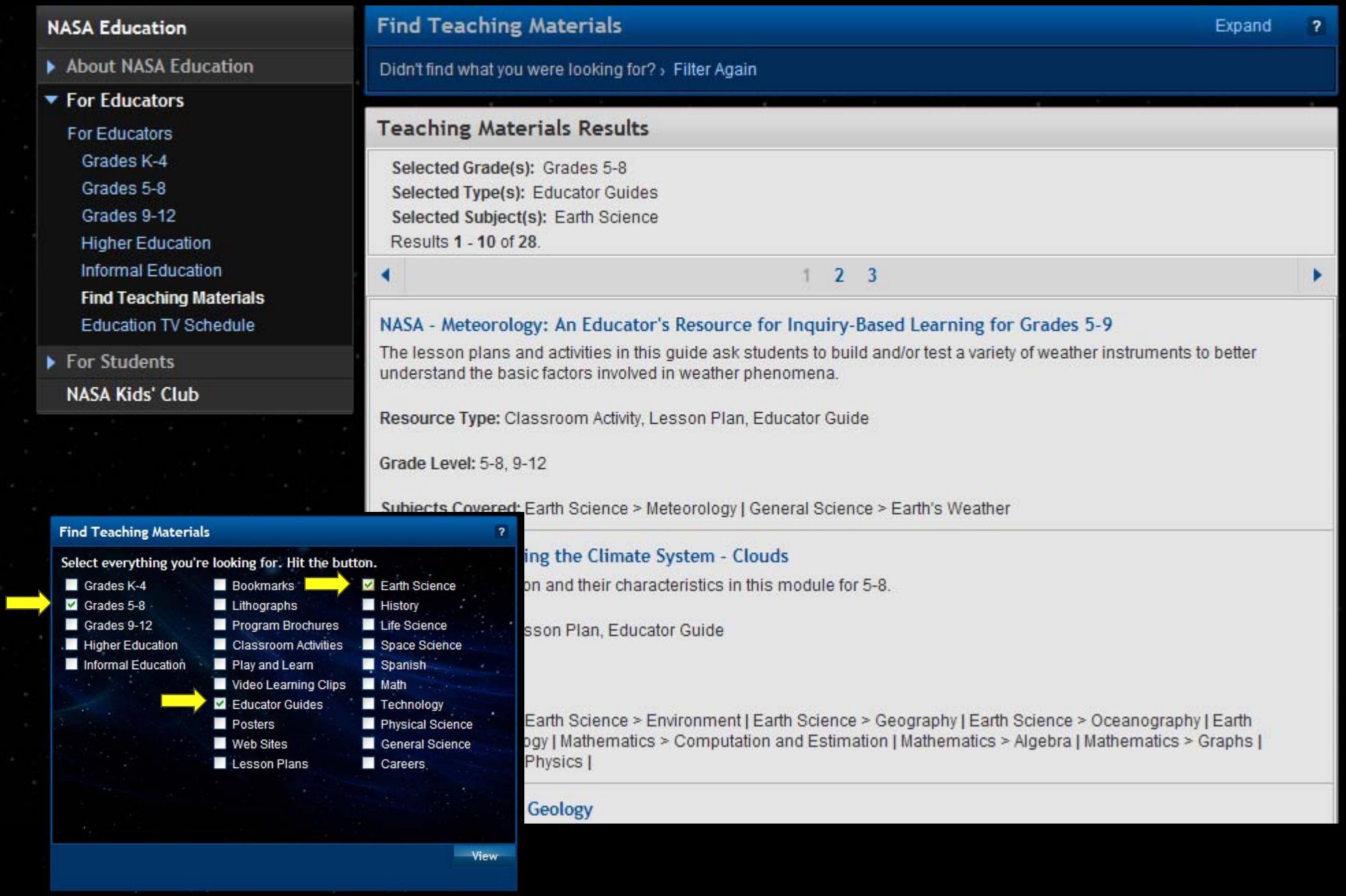
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Expand
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Teaching Materials Results
Selected Grade(s): Grades 5-8
Selected Type(s): Educator Guides
Selected Subject(s): Earth Science
Results 1 - 10 of 28.
1 2 3
NASA - Meteorology: An Educator's Resource for Inquiry-Based Learning for Grades 5-9
The lesson plans and activities in this guide ask students to build and/or test a variety of weather instruments to better understand the basic factors involved in weather phenomena.
Resource Type: Classroom Activity, Lesson Plan, Educator Guide
Grade Level: 5-8, 9-12
Subjects Covered: Earth Science > Meteorology | General Science > Earth's Weather
ing the Climate System - Clouds
on and their characteristics in this module for 5-8.
sson Plan, Educator Guide
Earth Science > Environment | Earth Science > Geography | Earth Science > Oceanography | Earth
ogy | Mathematics > Computation and Estimation | Mathematics > Algebra | Mathematics > Graphs |
Physics |
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# NASA Educator Resource Center

**For Educators**

- **Grades K-4**
  - Grades K-4
    - Featured Materials
    - Featured Sites
    - Have You Seen?
    - **Current Opportunities**
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- **Grades 5-8**
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## Learning Resources

Text Size

**NASA Educator Resource Center Network**

**Did you know there is a place where...**

- NASA has educator guides on a variety of subjects for grades K-12.
- You can attend educational workshops on NASA related subjects.
- You can learn about NASA educational programs available for students and educators across the country.


*Image to right: The purpose of a NASA Educator Resource Center (ERC) is to help teachers learn about and use NASA's educational resources. Credit: NASA*

Most of these resources are free to educators, and NASA is there to assist with instructions on how to use them.

That's where the **NASA Educator Resource Center Network** comes in. The purpose of a NASA Educator Resource Center (ERC) is to help teachers learn about and use NASA's educational resources. Personnel at ERCs located throughout the United States work with teachers to find out what they need and to share NASA's expertise. The ERCs provide educators with demonstrations of educational technologies such as NASA educational Web sites and NASA Television. ERCs provide inservice and preservice training utilizing NASA instructional products.

*Image to left: NASA's Aerospace Professional Development Center at Oklahoma State University (OSU) is part of NASA's Educator Resource Center Network. Credit: OSU*

**NASA Educational Resources are aligned with National Education Standards**

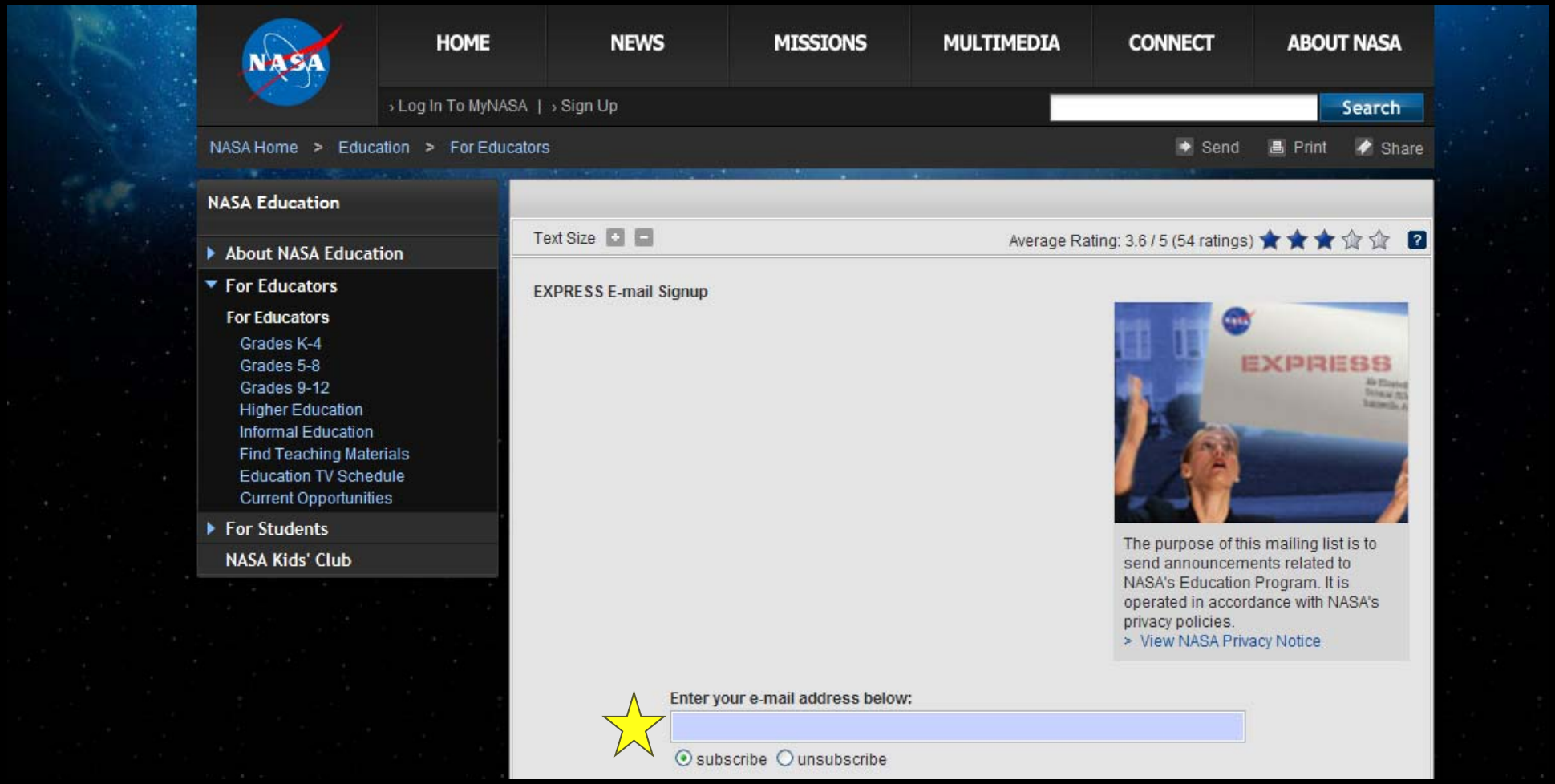
Through the Educator Resource Center Network, NASA provides the expertise and necessary facilities to help educators access and utilize science, mathematics, technology, and geography instructional products. All of these products are aligned with national standards and appropriate state frameworks and are based on NASA's unique mission and results. ERCs also partner with local, state, and regional educational organizations to become part of the systemic education reform initiatives in the state.

# www.nasa.gov/education/core

# NASA Educational Multimedia

# NASA Educational Multimedia

# NASA Education EXPRESS Mailing List
# www.nasa.gov/education/express




"We know that education is everything to our children's future. We know that they will no longer just compete for good jobs with children from Indiana, but children from India and China and all over the world.

"leadership tomorrow depends on how we educate our students today -- especially in science, technology, engineering and math.

~President Barack Obama

# Searching for Materials Using the Alabama Course of Study

6th

## SIXTH GRADE

## Earth and Space Science

Students will: …

7. Describe Earth's biomes.
   Examples: aquatic biomes, grasslands, deserts, chaparrals, taigas, tundras
   - Identifying geographic factors that cause diversity in flora and fauna, including elevation, location, and climate

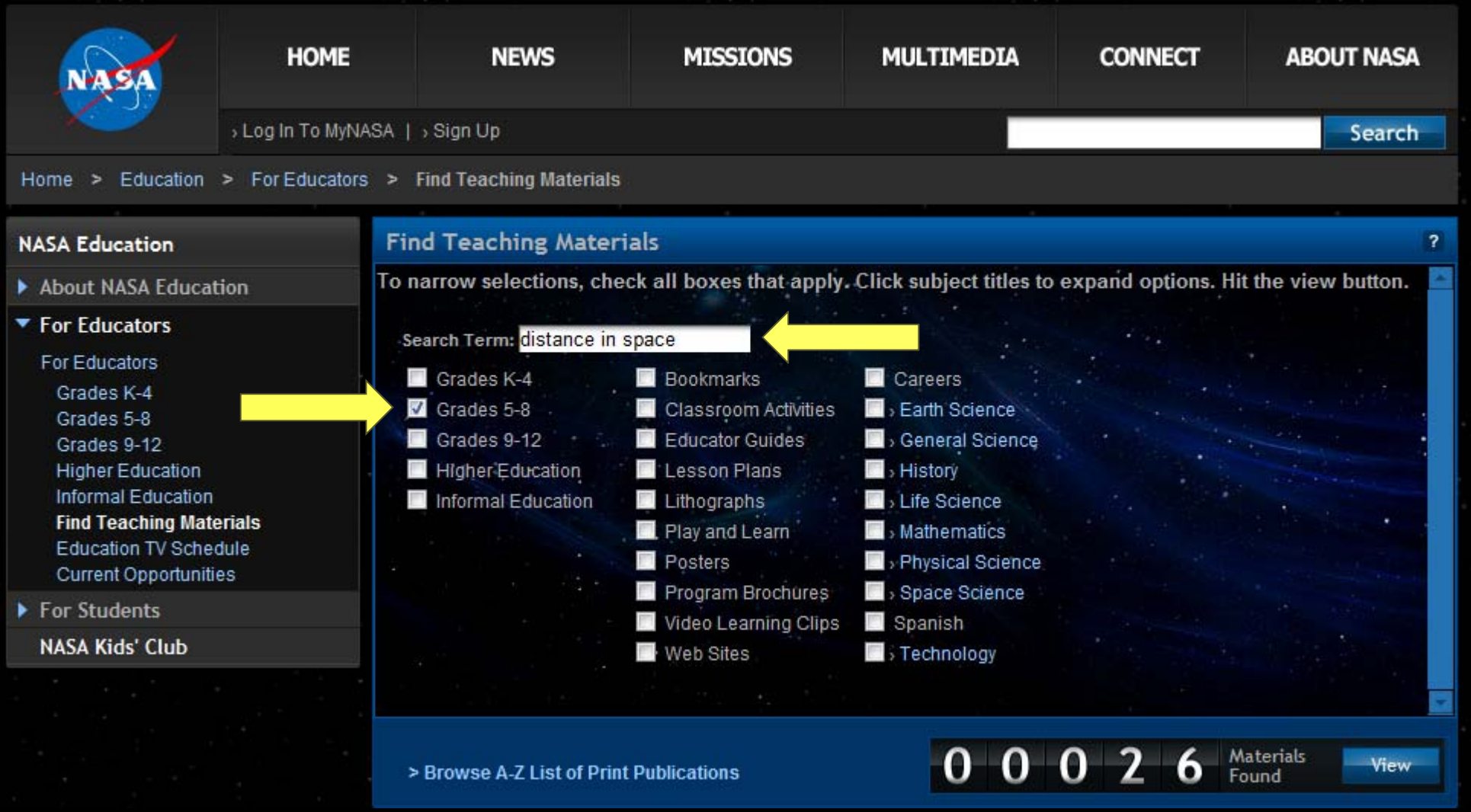
8. Describe how Earth's rotation, Earth's axial tilt, and distance from the equator cause variations in the heating and cooling of various locations on Earth.

9. Identify the moon's phases.
   - Describing lunar and solar eclipses
   - Relating effects of the moon's positions on oceanic tides

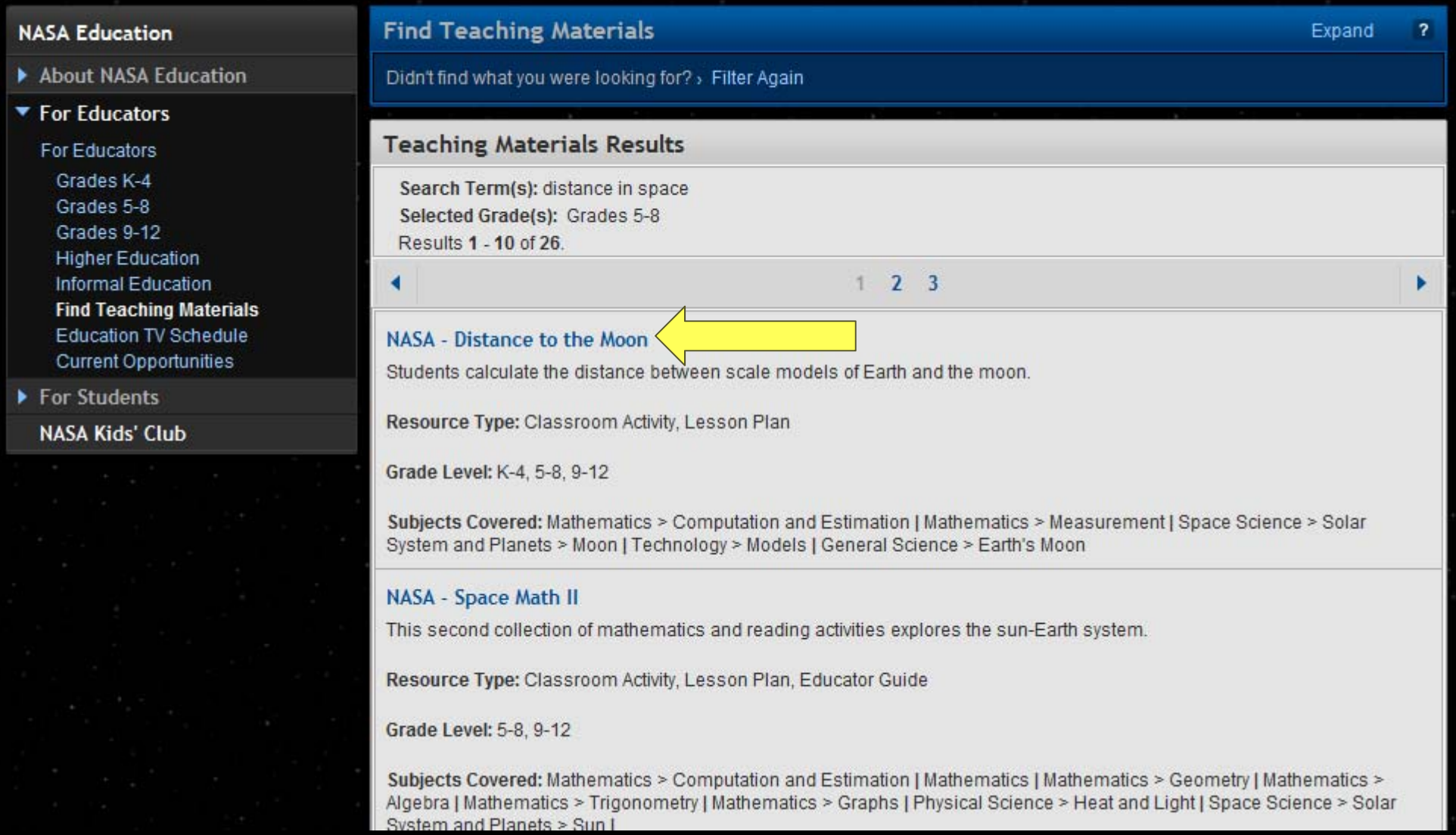
10. Describe components of the universe and their relationships to each other, including stars, planets and their moons, solar systems, and galaxies.
    - Identifying the impact of space exploration on innovations in technology
      Examples: MRI, microwave, satellite imagery, GPS
    - Mapping seasonal changes in locations of constellations in the night sky
    - Describing the life cycle of a star
      Example: H-R diagram

11. Describe units used to measure **distance in space**, including astronomical units and light years.

# Find Teaching Materials



# Results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Teaching Materials Results
Search Term(s): distance in space
Selected Grade(s): Grades 5-8
Results 1 - 10 of 26.
1 2 3
NASA - Distance to the Moon
Students calculate the distance between scale models of Earth and the moon.
Resource Type: Classroom Activity, Lesson Plan
Grade Level: K-4, 5-8, 9-12
Subjects Covered: Mathematics > Computation and Estimation | Mathematics > Measurement | Space Science > Solar System and Planets > Moon | Technology > Models | General Science > Earth's Moon
NASA - Space Math II
This second collection of mathematics and reading activities explores the sun-Earth system.
Resource Type: Classroom Activity, Lesson Plan, Educator Guide
Grade Level: 5-8, 9-12
Subjects Covered: Mathematics > Computation and Estimation | Mathematics | Mathematics > Geometry | Mathematics > Algebra | Mathematics > Trigonometry | Mathematics > Graphs | Physical Science > Heat and Light | Space Science > Solar System and Planets > Sun |

# Activity and Educator Guide

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## Classroom Activity

Text Size

Average Rating: 2.3 / 5 (4 ratings)

Distance to the Moon
**Audience:** Educators
**Grades:** 4-12

In this activity, students calculate the distance between scale models of Earth and the moon.

Distance to the Moon Activity [117KB PDF file]

This activity is part of the Exploring the Moon Educator Guide.


Teacher Page

Distance to the Moon

Purpose

Background

The information in this document was accurate as of the original publication date.

# Educator Guide

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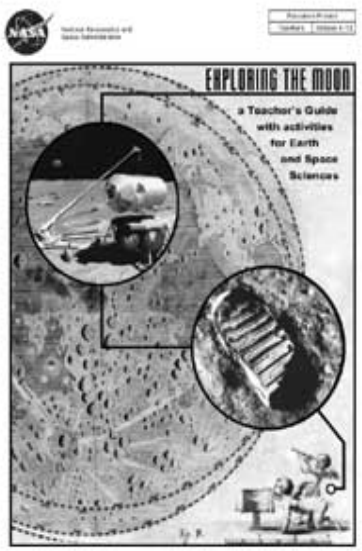
## Educator Guide

Text Size

Rate this:

**Exploring the Moon Educator Guide**
**Audience:** Educators
**Grades:** 4-12
**Product Number:** EG-1997-10-116-HQ




The activities in this guide promote problem solving, communication skills and teamwork. Earth and space science subjects include lunar geology and regolith, distance to the moon, Apollo landing sites and life support systems.

**Exploring the Moon Educator Guide** [7MB PDF file]

The information in this document was accurate as of the original publication date.

Individual sections:

- Cover
- Introductory Materials
- National Education Standards Charts
- The Moon -- Gateway to the Solar System Teacher's Guide
- Moon ABCs Fact Sheet
- Rock ABCs Fact Sheet
- Progress in Lunar Science
- Nearside of the Moon -- Apollo Landing Sites
- Pre-Apollo Activities
- Distance to the Moon
- Diameter of the Moon
- Reaping Rocks

# Using the Standards with "Distance to the Moon"

- NASA Educator Guides are aligned to the national standards in science, mathematics, technology, geography, and language arts standards.

- The Alabama Course of Study is closely aligned with the national standards.

| National Science Standards with "Distance to the Moon" |
|---|
| Unifying Concepts and Processes |
| Science as Inquiry |
| Physical Sciences<br>-Motion and Forces |
| Earth and Space Science<br>-Structure of the Earth System<br>- Earth in the Solar System |

| National Math Standards with "Distance to the Moon" |
|---|
| Numbers and Operations |
| Measurement |

# Alabama Course of Study Standards with "Distance to the Moon"

| 6th Grade Science Standards |
| --- |
| 10. Describe components of the universe and their relationships to each other, including stars, planets and their moons, solar systems, and galaxies. |
| 11. Describe units used to measure distance in space, including astronomical units and light years. |

| 6th Grade Math Standards |
| --- |
| Numbers and Operations<br>- Comparing rational numbers written as fractions, decimals, mixed numbers, and percents<br>- Solve problems involving decimals, percents, fractions, and proportions |
| Measurement<br>- Convert units of length, weight, or capacity within the same system (customary or metric) |

| 6th Grade Social Studies Standards |
| --- |
| Identify critical events…the Cold War…space race |
| Identify Alabama's role in the Cold War<br>- Rocket production at Redstone Arsenal |

# Distance to the Moon Activity
# Teacher Page



## Distance to the Moon

### Purpose

To calculate the distance between scale models of Earth and the Moon.

### Background

As long as people have looked at the Moon, they have wondered how far away it is from Earth. The average distance to the Moon is 382,500 km. The distance varies because the Moon travels around Earth in an elliptical orbit. At perigee, the point at which the Moon is closest to Earth, the distance is approximately 360,000 km. At apogee, the point at which the Moon is farthest from Earth, the distance is approximately 405,000 km.

Distance from Earth to the Moon for a given date can be obtained by asking a local planetarium staff. Students interested in astronomy may enjoy looking at *The Astronomical Almanac* printed yearly by the U.S. Government printing office. When the Apollo 11 crew landed on the Moon on July 20, 1969, they were 393,309 km away from home.

In this activity students will use simple sports balls as scale models of Earth and the Moon. Given the astronomical distance between Earth and the Moon, students will determine the scale of the model system and the distance that must separate the two models.

The "Moon ABCs Fact Sheet" lists the Earth's diameter as 12,756 km and the Moon's diameter as 3,476 km. Therefore, the Moon's diameter is 27.25% of Earth's diameter. An official basketball has a diameter of 24 cm. This can serve as a model for Earth. A tennis ball has a diameter of 6.9 cm which is close to 27.25% of the basketball. (The tennis ball is actually 28.8% the size of the basketball.) These values are very close to the size relationship between Earth and the Moon. The tennis ball, therefore, can be used as a model of the Moon.

The scale of the model system is determined by setting the diameter of the basketball equal to the diameter of Earth. This is written as a simple relationship shown below:

$$24 \text{ cm} = 12{,}756 \text{ km}$$

Expressed more simply, 1 cm in the model system equals 531.5 km in space:

$$1 \text{ cm} = 531.5 \text{ km}$$





## Distance to the Moon

Using this scale, the basketball-tennis ball separation in centimeters (x) is derived:

$$x = \frac{382{,}500 \text{ km}}{531.5 \text{ km}} = 719.7 \text{ cm}$$

The value x may be rounded to 720 cm and converted to meters so that the students need to place the basketball and tennis ball 7.2 m apart.

### Preparation

Review and prepare materials listed on the student sheet.
If it is not possible to obtain an official-size basketball and tennis ball, then you can use other spherical objects or circles drawn on paper. Clay balls may be used as models. For example, for two clay balls, 10 cm diameter and 2.7 cm diameter, the scale is 1 cm = 1,275.6 km. At this scale, students need to separate the clay balls by 3 m.

### In Class

Divide the students into cooperative groups. Students must keep track of units of measure.

### Wrap Up

Did the students have an accurate idea of the size relationship between Earth and the Moon before doing this activity?

Did the effect of separating the scale models help them visualize the distance to the Moon?

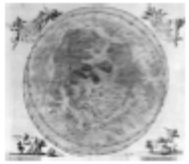
### Extensions

1. How long did it take Apollo astronauts to travel to the Moon?

2. Have students measure the circumferences of various spheres so that each group uses a different pair of models.

3. Instead of using the average distance to the Moon, use the distance from July 20, 1969, to recall the Apollo 11 landing or use the distance for today.

# Distance to the Moon Activity
# Student Page



## Distance to the Moon

### Purpose

To calculate the distance between scale models of Earth and the Moon.

### Key Word

scale

### Materials

"Moon ABCs Fact Sheet"
sports balls
calculator
meter tape

### Procedure

1. If Earth were the size of an official basketball, then the Moon would be the size of: another basketball? soccer ball? baseball? tennis ball? golf ball? marble?

_____

_____

2. The diameter of Earth in kilometers is:

_____

3. The diameter of the Moon in kilometers is:

_____

4. What percentage of Earth's diameter is the Moon's diameter?

_____

5. Use the list below to change or confirm your answer to Question 1.

| | diameter in cm |
|---|---|
| official basketball | 24 |
| size 5 soccer ball | 22 |
| official baseball | 7.3 |
| tennis ball | 6.9 |
| golf ball | 4.3 |
| marble | 0.6 |

If Earth is a basketball, then the Moon is a:

_____



## Distance to the Moon

6. Use an official basketball as a model of Earth. Use a second ball, the one you determined from Question 5, as a model of the Moon.

7. Determine the scale of your model system by setting the diameter of the basketball equal to the diameter of Earth.

_____cm = _____km therefore,

1 cm = [ ] km

8. If the distance to the Moon from Earth is 382,500 km, then how far apart must you separate the two scale models to accurately depict the Earth/Moon system?

Using the scale value in the box from Step 7, the model separation in centimeters (x) is derived:

$$x = \frac{\text{actual distance to the Moon in kilometers}}{\text{scale value in kilometers}}$$

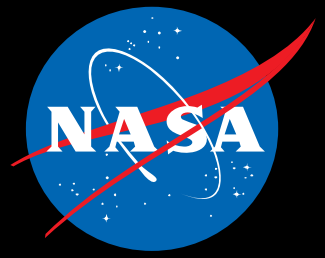
$$x = \frac{\square}{\square}$$

x = _____centimeters

The two scale models must be separated by _____ meters.

9. Set up your scale model of the Earth/Moon system. Does it fit in your classroom?

_____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