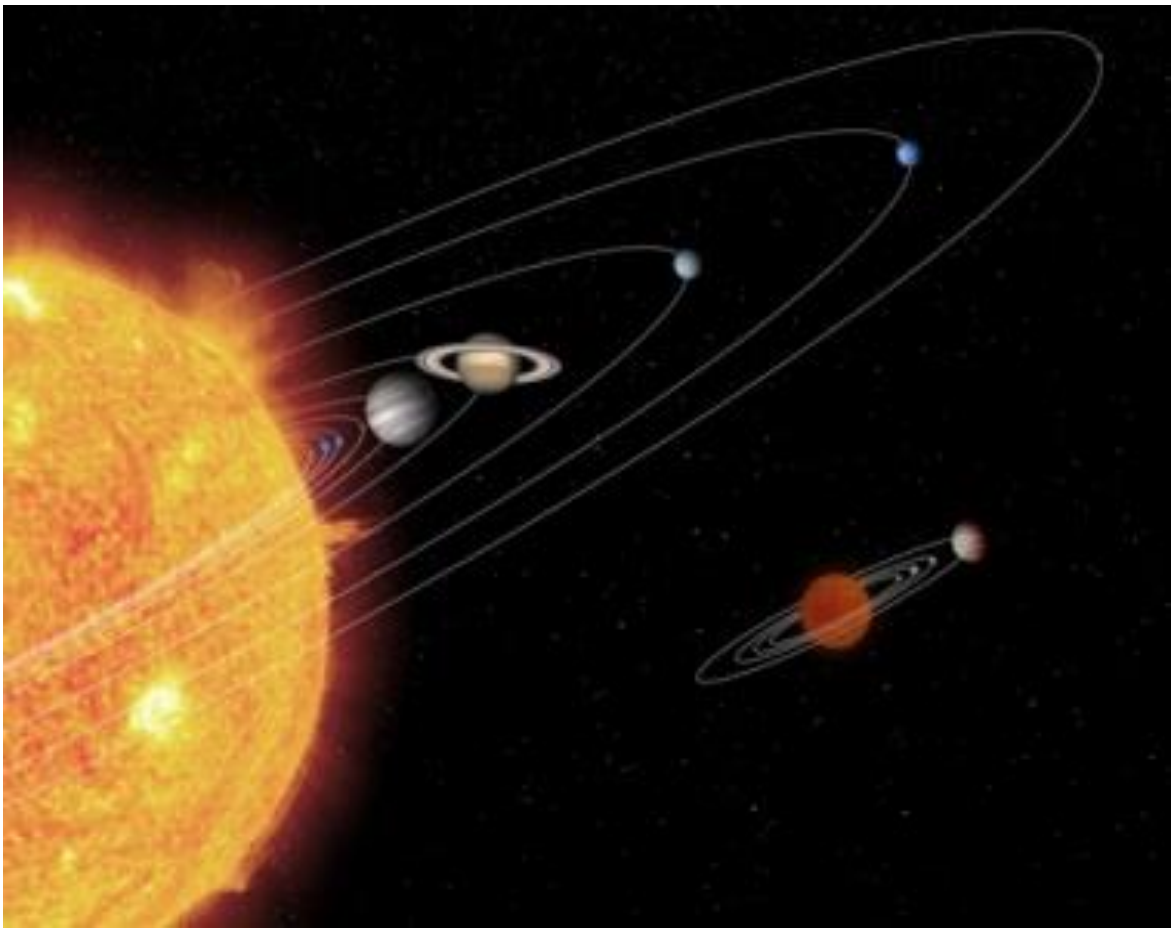
National Aeronautics and Space Administration

Mars Rover Celebration

Curriculum Module

Week 1: Learning Research Skills

Lesson 1: Overview of the Solar System



Educational Product	
Educators & Students	Grades 3-5

www.marsrover.org

Week 1: Learning Research Skills

LESSON 1: OVERVIEW OF THE SOLAR SYSTEM
GRADE LEVEL: 3-5
LENGTH: 2 DAYS

VOCABULARY:
calculate
represent
revolution
rotation
solar system

MATERIALS:

- For each team:
  - 5 meters of yarn
  - 9 pony beads, each a different color
  - Centimeter ruler
- One of each for demonstration
  - Beach ball
  - Cake sprinkles (round)
  - Cinnamon imperial candies
  - Dried peas
  - 6mm ball bearings or a bead from a lamp pull chain
  - Gumball
  - Styrofoam ball (2" diameter)
  - Ping pong ball
- 8- Index cards, each labeled with the name of a planet
- 1- Index card, labeled "Sun"
- Science Notebooks

ESSENTIAL QUESTION:

How might you describe the solar system to a friend who knows nothing about the relative sizes of the sun and planets or the distances among them?

LESSON OBJECTIVE(S):

Students will be able to:

- Identify that the Sun is the central body of the Solar System
- Identify the eight major planets
- Understand the planets are very far away from Earth and each other
- Understand the relative differences among the planets and the Sun
- Construct a model of the solar system
- Demonstrate a grade appropriate understanding of revolution and rotation

ENGAGEMENT

1. At the beginning of this lesson, and using the attached documents, present the Essential Question and Key Vocabulary for students to consider during the lesson.
2. In an open space and using the pre-labeled index cards, hand the cards to 9 students who will represent the planets and the Sun. Ask the other students to place them in order starting with the planet closest to the Sun and work outward. As students correctly identify the position of a planet, ask students what they know about each one.
3. Once students share what they already know, ask if students can identify how the planets travel around the sun. *(They rotate and revolve.)* Ask students to stand up and physically demonstrate revolution *(moving around the room in a circular path*), rotation *(spinning in place).*
4. Ask the students with the index cards to line up correctly and demonstrate the planets rotating and revolving around the Sun.
5. Allow students take turns so that all students get a chance to be a planet (or the Sun). Throughout the Engagement, stress the distances between the individual planets and the Sun.

EXPLORATION

1. With students divided into teams of 4-5, teams will assign a bead to represent each planet and record the data in their Science Notebooks.
2. By tying the Sun bead to the end the 5 meters of yarn, students will use the table in their Science Notebooks to measure out the distances of each of the planets from the Sun. Students will work together to correctly measure the distance from the Sun and tie the appropriate bead to the yarn.

EXPLANATION

1. After completing the Exploration, students should be brought together to discuss results and review notes and observations recorded in their Science Notebooks. The teacher should ask specific questions such as those listed below to identify and correct any misconceptions:
    a. What is the difference between rotation and revolution?
    b. Are all of the planets and the Sun the same size? How do you know?
2. To further solidify that the planets are different sizes, the teacher should hold up the beach ball and ask students to consider: If the beach ball represented the Sun, how big would each of the planets be?
3. Guide students to work together as a whole group to put the planet representations in the correct order (Starting with Mercury- *cake sprinkle, dried pea, ball bearing, cinnamon imperial, Styrofoam ball, ping pong ball, gumball, gumball)*
4. Then, students should individually answer the Essential Question in their Science Notebooks.

ELABORATION

1. Students are encouraged to make observations and measurements of planet motion. Students should gather evidence to show a pattern can be used to predict future motion.
2. Discuss with students the relative distances between the planets and introduce the Astronomical Unit- a unit of length (149,597,870.700 km) approximately equal to distance between Earth and the Sun.
3. More advanced students can calculate the distances between the planets themselves by using a scale factor of 1 Astronomical Unit (AU)= 10 cm instead of using the chart provided in the Science Notebook.

EVALUATION

1. After Day 1 of this lesson, students should complete the Mars Rover Celebration pre-assessment as a homework assignment. If your class will be participating in our ongoing evaluation of these materials, please keep the papers. If you are not yet working with us to improve our materials and would like to help, please contact us at mailto:MarsRover@uh.edu.
2. During this two day lesson, the teacher is encouraged to use formative assessments to determine and deepen student understanding. Teachers may wish to use one or both of the included Exit Tickets after the conclusion of the first day or review and/or grade students' Science Notebooks to establish student understanding.
3. Teachers are encouraged to create their own grade-level and ability-level assessments so as to best meet the needs of their students.

SUPPLEMENTAL RESOURCES

For Students

Planet Size Comparison
http://www.messenger-education.org/Interactives/ANIMATIONS/Planet_Size_Comparison/planet_size_comparison_full.htm

Explore the Solar System
http://spaceplace.nasa.gov/solar-system-explorer/en/
http://eyes.nasa.gov/

Solar System Storybook
http://www.nasa.gov/audience/forstudents/k-4/stories/what-is-the-solar-system.html

For Teachers

Solar System Lithograph Set
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Our_Solar_System_Lithograph_Set.html

Scale Model of the Solar System
http://www.nasa.gov/offices/education/programs/national/summer/education_resources/earthspacescience_grades7-9/ESS_ss-scale-models.html