National Aeronautics and Space Administration

Modeling Science

Solar System Bead Activity

5E Lesson Plan

Source Material: Solar System Bead Activity
Mission Focused Area: Solar System and Beyond

Lesson Overview

Students construct a scale model of the solar system using beads and string. Students will observe the relative distances of the planets, asteroid belt, and dwarf planet Pluto from one another and from the Sun; and gain a better understanding of the vast distances between planets in the outer solar system compared with those in the inner solar system.

NASA Connection

Our solar system is immense. We think of the planets as revolving around the Sun, but rarely consider how far each planet is from the Sun or from each other. Furthermore, we fail to appreciate the even greater distances to the other stars.

Objectives

- Students observe the relative distances of the planets, asteroid belt, and dwarf planet Pluto from one another and from the Sun
- Students gain a better understanding of the vast distances between planets in the solar system compared with those in the inner solar system

Guiding Questions

- What do we know about the planets and their relation to the Sun?
- What do we know about the planets and their sizes?
- What misconceptions do we know about?

Materials

- Large craft pony beads – 11 colors
- String – 5 meters
- Meter stick or ruler
- Student activity sheet

National STEM Standards

NGSS

- **MS-ESS1-3** Analyze and interpret data to determine scale properties of objects in the solar system.
- **MS-ESS1-1** Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.
- **MS-ETS1-4** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

5E Instructional Model

Suggested Scaffolding

This lesson was written for 3rd grade scholars but, can be extended for 4th and 5th grade scholars as well. Where 3rd graders will identify 4th and 5th graders will analyze previously identified information. Fifth graders will take it a step further and compare previously identified data.

Teacher Action

Engage - Video and Know, Want-to-Know, Learned (KWL) Chart

- Play video "Solar System Size and Distance"
- Distribute materials for scholars to complete the KWL chart
- Facilitate the share out portion after the KWL is completed

Scripted CFU questions

- How does Earth compare to other planets in our solar system?

Explore - Video and Journaling

- Play video "Planetary Posse"
- Monitor the students journaling and notetaking

Scripted CFU questions

- Can you name the first four planets in our Solar System?
- Can you tell me a detail about the size one of the planets in the video?

Explain - Planet Match Up Activity

- Give students clues to planets without sharing the planet name
- Check for mastery in this activity

Scripted CFU questions

- I am the planet that is the furthest away from the Sun; who am I?
- I am the planet that is red and close to the Sun; who am I?

Elaborate - Solar System Bead Activity

- Guide students through the Solar System Bead Activity by following the scales and measurements in the tables

Scripted CFU questions

- From your Solar System Bead what can you conclude?
- Which planet is the furthest from the Sun? Closest?

Evaluate - Summary Writing Activity

- Summarize activity and allow students to use their beads to complete a summary writing activity, "write it out."

Scripted CFU questions

- Using the academic term "compare," what can you tell me about the planets and their sizes?

Student Action

Engage - Video and Know-Want-Learn (KWL) Chart

- Complete a KWL chart (before and after the video) for the sizes of planets and their relation to the Sun
- Share out their KWL information

Explore - Video and Journaling

- Watch the "Planetary Posse" video to gain a better understanding of the order of the planets from the Sun and their size and composition
- Write details of planets in their science journals

Explain - Planet Match Up Activity

- Make predictions on planets using their science journals and the “Planetary Posse” video

Elaborate - Solar System Bead Activity

- Construct a distance model of the solar system to scale, using colored beads as planets

Student Procedure

- Complete the distance chart by multiplying each AU distance by a scale-factor of 10 centimeters per astronomical unit
- Start your scale model by cutting a 4.5-meter piece of string (5.0 meters if you are doing the Pluto extension) and tying the largest “Sun” bead to one end using a double knot
- Using the distances (in centimeters) that you calculated, measure the distance from the Sun on the string to each planet
- Tie a colored bead in place for each planet using a double knot. Note: The bead colors are rough approximations of the colors of the planets and the Sun.
- When you are finished, wrap your string Solar System around the cardboard holder

Evaluate - Summary Writing Activity

- Complete the L portion of the KWL chart including academic vocabulary such as *Scale*, *In relation to*, *Size*, *Compared to*

Work adapted by NASA from JPL. We thank JPL for collaboration efforts. https://www.jpl.nasa.gov/edu/teach/activity/solar-system-bead-activity/