



LSI Exploring the Scale of the Solar System

Subject: Science

**Grade: Kindergarten
through 8th Grade**

Time: 60 minutes

Learning Objectives:

In this lesson, students will gain an understanding of the vast scale of the solar system and the relative distances between celestial bodies. They will create a model of the solar system using scaled-down measurements to visualize and comprehend the immense size of our cosmic neighborhood.

Standards and Competencies:

NSTA Standard: Earth and Space Science - Content Standard D: Earth in the Solar System

- Students will gain an understanding of the structure and scale of the solar system.
- Students will learn about the relative sizes and distances between celestial bodies in the solar system.

NSTA Standard: Earth and Space Science - Content Standard D: Earth's Place in the Universe

- The lesson emphasizes the vast scale of the solar system and the relative distances between celestial bodies.
- Students will explore the concept of scale in the context of the solar system.

NSTA Standard: Earth and Space Science - Content Standard D: Changes in Earth and Sky

- Students will explore the concept of scale in relation to the size and distances within the solar system.
- The lesson encourages students to reflect on their understanding of the scale of the solar system.

NSTA Standard: Science and Engineering Practices - Practice 2: Developing and Using Models

- Students will create a model of the solar system using scaled-down measurements to visualize and comprehend its immense size.
- Students will use objects and measurements to represent celestial bodies and their distances.

NSTA Standard: Science and Engineering Practices - Practice 7: Engaging in Argument from Evidence

- The lesson plan includes a class discussion about the challenges and insights gained from creating the model, fostering scientific argumentation.



NSTA Standard: Crosscutting Concept - Scale, Proportion, and Quantity

- The lesson explicitly incorporates the concept of scale, emphasizing its importance in understanding the relative sizes and distances within the solar system.

Background Knowledge:

- **Basic Knowledge of the Solar System:**
 - Students should have a general awareness of the sun, planets, moons, and other celestial bodies within our solar system.
- **Familiarity with Celestial Bodies:**
 - Students might benefit from knowing the names of the planets in our solar system and a few key characteristics about them.
- **Understanding of Scale:**
 - A basic understanding of the concept of scale would be helpful. Students should be familiar with the idea that models can be used to represent objects or systems at a different size.
- **Measurement Skills:**
 - Some basic measurement skills using a ruler or measuring tape will be necessary for the scaling exercises. Students should be comfortable using these tools to measure and scale down sizes and distances.
- **Concept of Distance:**
 - Students should have a basic concept of distance and an understanding that distances in space are vast. They don't need to know specific astronomical units, but a general idea that space distances are much larger than everyday distances would be beneficial.

Materials:

Various objects to represent celestial bodies:

- Small ball for the sun
- Various sizes of balls for planets
- Marbles for moons
- Other objects for asteroids or additional celestial bodies

Measuring tools:

- Measuring tape or ruler

Reference materials (optional):

- Chart or poster of the solar system for visual reference
- Chart or diagram displaying relative distances within the solar system

Additional objects for scaling exercises:

- Popsicle sticks or other objects for measuring and representing distances between celestial bodies

Optional Extension Activities materials:

- Research materials on the historical development of understanding the solar system's scale
- Information on astronomical units (AU) as a unit of measurement for distances within the

solar system

- Technology resources such as computers, tablets, or VR devices for online interactive simulations or virtual reality exploration

Writing and drawing materials (for reflections and summary):

- Paper
- Pens or pencils

Procedure:

Introduction (5 minutes):

- Begin by engaging students in a discussion about the solar system, asking questions to assess their prior knowledge.
- Explain the objective of the lesson: to understand the vast scale of the solar system and the relative distances between its celestial bodies.

Solar System Overview (10 minutes):

- Provide a brief overview of the solar system, including the sun, planets, moons, and other objects.
- Optionally, use a chart or poster to visually display the layout and order of the celestial bodies in the solar system.
- Discuss the concept of scale and its importance in understanding the relative sizes and distances within the solar system.

Scaling Exercise: Size of Celestial Bodies (15 minutes):

- Introduce the concept of scaling and explain how it can help us comprehend the vastness of the solar system.
- Distribute the objects representing celestial bodies (e.g., small ball for the sun, various sizes of balls for planets, marbles for moons).
- Using a measuring tape or ruler, guide students in measuring and scaling down the sizes of the objects based on a predetermined scale (e.g., 1 cm = 1,000 kilometers).

Scaling Exercise: Distance Between Celestial Bodies (20 minutes):

- Explain that the distances between celestial bodies are also immense and require scaling to be comprehensible.
- Optionally, display a chart or diagram showing the relative distances between celestial bodies in the solar system.
- Distribute additional objects (e.g., popsicle sticks) and guide students in measuring and scaling down the distances between the celestial bodies based on a predetermined scale (e.g., 1 meter = 100 million kilometers).

Model Assembly and Discussion (10 minutes):

- Instruct students to use their scaled-down celestial body objects and distances to create a model of the solar system.
- Encourage students to arrange the objects in the correct order and spacing, reflecting the scale they have used.

- Facilitate a class discussion about the challenges and insights gained from creating the model, focusing on the enormous sizes and distances involved.

Reflection and Wrap-up (5 minutes):

- Lead a short reflection activity, asking students to share their thoughts on the scale of the solar system and what they found most surprising or fascinating.
- Summarize the key takeaways from the lesson, emphasizing the vastness of the solar system and the importance of scale in understanding its size.

Assessment:

Formative Assessment during Activities:

- **Observation:** As students engage in the scaling exercises and model assembly, observe their interactions, understanding of scaling, and ability to apply the concept to represent the solar system.
- **Questioning:** Ask questions throughout the lesson to gauge individual and collective understanding. For example, inquire about the reasons behind their scaling choices, or prompt them to explain the challenges faced during the model assembly.

Group Discussion and Participation:

- **Class Discussion:** Assess students' participation in the class discussion following the model assembly. Look for evidence of their ability to reflect on the challenges and insights gained, as well as their understanding of the enormous sizes and distances involved in the solar system.

Model Evaluation:

- **Accuracy of Model:** Evaluate the accuracy of each group's solar system model. Check if celestial bodies are arranged in the correct order, and if the distances are scaled appropriately according to the predetermined scale.
- **Use of Scale:** Assess whether students effectively applied the concept of scale

Additional Resources:

Extension Activities

- Research and discuss the historical development of our understanding of the solar system's scale, including the contributions of astronomers and scientists.
- Explore the concept of astronomical units (AU) as a unit of measurement for distances within the solar system.
- Utilize technology, such as online interactive simulations or virtual reality, to further explore the scale and distances within the solar system.

in both the sizes of celestial bodies and the distances between them.

Reflection and Summary:

- Reflection Activity: Review students' reflections on the scale of the solar system. Look for evidence of thoughtful consideration and understanding of key concepts discussed during the lesson.
- Summary Contributions: Assess the quality of student contributions during the summary of key takeaways. Look for evidence that students have grasped the main concepts related to the vastness of the solar system and the importance of scale.

**Note: The duration and complexity of the design challenge can be adjusted based on the students' age, skill level, available materials, and time constraints.

