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LESSON PLAN

THE SUN AND OTHER STARS

GRADES 3-5

SUMMARY

The focus of this lesson is the difference in appearance of stars based on their distance from Earth. Central to this concept is recognizing our Sun as a star, just like the distant stars. Students begin to comprehend the vast scale of the universe by comparing brightness and size of stars in the night sky to our sun.

NEXT GENERATION SCIENCE STANDARDS CORRELATION

5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.

Science & Engineering Practices	Connections to Classroom Activity
Engaging in Argument from Evidence	• Students use reasoning to support a claim based on evidence collected using a model.
Disciplinary Core Ideas	**Connections to Classroom Activity**
ESS1.A: The Universe and its Stars The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. Other DCIs addressed in this lesson ESS1.B: Earth and the Solar System The orbits of Earth around the sun and of the moon	• Students observe stars that form nearly always visible constellations in the night sky and compare their observations of those distant stars to each other and our sun. • Students observe characteristics of several nearby stars (including our sun) such as distance from Earth. • Students build and use planispheres to synthesized understanding related to distances of stars and orbit

around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	of Earth around the sun.
Crosscutting Concepts	**Connections to Classroom Activity**
Scale, Proportion, and Quantity	• Students recognize the immense size of stars and distances in the universe and attempt to comprehend these relatively and concretely.

DURATION

At least one clear dark evening preceding the lesson, one to two 45-minute classroom periods, at least one clear dark evening after the lesson.

PRE-ASSESSMENT QUESTIONS

Please see discussion questions located under the video. These can be discussed as a group or answered individually in student science notebooks.

MATERIALS

- Note for parents (optional)
- Dark, clear night
- Two identical paper plates
- A long hallway
- Tape measure
- Science notebooks
- Pencils

DIY Activity

- Two sheets of paper
- Scissors
- Constellation charts PDF file (found at www.GenerationGenius.com)
- Printer

ENGAGE

Arrange an out of school time stargazing event for students and parents on a clear, dark night. You could bring in a local astronomy club or simply look for identifiable constellations such as the Big Dipper or Southern Cross (depending on which hemisphere you live in). If this is not possible, send the following note home with students several days or weeks prior to the lesson:

Dear Parents,

Our class is studying the sun and other stars. To kick of the lesson, all students should have the opportunity to observe at least one constellation, or group of stars that forms a recognizable shape. For this activity our focus will be on what some people call the Big Dipper (Northern Hemisphere) or Southern Cross (Southern Hemisphere). You may come from a background with another name for this group of stars. If so, please explain this with your child to share in class.

Since school takes place during the day, we hope that you will help your child in his/her observations of the night sky. The following instructions will help you to locate the constellation in the night sky. Your child should observe the stars and make as accurate a sketch as possible showing the arrangement of the stars in the constellation, and other nearby stars and their relative size and/or brightness.

Big Dipper

1. Find a dark area from which to view the night sky.
2. Look to the northern part of the sky. If its spring or summer look high in the northern sky. If its fall or winter look closer to the horizon.
3. Look for seven relatively bright stars that form the shape of a dipper or ladle. Four stars form a box like bowl and three more form the handle.
4. If you would like to try to locate the North Star, follow the line formed by the two stars that form the part of the ladle that would be used to scoop. These point directly to a bright star called Polaris, or the North Star.
5. If you would like to try to locate the little dipper, find Polaris and then look around it—Polaris is the last star in the Little Dipper's handle.

Southern Cross

1. The Southern Cross or Crux constellation is a group of 4 bright stars that form a kite like shape. There are also two other stars nearby that serve as pointers—follow them to the Southern Cross.
2. Look to the South from any location in the Southern Hemisphere (and even from about 25 degrees north of the Equator) and the Southern Cross should be visible. It is fairly high in the sky during late summer and early fall.

Thank you for your assistance in our lesson! Your child will soon be ready to report back about how this activity ties in to what they are learning about the Earth's place in our Universe.

Sincerely,

EXPLORE

After all students have had a chance to view the relative size and brightness of stars in the night sky and record their observations, gather the class (with their drawings) and ask them to discuss what they saw. Gently guide the conversation toward the varying brightness of the different stars they saw.

Ask students:

- Did all the stars in the constellation the same brightness? (No, although they were all brighter than many of the other stars in the sky)
- Did all the stars in the sky appear to be the same brightness? (No, some stars are much brighter than others)
- What might be causing some stars to appear brighter than others? (Possible answers include size, distance or what they are made out of.)

Guide the conversation toward size. Ask students, can two objects of the same size appear to be different sizes? How? For example, what if you had these two objects (show students two paper plates) and a long hallway? How might you demonstrate how size is affected by distance? Take the class to the hallway and explore how large the plates appear at various distances from the students.

EXPLAIN

AS A GROUP, WATCH THE GENERATION GENIUS VIDEO: SUN AND OTHER STARS.

Then, facilitate a conversation using the Discussion Questions.

ELABORATE

Students now have an understanding that our sun is a star and is much closer to Earth than other stars. It therefore appears much larger and brighter than other stars. To connect their understanding about the sun and other stars to what they have or are learning about Earth's rotation and orbit, use the DIY Activity for each student to create their own planisphere just like Zoë's from the video. As a group during an evening event, or individually at home with their parents encourage students to use their planisphere to help them locate constellations that can only be seen at certain times of year in the night sky (vs. the Big Dipper or Southern Cross which are circumpolar constellations that are nearly always visible).

EVALUATE

In their science notebooks have students individually finish CER (claim, evidence, reasoning) charts using evidence from the demonstration they took part in during the Explore portion of the lesson.

Claim	Evidence (the evidence gathered)	Reasoning (why you think the claim is correct based on the evidence)
Some stars appear bigger and brighter than others due to their relative distances from Earth.		

Claim	Evidence	Reasoning
Some stars appear brighter than others due to their relative distances from Earth.	When two identical paper plates were held at two different distances the closer plate appeared to be larger than the plate further away.	The plates and hallway served as a model representing two identically sized stars. Though the two paper plates were known to be the same size, the one closer to the students appeared much larger than the plate at the end of the hallway.

EXTENSIONS

Attempt to build a scale model of two stars (like the Sun, which is about 93 million miles, or 0.00001581 light years away, and Alpha Centauri, the next closest star to Earth which is about 4.83 light years away) using the two paper plates. This will help the students start to comprehend the immensity of the distances in the universe.