Unit plan: Our Solar System

A 3 WEEK UNIT PLAN BASED ON FLORIDA NEXT GENERATION SUNSHINE STATE SCIENCE STANDARDS

WEINBERG, AMY

Unit Title: Our Solar System

Content Area: Earth and Space Science

Grade: 5

Duration: Approximately 3 weeks

Lesson Objectives:

By the end of this unit, students will have concreate understanding of what a galaxy consists of and of the patterns within our solar system. Students will be able to demonstrate an understanding of the difference between rotation and revolution by physically moving to demonstrate the difference. Students will be able to relate the rotation and revolution of the earth and moon to explain the changes in the observable shape of the moon over the course of a month. Students will be able to distinguish and describe objects in our solar system including planets, moons, asteroids, comets, and the sun, and will have an understanding of the relative distances between these objects.

Lesson Adaptations for ESOL/ESE Students:

- Students will work collaboratively in mixed-ability groups
- Science text book has audio component for students with reading comprehension difficulties
- Lessons include various methods of disseminating information including videos, movement, modeling, pictures/graphics, charts and diagrams

Pre-Assessment:

Prior to the unit, the class will complete a group T-chart on a large piece of bulletin board paper with the sections “I know” and “I wonder”. The teacher will then review the section labeled “I know” and will address any misconceptions held by the class.

Unit Standards/Florida Benchmarks:

SC.4.E.5.4 Relate that the rotation of Earth (day and night) and apparent movements of the sun, moon, and stars are connected.
SC.4.E.5.2 Describe the changes in observable shape of the moon over the course of about a month.
SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model
SC.5.E.5.1: Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.
SC.5.E.5.2: Recognize the major common characteristics of all planets and compare/contrast the properties of inner and outer planets.
SC.5.E.5.3: Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it
SC.5.N.1.3 Recognize and explain the need for repeated experimental trials.

SC.5.N.1.1: Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions
SC.5.N.1.5: Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."

SC.35.CS-CS.2.4-Solve real-world problems in science and engineering using computational skills
SC.35.CS-CP.1.3-Identify, research and collect a data set on a topic issue, problem or question using age-appropriate technologies
MAFS.5.NBT.1.1: Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left
MAFS.5.NBT.1.2: Explain patterns in the number of zeros of the product when multiplying a number by powers of 10 and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.

Lesson 1-Exploring the Moon

Essential Question: How does the shape of the moon change over the course of a month? What factors cause this to happen?

Lesson Objectives

SC.4.E.5.4 Relate that the rotation of Earth (day and night) and apparent movements of the sun, moon, and stars are connected.
SC.4.E.5.2 Describe the changes in observable shape of the moon over the course of about a month.
SC.5.E.5.3: Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it
SC.5.N.1.5: Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."

SC.35.CS-CS.2.4-Solve real-world problems in science and engineering using computational skills

Engage (approx. 2 hours, split over 3 days)

- Students write everything they can think of about the moon-phases, location, surface texture, shape, exploration in one minute. Discuss as a class to address any misconceptions.
- Apolllo 11 Introduction Video https://www.nasa.gov/multimedia/hd/apollo11_hdpage.html
- Students will use “Touchdown” activity (https://www.jpl.nasa.gov/edu/teach/activity/touchdown/) to create and test a model of a lunar lander. Students will explore the engineering design process using an engineering design notebook to develop a lunar lander that will land safely on the surface of the “moon” while protecting the (marshmallow) astronauts. (see challenge sheet/web site for materials)

Explore (approx. 60 min, split over 2 days)

- Students will observe the phases of the moon using Moon Phases Demonstration https://www.nasa.gov/centers/jpl/education/moonphases-20100913.html
- Students will complete Gizmos Phases of the Moon-Activity B (https://el-gizmos.s3.amazonaws.com/materials/PhasesMoonSE.pdf)

Explain (approx. 45 min)

- Students will read Pearson Elevate Grade 4 text book (shown digitally on SmartBoard by teacher) p. 26-30-Moon Phases and Eclipses
- Students will answer questions and draw diagrams to show position of moon, Earth, and Sun during Solar and Lunar eclipse in notebooks.

Elaborate/Extend (approx. 90 min over 2 days)

- Students will work with the teacher to design an experiment to test how the size of an object hitting a "lunar" surface will affect the features of the surface-adapted from Make a Crater (https://www.jpl.nasa.gov/edu/teach/activity/make-a-crater/) . (see attached)
- Students will work in small groups to conduct the experiment and will share their results with the class.

Evaluate (ongoing throughout lesson)

- Lunar Lander-see Engineering Design rubric
- Gizmos Phases of the Moon Assessment Questions
- Pearson Elevate on-line Lesson Quiz

Lesson 2-Objects in our Solar System-Planets

Essential Question: How does a planet's relative distance from the sun affect the amount of time it takes to complete one orbit around the sun?

Lesson Objectives

SC.5.E.5.1: Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.
SC.5.E.5.3: Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it
SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model
SC.5.N.1.3 Recognize and explain the need for repeated experimental trials.

SC.5.N.1.1: Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions
SC.5.N.1.5: Recognize and explain that authentic scientific investigation frequently does not parallel the steps of "the scientific method."

MAFS.5.NBT.1.1: Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left
MAFS.5.NBT.1.2: Explain patterns in the number of zeros of the product when multiplying a number by powers of 10 and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.

Engage (approx. 30 min)

- Students will watch Study Jams-The Universe (http://studyjams.scholastic.com/studyjams/jams/science/solar-system/universe.htm)
- Students will start a KWL chart about the Universe

Explore (approx. 120 min over 3 days)

- Planet Walk Activity- (from Miami-Dade County Public Schools)
  - Students are put into groups and assigned a planet.
  - Groups will research interesting facts about their planet and will create a poster to share their information.
  - Students will create a model of their planet using Styrofoam balls and paint.
  - Students will take models outside and will show relative distance of the planets from the sun. Also, students will explore the length of a year on each planet by counting the number of times their planet completes one orbit in 5 minutes.

Explain (approx. 30 min)

- Students will read Pearson Elevate Grade 5 p. 7-12
- Students will complete Pearson Elevate Grade 5 Interactivity: Galaxy Structures

Elaborate/Extend (approx. 45 min)

- Students will create a quiz about their planet using Google Forms and will make a QR code to attach to the poster for other students take the quiz.
- Students will practice using powers of 10 to write the distances between the sun and the planets in our solar system.

Evaluate (ongoing throughout lesson)

- Pearson Elevate Quest Check-In: Draw a poster of the Milky Way Galaxy
- Student created quiz

Lesson 3-Objects in our Solar System-Asteroids, Comets, and Meteorites

Essential Question: How are asteroids and comets similar and how are they different?

Lesson Objectives

SC.5.E.5.1: Recognize that a galaxy consists of gas, dust, and many stars, including any objects orbiting the stars. Identify our home galaxy as the Milky Way.
SC.5.E.5.3: Distinguish among the following objects of the Solar System -- Sun, planets, moons, asteroids, comets -- and identify Earth's position in it
SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model

Engage (approx. 10 min)

- Students will watch video of Chelyabinsk (Russia) meteorite explosion (https://www.youtube.com/watch?v=dpmXyJrs7iU)

Explore (approx. 45 min)

- Students will create a "Comet on a Stick" (https://spaceplace.nasa.gov/comet-stick/en/) and learn about the parts of a comet.
- Students will complete "Model an Asteroid" activity (https://www.jpl.nasa.gov/edu/teach/activity/modeling-an-asteroid/)
- Students will reflect on the similarities and differences between their models and actual comets and astroids.

Explain (approx. 75 min, split over 2 days)

- Students will be split into groups and will read a portion of the article "Asteroid Watch: Asteroids, Comets, Meteorites" to create Magnet Summaries about their portion. Portions will be:
  - Asteroids
  - Comets
  - Near Earth Objects and Potentially Hazardous Objects
  - Meteors and Meteorites
- Students will present Magnet Summaries to the class

Elaborate/Extend (approx. 30-45 min)

- Students will write a song, rap, or poem about the differences between asteroids and comets and their distinguishing features.

Evaluate (ongoing throughout lesson)

- Magnet Summaries-Students write one word in the center of the magnet. Then, they write related words attracting to the ends of the magnet. Using these key words, students write a 1-2 sentence summary of the text.
- Reflection-How is your model like a comet/asteroid and how is it different?

RESOURCES:

Touchdown Activity | NASA/JPL Edu. (2018, January 26). Retrieved from https://www.jpl.nasa.gov/edu/teach/activity/touchdown/

Loff, S. (2015, March 16). Apollo 11 HD Videos. Retrieved from https://www.nasa.gov/multimedia/hd/apollo11_hdpage.html

Dunbar, B. (n.d.). Moon Phases Demonstration. Retrieved from https://www.nasa.gov/centers/jpl/education/moonphases-20100913.html

Phases of the Moon Gizmo : Lesson Info : ExploreLearning. (n.d.). Retrieved from https://www.explorelearning.com/index.cfm?method=cResource.dspDetail&resourceID=613

Whip Up a Moon-Like Crater Activity | NASA/JPL Edu. (2017, October 17). Retrieved from https://www.jpl.nasa.gov/edu/teach/activity/make-a-crater/

The Universe. (n.d.). Retrieved from http://studyjams.scholastic.com/studyjams/jams/science/solar-system/universe.htm

Solar System Model and "Planet Walk". (n.d.). Retrieved from http://science.dadeschools.net/elem/InstructionalResources/IR-5.html
SC.5.E.5.1, SC.5.E.5.2, SC.5.E.5.3 Solar System Activity

T. (2013, February 18). Meteor Hits Russia Feb 15, 2013 - Event Archive. Retrieved from https://www.youtube.com/watch?v=dpmXyJrs7iU

Comet on a Stick. (n.d.). Retrieved from https://spaceplace.nasa.gov/comet-stick/en/

Modeling an Asteroid Activity | NASA/JPL Edu. (2017, October 17). Retrieved from https://www.jpl.nasa.gov/edu/teach/activity/modeling-an-asteroid/

Asteroid Watch | Asteroids, Comets, Meteorites. (n.d.). Retrieved from https://www.jpl.nasa.gov/asteroidwatch/asteroids-comets.php

Miller, Z., Padilla, M. J., & Wysession, M. (2019). *Elevate Science Florida-Grade 5*. New York, NY: Pearson Education.