ILLUMINATED ZODIAC MIDDLE SCHOOL LEVEL 2

What's your sign? Let's make it shine! Constellations are groups of stars that the ancients believed formed the outlines of gods and deities. These groupings of stars became the foundation for the 12 astrological signs. Use an empty box as a canvas and add LED lights to illustrate the constellation of your sign.

EDUCATIONAL STANDARDS:

NGSS CONNECTION:

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.

COMMON CORE CONNECTION: ELA/Literacy

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Mathematics

MP.4 Model with mathematics.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

7.RP.A.2 Recognize and represent proportional relationships between quantities.

DOK:



MATERIALS NEEDED:

- Empty box
- LED light string, small
- A printout of your astrological sign
- Pencil
- Paint
- Paint brush
- Masking tape or glue

DIRECTIONS:

- 1. Start by looking up your sign and identifying its constellation.
- 2. Paint the bottom of your box to resemble a night sky. Paint on your constellation, making clear indications of the stars that it consists of.
- 3. Use your pencil to poke holes in the box, at the star points.
- Poke the LED bulbs through the inside of the box coming out through your painting. These bulbs will light up and represent the stars in your constellation. Any extra bulbs can be left in the box.
- 5. Run the power cord to the wall plug, light up your night sky.
- 6. Place the box on a shelf at home and enjoy your illuminated zodiac sign.



OBJECTIVE:

Students will develop a model of the Sun-Earth-Moon system to explain cyclic patterns.

ESSENTIAL QUESTIONS:

- How does the night sky work?
- How did our ancestors use patterns in the sky?
- What patterns in the sky exist?

ENGAGE:

- 1. Have students look at an astrological chart and find their "sign"
- 2. Students create their sign's constellation.
- 3. Students can research the zodiac constellations
- 4. Provide students several questions to respond/research about the zodiac constellations
 - a. How did they come about?
 - i. Ancestors used the stars to tell mythological stories about their gods (many ancient cultures did this and came up with different names and shapes)
 - ii. The zodiac signs are names from greek and roman mythology.

- b. Are the stars in their constellation even related or near each other?
 - i. Most of the stars have no connection to each other beyond the way they appear in the sky to us here on Earth.
- c. Are the zodiac signs actually "there"?
 - i. They are created by our perspective of the stars from Earth
 - ii. Elsewhere in the universe those patterns do not exist in that way (others do)
 - iii. Observatory may have a great exhibit piece demonstrating a change in stars patterns based on perspective (great field trip!)
- 2. Article about constellations
 - a. <u>https://www.space.com/15722-constella</u> tions.html
- 3. Have students make a list of their questions

EXPLORE:

- 1. Have students go out during class time and make celestial observations
 - a. What they see in the sky
 - i. Many students will be amazed that they may see the Moon during the day
 - b. What they feel
 - i. Warmth from the Sun
 - ii. Coldness
 - iii. Wind, rain, snow, clouds
 - c. Students generate a model of the motions of the Sun, Moon and Earth based on what they see
- 2. If possible hold an astronomy night(s)
 - a. Have students repeat Explore part 1
 - b. Students should generate a model to explain the motion of the stars, Sun, Moon, planets
 - i. They may notice "static motion" of stars—they all move together through the sky
 - ii. Random "stars" that move through sky faster than others1. These are planets
 - iii. Motion and shape of Moon

EXPLAIN:

- 1. Show students first 33 minutes of Universe season 1 episode 1: Beyond the big bang
 - a. <u>Beyond the big bang</u> pause the movie between scientist to allow students to add the discover to a revised model of the sun,earth, moon system.
 - i. Astrologers patterns in the (zodiac signs) vs Astronomy
 - 1. Pause the movie and have students conduct a quick compare/contrast
 - 2. Astrology concerned with how the stars affect us (superstition)
 - 3. Astronomy scientific study of how the stars and celestial bodies move
 - ii. Greeks and other ancient civilizations sky is a calendar
 - 1. Ptolemy epicycles
 - 2. 5 celestial planets, sun, and the moon (7 objects) Discuss the days of the weeks with students.
 - a. Sunday (day of the Sun)
 - b. Monday (day of the Moon)
 - c. Tuesday (Martes in spanish) (Mars day)
 - d. Wednesday (Miercoles in spanish) (Mercury Day)
 - e. Thursday (Jueves in spanish) (Jupiter Day)
 - f. Friday (Viernes in spanish) (Venus Day)
 - g. Saturday (Saturn Day)
 - iii. Copernicus
 - 1. Heliocentrism
 - a. Sun is the center of the solar system
 - b. Planets revolve around the sun not earth!
 - 2. The planets are rotating about their axis
 - a. Reason for night day
 - b. Reason stars move all together in the night sky (we are moving!)
 - iv. Kepler
 - 1. Mathematical data to support heliocentrism
 - 2. Tilt of the earth's axis (may have been measured by earlier greek and chinese civilizations)
 - a. Reason for seasons
 - 3. Variable speed model of planets (evidence of gravitation effects)
 - v. Galileo
 - 1. Physical evidence of heliocentrism
 - a. Galilean moons around Jupiter
 - b. Rings around saturn
 - c. Phases of venus
 - 2. Acceleration of falling bodies on earth
 - vi. Newton
 - 1. Theory of Gravity
 - a. Connection of falling object on earth and variable speed model of planets
 - 2. The first written Physics theories
 - 3. Newton's laws of moving bodies.
- 2. After the movie, teacher should review the heliocentric model with students and the gregorian calendar.

ELABORATE:

a.

1. Have students perform an experiment to explore the phases of the Moon

- a. Flashlight (sun)
- b. Students use two different size balls to represent Earth and the Moon.
 - i. Students explore the shadows cast on the Moon by the Sun
 - ii. Note that the Moon doesn't illuminate itself, rather it is reflected light from the Sun.
 - iii. Visibility of one side of the Moon only due to rotation of the Moon
 - iv. Explore what causes eclipses (positioning of Moon, Earth and Sun)
 - v. video of moon phase experiment

2. Astronomy night If possible (time of year and resources)

- Have students locate Venus in the night sky
 - i. One of the brightest objects in the sky
 - ii. <u>Google</u> and <u>Apple</u> have sky maps that chart the night sky
- b. Use a telescope to look at Venus
 - i. At times Venus is visible in phases (like the Moon!)
- c. Have students use their model of the phases of the Moon to demonstrate why Venus goes through phases
 - i. It passes between the Earth and the Sun
 - ii. From our perspective we see cast shadows on Venus like our Moon
 - 1. This is true for any interior planet from your location
 - 2. I.e, if we go to Mars, we will see Earth go through phases

EXPLAIN 2:

1. Teacher and students should use their experiment and information from video to synthesize comprehension of the calendar and reason for seasons.

- a. Calendar
 - i. 7 days in a week-celestial objects visible by the naked eye
 - ii. Roughly 30 days in a month-lunar cycle is 29.5 days
 - iii. 365.25 days in a year-time for the Earth and Moon to revolve around the Sun.
 - iv. 24 hours in a day-time for one Earth rotation around its axis
- b. Seasons
 - i. Earth's tilt and location in orbit around the Sun.
 - ii. This can be modeled with a globe and a light (like the lunar phases)

EVALUATE:

1. Students' completed models (they can be in a form of the teacher's discretion)

- a. Explanation of heliocentric Earth, Moon, Sun system
- b. Rotation and revolution of the Earth and Moon
- c. Lunar phases, eclipses
- d. Gregorian calendar
- e. Seasons