LESSON PLAN

Teacher:

Date: Prior to "GIVE ME SPACE!" performance

Grade Level/Subject: 3rd/Math & Science

Co-Teaching Model Utilized:

Central Focus:

To only serve as a predecessor classroom activity accompaniment for students meant to experience the performance of "GIVE ME SPACE!" During the performance, students in the third grade should be reminded of their previously conducted study: the big picture of where we are located as earthlings in the solar system.

Standards:

Math
3.NF.A.1. Understand a fraction *a/b* as the quantity formed by *a* parts of size 1/*b*.
3.NF.A.2. Understand a fraction as a number on a number line. Represent fractions on a number line.
3.NF.A.3. Explain equivalence of fractions and compare fractions by reasoning about their size.
3.MD.B.3. Draw a scaled pictograph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled graphs.
3.MD.B.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units: whole numbers, halves, or quarters.

Science
3.ESS1:1) Use data to categorize the planets in the solar system as inner or outer planets according to their physical properties.

Objective(s):

To realize Earths' placement in the solar system, scaled planet distances from the Sun will be modeled with fractions by closely making proportionate folds on a rectangular-shaped paper strip such as adding machine paper with the distance between Sun and Pluto equating to 1 unit in length. Planetary orbital periods are also modeled using timed beats from metronome and tonal devices after calculating them.

Academic Language Demands:

Mercury	Pluto	Orbit	Comet
Venus	Sun	Orbital period	Icy objects
Earth	Galaxy (including Milky Way)	Frequency	Rings
Mars	Natural satellites (Moons)	Light year	Fraction
Jupiter	Terrestrial	Astronomical unit (AU)	Proportion
Saturn	Gas giant	Asteroid belt	Meter
Uranus	Ice giant	Kuiper Belt	Metronome
Neptune	Dwarf planet	Rings	Ellipse (oval)
Solar system	Universe	Scale	Model
Gravitational assist			

Accommodations:

It would be wise to discuss the baseline construction of the *pocket solar system* using appropriate folds first and then proceed with all further discussions as how the variety of objects distance themselves in order out from the Sun.

Assessment Measures:

Formative: Q & A during lesson and success of activity accomplishment determined visually
Summative: None

Materials:

Roll of receipt paper (subdivided into 1-meter sections)
Meter sticks
Calculators
Stopwatches
Metronome
8 different tonal devises

PROCEDURES & TIMELINE

Introductory Set:

Freelance communication with the students about their knowledge of the solar system (its parts, its size, where it is, order); additionally, their current fraction(s) knowledge.

Work Session:

Part 1-
Label one end of supplied meter-long paper strip: Sun, the other Pluto.
Fold Sun to Pluto, unfold, mark as Uranus, refold.
Fold Uranus to Sun, unfold.
Mark Saturn on fold closest to Sun, Neptune on fold closest to Pluto.
Fold Sun to Saturn, unfold, mark as Jupiter.
Fold Sun to Jupiter, unfold, mark as Asteroid belt.
Fold Sun to Asteroid belt, unfold, mark as Mars.
Fold Sun to Mars, leave folded.
Fold remainder in half again, unfold.
Mark Mercury closest to Sun.
Mark Earth closest to Mars.
Mark Venus between Mercury and Earth.

Note: all these folds represent some portion or fraction of the intended whole (distance between Sun and Pluto).

Part 2-
Have a metronome set to beat every second and represent one orbital period of Mercury (88 earth days)
Compute the orbital periods of remaining planets in seconds based on above. Example: If Earth has an orbital period of 365 days, then it is 365/88 longer than Mercury's time, thus about 4 seconds.
Considering May 2019 orientations of the planets, orbital periods (different tonal sound for each planet besides Mercury) could be modeled by "rough" approximation with a start tone for each based on times approximated for you below then repeating more systematically as also indicated. By no means is this a very precise model, but it can indicate patterns which are mathematically maintained. Tones could be chosen to represent planet sizes smallest to largest as highest frequency to lowest frequency respectively and also consider the terrestrial planets use percussion tones versus wind instruments to differentiate them.

Mercury – Start on the first metronome beat everyone will use – not manipulated further
Venus – Immediately sounded after first metronome beat – thereafter every 2.5 seconds
Earth – Sounded 1.5 seconds after first metronome beat – thereafter every 4 seconds
Mars – Sounded 6 seconds after first metronome beat – thereafter every 8 seconds
Jupiter – Sounded 16 seconds after first metronome beat – thereafter every 49 seconds
Saturn – Sounded 30 seconds after first metronome beat – thereafter every 2 min. 2 sec.
Neptune – Sounded 51 seconds after first metronome beat – thereafter every 11min-24sec.
Pluto – Sounded 3 min. 51 seconds after first metronome beat – thereafter every 17min-9sec.
Uranus – Sounded 5 min. 29 seconds after first metronome beat – thereafter every 5min-49sec.

Closure:

Since gravitational assist will be considered on the voyage presented at the concert, list a physical characteristic of the planets which could be looked upon to aid and relate them all, although understanding assists comes from more than just this.
Surface gravitational force presented in order (largest to smallest): Jupiter, Neptune, Earth, Saturn, Venus, Uranus, Mercury, Mars, Pluto.
Surprised?

Lesson References:

www.theplanetstoday.com
https://en.wikipedia.org/wiki/Planet
https://nssdc.gsfc.nasa.gov/planetary/factsheet/planet_table_ratio.html