Edible Universe on a String

Summary

Students will create a model solar system using the concept of scale. They will model the planets to an accurate scale and the distance between them.

Time Frame

2 class periods of 45 minutes each

Group Size

Pairs

Life Skills

Aesthetics, Thinking & Reasoning, Communication, Employability, Systems Thinking

Materials

Light colored ribbon (the kind for wrapping holiday gifts)
Markers
Yarn
Whole coffee bean or pinto bean
Grapefruits
Limes
Clementines or small oranges
Grapes
Peppercorns
Sesame seeds or sunflower seeds or both
Marbles (Optional)
Rulers and meter sticks
Science Journals
Tape
Camera
Scissors
Gallon size Ziploc bags
Other materials which fit the sizing of the planets in the attached table, get creative!

Background for Teachers

The concept of scale is a ratio representing the real thing. The diameter of the sun is about 865,000 miles. Since we cannot reproduce this in the classroom we can come up with a scale model that can show us the different sizes and distances between planets.

The sun is about 100 times bigger than the earth. This means we could fit 100 Earth's across the width of the Sun.

The universe is enormous, we can model it in the classroom but only to a certain extent.

Some models have limitations. Ask the students what kind of limitations they might come to find when modeling the universe (such as the classroom isn't big enough to do this activity!).

The inner planets are Mercury, Venus, Earth, and Mars and are considered to be more terrestrial, meaning they have a land like surface. The outer planets of Jupiter, Saturn, Uranus, and Neptune. The outer planets are gaseous and have liquid cores.

Student Prior Knowledge

Students should understand that the Sun is the center of our universe and that planets have moons, but moons are not planets.

Some students may need a review of decimals along with how to use a ruler to measure in centimeters.

Students should be familiar with the earth's orbit around the sun and understand that other planets move around the sun at different speeds.
Students should have an understanding of how models are used to represent things that cannot be fit, because of limitations, into the classroom.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
    c. Given the appropriate instrument, measure length, temperature, volume, and mass in metric units as specified.
    d. Compare things, processes, and events.
    3. Understand Science Concepts and Principles
    a. Know and explain science information specified for the grade level.
    4. Communicate Effectively Using Science Language and Reasoning
    a. Record data accurately when given the appropriate form (e.g., table, graph, chart).
    b. Describe or explain observations carefully and report with pictures, sentences, and models

Instructional Procedures

Begin the lesson with drawing a big circle on the board representing the Sun. Ask a few students to come up with how big they think earth might be compared to the Sun. Students may draw many sizes, some students may have the misconception that the Sun is smaller than the earth since it looks so small when we are outside.

Ask students some other questions about why earth is so special. Example questions might be "What makes earth unique?" "Is it the only planet that gets sunlight?" "Do you think trees grow on other planets?". Engage the students and even challenge them to write all the planets on the board if they can. If you have not introduced planets yet, they may only come up with a few planets.

Introducing the concepts of models and reviewing it will be important. Ask your students to tell you what a model is (A smaller representation of the real thing). Since we cannot bring the Sun into our classroom, a model will have to do.

Ask the students "Are models always accurate?". Why or why not? The students may answer with various explanations. Ask again, "How could we get our models to be more accurate?" They may or may not know what you are talking about. "What is a scale?" (a popular answer might be the kind you weigh yourself on). Models of "SCALE" are models representing the real thing with real measurements but shrunk down or enlarged. If we drew an earth on the board of 1 cm, we know the Sun is 100 times bigger than the earth. This would mean our Sun picture would be 100 cm (or 1 meter)! By shrinking down the real numbers into units that are smaller, a model can be created "to

scale". If we blew the model back up, it would still be accurate.

Tell your students today they will have the challenge of creating a solar system (which may or may not be edible) but they are in charge of measurements and collecting planets for their teams. This lesson can be done in two ways, if your students are more advanced in mathematics and if you have more time, you can actually get the students to calculate the numbers they will need. Otherwise use the attached worksheet (which can be modified).

First, have students cut out labels for their planets and fill in the planet names in those labels, spelling counts. Put the labels in the big Ziploc baggies for safe keeping or if they are working at a set desk, they can put the labels in their work area. The students may also want to write their name on their baggies.

Next, have the students use measurement tools like rulers to find objects that match on their table. (Earth is around 1 cm, they might measure a bean). The Sun is 1 meter in diameter, since many objects will not be that big in the classroom, ask the students how they could create a circle that size given the supplies available. (Usually they will choose yarn and ribbon and tie the ends).

Once the students have figured out how big or small their planets are and labeled them they will have to create the model to represent the distance of the planets from the Sun. This is a good place to stop for Day 1 and continue this on Day 2. This is also a good time to talk about what's wrong with the model (the Sun will be at one end of the model instead of in the middle, so it's not a good representation of position).

Have students place a Sun at one end of the room (or outside). They will again use their data table to measure. Ask the students, "How will we know how much string to use or ribbon to use?". They may come up with "check which planet is the farthest and work backward." If they cannot come to a conclusion on this, you may have to help them.

Have the students use their ribbon and mark where the planets will be located. They will then stick their labels and their fruit or beans on the ribbon and demonstrate their model.

When they have completed their model the instructor can check for accuracy or if one group of students finishes quickly and accurately, they could help to check the other students work.

Students should be able to answer questions such as, "Which planet is the closest to the Sun and which is the farthest?"

Also have a round table discussion on why this all really matters to begin with. Why on earth, should we care about the other planets and how far or close they are to the sun? How will that help us in science?

Strategies for Diverse Learners

If students do not speak English as a first language, the teacher may want to model what to do. Perhaps work on the first planet together and how to fill out the table.

Encourage students to use language skills and share some words with the class. Some students may know many languages and words for "Planets, stars, space". This could be incorporated into the lesson.

Extensions

Students can use a video camera device and record their model complete with a narrative about it. Students can assign a person on their team to be the "documentary" person and he or she can take photos during the construction and put together a slide show upon completion.

Assessment Plan

Students will need to explain what their model represents to the class.
The following day, a paragraph about the relative size of planets and distances compared to the sun should be written.

Have students create a circular plot on a butcher paper or scrap news papers representing the size of the planets from the table where the sun was 1 meter in size. Have them draw the sizes of the other planets and label them.

Bibliography

Relative Sizes of the Earth and Planets
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