



Science Unit: *Space*

Lesson 6: *Our Star the Sun and its Friends the Planets*

School year: 2006/2007

Developed for: Sexsmith Elementary School, Vancouver School District

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Grade level: Presented to grades 2 and 3, appropriate for grades 2-6 with age appropriate modifications.

Duration of lesson: 1 hour and 20 minutes

Notes: Half of the lesson was delivered to two classes together - the Relative Orbiting activity could require a large number of students (may be adapted for a smaller group).

Objectives

1. Students will be able to correctly order the planets from the sun
2. Students will be able to recognize the relative size of planets respective to the sun
3. Students will be able to correlate distance from the sun with orbit size

Background Information

There are two main theories on how the solar system was created. When stars are formed they go through a process of collapsing gases and dust into a blob. This blob collapses and forms a disk with the new star at its centre. As the star grows, the material left over from the blob enters the disk and becomes trapped around the growing star by gravity and accumulates forming a disk around the star. When the star stops attracting particles from the disk-shaped cloud, it becomes a real star. At this point the star can produce nuclear reactions that fuse hydrogen atoms into helium and therefore there is a force counteracting the pull of gravity. The left-over matter orbiting the star will collide and forms the planets, which will in turn orbit around the star, thus forming a solar system. This is the protoplanetary theory.

New supportive evidence for this theory was recently uncovered in 2004. The evidence comes from the observation of a new star in formation in the Milky Way. The star called AU Microscopii is small in size but was observed to have a dust disk around it. More observation showed that clumps in the outer edge of the disk are already formed. The new theory states that the star and its planets are formed simultaneously from the same nebula.

This theory explains why the star in our solar system is so much bigger than the planets. Most of the nebula went into making the sun and the left over material, about 1% of the nebula formed smaller clumps, which eventually became the planets of the solar system.

The solar system contains our star, the sun, many asteroids and comets and it used to contain 9 planets. Pluto was the farthest planet, but it got demoted from a planet to a dwarf planet. The planets of the solar system form 2 categories: the inner planets and the outer planets, which are separated by an asteroid belt. The inner planets are: Mercury, Venus, Earth and Mars. The inner planets are the smallest planets of the solar system and have a rocky composition. These are the terrestrial planets. Beyond Mars lie the Asteroid belt that separates the inner planets from the outer planets. The outer planets are: Jupiter, Saturn, Uranus and Neptune. These are the jovian planets or the gas giants. The outer planets are the largest in the solar system but each planet is mostly made of gas.



Neptune is the farthest planet from the sun and therefore the largest orbit, taking about 165 years to go once around the sun. In comparison, Mercury, being the planet closest to the sun has the smallest orbit, only taking about 87 days to go around the sun.

Vocabulary

Orbit: The path a space object takes around another larger object (ie. Earth around the sun, moon around Earth.)

Materials for this lesson

- Material for Earth as a peppercorn activity
- Foil
- Pylons
- Card paper (orange or yellow)
- Styrofoam sheets
- Wooden skewers
- Different colours of Plasticine or Playdough
- 9 white poster boards
- Crayons, clear tape
- 8 yard sticks
- Drum
- 15 m paper roll

In the Classroom

Introductory Discussion (Hook)

1. Review the material learned up to this lesson - make it a charades game
2. Ask students about the closest star to our planet.
 - o Where is that star? (solar system)
 - o What else do we have in the solar system? (planets, comets, asteroids, meteorites)
3. Ask them to talk about the solar system planets
4. Guide them to wonder about the relative sizes of the planets as compared to the sun

Science Activity/Experiment

Activity Title: Earth as a Peppercorn (Science World Binder of Activities)

Purpose of Activity: Shows the relative size of each planet as compared to the sun and the other planets.

Activity Instructions:

1. Use a white poster board and use tape to attach an inflated yellow balloon (about 20cm) – this is the sun
2. Have the students call the order of the planets and place them in order from the sun. Write the planets’ name on the poster board above the taped object to represent the relative size of the planet.

Planet	Object to represent	Diameter size
Sun	Balloon or ball	200 mm
Mercury	Thumbtack tip, or cake sprinkle	0.75 mm
Venus	Peppercorn	2.0 mm



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Earth	Peppercorn	2.0 mm
Mars	Thumbtack tip, or cake sprinkle	1.0 mm
Jupiter	Malt ball, chestnut, pecan or gooseberry	22.5 mm
Saturn	Scotch mint, hazelnut or acorn	17.5 mm
Uranus	Peanut, coffee bean or chickpea	7.5 mm
Neptune	Peanut, coffee bean or chickpea	7.5 mm

Science Activity/Experiment

Activity Title: Relative Orbiting

Purpose of Activity: Show the relative distance of each planet from the sun and each other

Activity Instructions:

Making the paper tape solar system – this can be done in preparation for the lesson or the students could make this as part of their learning.

1. Use a long roll of paper (15m). At one edge of the paper draw and write sun.
2. Using the table below draw the other planets of the solar system

Space Object	Distance from the sun (edge of paper roll)
Sun	0
Mercury	0.19 (19 cm)
Venus	0.36 (36 cm)
Earth	0.50 (50 cm)
Mars	0.75 (75 cm)
Asteroid belt	1.1 to 1.6 m
Jupiter	2.6 m
Saturn	4.75 m
Uranus	9.6 m
Neptune	15 m

3. Laminate the paper tape (this is mostly for durability and in case of rain)

Making the Planet Signs

1. Divide the students into 8 groups – one for each planet
2. Give each group a white poster board and show them how to draw a circle using a pencil attached to a string previously cut to the correct size (in this lesson our circles had a radius of 26cm) and cut the circle.
3. Provide each group with facts and pictures of their planets and tell the students to decorate their circular sign with the colours of their planet.



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4. Using tape, attach a yard stick to the back on the circle write the planet's name and any fun facts about it.
5. Have each group pick their favourite fact and to choose a presenter to share it with the class.

Orbiting – outdoor activity

1. Take the students to a large field
2. Starting at the sun, unroll the paper tape and have the Mercury group stand by that planet's marking on the paper tape. You could have the tape on the ground or have an adult hold the tape and be the sun.
3. Using 4 pylons mark the orbit that Mercury would take around the sun
4. Holding their planets sign, have one person from the Mercury group go around the outside of the pylons and use the drum to mark the pace.
5. All the other students should be counting out loud the number of steps (=drum beats) until the planet's representative has made a full circle around the sun. Record the number of steps.
6. Do the same for all the other planets, always counting the steps to the beat and recording the final number of steps.
7. After the last planet, ask the other students to join their group's representative and together the entire 'solar system' should orbit to the beat of the drum.
8. Take the students back to the classroom and discuss the activity.

Science Activity/Experiment

Activity Title: Solar System Model

Purpose of Activity: Show the order and the colour of the solar system planets

Activity Instructions:

1. Give each student a rectangle piece of Styrofoam (~40 x 30 cm), a piece of foil large enough to cover the Styrofoam, 9 wooden skewers, one sheet of yellow or orange card paper, small pieces of plasticine of different colours.
2. Instruct the students to wrap their Styrofoam with the foil and to cut the orange card paper into the shape of the sun (try to keep it as big a possible)
3. With tape, attach a skewer to the sun and poke the pointy end to hold the sun onto the Styrofoam sheet.
4. Instruct them to use the different colours of plasticine to make the planets true to their original colour.
5. Make the planets from the biggest to the smallest (to make sure there will be enough plasticine for all the planets)
6. Attach the plasticine planet to the blunt end to a skewer and again poke the pointy end on the Styrofoam to hold the planet up.

Scientific Report: write on their space journal (time for this is not included in this lesson)



References

1. Engaging Science. Pacific Space Centre. Surfing the Solar System. Science World Activities Resource Binder.

Teacher Assessment of Learning

1. Are the students able to correctly order the planets from the sun?
2. Are the students able to understand the relative planet sizes as compared to the sun?
3. Are the students able to correlate distance from the sun and orbit length?

Extension of Lesson Plan

1. Research planets' characteristics and write on their space journal.
2. Add the asteroid belts to the solar system model.