

## ***A Journey Through the Solar System***

Lesson Plan

Grade(s): 1-3

### **Goal/Purpose:**

The purpose of this lesson is for students to acquire information about the objects in the solar system, how they are viewed from Earth, and how light pollution can affect viewing of, research on, and our understanding of our solar system and the universe.

### **Desired Learning Outcomes:**

1. Students will learn that the Earth is one of several planets orbiting the sun.
2. Students will learn that there are nine planets varying in size, structure, appearance, and distance from the sun.
3. Students will learn that artificial outdoor light changes the night sky and our visibility of solar bodies and others throughout the universe.
4. Students will learn that negative changes can occur in the Earth's ecosystems when there is too much artificial outdoor lighting (light pollution).

### **New Vocabulary:**

Light Pollution: Too much outdoor light (glare and light trespass) that causes a glow above a city. It interferes with viewing the night sky and can disrupt surrounding environments.

Telescope: An optical device that uses lenses and mirrors to collect and focus light so humans can see distant objects.

Crater: A depression or cavity that is made on a space object when it is struck by another object.

Sky glow: A brightening of the night sky by manmade outdoor lighting that blocks the view of the stars.

Nocturnal animals: Animals who are mostly active during the night instead of the day.

Artificial lighting: Light that is human made, not by nature.

Glare: An intense and blinding halo of light that causes you to squint. It comes from an unshielded or partially shielded light fixture and contributes to sky glow.

Light Trespass: Outdoor lighting that falls where it is not wanted or needed, such as through a bedroom window when you are trying to sleep.

## **Background:**

Light pollution was unheard of until far after 1854 when the light bulb was invented. As lights became more common, light pollution became more of an issue. Today, bubbles of light fill the sky over human populations, blotting out the planets, stars and galaxies that humans have spent thousands of years learning from. The effects of light pollution are often underestimated by society since light has become such an integral part of nighttime safety, but in truth, light pollution is a major environmental hazard.

Light pollution is a major factor in energy waste. Every year, bad lighting that shines into the sky wastes billions of dollars and gross amounts of fossil fuels. Much energy would be saved if proper lighting were used. This means energy efficient lighting that only shines light toward the ground where people are. Another overlooked factor of the effects of light pollution is the impact it has on the nighttime ecosystem. By turning our night into day, we are changing the habitats of millions of plants and animals. Some animals, like loggerhead sea turtles, are becoming extinct because of this.

Perhaps the most visual effect of light pollution is how it blocks the stars and planets from our view. Humans have been using the night sky as a resource to develop culture and technology for thousands of years. Many modern technologies (such as cell phone satellites) have been developed using physical properties discovered while studying the stars. By erasing the night sky, humans are erasing a rich history and possible future technology. It is important that humans study the night sky, and learning about the solar system is the first step to a greater understanding of it.

## **General Misconceptions:**

- The Earth is at the center of the solar system.
- Lights do not have an affect on the night ecosystem.
- The biggest object in the solar system is Earth.
- The solar system includes all of the stars and galaxies.
- The sun is not a star.
- The solar system is small.
- We can blow up the sun.
- It is easier to see at night when there is a lot of light.

## **Preparation Time:**

Instructor should allow time to thoroughly review presentations and materials.

## **Presentation Time:**

Presentation time will take approximately 40-55 minutes.

## **Physical Layout of Room:**

The room requires a projection screen. In classrooms where there are skylights or windows that cannot be covered, it may be necessary to use an alternative space or method of presentation, such as through color copies or transparencies. In a classroom where a projector and a computer are available, students will need to be arranged so that the projector can be placed in the center of the room.

**Materials:**

- Computer with PowerPoint 2000 or above. Computer should be attached to a projector. PowerPoint Reader 2003 is included on the CD for computers without PowerPoint.
- Computer should have Adobe Reader. It is included on the CD.
- A Journey Through the Solar System PowerPoint presentation
- A Journey Through the Solar System: Shakedown game
- Solar System Double Take game
- Flash cards

**Procedure/Directions:**

- **Introduction**  
The instructor will guide students through the PowerPoint presentation. Each slide is organized with graphics and text to lead students through the components of the solar system and light pollution. At the end of the presentation, students will be assessed with an interactive card game and/or a Jeopardy style trivia game.
- **Engagement Activity**  
Here are some suggestions:
  1. Have students draw pictures of the planets and what they think the solar system looks like without prior research.
  2. Have the students draw a picture of one of the planets and include why they would like to live there.
  3. Have the students draw pictures of what the lights around their homes and communities look like.
  4. Have the students brainstorm and discuss what Earth would be like without the use of lights.
- **Step-by-Step Instructions**

**A Journey Through the Solar System Presentation:**

1. If you need to install Adobe Acrobat Reader, open the presentation CD and find your operating system under the Adobe folder. Double click on the .exe file under your operating system version and follow the onscreen instructions. If your version is not listed, please visit [http://www.adobe.com/products/acrobat/readstep2\\_allversions.html](http://www.adobe.com/products/acrobat/readstep2_allversions.html) for more options.

2. If you need to install PowerPoint Reader, double click on ppviewer.exe and follow the onscreen instructions.
3. Before beginning, you may choose to open AJourneyThroughtheSolarSystem.ppt and print the slide notes by: click on 'file' → 'print' → under 'print what?' choose 'notes pages' and click 'ok.' These notes are provided as speaking topics for each slide.
4. The slide notes are written in a bulleted format to make it easy to choose which facts will be used to teach the presentation. However, it is recommended to use all of the facts if time permits. Facts are written based on the U.S. National Science Standards for this grade level.
5. Setup computer and projector in a dark classroom. Open AJourneyThroughtheSolarSystem.ppt in PowerPoint in 'slide show' mode.
6. Use slide notes to give the presentation. Note: Enhanced Photos are photos taken in other wavelengths such as infrared, radio, ultra-violet, x-ray, and gamma. Scientists can also enhance photos to be a different color or adjust the brightness and contrast. This helps scientists to easily see unique features of solar bodies.

#### Solar System Double Take Game:

1. Open cd:/doubletake/doubletake.pdf
2. The directions for game rules and assembling game are included in the file.

#### Solar System Shake Down

1. Open Solar System Shakedown.ppt in PowerPoint or PowerPoint reader. In order for the game to work properly, it must be opened in 'slide show' mode. It is recommended to read the game instructions, which are included within the game.
2. The main menu should be on the screen. Use the mouse to click on the available button choices. 'Instructions' will take you to the instructions for playing the game, 'play game' will take you to the game board and 'quit' will exit the game.
3. Once inside the game, click on 'main menu' at the bottom right of the game board and then 'quit' to exit the game.
4. Solar System Shake Down is designed to compliment the information given in the presentation. If you chose not to use all of the slide notes in the presentation, then you can use the Solar System Shake Down study sheet to make sure students are prepared to answer the questions.

#### **Evaluation/Assessment**

Students can be evaluated with a quiz. Some other suggestions are:

- Have the students draw a picture and explain their favorite object in the solar system.

- Have the students draw an alien that lives on a specific planet. The students must use the information learned in the presentation to explain the alien's appearance.

### **Follow-Up Activities**

1. Using bottles of different weights, students guess which planet each one is and place them in the correct order from the sun to Pluto.
2. Use the flash cards to review the information learned in the presentation.
3. Students will create a solar system mobile that shows differences in the sizes, physical features, and colors of each planet and the sun.
4. Students will write down any questions they still have after the presentation is complete and then research the answers.
5. Students will draw a picture depicting how different astronomy would be if there was no light pollution.
6. Students can draw a picture of how they think the night sky looks, and then compare it with an image of how the night sky looks without light pollution.
7. Students can participate in a group discussion about how a group of people moving to Mars can keep light pollution from ruining their new planet.
8. During group time, the students can be read books, poems, or songs that involve the stars and their importance.
9. Play *Astronomy Shakedown!*
10. Students will fill out the *Solar System: Above and Beyond* workbook.

### **One Computer Classroom**

#### **Classrooms Without Computers**

Here are some suggestions:

1. If you have access to a computer at home or in the school library, you may print selected parts of the lesson as paper copies or transparencies.
2. If your school has projection capabilities in the library or another room located outside your classroom, use this location as your presentation site.

### **Home Schooled**

This lesson can easily be followed and conducted in a home school group session as long as the district-mandated prerequisites are met. Parents should review the lesson information and fully examine the teacher's guide beforehand.

## **Addendum**

Solar System: The expanse of space near the sun, which includes Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, asteroids, comets, and meteors.

The Sun: The star nearest to Earth which provides the solar system with most of its natural energy and consumes more than 98% of all the mass in the solar system. Most objects in the solar system orbit around it.

Mercury: This planet is nearest to the sun, small, and has no atmosphere. This means there is no wind or rain to erode the land and change the way it looks.

Venus: This planet is known for rotating backwards (clockwise) and being the hottest planet in the solar system, 900° F on the average day. Its day is also longer than its year.

Earth: This planet is known for being the only one with liquid water and life.

Mars: This planet is known for being the most likely planet to have had life before Earth. Its also is the most explored planet by unmanned spacecraft.

Jupiter: This planet is 11 times the size of Earth. It is made of gas, has over 60 moons, and has a famous storm that is at least twice the size of Earth and has lasted for over 300 years.

Saturn: This planet is known for its massive rings. It is also the second largest planet in the solar system, being 9 times larger than Earth. It is completely made of gas.

Uranus: This planet is known for being “the lazy planet” because it orbits on its side. It’s also mostly made of the gas helium.

Neptune: This planet is known for being the first planet discovered mathematically rather than by observation. It is mostly made of a gas called methane.

Pluto: This dwarf planet is known for being the furthest from the sun. It is made mostly of rock and ice. Recently, it has become a highly controversial subject as to whether or not it is actually a planet.