

# Delaware Science Coalition



## Grade 4 Sky Watchers Unit Template



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*Preface: This unit has been created as a model for teachers in their designing or redesigning of course curricula. It is by no means intended to be inclusive; rather it is meant to be a springboard for teacher thought and creativity. The information we have included represents one possibility for developing a unit based on the Delaware content standards and the Understanding by Design framework and philosophy.*

### **Brief Summary of Unit:**

**In this unit students will learn about comparing and contrasting the day and nighttime sky, earth rotation and revolution and its affect on seasonal change, moon phases, the effects of the sun in producing light and heat, and the components of the solar system.**

## **Stage 1: Desired Results** **Delaware Science Content Standards**

### **Delaware Science Content Standards**

**This course focuses on the Delaware Science Content Standards and Grade Level Expectations in Standards 1 and 4 found on the following web site: [http://www.doe.k12.de.us/programs/ci/content\\_areas/science.shtml](http://www.doe.k12.de.us/programs/ci/content_areas/science.shtml)**

### **Standard 1: Nature and Application of Science and Technology**

Understandings and Abilities of Scientific Inquiry

Students should know and be able to:

1. Understand that: Scientific investigations involve asking a focused scientific question. Investigations differ depending upon the question being asked.
  - Be able to: Generate focused questions and informed predictions about the natural world.
2. Understand that: Fair test design supports the validity of the investigation. Sometimes it is not possible to know everything that will have an effect on the investigation or control all conditions.
  - Be able to: Design and conduct simple to multi-step investigations in order to test predictions. Keep constant all but the condition being tested.
3. Understand that: The purpose of accurate data collection is to provide evidence to compare with the prediction.
  - Be able to: Accurately collect data using observations, simple tools and equipment. Display and organize data in tables, charts, diagrams, and bar graphs or plots over time. Compare and question results with and from others.
4. Understand that: The body of scientific knowledge grows as scientists ask questions, conduct investigations, develop explanations and compare results with what is already known.
  - Be able to: Construct a reasonable explanation by analyzing evidence from the data. Revise the explanation after comparing results with other sources or after further investigation.

5. Understand that: The purpose of communicating is to share and justify results. Scientists communicate their results to others, including the details that allow others to replicate the results.
  - Be able to: Communicate procedures, data, and explanations to a variety of audiences. Justify the results by using evidence to form an argument.
6. Understand that: The use of mathematics, reading, writing, and technology are important in conducting scientific inquiries.
  - Be able to: Use mathematics, reading, writing, and technology when conducting scientific inquiries.

#### Science, Technology, and Society

Students should know that:

1. Science and technology are related. Technology provides the tools needed for science to investigate questions and may provide solutions to society's problems, wants, or needs. Not all technological solutions are effective, uniformly beneficial, or equally available to everyone.

Students should be able to:

- Using newspapers, the internet, and actual sky observations when possible, chart the appearance of the Moon in the night sky over the course of at least two months. Identify the basic pattern of the Moon's appearance. Classify the Moon's appearance by using the terms new, first quarter, full, last (third) quarter.
- Use photos gathered from robot probes, the Hubble telescope, and manned exploration of the Moon, to examine pictures of the planets and Moon.

#### **Standard 4: Earth in Space**

##### The Earth/Moon/Sun System

Students should know that:

1. The apparent path of the Sun, as seen from Earth, is from east to west. Over the course of a day, half of the Earth is always illuminated by the Sun causing day, and the half not illuminated by the Sun experiences nighttime.

Students should be able to:

- Observe and describe the path of the Sun as it appears to move across the sky from east to west during the course of a day.

Students should know that:

2. The cycle from day to night is caused by the Earth's rotation. Earth undergoes one complete rotation about every 24 hours.

Students should be able to:

- Use models to describe how the Earth's rotation on its axis causes one half of the Earth to always be illuminated by the Sun (day) and one half to not be illuminated by the Sun (night). Apply this model of the rotating Earth to explain why the Sun appears to move across the sky each day from east to west.

Students should know that:

3. The Moon orbits the Earth. The appearance of the Moon changes as it moves through its orbit. These changes are called phases.

Students should be able to:

- Using newspapers, the internet, and actual sky observations when possible, charts the appearance of the Moon in the night sky over the course of at least two months. Identify the basic pattern of the Moon's appearance. Classify the Moon's appearance by using the terms new, first quarter, full, last (third) quarter.

Students should know that:

4. The Sun is much larger than the Moon. Although the Moon is closer to Earth than the Sun, the two appear to be the same size when viewed from Earth. This is because objects appear smaller as the distance from the viewer increases.

Students should be able to:

- Observe the size of the Sun and Moon in the sky. Use models to illustrate the approximate size and distance relationship between the Sun and Moon. Explain why the Sun and Moon appear to be similar in size when observed in the sky.

### The Solar System

Students should know that:

1. Earth is one of the planets in our Solar System that orbits the Sun. The Sun we see during the day is our nearest star. Stars we see at night lie outside our Solar System.

Students should be able to:

- Identify and order the major planets and describe how they all revolve around the Sun.
- Research and develop a short report on one of the planets in the Solar System. Compare the information learned in the reports.
- Describe our Sun as a star that is similar to other stars that are seen in the night sky. Explain why our Sun appears to be larger in size than other stars.

### Technology and Applications

Students should know that:

1. Humanity's view of the Solar System has expanded enormously as a result of our exploration of outer space. The Hubble telescope gives us a better view of the many planets than the view we have from the Earth. Robot probes; sent to planets, send back close-up pictures of their surfaces.

Students should be able to:

- Use photos gathered from terrestrial telescopes, robot probes, the Hubble telescope, and manned exploration of the Moon to examine pictures of the planets and Moon.

### **Big Ideas**

1. Observe different objects in the daytime and nighttime sky.
2. Using models to demonstrate that rotation, revolutions, day, night, and seasons are repeating predictable patterns.

3. Observe the cycles or predictable pattern of the moon phases.
4. Use of technology to gather planetary data for comparison.
5. Investigate the pattern of the sun's movement across the sky and its effects.

**Unit Enduring Understandings****Students will understand that...**

1. Scientific inquiry involves asking scientifically oriented questions, collecting evidence, forming explanations, connecting explanations to scientific knowledge and theory, and communicating and justifying the explanation.
2. Understanding past processes and contributions is essential in building scientific knowledge.
3. There are observable, predictable patterns of movement in the Earth, Moon, and Sun system that account for day and night.
4. Technology expands our knowledge of the Earth, Moon, and Sun System.
5. Earth is part of a system that includes other planets.

**Unit Essential Question(s)**

1. How have past scientific contributions influenced current scientific understanding of the world?
2. What predictable, observable patterns occur as a result of the interaction between the Earth, Moon, and Sun? What causes these patterns?
3. What is Earth's place in the Solar System?
4. How has technology expanded our knowledge of the Earth, Moon, and Sun System?

**Knowledge & Skills****Students will know....**

- Different objects appear in the daytime and nighttime sky.
- Night and day are caused by the rotation of the earth on its axis.

- Earth revolves around the sun once a year.
- The tilt of Earth results in seasonal changes.
- The sun gives us energy in the form of light and heat.
- The position of the sun in the sky appears to change over the course of a day.
- The moon appears to change shape in a predictable, repeated monthly pattern of phases.
- The sun, the center of our solar system, is only one of billions of stars in the universe.
- The planets differ in size, composition, and characteristics.
- The planets all orbit the sun in a fixed arrangement in the solar system.

**Students will be able to (Grade Level Expectations)...**

Measure and record temperature

Measure and record height of shadows

Use simple tools to take measurements including temperature and height,

Use models to demonstrate and describe rotation and revolution, day and night, and seasonal change,

Illustrate moon phases, shadow tracings, and features in the day and night sky,

Conduct simple experiments and draw conclusions from the results,

Make predictions about the sun's position in the sky, temperatures in sunlight and shade, and phases of the moon,

Communicate ideas, observations, and experiences through discussion, writing, and drawings,

Observe characteristics of the planets,

Create a model of the solar system,

Observe the size of the sun and moon in the sky

Use models to illustrate the approximate size and distance relationship between the sun and the moon

Explain why the sun and moon appear to be similar in size when observed in the sky

Use photos gathered from terrestrial telescopes, robot probes, the Hubble telescope and manned exploration of the moon to examine pictures of the planets and moon

**Stage 2: Assessment Evidence**  
(Design Assessments To Guide Instruction)

**Suggested Performance Task(s)**

The SkyWatchers unit is assessed through the use of an end-of-unit summative assessment. This assessment is intended to uncover student misconceptions, which will then inform instruction. At this time there is no summative assessment developed by the Coalition. It is currently under development.

**Other Evidence**

Possible Formative Assessments from Investigations

Lesson 1: What can we see in the Sky?  
Activity Sheet #1: Day and Night

Lesson 2: Rotation and Revolution  
Activity Sheet #2: Rotation and Revolution

Lesson 3: The Effects of the Sun  
Activity Sheet #3A: Changing Shadows  
Activity Sheet #3B: Temperatures in Sun and Shade

Lesson 4: The Phases of the Moon  
Activity Sheet #4: Phases of the Moon

Lesson 5: Our Place in Space  
Activity Sheet #5: The Nine Planets

Overall Assessment: Research project and presentation on planets

### Stage 3: Learning Plan

(Design Learning Activities To Align with Goals and Assessments)

#### Key learning events needed to achieve unit goals

Carolina Biological: Sky Watchers. Building Blocks Science. 2006.

#### **Investigation 1: What Can We See in the Sky?**

Activity – Students compare and contrast what they see in the day and nighttime sky.

#### **Investigation 2: Rotation and Revolution**

Activity – Students model how the rotation and revolution of the earth around the sun creates seasonal changes and day/night

#### **Investigation 3: The Effects of the Sun: Heat and Light**

Activity-Students perform experiments proving the Sun is the source of heat and light, and the apparent movement of the Sun across the sky is evidenced by shadows.

#### **Investigation 4: The Phases of the Moon**

Activity-Students recall information about rotation and revolution to begin to understand how the moon moves relative to the Sun and Earth creating predictable, monthly patterns of moon phases.

#### **Investigation 5: Our Place in Space: The Nine Planets**

Activity-Students research and observe images on the internet, posters and text sources to compare the physical features of each planet and use this information to create a model of the solar system.

#### **Resources & Teaching Tips** (Consider the two questions below when completing this section.)

- **What text/print/media/kit/web resources best support this unit?**

#### **Websites:**

[www.nasa.gov](http://www.nasa.gov)

[www.onr.navy.mil/focus/spacesciences/observingsky/motion1.htm](http://www.onr.navy.mil/focus/spacesciences/observingsky/motion1.htm)

[www.classzone.com/books/earthscience/terc/content/visualizations/es0408/es0408page01](http://www.classzone.com/books/earthscience/terc/content/visualizations/es0408/es0408page01)

[www.spo.gov/gffc.nasa.gov/stargaze/Sundial.htm](http://www.spo.gov/gffc.nasa.gov/stargaze/Sundial.htm)

<http://kids.msfc.nasa.gov>

<http://solarsystem.nasa.gov/educ/docs/Solar Sys Litho.pdf>

[www.astro.umd.edu/education/astro/moon/phases.html](http://www.astro.umd.edu/education/astro/moon/phases.html)

<http://starchild.gsfc.nasa.gov/>

Resources for Students: Books

Ashby, Ruth. Rocket Man: The Mercury Adventure of John Glenn Peachtree Publishers, 2005

Fredericks, Anthony. Exploring the Universe. Fulcrum Publishing, 2000

Gormley, Beatrice. Maria Mitchell: The Soul of an Astronomer. Eerdmans Books for Young Readers, 2004.

Nelson, Nigel. Looking into Space. Readers Digest, 1998.

Ride, Sally and Tam O'Shaughnessy. Exploring our Solar System. Crown, 2003.

Riley, Peter. Our Solar System. Random House Value Publishing, 1996.

Simon, Seymour. The Moon. Schuster, 2003.

- What tips to teachers of the unit can you offer about likely rough spots/student misunderstandings and performance weaknesses, and how to troubleshoot those issues?

To be completed by District teachers...

<b>Accommodation/Differentiation ideas and tips</b>