



## Seasons

### DESCRIPTION

In this set of activities, students explore different factors related to seasonal changes.

### OBJECTIVES

Students will:

- Access NOAA and NASA climate data from Internet resources.
- Determine changes in average temperatures, precipitation and cloud cover over time from data.
- Relate global changes to local changes
- Explain the relationship between the earth and the Sun.
- Model the movement of the earth around the sun.
- Define Solstice and Equinox.

## NASA SUMMER OF INNOVATION

### UNIT

*Earth and Space – Climate and Seasons*

### GRADE LEVELS

7<sup>th</sup> – 9<sup>th</sup>

### CONNECTION TO CURRICULUM

*Science*

### TEACHER PREPARATION TIME

1 hour

### LESSON TIME NEEDED

4 hours      *Complexity: Moderate*



## NATIONAL STANDARDS

### National Science Education Standards (NSTA)

#### *Science as Inquiry*

- Understanding of scientific concepts
- An appreciation of 'how we know' what we know in science
- Understanding of the nature of science
- Skills necessary to become independent inquirers about the natural world
- The dispositions to use the skills, abilities, and attitudes associated with science

#### *Science in Personal and Social Perspectives*

- Populations, resources, and environments
- Natural hazards, risks and benefits
- Science and technology in society

## MANAGEMENT

The activities in this lesson should be done with pairs and cooperative groups of three to four students. If high-quality color copies of the Color Visualizations are not available, students can create them using *Work Sheet* copies and colored pencils or markers. Alternatively, if there are enough computers for each group (e.g., in a lab setup), students can access the visualizations on the GLOBE Web site.

## CONTENT RESEARCH

It is essential for students to understand the mechanics of seasons, how the earth orbits on its axis around the sun to create our seasons. Each of the four divisions of the year (spring, summer, autumn, and winter) marked by particular weather patterns and daylight hours, result from the earth's changing position with regard to the sun. The difference between weather and climate is a measure of time. **Weather** is what conditions of the atmosphere are over a short period of time, and **climate** is how the atmosphere "behaves" over relatively long periods of time.

### Key Terms:

- **Anomaly** – Something that deviates from what is standard, normal, or expected.
- **Axis** - An imaginary line about which a body rotates.
- **Climate** - The weather conditions prevailing in an area in general and over a long period of time.
- **Equinox** - Twice each year the sun crosses the celestial equator, when day and night are of equal length (about September 22 and March 20).
- **Temperature** - The degree or intensity of heat present in a substance or object, such as air
- **Orbit** - to travel in space around a planet or other object. Example: Glenn he orbited the Earth three times.
- **Revolution** - The action by a celestial body of going round in an orbit or elliptical course
- **Rotation** - The action of rotating around an axis or center
- **Solstice** – The sun reaches its highest or lowest point in the sky at noon, marked by the longest and shortest days of the year.
- **Weather** - The state of the atmosphere at a place and time.

## LESSON ACTIVITIES

- *Habits of the Mind*  
Students make connections between events in their lives and the seasons of the year. One major connection relates the concept of the seasons to past observations.  
[http://sunearthday.nasa.gov/2005/educators/lp\\_68.htm](http://sunearthday.nasa.gov/2005/educators/lp_68.htm)
- *Kinesthetic Astronomy*  
Students explain the relationship between the earth and the sun, model the movement of the earth around the sun and define Solstice and Equinox  
[http://sdo.gsfc.nasa.gov/assets/docs/Kenestetic\\_Astronomy.pdf](http://sdo.gsfc.nasa.gov/assets/docs/Kenestetic_Astronomy.pdf)
- *Is Grandpa Right, Were Winters Colder When He Was A Boy?*  
Activity uses historic weather information and compares current data to determine if there is a significant temperature change.

## MATERIALS

- Signs for each month
- Object to represent the sun
- Globe(s)
- "East" and "West" popsicle sticks
- Flashlight
- Object or sign to represent Polaris
- Optional: Zodiac constellation signs
- Overhead transparencies of color visualizations and overhead projector
- Copy of color visualizations for each student group.
- Copy of *Work Sheet* for each student group
- Wall map to support class discussions

[http://mynasadata.larc.nasa.gov/index\\_search\\_results.html?cx=014051775777055143738%3Aulsvmlaooiy&cof=FORID%3A11%3BNB%3A1&ie=UTF-8&q=was+grandpa+right&sa=Search#725](http://mynasadata.larc.nasa.gov/index_search_results.html?cx=014051775777055143738%3Aulsvmlaooiy&cof=FORID%3A11%3BNB%3A1&ie=UTF-8&q=was+grandpa+right&sa=Search#725))

- *Seasonal Change on Land and Water*

To further understanding of the causes of seasonal change, students use visualizations to compare effects of incoming solar energy in the two hemispheres.

[www.nasa.gov/pdf/319904main\\_The\\_Electromagnetic\\_Spectrum.pdf](http://www.nasa.gov/pdf/319904main_The_Electromagnetic_Spectrum.pdf)

## **ADDITIONAL RESOURCES**

JPL Solar System Simulator:

<http://space.jpl.nasa.gov/>

Hurricane season video –

<http://www.nasa.gov/topics/earth/features/2009-hurricane-vid.html>

The perfect season to talk about the sun –

<http://www.jpl.nasa.gov/video/index.cfm?id=746>

Launchpad Moon Magic –

<http://www.nasa.gov/audience/foreducators/nasaclips/launchpad/earth.html>

## **DISCUSSION QUESTIONS**

Each NASA activity includes discussion questions in the provided Student Data components.

## **ASSESSMENT ACTIVITIES**

Each activity includes a “Student Data Sheet”. Alternatively, have students position themselves in a circle representing the earth’s orbit, around a “Sun,” and instruct them to go stand where the earth’s position would be on their birthdays. Have students take turns predicting the month or season of several students’ birthdays based on where students are standing.

## **ENRICHMENT**

Each activity includes extensions to allow students to continue their learning experiences.