Atmosphere Lesson Plan
Kristen Wertz

Grade Level: 4th-5th Grade

Length of Lesson: 2-3 days

Next Generation Science Standards:

5-ESS1-2 - Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)

NGSS Practices

- Engaging in Argument from Evidence
- Developing and Using Models

Common Core Math Standards

- CC 2.4.5.A.2 - Represent and interpret data using appropriate scale.
- CCSS.Math.Content.4.MD.C.6 - Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

Common Core ELA Standards:

- CC 1.2.5.G - Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- CC.1.5.5.A - Engage effectively in a range of collaborative discussions on grade-level topics and texts, building on others' ideas and expressing their own clearly.

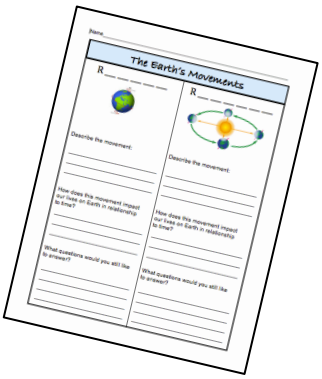
Materials:

Large inflatable globe.
Earth's Movements Worksheet
Earth, Moon, and Sun model – Card stock, brass fasteners, scissors, markers
Flashlights
Various materials to make a model (Balls: tennis balls, beach balls, Styrofoam balls, toothpicks, sticks, pictures, etc.)
Internet access
Graph Sheet
Sun over New York at noon worksheet
Protractor

Lesson Overview –
In this lesson students will examine the movements of the Earth and how those movements affect our day and night as well as seasons. At the beginning of the lesson, students will watch a video demonstrating the movements of the Earth. They will need to identify the different movements they see, rotating and revolving. They will create a model of the Earth, Moon, and Sun that represents those movements while identifying questions they have about the movements and the affect it has on Earth. They will watch a short video explaining that rotation brings us day and night and revolving around the sun while rotating on our axis brings us the seasons. Students will then explore why we have seasons. First they will collect and graph average temperature data from your location. By coloring the hottest 3 months and coldest 3 months, they will identify how the seasons are identified. Students will explore the NASA Simulator for Why We Have Seasons and measure the angle of the sun as it hits the Earth during each of those months. Groups will compare their data and make connections. They will then create a model to explain their findings, using additional information from two websites. Finally, students will predict data and defend their predictions from a city in the opposite hemisphere.

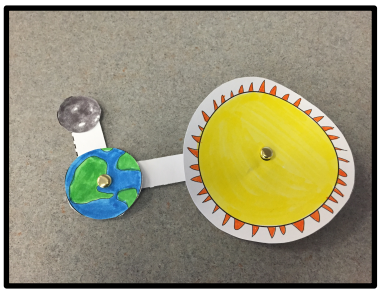
Engage –

- Let students know that you are going to be watching a video of the Earth's movements. Tell them that while they watch, they should look for different ways that the Earth moves in the video. Show the video at this link - https://youtu.be/R2lP146KA5A.



- After watching the video, invite students up to model the movements they have seen. Explain that you are looking at two types of turns, rotations and revolutions. Give students the Earth's Movements Worksheet. Have them fill in the words at the top above the appropriate picture. Explain that the movements impact us on Earth.

- Have students create a paper model of the Earth, Moon, and Sun. Here is a link to the activity on Teachers Pay Teachers (It is Free). While students work, encourage them to develop a list of questions they have about the turning of the Earth. When finished, share the questions that have been developed.

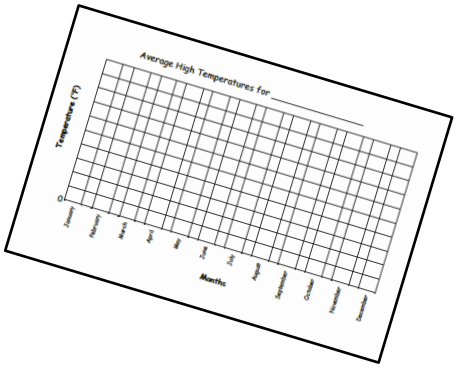


- Link to TPT Model - https://www.teacherspayteachers.com/Product/Space-Model-of-Earth-Moons-orbit-565681

Explore –

Exploration – Part 1 –

- Show the video "Earth's Rotations and Revolutions" on Crash Course Kids at https://youtu.be/l64YwNl1wr0 It explains the difference between rotations and revolutions. Use a large inflatable globe to model the transformation between day and night. Revisit the questions to see what has already been answered. Explain that understanding how the seasons are formed is a bit more challenging to understand.

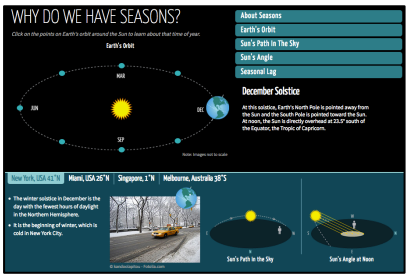


- Pass out the "Graph for Average Temperatures". Send students to the US Climate Data website and find the location of your town. Mine is York, PA. Have students fill in a bar graph to identify the average temperatures for each month of the year. Just have them draw a line to mark the temperature. Identify the 3 warmest months. Have them shade them in with red. Have them identify the 3 coldest months. Color those bars in blue. Ask students what seasons they think these red months represent. (Summer). What season do the blue months represent? (Winter). See if students can identify the 3 months in between each as Fall or Spring and select a color for each.

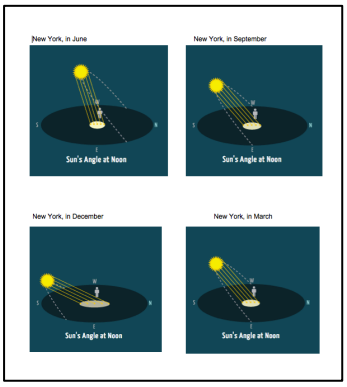
Exploration – Part 2 –

- In order to review, discuss what you had previously learned about rotations and revolutions. Complete the rest of the 'Earth's Movement's' worksheet.

- So we have identified that the seasons are determined by the temperatures of the months. Invite students to share what they think is happening when the seasons change. Some may have understood this from the Crash Course Kids video.



- Present students with the NASA – Why Do We Have Seasons – simulator at http://d3tt741pwxqwm0.cloudfront.net/WGBH/npls13/npls13_int_seasons/index.html
- Give students some time to explore the simulator and click on the different resources. After a few minutes, invite them to share what they have noticed about the simulator (ex. Where to find factual information, what changes when you click on different months, etc)



- Look at a globe and identify your location on the globe. Find the location, of the four on the simulator (NY, Miami, Singapore, and Melbourne) that is closest to your location. Click on that tap. Ask students to locate the summer months on their graph. Then click on the month June on the Simulator. Ask them to identify what they notice about the position of the sun at noon. I have included a printout of NY. If you are using another city, you will need to make another one. Print out the copies of NY at each position on the

simulator. Have students use a protractor to measure the angle of the sun at noon during each time of the year. Record the angles for each month.

Have students compare the data they have collected with the data in the temperature graph. What similarities do they notice? Is there a correlation between the two sets of data. Invite students to share within their groups what they notice and then share out as a class.

Explain –

- Provide with a variety of materials to choose from. (Balls, beachballs, light source, sticks, Styrofoam, pictures, flashlights, etc) Tell them that they will be creating a model that they will use to explain this process to the class. They can present the information live or record it.

- In their presentation, students should answer the question, "How does the Earth's Movement affect time on Earth?"

- Provide students with the following websites to gather more information about the movements.
- NASA Research - https://spaceplace.nasa.gov/seasons/en/
  https://kidsgeo.com/geography-for-kids/the-rotation-of-the-earth/

Elaborate -

- Based on what they know, have students predict what the data might say for a city on a hemisphere opposite from where they gathered data. Groups will need to present their prediction and defend it to the audience. Their prediction should be supported by evidence. Provide students with the same websites listed above to help support their selection.

Links

- NASA Research - https://spaceplace.nasa.gov/seasons/en/
- https://kidsgeo.com/geography-for-kids/the-rotation-of-the-earth/

- What patterns will they see in average temperatures and position of the sun during each month? Will it be the same as our data or opposite? Have them create a set of hypothesized data. After the data has been predicted, have students go onto the simulator and gather the actual data. Groups should compare their findings to their hypothesis.

Evaluate –

- Have students revisit the questions they formed at the beginning of the lesson. Were their questions answered? Have them look at the Earth's Movements worksheet and evaluate their understanding of the movements of the Earth. Students should also revisit the questions they listed at that point of the lesson.

- Have students explore the "What Next?" What would they still like to explore? Where might they be able to go to find this information? Are there any resources we have already shared that

Assessment -

- Teacher will observe student creation of graphs as a formative and summative assessment.
- Teacher will be able to evaluate the quality of the model and the explanation behind the model.
- Teacher will be able to observe learning as students make predictions on the data for the city in the opposite hemisphere.

Optional

Model the differences in sun position using a flashlight. Hold the flashlight straight down at a 90° angle. Identify the brightness of the light and measure the dimensions of the circle or halo formed. It should be bright and a relatively small circle. Then hold the flashlight at a 60° angle and repeat. Do this again at 30°. Compare what you have found.

Hold a light source in the middle of the room. Place 4 globes around the light, keeping the axis pointed in the same direction. Have students predict which season is represented in each position.