

### Earth's Seasons Investigation

THEME: Seasons

GRADE LEVEL: Middle School (ideally for 7th grade, but can be adapted for 6th-8th grade)

TIME: This will span about two 55 minute periods:

Day 1: Engage, Explore, and start Explain

Day 2: Finish Explain, Elaborate, Evaluate

MATERIALS: Class set of iPads or personal Chromebooks, note-taking materials

CCSS (Language Arts):

EE.W.8.1.b Write reasons to support a claim about a topic or text.

EE.W.8.2.a Introduce a topic clearly and write to convey ideas and information about it including visual, tactual, or multimedia information as appropriate.

EE.W.8.6 Use technology, including the Internet, to produce writing to interact and collaborate with others.

Archdiocese of Portland Standards (Math):

8.2.8	Use data to estimate the likelihood of future events and evaluate the reasonableness of predictions.
8.2.1	Organize and display data (e.g., histograms, box-and-whisker plots, stem and leaf, scatter plots) to pose and answer questions, and justify the reasonableness of the choice of display.

NGSS (Disciplinary Core Ideas):

ESS 1.A. 6-8. 1	Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
ESS 1.B. 6-8. 2	This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)

NGSS (Engineering and Science Practices):

8.5	Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.
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### LEARNING OBJECTIVES

- Students will be able to describe how seasons are formed on Earth.
- Students will be able to identify the season for a given location on Earth when shown a diagram of Earth's location in its orbit for a given time period.
- Students will be able to identify the major misconceptions about how seasons are formed.
- Students will be able to explain patterns in the relationships between the month, the location in Earth's orbit, the path of the Sun across the sky, and the Sun's angle at noon for a given city.
- Students will be able to utilise the technology we have appropriately.

### DRIVING QUESTION

What causes the seasons on Earth, and how does a city's location on Earth impact how and when it experiences seasons?

### JUSTIFICATION

As part of my weather and climate unit, I usually include a short investigation where students work in small groups to track weather data for a specific city and for them to notice patterns based on locations. I also tend to end this entire unit with a "Flashlight Lab" with a formal write-up at the end. This lesson would be a great addition because it will give students a better visual understanding of how these variables interact before doing the "Flashlight Lab".

### PRIOR KNOWLEDGE:

In science, students have been building their background knowledge and understanding of the difference between weather and climate, the tools associated with measuring the relevant data, how weather patterns are tracked, and what impacts the weather and climate of a region. In 6th grade we explored waves, including the angle of incidence and the angle of reflection of light waves.

In math, students have been working with angles, identifying patterns in data, and collecting/representing data.

In social studies, students have been continuing to build their knowledge of geography.

5E Lesson Plan	
<p><b>Engage</b> The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.</p>	<p>Warm-up Question: What is your favourite season and why?</p> <p>Instead of having a couple students share out their answers like I usually do, I will have students participate in a 4-corners activity. I will start off by labelling the four corners of our room with each of the four seasons and asking students to move themselves to the corner corresponding to their choice. When they get there, they will have 1 minute to work as a team to make a CER to answer the question.</p> <p>Next, I will ask students to answer some questions relating to common weather/climate misconceptions. (I have also done this as a Google Form before so that I can see at a glance the results) They will all be true or false questions and students will need to go to the side corresponding with their answer. After they have all moved, I will ask a representative from each side to share their reasoning.</p> <p>Examples: When water boils, the bubbles are filled with water vapor. Condensation on the outside of a glass comes from the water on the inside of the glass. Rain drops are usually “teardrop” shaped Heat rises Hot air has less mass than cold air. When the Earth is tilted away from the Sun, it is night. When the Earth’s orbit is further from the Sun, it will be Winter.</p>
<p><b>Explore</b> The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.</p>	<p>Based on the final question, I will explain to students that I want them to explore the resource I posted to Google Classroom:</p> <p><a href="http://d3tt741pwxqwm0.cloudfront.net/WGBH/npls13/npls13_int_seasons/index.html">http://d3tt741pwxqwm0.cloudfront.net/WGBH/npls13/npls13_int_seasons/index.html</a></p>

	<p>(which I retrieved from:  <a href="https://www.pbslearningmedia.org/resource/npls13.sci.ess.seasons/why-seasons/en/#.WUskARMrLLZ">https://www.pbslearningmedia.org/resource/npls13.sci.ess.seasons/why-seasons/en/#.WUskARMrLLZ</a> )</p> <p>I will give them 5 minutes to just explore the resource before I have them all pause and share out what they have discovered so far.</p>
<p><b>Explain</b>  The purpose for the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.</p>	<p>Now, I will give students the task of collecting data and evidence to support a claim they can make to answer the question: How does a city's location on Earth impact the way it experiences seasons?</p> <p>I will count students off by 4s with each number being a different city on the resource. They will get into groups with the people looking at the same city as them so that they can collaborate and share their observations as they go.</p> <p>They should be making the connection between the hemispheres and the tilt of the poles as well as the location in the orbital path.</p>
<p><b>Elaborate/Extend</b>  The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.</p>	<p>I will have students turn their focus to comparing the path of the Sun as well as its angle at noon. They should note any patterns they see in this as well.</p> <p>Once they have the opportunity to become experts on their city, I will count them off in their groups to make new groups of four, where each person is an expert of a different city.</p> <p>Note: This and the following steps may need to be on the second day depending on how long the previous sections took the class.</p>

<p><b>Evaluate</b> The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.</p>	<p>Formative: I will have students write a CER as an exit ticket to answer the initial question of “How does a city’s location on Earth impact the way it experiences seasons?” They will need to provide specific evidence gathered from the resource as well as their own reasoning to support their claim.</p> <p>Summative: This will serve as background information for when they complete their indirect and direct sunlight “Flashlight Lab.”</p>
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Citations:

PBS. (2018, September 12). Why Do We Have Seasons? Retrieved June 13, 2019, from <https://www.pbslearningmedia.org/resource/npls13.sci.ess.seasons/why-seasons/en/#.WU skARMrLLZ>