Unit: Modeling the Solar System **Sub-Unit:** Earth's Axis Tilt Causes Earth's Seasons

Step in Learning Cycle	Lessons/Activities	NGSS Practices and CCSS ELA Science Literacy Standards
Engage	In-class writing activity: Ask students to explain in writing and with diagrams what it means for seasons to change and what they think causes Earth's seasons.	NGSS Practices 2 and 6; CCSS 6-8.WHST.2
	In-class discussion: Students together examine the questions "What are the seasons?" and "What causes Earth's seasons?" They share their explanations and diagrams, and they critically evaluate these explanations and diagrams, including distinguishing between fact, reasoned judgment based on evidence, and speculation. Students begin to consider what the known facts are about what changes from one season to another (e.g., sun's path, amount of daylight, temperature) and what parts of Earth are affected (e.g., Do the equatorial or polar regions experience seasons?).	NGSS Practices 1, 2, 4, 6, 7, and 8; CCSS.RST.7 and 8
Explore	Investigation: Students research the seasonal changes for their city, the equatorial region, and the polar regions. Writing: They present their findings in a written report.	CCSS 6-8.WHST.2, 7, and 8 and 6-8.RST.2, 4, 7, 8, 9
	In-class discussion: Students examine questions raised by their research findings: "Why is the equatorial region so much warmer than the polar region?" "Why is the equatorial region consistently warm?" "Why do the polar regions experience periods of 24-hour sunlight and 24-hour darkness?"	NGSS Practices 1, 2, 4, 5, 6, 7, and 8
	Investigation: Students follow set of instructions for measuring the sun's path across the sky (azimuth and altitude) and record their measurements in writing and with a diagram.	NGSS Practices 2, 3, 5, and 8; CCSS 6-8.RST.3
	Investigation: Students conduct research (*using a text set provided/identified by the instructor) to identify how the sun's path across the sky changes over the course of a year and how these changes vary for their area, the equatorial region, and the polar regions. Writing: Students create a written and visual presentation of their findings.	CCSS 6-8.WHST.2, 7, and 8 and 6-8.RST.2, 4, 7, 8, 9
	Investigation and Discussion: Students create a physical model of Earth's revolution around the sun. They use it to further investigate and apply their findings about changes in the sun's path in the sky over the course of the year.	NGSS Practices 2, 3, 4, 5, 6, 7, 8
	Investigation and Discussion: Students investigate sun's light distribution onto Earth using a projector.	NGSS Practices 2, 3, 4, 5, 6, 7, 8
Explain	In-class discussion: Students discuss the information they have obtained and apply this evidence to again discuss the question, "What causes Earth's seasons?" Emphasis is on evidence-based reasoning. Students should be able to explain why common misconceptions such as Earth's changing distance from the sun fail to explain the facts they have identified. They should be able to explain how Earth's axis tilt helps explain the facts they identified.	NGSS Processes 1, 2, 4, 5, 6, 7, 8
	Writing: Students draw upon their work thus far to argue why Earth's axis tilt is the best explanation for Earth's seasons, and in doing so consider one or more alternative explanations (e.g., changing distance from sun). They revise the essay in response to peer review.	CCSS.WHST.1, 4, 5, 8, 9