Unit Title: Reason for the Seasons | Duration: 2 weeks | Grade Level: 7th

1. Begin with the End in Mind

Content Standards

Math Standards: 7.RP.2 Analyze proportional relationships and use them to solve real-world and mathematical problems. Recognize and represent proportional relationships between quantities., 7.G.1 Draw, construct, and describe geometrical figures and describe the relationships between them. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
Science Standards: S6-C3-PO 4. Explain the seasons in the Northern and Southern Hemispheres in terms of the tilt of the Earth's axis relative to the Earth's revolution around the Sun.
ELA Standards: 7.W.1 Write arguments to support claims with clear reasons and relevant evidence., 7.W.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.
Social Studies Standards: NO SOCIAL STUDIES STANDARDS INCLUDED

What will students **KNOW** (knowledge/content):	What will students be **ABLE TO DO** (skills):
Proportional relationships between quantities surface area of a 2 dimensional shape scale drawings Relationship between tilt of the earth and effect on the seasons Claims supported by evidence	find the proportional relationship between the scale and object on a scale drawings make scale drawings of geographical locations explain the season of a location in respect to tilt of the earth write an evidence based scientific argument refute counter claims using evidence

21st Century Skills Addressed:	Where will 21st Century Skill be evident?
Communication, Problem Solving	Students will be communicating at various levels: with each other in small groups as they do research and gather evidence, with partners from other world locations when they interview students in assigned locations, when they present their proposal for their solar panel viability for their assigned location Students will be solving a real situational problem by having to make a decision as to where would be the most efficient place for solar panel installation.
Anticipated Mathematical Practices:	Where will the Mathematical Practices be evident?
Make sense of problems and persevere in solving them., Construct viable arguments and critique the reasoning of others, Model with mathematics	When students make a scale drawing of Arizona and explain their procedure or solution method, they will be persevering in solving problems and constructing viable arguments during their share out of solution path and results. Other will be able to challenge solution methods as well as defend their own while making conjectures and having discourse about the proportional relationships involve when making scale drawings. When students find make a scale drawing of their assigned location, they will be modeling with mathematics as an application in science (sunlight

	concentration dispersal)
Anticipated Science and Engineering Practices: Developing and using models, Analyzing and interpreting data, Using mathematics and computational thinking	Where will the Science Practices be evident? Students will use globes and other materials to create a model of the angles of sunlight striking the earth at different locations during differnt times of the year. They will then take their data gathered and analyze to help decide which location has a greater direct concentration of sunlight year round. Students will use measurement of angles and averaging amounts during their model development and analyzing of data.
Anticipated ELA Student Capacities: Students will use globes and other materials to create a model of the angles of sunlight striking the earth at different locations during differnt times of the year. They will then take their data gathered and analyze to help decide which location has a greater direct concentration of sunlight year round. Students will use measurement of angles and averaging amounts during their model development and analyzing of data.	Where will the ELA Student Capacities be evident? Students will use research to build a strong science content base on seasons and earth orbit and tilt. Students will use evidence to refute a misconception counterclaim about what caused the earth's seasons. Students will critique each others location proposal for solar panel installation in group discussion (socratic seminar) form.

Summary of Project: Students will gather basic background knowledge on solar energy and how photo-voltaic cells work. They will then be assigned a location on earth and sill decide if this location will be a viable location for solar energy collection. Students will need to use scale drawings of their assigned location to calculate sunlight concentration levels. They will then need to construct their understanding of the suns light on earth at different times of the year, by constructing a model. they will use this data to create a presentation to APS engineers outline their proposal for their assigned location as an efficient location for collecting sunlight year round.
Authentic Project Audience: Students will be presenting their final location proposal to APS engineers.

Scope of the Project:
(On a scale of 1-5 Where does this project rate on the following components?)

	Small Project	1	2	3	4	5	**Ambitious Projects**
Duration	5-10 Days		2				Semester Long
Breadth:	1Topic/1Standard				4		Multiple Standards/Multiple Disciplines
Technology:	Limited			3			Extensive
Outreach:	Classroom-based				4		Community-based
Partnership:	One Teacher			3			Multiple Teachers/Community Members
Audience;	Classroom/School					5	Expert Panel

2. Craft the Driving Question

Driving Question:

How do we as engineers, decide if a location is viable for solar panel installation and solar energy collection?

3. Plan the Assessment

List Teacher/District Generated Assessments:
(ex, Galileo, Beyond Textbooks, Scantron, ALEX, STAR)

Galileo Formative Scale Drawings Test 5-3
Galileo Formative - Seasons on Earth 3-1
Group Surface Area Grid
Seasons Unraveled Data Spreadsheet

Culminating Product:

Multimedia Show (K-2 teacher assisted), Presentation within the school, Refutational Essay

Describe the Culminating Product in this PBL Unit:

The Culminating product will be a proposal presentation to APS engineers, in a multimedia form (Powerpoint, Prezi, Padlet) The presentation needs to include data collected on sun angles on location for different times of the year and averages of sunlight for location year round. The student will need to defend their proposal using evidence.

Students will also turn in a refutational scientific argument to the counter claim that the seasons on earth are caused by the orbit of the earth around the sun bringing it closer to the sun.

Multiple Products:

Research Notes, Written Work, Drafts, Model, interview notes

Describe the Multiple Products you will use as Checkpoints:

Drafts of essay will be used as formative for content knowledge about reason for earths seasons. Drafts of

presentation proposals will serve as a check for understanding on scale drawings and data collection and analysis. Interview notes will be collected to review and give feedback to students on communication skills and global & cultural awareness,

List any Rubrics to be used for assessment in this Project:

Group Presentation rubric (rubistar- multimedia science)
Communication skills rubric- for group communication
Writing argument Rubric (Google sheets)

4. Map the Project

Describe how you will Launch the Project:

Students will have a discussion about why their are solar panels going up in their covered parking lot at the school. Questions should arise about what they are, Why here in Arizona? Where else are these being used and why. After discussion an APS engineer will come to class and answer some of these questions as well as pose the challenge of teams helping him find a viable location for installing solar panels that would be the most efficient.

Resources needed prior to Launch:

SRP Solar energy kits (6), Globes (6), protractors, skewers, scotch tape, foam balls, markers, reserve ipad class set, reserve 4 computer lab times, 1cm grid paper, psoter paper, sticky notes.

Attached Storyboard:

Sketch

5. Manage the Process

How will you Share Project Goals with students?

Students will be given project goals after first expert visit. Students will have individual learning goals shared before new learning and application of skills and content. Every new learning will be tied back to the driving question and final culminating product: scale drawing- light concentration dispersal to be used as data for the proposal, interview notes- to be used as evidence for viability of location from an inhabitants point of view. Models and angle data table meets the learning goal of the science content, which in tern will be used as evidence in the proposal. so all learning goals and checkpoints will tie back to the driving question and that ultimate product "the proposal"

How will you use Checkpoints and Milestones?

After Scale drawings of Arizona are shared out, this will serve as a formative check for understanding on scale drawings and proportional relationships. those who do not show a mastery of these concepts will be part of intervention (Small group) before they can repeat with their assigned location.
Science data table will be used as a check for understanding of science content of cause for the seasons, students not understanding will be directed to watch an instructional video on the seasons and will try again.
The first draft of counterclaim essay will serve as a checkpoint for arguing from evidence.

When do you plan for Evaluation and Reflection?

Students will use self reflection after rubric and results of each checkpoint is shared with them. students will

then help develop individual learning goals for the remainder of the project so that they met the criteria for each component that will make up the ultimate product.
Describe how your class plans to Celebrate the PBL? After presenting to the engineers, tudents will share their findings with their interviewee abroad to let them know why or why not their place on earth would benefit from solar panel installation. This instills a feeling of accomplishment in the students, in being able to share some real world information about an important topic like renewable energy and sustainability.