PBL Unit Planning Guide

Direct-to-Design: How Can We Design Solar Power Systems for our Community?

8th Grade Integrated Content Areas:

Math, Science,Technology & Engineering, Computer Science

Standards

Technology & Engineering

MSENGR-TS-1
MSENGR-TS-2
MSENGR-TS-6

Science

S8P2
S8P4
SPS7
SPS9
SPS10

Math

MGSE8.F.1
MGSE8.EE.5
MGSE8.EE.6

Computer Science

CSS.KC.6-8.15
CSS.KC.6-8.17
CSS.IDC.6-8.22
CSS.IDC.6-8.23

Big Idea

Innovations in solar power technology have produced a variety of options such that proper design can lead to reduced cost and a cleaner carbon footprint over time.

Learning Objectives

At the conclusion of this PBL,STEM cohort members will be able to:

Diagram a variety of solar power systems, and be able to explain how each system works, including benefits and limitations.

Create a 3D model of a proposed solar array specific to a community proposal.

Argue for the adoption of their solar power system design to stakeholders.

Create mathematical representations of the electricity generated and cost-comparison to conventional electricity from a utility.

Key Terms

- Engineering Design Process
- 3D Modeling
- Solar Power
- Cost-Benefit Analysis

Process Based Thinking

- Engineering Design Process
- Design Thinking
- Evidence-Based Claims

Formative Assessment

Formative assessments are used throughout all TMS STEM PBLs to ensure mastery of concepts/standards across all content areas and include the following strategies:

- **Self-Assessment-Individual & Group level to be documented in The TMS STEM Notebook.**
- **Informal guided/leading questioning (*can you explain in more detail?, what evidence do you have?*, etc.).**
- **Discreet Observation**

Summative Assessment

Direct to Discovery Design Challenge Rubric

Community Connections and Partners

- TMS PTO
- Georgia Tech Research Institute
- Local Business Stakeholders

Materials and Resources

- Resources will vary per proposal and will include spreadsheet and presentation software.
- All students will use the PVWatts calculator facilitate the iteration of the solar power systems and mathematical determinations. (https://pvwatts.nrel.gov/pvwatts.php)

Lesson Procedures

Real World Hook/ Introduction

- *Kickoff Video!: https://vimeo.com/500182521/beadb3a2e2*
- *Following the launch of this PBL, Georgia Tech Research Institute will host two live Q & A sessions, one each in weeks 1 & 2 of the rollout!*

Student Engagement through Process Based Thinking

Groups will be required to document the entire experience. Using the TMS STEM Notebook, each student will write, sketch, journal, plan, and collaborate using the Notebook to document this iterative journey from beginning to end.

Student Presentation

Student groups will pitch their solar power design proposals Alternative Energy Committee (all four STEM Cohort Subject Area teachers, the 8th Grade STEM Cohort Facilitator, the IB Coordinator, the 8th Grade AP, representatives from the PTO, representatives from Georgia Tech Research Institute, and representatives from relevant business leaders in Tucker. Groups are free to design their proposal using whatever platform(s) they deem most effective.

Student Reflection

At the conclusion of the PBL, groups will be tasked with reflecting on both their individual journey AND the overall Cohort outcome with the following prompts:

- Which group's proposal was chosen? What merited this choice over other proposals?
- Given what you've learned throughout this experience, what actionable advice would you like to leave for next year's 8th Grade Cohort to ensure cost-effective, innovative solar power designs?