WAMC Lab Pamela Perez#2
Math Concept(s): Parabolas
Source / Text: IXL youtube Video1 Video2 Video3 video4
Developed by: Pamela Perez E-Mail: pperez@toppenish.wednet.edu Date: June 2024

Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

- Student use Parabolas and focus to build a parabolic solar cooker.

Lab Plan
Lab Title: Solar cooker.

Prerequisite skills:
Find the equation of a parabola given vertex and two other points.
Find the focus of the parabola

Lab objective:
Students will be able to warm or cook food/water from the parabolic solar cooker.

Standards: *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards:

- **HSF-IF.C.7.a**
  Graph linear and quadratic functions and show intercepts, maxima, and minima.
- Optional: **HSG-GPE.A.2**
  Derive the equation of a **parabola** given a focus and directrix.

Standards for Mathematical Practice:

- Model with mathematics.
- Use appropriate tools strategically
- Attend to precision.

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ETS1-1),(HS-ETS1-3)

K-12 Science Standards

- HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.*

Technology

- 4.b. Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

Engineering

- HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)
x☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy x☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
x☐ Think Creatively
x☐ Work Creatively with Others
x☐ Implement Innovations
Critical Thinking and Problem Solving
x☐ Reason Effectively
x☐ Use Systems Thinking
x☐ Make Judgments and Decisions
☐ Solve Problems
Communication and Collaboration
☐ Communicate Clearly
x☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
x☐ Use and manage Information
Media Literacy
☐ Analyze Media
☐ Create Media Products
Information, Communications and Technology (ICT Literacy)
x☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☐ Be Flexible
Initiative and Self-Direction
x☐ Manage Goals and Time
☐ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural
x☐ Interact Effectively with Others
☐ Work Effectively in Diverse Teams

Productivity and Accountability
☐ Manage Projects
x☐ Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
x☐ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Desmos graphing calculator, Cardboard paper, thick poster paper, reflective surface (aluminum foil or similar), tape, ruler or other measure device, glue gun, box cutter, poster graph paper, lightweight pan (cup) to cook with, other means to hold pan/cup in place. Food to cook (chocolate chips, hotdogs, etc), possible redlight or high power flashlight to check the focus point.

Set-Up Required:

- Just the gathering of the materials.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Students have to apply technology to come up with their parabola formula and think creatively to alter set up to fit their needs.

Cooperative Learning:

- Students are working cooperatively in groups to create a hands-on project solar cooker.

Expectations:

- Students apply the knowledge of parabolas to create the solar cooker project effectively.

Timeline:

- Approximately two days

Teacher Prep materials

Website Lab instructions and paperwork.
Other website inspirations
youtube Video1 Video2 Video3 video4

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Why go solar? Climate and/or survival skills.

Career Applications

- STEM – Science, Math, Engineering

Optional or Extension Activities

- Try another method and compare results.