

Lesson Update and CRT Addendum

Lesson/Activity Title: Feel the Heat **ID:** 17-844

Subject: Technology **Grade:** HS

Summary: In this challenge, kids follow the engineering design process to:

- (1) build a solar hot water heater;
- (2) test to see if it can raise the temperature of water; and
- (3) use their testing results to improve their heater and get as big a temperature change as possible.

Review and Recommendations

ALIGNMENT TO STANDARDS

NGSS

HS-ESS2

Common Core State Standards in Mathematics

The lesson does not provide a strong focus on Common Core Standards with an emphasis in Mathematics.

Recommendations:

There are several opportunities to incorporate mathematics in this lesson. Identify specific Common Core areas that could be displayed. For example, converting temperature from Celsius to Fahrenheit could allow students to utilize both Chemistry and Algebraic concepts. The range for grade levels (9-12) is too broad. This lesson needs to be designated for a specific grade level (High School) and content area (Physical Science). This may be too informal for a Physics course.

INSTRUCTIONAL SUPPORT

Materials for Lesson

(per heater) • aluminum foil • large sheet of cardboard (e.g., 11 x 17 inches/ 28 x 43 cm)
• gooseneck lamp with an indoor 100-watt floodlight light bulb (optional if using sunlight) • black marker • black paper • 2 paper cups (medium-sized) • 3 feet (0.9 m)

clear plastic tubing (Outside diameter: ¼ inch /6 mm) • pitcher of water • ruler • scissors • straws • duct tape • an indoor-outdoor digital thermometer that can read tenths of a degree.

CULTURAL RESPONSIVE TEACHING (CRT) RECOMMENDATIONS

5E Lesson/Description

1. Engage

The lesson needs to incorporate inferences that will enable students to use prior knowledge and skills to aid in the project.

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2. Explore

Allow the students to translate parts of the project in their own language and then share with other students. A suggestion here would be to allow students to apply proper uses of the solar water heating system at home and in their respective neighborhoods for people such as the poor or homeless who will need heat during winter and cold days.

3. Explain

There is an opportunity for discussion that students/teachers can take advantage of once the project during the design and after the project is complete.

During the brainstorming and design process, the teacher can focus students attending based on the brainstorming questions. The students or kids can exhibit their heaters and discuss how they solved any problems that came up.

4. Expand/Enhance

The teacher or facilitator can have students reflect and brainstorm ways water is heated and use their primary language to create vocabulary words.

5. Evaluate

There are no assessments associated with the lesson. A rubric designed to measure appropriate criteria should be considered.

Consider assessing students on their reasoning for using certain materials and provide clear rationale(s) for their designs and be ready to defend.

Additional Resources: