

### **Thermal Energy Unit Plan**

Course: Science Grade: 7th Teacher: Ruth/Ghee	Unit: Thermal Energy Transfer	Time: 15 days
07-PS3-4 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in average kinetic energy of the particles as measured by the temperature of the sample. 07-PS3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.		
<u><b>Critical Vocabulary</b></u>		
thermal energy, conduction, convection, radiation, temperature, thermometer, insulator, conductor.		
<u><b>Success Criteria</b></u>		
Given a problem to solve that requires either minimizing or maximizing thermal energy transfer, students design and build a solution to the problem. In the designs, students:		
i. Identify that thermal energy is transferred from hotter objects to colder objects.		
ii. Describe different types of materials used in the design solution and their properties (e.g., thickness, heat conductivity, reflectivity) and how these materials will be used to minimize or maximize thermal energy transfer.		
iii. Specify how the device will solve the problem.		
Students describe the given criteria and constraints that will be taken into account in the design solution:		
i. Students describe criteria, including: The minimum or maximum temperature difference that the device is required to maintain, the amount of time that the device is required to maintain this difference, and whether the device is intended to maximize or minimize the transfer of thermal energy.		
ii. Students describe constraints, which may include: materials, safety, time, cost.		

### **Tentative Schedule**

Date	Lesson
10/29	Study Stations
10/30	Unit 2 Energy Exam
-10/31	Differentiation:
1	Proficient-Move on to PBL planning for Unit 3 Thermal Energy/PBL reflection survey Close- Test corrections and explanations Far- Energy Intervention packet in small group with teacher Flex Activity-Visioning Activity(Ruth) Flex Activity - Sources of Strength Campaign (Ghee)
11/1	I can identify a problem and define criteria/constraints for proposed solution. Engage: Solar Oven video and introduce Entry document. Students will work to construct an oven that uses thermal energy to cook a s'more. There are specific constraints and a cost analysis associated with the design.

	<p>Explore: Complete What We Know and What We Need to Know Chart. Label problem, constraints, group assignments, group roles, norms, and schedule.</p> <p>Explain: Teacher will use direct instruction to explain constraints/criteria. Check schedule for understanding.</p>
11/2	<p><b>I can differentiate between thermal energy and heat.</b></p> <p>Engage: Thermal Energy-accessing prior knowledge worksheet-Which cooler and why? Guide students to realize there is a difference in thermal energy and heat. We must research to find the difference.</p> <p>Explore: Read, Write, Think notes over thermal energy and energy transfer- this will take one and a half class periods to complete. (Ch. 2 reading and notes).</p> <p>Explain: Ice cube demonstration-discussion over thermal energy transfer from ice cubes.</p> <p>Evaluate: Human Molecule Model-students will have to position themselves in the room to demonstrate thermal energy transfer within a solid, liquid, gas.</p>
11/5-	<p><b>I can plan an investigation to observe how thermal energy is dependent upon the amount of matter.</b></p> <p>Engage: Does size of the object affect how thermal energy transfers? What size should our oven be?</p> <p>Explore: Heat vs. Thermal Energy Lab</p> <p>Explain: Teacher will discuss results, student will discover the larger the object the longer it takes for thermal energy (temperature) to increase.</p> <p>Evaluate: CER discussing results of lab.</p>
11/6-7	<p><b>I can plan an investigation to observe how different types of matter can maximize or minimize the energy transfer in a system.</b></p> <p>Engage: What materials do you plan to use for your oven? How can you figure out which is best? Make a list of materials on board.</p> <p>Explore: Energy transfer and matter investigation- students will test various materials and measure energy transfer of each outside in outdoor climate conditions.</p> <p>Explain: Show definitions of insulator and conductor-have students identify their materials based on what they just observed and add to graphic organizer.</p> <p>Evaluate: Students will write a CER explaining what materials they will use for their oven using data from lab to support decision.</p> <p>Flex Activity: Positive Character Traits and Goal Sheet(Ruth)</p> <p>Flex Activity: Sources of Strength Campaign (Ghee)</p>
11/8	<p><b>I can explain three ways thermal energy transfers; conduction, convection, and radiation.</b></p> <p>Engage: We know that size and type of matter matters (haha), but how does the energy transfer exactly? What happens? Group discuss and write answer on whiteboard-share out.</p> <p>Hand boiler demonstration- Conduction, Convection, or Radiation?</p> <p>Explore: Conduction, Convection, Radiation Lab-students will make observations of different scenarios involving thermal energy transfer. They must write observation to discover ways energy transfers.</p> <p>Explain: Thermal energy transfer virtual lab- eScopedia through stemsopes. Students will complete a guided tour of the different ways energy transfers.</p>

11/9	<p>I can explain three ways thermal energy transfers; conduction, convection, and radiation.</p> <p>Engage: Hand boiler demonstration- Conduction, Convection, or Radiation?</p> <p>Explore: Tablecloth talk-students will have big sheets of paper and will be in charge of discussing the different types of energy transfer.</p> <p>Explain: Students will then complete vocabulary graphic organizer for all vocabulary words listed above.</p>
11/12 -11/1 4	<p>Solar Oven Project Work Day</p> <p>Students will collect data throughout process-each student has their own role to fulfill.</p> <p>Flex Activity: Gratitude Activity and Thanksgiving breakfast(Ruth)</p> <p>Flex Activity: Sources of Strength Campaign (Ghee)</p>
11/15	Initial Test-Redesign of oven.
11/16	<p>Last work day to finish retest/redesign revisions.</p> <p>Oven Cost Analysis complete</p>
11/19	<p>Solar Oven Presentation/Data Collection</p> <p>Students will work on study guides during data collection.</p> <p>After students collect data students will come back inside and complete Unit 3 Summative Short Answer</p> <p>Differentiation activities will occur after Thanksgiving break and based on project submissions and Unit 3 Summative Short Answer</p>
11/20	Spread the Red Field Trip