Science Sound & Light Solar Cooker Guidelines (4/18)

What: Solar Cookers (See video on Light page of my website for past designs.)

Who: All Monsoons (alone, in pairs, or in trios)

When: Work is to be completed at home. Cookers will be due in late May or early June. **Exact date is dependent on weather.** There is no room in our classroom for student cookers. **You may bring them in to test them, but must take them home the same day!**

Why: This is the central activity for our Sound & Light unit. Students must **apply their knowledge** of energy transfer to build a successful cooker. The cooker (product) is only one part of this assessment. The main objective is being able to explain how a solar cooker works, even if yours doesn't heat up a lot.

Details: The goal is to heat up a space as much as possible. Cookers will be placed outside in the sun before A period. Students will cook s'mores at the end of that day! Infrared (IR) thermometers will measure the temperatures in the cooking space of all cookers. Temperatures will be recorded by students during each science period. The cooking space needs to be at least 10 cm x 10 cm x 5 cm (deep) to hold the s'mores. The IR thermometers give inaccurate readings off shiny materials, so keep that in mind when designing your cooking space.

Each student (group) is expected to build and test **at least 2** different cooker designs between now and the due date. Students must complete **two design** logs. (I give out logs in class, but extras may be printed from the Light page of my website.) Students should use ***some method to measure the effectiveness of their cookers.*** Examples could be a thermometer, ice cube melting rate, or Hershey Kiss (or other chocolate) softening/melting time.

Initial Design Logs (all individual): Students will have one week (with a weekend included) to complete this.

Re-Design Log (individual or with partners): Students will have an additional week. **Note:** Teachers will alert students of good weather days, but students need to work around Mother Nature! Due dates may be extended in cases of long-term cold and rainy weather.

Safety considerations: Magnifying glasses and concave mirrors (shaped like bowl) can focus sunlight, causing fires. For this reason, **magnifying glasses and concave mirrors may not** be part of the solar cooker design. In addition, solar cookers **should be placed on non-flammable surfaces** during testing (i.e. paved driveway rather than grass).

Jobs to do.

1. Arrange partners (or work alone)
2. Decide what cooker will be made of. Try using recycled materials/containers (i.e. about to be thrown away). You need not spend any money on this project.
3. Build and test your cookers, and fill out your initial and your re-design logs. **Due dates for these logs are to be determined.**
4. Decide on final cooker design. Bring cooker to class by due date **(TBD)**

Suggestions:

Your initial design log may be one small part of the cooker—perhaps just the cooking space. See how fast you can melt an ice cube. Change ONE variable and see if this improves your design. Better yet, ask your parents to buy you some Hershey's Kisses. At room temperature they are too solid to stick a toothpick into. Place a Kiss in your cooker for a specific amount of time, and see if you can stick a toothpick into it. Compare different designs. **Your re-design log must be for a complete cooker.**

Do an internet search for solar cookers. In addition to researching building plans, search for "how solar cookers work". You need to know HOW a solar cooker works. There is no shortage of information on-line. Try different sites, some are much clearer than others.

Question: When you first try your cookers outside in the sun, you will likely encounter two problems. Hint: If you never account for one of the problems, your cooker will probably interfere with others on the final outdoor "test" day. If we get a cloudy week, you may test your cooker under a light indoors, but this Isn't nearly as useful as testing in sunlight. **Pay attention to the forecast!**

Competencies and Transfer Goals:

- Properties of Energy: Identify specific types of energy in everyday situations and explain that energy can change forms.
- Process Skills & Practices: Students can analyze and interpret data.

Additional Knowledge and Skills:

- Students can control variables in an experiment and can measure accurately.
- Students can recognize variables beyond their control and apply that information to their project.

Specific content and skills on which students will be evaluated:

- Students can explain **energy transfer** in a solar cooker.
- Students can explain how light is **transmitted** and what materials allow this to happen in a solar cooker.
- Students can explain how light is **reflected** and what materials allow this to happen in a solar cooker.
- Students can explain how light is **absorbed** and what materials allow this to happen in a solar cooker.
- Students can **analyze and interpret** data.

Scoring:

1. Student shows no understanding.
2. Student shows some understanding, but not completely or independently.
3. Student shows complete, consistent understanding independently.