Can we cook while on the Moon?

While astronauts might have to bring just about everything with them when we establish a habitat on the Moon, one thing they won't need is solar energy. There may be no atmosphere, no climate nor weather on the Moon, but that DOES make it an ideal place to collect solar energy. Much of the Moon is exposed to sunlight constantly, except briefly during a rare lunar eclipse. If that energy could be harnessed, it could power almost everything in the lunar habitat...including that most important device that helps prepare delicious food – an oven!



THE CHALLENGE:

Your mission is to design and build a solar oven to cook your own S'mores with the materials provided. Your design constraints are:

- 1. The oven must have a "footprint" of no more than 40 cm x 40 cm.
- 2. In 10 minutes, the temperature inside the oven must increase by 15 °C.
- 3. Your food may not touch the bottom of the oven directly. You must design an effective way to cook the two S'mores without their touching of the oven bottom.
- 4. You must cook the two S'mores at two different heights. You will also test which height allows food to cook at a faster rate.

SAFETY NOTE: Contents of solar oven can get very hot. Make sure you use oven mitts or other protective wear when manipulating anything inside of your oven!



To design and build a solar box cooker, and test it to see if it works well enough to make S'mores!

Build a Solar Oven
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What questions do you have about today's challenge?

Below is a graph showing data that demonstrates the efficiency of three different solar oven designs: (1) plain box, (2) box with a black bottom and (3) a box with aluminum foil and a black bottom.





Which line do you think represents the solar oven with aluminum foil and a black bottom? Explain why.

What purpose do you think aluminum foil might serve?

How will you meet the design constraint of the food not being allowed to touch the bottom surface of the solar oven?

Draw and label your solar oven.





Experiment & Record

- 1. Using the materials provided, build you solar oven based on your design. Remember the goal is to capture heat in your oven.
- 2. Record the starting temperature of the oven: _____°C
- 3. Record the heights of the food from the oven floor: ____ cm ___ cm
- 4. Prepare your S'mores and place them in the oven. Cover the oven with the plexiglass lid or plastic wrap and begin cooking.



5. Record the temperature change in the table below.

Solar Oven Data Table

Time Min:sec	Oven Temperature °C	Time Min:sec	Oven Temperature °C
0:00		5:30	
0:30		6:00	
1:00		6:30	
1:30		7:00	
2:00		7:30	
2:30		8:00	
3:00		8:30	
3:30		9:00	
4:00		9:30	
4:30		10:00	
5:00		10:30	











Record any observations of your food while it is cooking. These observations will help to determine which food placement height allows for quicker cooking.

Time	S'more 1	S'more 2
Min:sec	cm	cm
1:00		
2:00		
3:00		
4:00		
5:00		
6:00		
7:00		
8:00		
9:00		
10:00		

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QUALITY ASSURANCE FORM

Each team is to review another team's design and model, then answer the following questions.

Name of team reviewed: _____

	YES	NO
Did the solar oven increase in temperature by more than 10 °C?		
Did this team's design differ from your team's design?		
Did both S'mores melt?		

Which height/cooking position worked best in this solar oven?

List the specific strengths of the design:

List the specific weaknesses of the design:

How would you improve the design?

Inspected by:

Signatures:





Fun with Engineering at Home



Today you learned a fun way to harness the Sun's energy, trapping the radiant heat from the Sun to cook food. With your family members, look up the meaning of "the greenhouse effect". Can you explain what "the greenhouse effect" has to do with the solar oven your team designed and built?

Discuss with your family members the following question:

Why do we use the term "the greenhouse effect" when talking about global warming?

YOU BE THE TEACHER!

Show your family how to build a solar oven. Test it out by cooking something new. How about baking a pizza in your solar oven? Grab a frozen pizza from the store or make one from scratch. Use the results of your experiment to determine at what height to place your pizza in the oven.

This marks the end to the NASA Beginning, Engineering, Science and Technology (BEST) series. We encourage you to continue to look for more activities, articles and podcasts about NASA any day and every day!

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