Part 1- Research and Planning

1. Identify the "Big" concept to be covered by the engineering design challenge.

For my engineering design challenge, the big concept is how can we use solar energy to cook. Today, natural gas prices and oil prices are very high. With concerns about climate change and limited resources, people are looking to renewable energy sources to help save money. One renewable energy that is easily available is solar. Students will be faced with the following problem: Design and build a solar oven to make smores.

2. Research appropriate learning standards associated with the topic.

New Jersey Science Standards-

• 3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
• 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
• 3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
• 4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
• 4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

3. Identify and discuss the different types of problem solving and declarative/procedure knowledge needed.

Declarative Knowledge-

- Dark colors absorb sunlight
- Light colors reflect sunlight
- Greenhouse effect

Procedural knowledge-

- Moderatly Structured Problem
    - Students are provided with the background knowledge needed.
    - There is one possible solution using the given materials- even though student creations may look different they will all contain the same parts.
    - Students will

4. Explore objectives and ancillary concepts/content covered by the project.

Objective:
I can work through the engineering design process to construct a solar oven to make a smore by following the criteria and constraints.

Ancillary Concepts:

- Greenhouse effect- By using the plastic wrap around the top of the cardboard this allows the light energy in but then traps it within the box, causing it to get very warm. This is similar to what is happening in the atmosphere.
- Renewable Energy- Solar energy is a form of renewable energy. It is easily accessible to everyone .

5. Identify possible activities. Select the best activity for your classroom.

Students will work in groups of 3-4 to generate a solution to the problem. Students will be asked to design and build a solar oven to make a smore. Students will only be able to use the supplies provided; black paper, cardboard box, aluminium foil, aluminium pan and plastic wrap to create their prototype. They will then leave it in the sun for 10 mins and 30 secs recording the temperature every thirty seconds. After, students will graph the temperature as a line graph and make improvement to their design.