Women in STEM History Engineering Design Challenges

1. **Window Greenhouses with Dr. Katherine Esau**- Dr. Katherine Esau was a pioneering botanist who received the National Medal of Science for her famous work in understanding the structure and workings of plants.  Most students are familiar with planting seeds, but have they ever watched the seedling sprout and grow without dirt? Create mini-greenhouses that you can hang in a window! “Plant” a seed by putting it with a moist cotton ball into a baggie and tape it to a window with a decorated greenhouse frame (included in [product](https://www.teacherspayteachers.com/Product/Botany-STEM-Challenge-Plant-Anatomy-Engineering-Womens-History-Activity-3094766) packet). Over the next several days, they will be able to observe and chart the growth of their little plants. A handout on plant and seed anatomy is also included as well as a mini-lesson on Dr. Katherine Esau. After their seedling has grown, students will answer reflection and math extension questions relating to the activity. These include graphing, interpreting graphs, and rates. Find this activity on [TpT here](https://www.teacherspayteachers.com/Product/Botany-STEM-Challenge-Plant-Anatomy-Engineering-Womens-History-Activity-3094766) or on our website product page [here](https://www.vivifystem.com/new-products/6atbetua80xte75wzb70muimdd4jcr).
2. **Solar Ovens with Maria Telkes**- Maria Telkes is the inventor of the first system to heat a home with solar power! Talk about the amazing things that our Sun does for us. Providing heat using the Sun and harnessing that energy is a growing field of science with many applications.  Have you tried cooking with the heat of the Sun? Making a solar oven to cook s’mores is a favorite with my kids! Here is how to do this awesome activity that ends with eating chocolate :
   * Grab a pizza box or something similar, and cut a square flap in the lid (with one side still attached) and put foil on the inside.
   * Angle the flap so that it reflects the sunlight into the box.
   * Add plastic wrap to the part of the box where you cut the flap to keep dirt and bugs away from your food!
   * Inside the box, layer a graham cracker, chocolate square, and a marshmallow.
   * Leave outside to cook. Cooking time varies! A great extension is to measure cooking time for different days as well as measure the temperature inside the box.
   * You will add the graham cracker top once the s’more is heated to your liking.
3. You can do this at home or in the classroom (with access to the outside) using our engineering design challenge guide [here](https://www.teacherspayteachers.com/Product/Solar-Oven-STEM-Challenge-Women-in-STEM-History-Engineering-Activity-3682355) on TpT or [here on our website](https://www.vivifystem.com/new-products/solar-oven-stem-challenge)! This guide walks students through the engineering design process to create their own solar ovens to optimize the cooking of their s’mores!
4. **Coding with Grace Hopper**- Grace Hopper was a Navy admiral and one of the first computer programmers. She even invented something called a link editor that combines object files inside of a program. Learn about Grace Hopper and play fun games on Code.org or program a robot. Check out some activities you can do with Sphero robots [here](https://www.vivifystem.com/blog/2018/9/16/5-reasons-i-love-sphero-3-awesome-stem-activities). Pair these activities with the book [Grace Hopper: Queen of Computer Code](https://amzn.to/2TlClwO)
5. **Constellations with Williamina Fleming and Anna Jump Cannon**- These women were both instrumental in developing the classification system that is still used to catalog stars today! Make your own constellations or create mini versions of constellations to display inside your classroom or home. To do this, attach paper covering one end of a cardboard tube (empty toilet paper roll). Then poke holes in the paper that mirror the stars in a known constellation. Shine a flashlight through the open end and point it at a wall! You now have an indoor planetarium! Can you create a bigger or brighter version? Use the engineering design process to hone in on an improved design.
6. **Extract DNA with Rosalind Franklin** - Rosalind was a chemist and X-ray crystallographer who helped discover the double helix structure of DNA among other accomplishments. Discuss her achievement and conduct an experiment to extract DNA from fruit! (Find the instructions [here](https://www.imaginationstationtoledo.org/educator/activities/extract-dna)). Then see who can make the tallest freestanding double helix DNA structure using only pipe cleaners!
7. **Paper circuits with Edith Clarke** - Edith was the first professionally employed female electrical engineer in the United States in 1922! Do your own electrical engineering project by constructing a house out of construction paper. Turn the door into a switch by running copper tape from a coin battery on the door to a small LED light attached to the outside of your house then looped back to the battery on the door. Make it such that when the door closes, it completes the circuit and turns on the light.  You can also play with [snap circuits](https://amzn.to/3aw9tb0) to learn the basics of electrical circuits.