

Name:

Date:

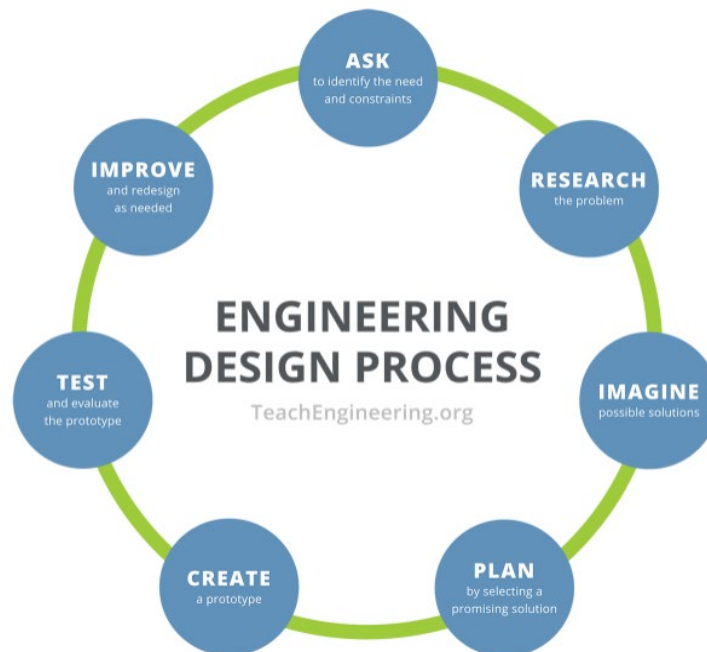
Class:

# Engineering Journal

Instructions: Complete the following sections as instructed.

Questions to keep in mind throughout this process.

1. What is clean cooking? Is clean cooking important? Why/Why not?
2. What does the family structure look like in the US?
3. What does cooking at home look like in the US?
4. What does the family structure look like in Kenya?
5. What does cooking at home look like in Kenya?
6. Is knowledge of culture important to scientific innovation? If so, how? Provide an example.
7. What are engineers doing at Burn Design Lab?
8. What United Nations Sustainable Development Goals are met by you and the Burn Design Lab working on the clean cookstoves? How do they make the world a better place?



Name:

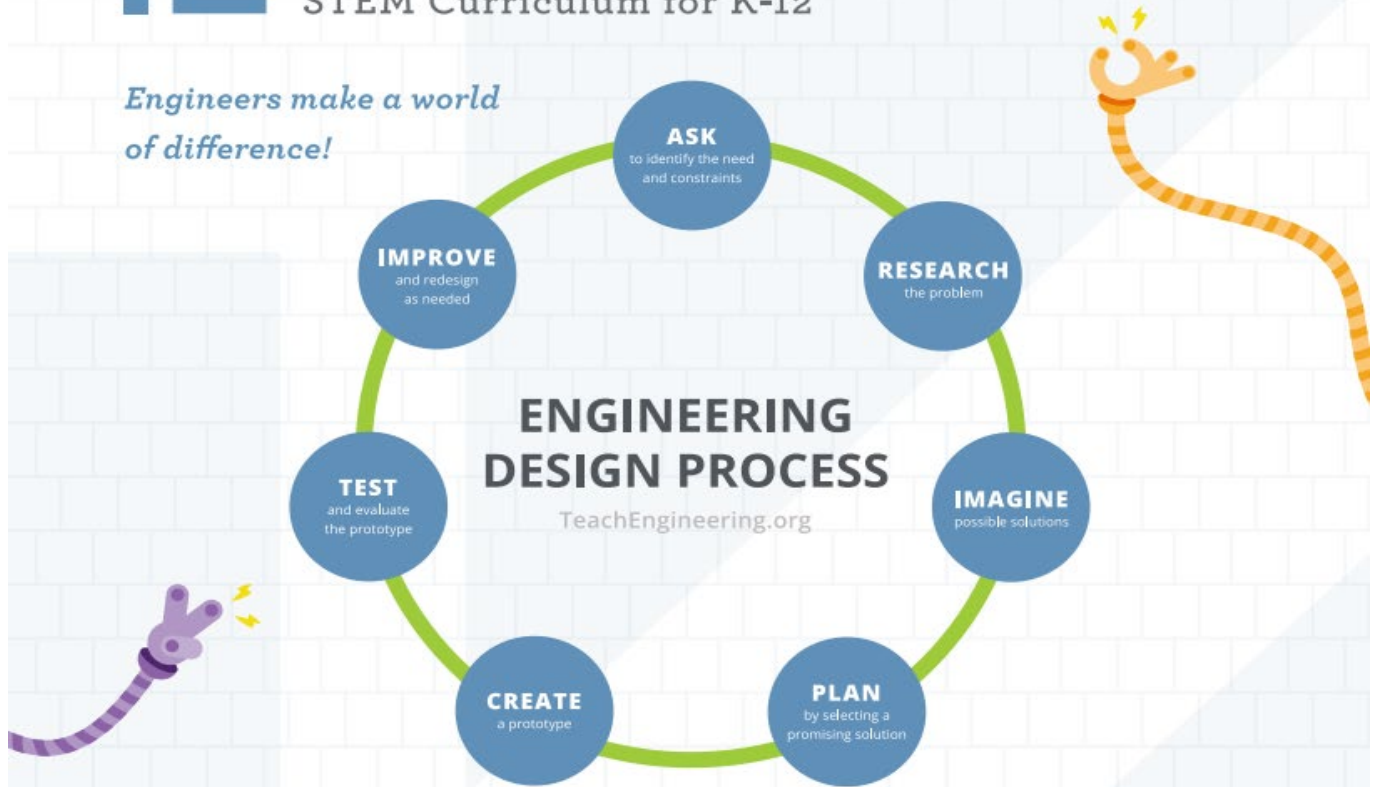
Date:

Class:

# TeachEngineering

STEM Curriculum for K-12

*Engineers make a world  
of difference!*



**1 ASK TO IDENTIFY THE NEED** Engineers ask critical questions about what they want to create: What is the problem? What do we want to design? Who is it for? What do we want to accomplish? What are the project requirements and limitations? What is our goal?

**2 RESEARCH THE PROBLEM** This includes talking to people from many different backgrounds and specialties to assist with researching what products or solutions already exist, or what technologies might be adaptable to your needs.

**3 IMAGINE POSSIBLE SOLUTIONS** Work with a team to brainstorm ideas and develop as many solutions as possible. Encourage wild ideas and defer judgment! Stay focused on topic, and have one conversation at a time. Good design is all about teamwork!

**4 PLAN BY SELECTING A SOLUTION** Revisit the needs, constraints and research from the earlier steps, compare your best ideas, select one solution and make a plan to move forward.

**5 CREATE A PROTOTYPE** Building a prototype makes your ideas real! Early versions of the design solution help your team verify whether the design meets the original challenge objectives. Push yourself for creativity, imagination and excellence in design.

**6 TEST THE PROTOTYPE** Does it work? Does it solve the need? Communicate the results and get feedback. Analyze and talk about what works, what doesn't and what could be improved.

**7 IMPROVE AND REDESIGN** Discuss how you could improve your solution. Make revisions. Iterate your design, continuously improving it, to make your product the best it can be within your design constraints.

**And now, ITERATE YOUR DESIGN!**

Start exploring at [TeachEngineering.org](https://www.teachengineering.org)

Find us on social media!     

Brought to you by



Name:

Date:

Class:

Ask: Complete the T-Chart and identify the constraints.

What do you know about clean cooking?	What do you need to know about clean cooking in order to build a cookstove?

**Constraints:** Watch the following videos:

- Cookstove Design #1: <https://www.youtube.com/watch?v=uKpar5nvCns>
- Cookstove Design #2: [https://www.youtube.com/watch?v=o\\_JLfPrLqOo](https://www.youtube.com/watch?v=o_JLfPrLqOo)
- Cookstove Design #3: <http://www.youtube.com/watch?v=rddmcl6iDo>
- Cookstove Design #4: <https://www.youtube.com/watch?v=deCzUOZYlI8>

As a class, decide on what cookstove can constraints your class must follow. Some options include: only one can per cookstove, two cans of the same size, two cans of different sizes, etc. Note: In order to get usable scientific data, every group must use the same number of and same sized cans.

Name:

Date:

Class:

Research: Read the articles and answer

**Part A. Burn Design Lab**

Go to [www.burndesignlab.org/about](http://www.burndesignlab.org/about)

- a) What do they design?
  
  
  
  
  
  
  
  
  
  
- b) Scroll down to "A Local Solution for a Global Problem." According to the World Health Organization (WHO), how many people use open fires to heat their homes and cook?
  
  
  
  
  
  
  
  
  
  
- c) What is one of the Burn Design Lab aims?
  
  
  
  
  
  
  
  
  
  
- d) Scroll down to "How We Work." What are the 5 parts of the (Engineering Design) cycle that Burn Design Lab engages in?
  
  
  
  
  
  
  
  
  
  
- e) Click "Mission" (at the top). Watch the video? Burn Design Lab works with partners in other countries. What knowledge do the people in these countries bring?
  
  
  
  
  
  
  
  
  
  
- f) What is one country Burn Design Lab partners with?
  
  
  
  
  
  
  
  
  
  
- g) What university in Ghana partners with Burn Design Lab?

Name:

Date:

Class:

Go to <https://www.burndesignlab.org/blogs/success-stories-aller-stove>. Read the blog.

- a) Paraphrase what Juana Pedro, President of the Women's Committee at Buena Vista, said?
  
  
  
  
  
  
  
  
  
  
- b) Paraphrase what Juan Juan De Francisco said?
  
  
  
  
  
  
  
  
  
  
- c) Paraphrase what Teresa Francisco said about the cookstove with relationship to her eyes?
  
  
  
  
  
  
  
  
  
  
- d) Paraphrase what she said about the cookstove with relationship to her children?

Name:

Date:

Class:

## Part B. Cookstoves

Watch

- Nigeria's Okey Esse Creates Clean Cooking Power Stove | Tech Trends - YouTube: <https://www.youtube.com/watch?v=sgAunt6omjs>

Watch 3 of the 4 videos listed below

- How Clean Cookstoves Improve Lives - YouTube: [https://www.youtube.com/watch?v=Yu5SdH2\\_0JU&t=9s](https://www.youtube.com/watch?v=Yu5SdH2_0JU&t=9s)
- Clean Cookstoves: “Black Inside, Three Women’s Voices”: <https://www.youtube.com/watch?v=qm9ODkF4VRo>
- Clean Cookstove Project in Kenya: <https://www.youtube.com/watch?v=L65htWQ4EmE&t=72s>
- Designing cleaner stoves for the developing world: <https://www.youtube.com/watch?v=Z0XrARfLfuk>

- a) What is clean cooking?
- b) What are the benefits of clean cooking versus using an open fire to cook?
- c) What 3 United Nations Sustainable Development Goals are being met by this work?
- d) Is clean cooking important? Why/Why not?

Name:

Date:

Class:

### Part C. The United Nations Sustainable Development Goals

1. Go to <https://www.un.org/sustainabledevelopment/student-resources/>
2. Scroll down to "Frieda."
3. Read the digital book and note the colorful boxes in the illustrations.
4. What is Goal #3?

5. What is Goal #5?

6. What is Goal #7?

7. What is Goal #10?

8. What is Goal #11?

9. What is Goal #17?

Name:

Date:

Class:

### Part D. Culture and Innovation

Watch: [https://www.youtube.com/watch?v=J3Zsj4Lfs\\_o](https://www.youtube.com/watch?v=J3Zsj4Lfs_o)

1. Half of the two million people who die are children under the age of \_\_\_\_\_. This is the equivalent of these children smoking 2 \_\_\_\_\_ per day.
2. What were two problems with the stove made by the large British oil company?
3. Technology + \_\_\_\_\_
4. So many attempts to improve the lives of people in poverty fail because they do not take a \_\_\_\_\_ centered approach and they fail to take into account how real people live (their real behaviors) and \_\_\_\_\_ preferences.
5. A design consideration that needed to be made was that people in different regions cook different \_\_\_\_\_.
6. In Guatemala, people make tortillas, so they need a \_\_\_\_\_ cooking surface.
7. In Ghana, they stir large \_\_\_\_\_ of stew so they need a \_\_\_\_\_ stove that won't topple.
8. What are two reasons why we shouldn't just give these stoves away?
9. In order to market the stoves effectively, what is one thing the company has to do?
10. Is knowledge of culture important to scientific innovation (design)? If so, why? Provide an example.



Name:

Date:

Class:

### Part E. Life in Kenya.

Watch and answer.

<https://www.youtube.com/watch?v=NhkqcfIxtil&t=5s>

1. Describe the family and home in this video.
2. Describe the food in this video.
3. The person who did the cooking was of which gender?
4. Where was the cooking done? What was used to cook the food?

An Indigenous Community in Kenya: the Luhya people: <https://www.youtube.com/watch?v=kQVUYmiEREA>

African Village Life/Cooking The Most Appetizing Kenyan village Food:

<https://www.youtube.com/watch?v=8v7qZv-D2JE>

5. Tell two things that surprised you about what you saw.
6. Describe the foods and things used or cooking. Is the food mostly processed food or natural plants, crops, meat, etc.?

Another Indigenous Kenyan People Group:

<https://www.youtube.com/watch?v=ThcppnztYpw>

<https://www.youtube.com/watch?v=NorrsBsOnZ0>

7. Describe the values these men and their community operate with.
8. What can you say about (Masai) Kenyan families based on these videos?

Name:

Date:

Class:

Life in Nairobi, Kenya

<https://www.youtube.com/watch?v=dIOWovGPD6c>

<https://www.youtube.com/watch?v=pLYXOMCkFHQ>

<https://www.youtube.com/watch?v=Q32aZTNP1JE>

9. Tell two things that surprised you about life in Nairobi, the capital city of Kenya.

10. Describe what you see in the backgrounds of these videos.

11. Describe the foods you saw in these videos?

<https://www.youtube.com/watch?v=ChyPpnQaBs0>

12. List four things you think of when you hear the term Africa.

13. Based on all the videos you've seen, what can you ascertain (guess/say/assume) about Kenyan families?

Name:

Date:

Class:

**Imagine (Individual Brainstorm):** Draw a detailed sketch of your design. Be sure to include the number, size, and shapes of any holes or openings. If you are working with a digital Engineering Journal, you may sketch on paper and then upload a picture of your sketch or sketch in program, app, etc. Share/Show your file with(to) your teacher. Have your teacher initial your design.

Teacher Initials: \_\_\_\_\_

**Plan (Group Decision):** Sketch your team's final design. Include a statement detailing why you picked this design. If you are working with a digital Engineering Journal, you may sketch on paper and then upload a picture of your sketch or sketch in program, app, etc. Take your packet/computer to your teacher. Have your teacher initial when you finish.

Teacher Initials: \_\_\_\_\_

Name:

Date:

Class:

**Build Prototype: Build your prototype. Paste/Upload two pictures (or provide two sketches) from different angles of your prototype below.**

**Test Prototype: Upload a picture or provide a sketch of your team testing your prototype while you do Cookstove Lab I: Testing the Cookstove.**

Name:

Date:

Class:

**Evaluation of Data: Class Discussion - Record the trends observed in the class data that were discussed by your class and your thoughts on your redesign. Take your packet/computer to your teacher. Have your teacher initial when you finish and record your points in the gradebook.**

Trends:

Redesign Thoughts/Ideas and Why:

Teacher Initials: \_\_\_\_\_

**Redesign Plan: Describe the changes decided upon and sketch your team's new cookstove. Upload a picture if working with a digital journal. Have your teacher initial your packet.**

Teacher Initials: \_\_\_\_\_

Name:

Date:

Class:

**Redesign Build: Upload a picture or provide a detailed sketch of your team's redesigned cookstove. Take your packet/computer to your teacher. Have your teacher initial when you finish and record your points in the gradebook.**

Teacher Initials: \_\_\_\_\_

**Testing the Redesign: Upload a picture or provide a sketch of your team doing Cookstove Lab II: Testing the Redesign.**

Name:

Date:

Class:

Reflection: Copy your answers from Lab II: Testing the Redesign below. Take your packet/computer to your teacher. Have your teacher initial when you finish and record your points in the gradebook.

1. Did your redesign have a longer or shorter boil time?

2. What are your thoughts as to why?

3. If you could redesign it again, what would you do?

Teacher Initials: \_\_\_\_\_

Name:

Date:

Class:

Extra Credit

Go to Student Resources - United Nations Sustainable Development (<https://www.un.org/sustainabledevelopment/student-resources/>). Scroll down to *170 Actions to Transform Our World*. Read the digital book. Choose 4 Goals. Choose one action you, your friends, our class, etc. could do for each goal.

Goal Number	Goal	Action