



Examining the Engineering Design Process

Purpose:

- To identify the components of the engineering design process.
- To identify how the engineering design process works and how it is implemented with *The Power of the Wind*

Time: 20 minutes

Materials:

Trainer Resource:

- Engineering design process
- Flip chart with engineering design process

Handout:

Engineering design process chart

Trainer Notes:

STEP 1: Context

The Power of the Wind includes the engineering design process and it is important for you to know about this process as you are working with youth. As you built an initial pinwheel, tested, and are now thinking about redesign, you are going through the engineering design process. Please turn to page eight in the Youth Guide. Let's apply the engineering design process to the activity you did.

STEP 2: Discussion of Process

With the chart on the wall and participants referring to it in their books, walk through it briefly so they think about each component. As you do, ask participants about each step and whether they used this in their pinwheel design. Use the trainer resource sheet to discuss the components. If time allows, ask the following questions:

- What do you notice on this chart?
- How many of you have used something like this with youth already?
- How might this help young people think through their design and their role as engineers?





STEP 3: Discuss Applying with Youth

The engineering design process really is about identifying a challenge or problem, identifying solutions, testing them, getting results, and making the product better. Think about new products coming out all of the time. One product may have several models or versions. Engineers are continually improving their products.

- How would you go about making this a focal point of the lessons?
- How do you think youth will benefit from using this model?

STEP 4: Transition

In the next activity, we will use the engineering design process again, but, this time, instead of thinking about it after you have done the activity, I want you to complete the chart as you are doing each step. This is a way for you to become more familiar with the process and to make decisions as a group. Remember that the engineering design process is always circular. This handout merely gives you a place to record your thoughts and progress. Working as “teams” is another important part of how engineers design and an exciting part of this career.



Hand out the engineering design process chart and say that in the next activity they will have a chance to complete this chart for how they make the pinwheel “better”.





TRAINER RESOURCE Engineering Design Process

Remember that the engineering design process is always a circular process like the chart in the Facilitator Guide.

STEP 1: What is the challenge?

Engineering work is based on “challenges” or “problems.” There must be a problem for engineers to solve. Clearly identifying the problem or challenge is the first step to thinking like an engineer.

STEP 2: How have others solved this?

Engineers don’t think only by themselves. In order to be efficient in their work, before they attempt to find a solution, they gather information. They might look at similar problems and collect information on what others have learned. They may ask other engineers or researchers, or tap into their prior experiences.

STEP 3: What are the design criteria and constraints? Brainstorm possible solutions.

Before engineers can identify possible solutions, they need to know what is available to them. What is their budget? What are the materials? How much time is available? After identifying these, they can begin to brainstorm possible solutions.

STEP 4: Which of the possible solutions do you choose?

Engineers don’t identify only one possible solution. They brainstorm several solutions and identify the pros and cons of each. During their identification of pros and cons, they take into consideration what they know from steps two and three. After careful thought, they can select the best solution for the problem.



STEP 5: Build a prototype.

A prototype is a first design of the solution. Engineers know that their work will be refined and the product made better, but they always need to start with an initial design.

STEP 6: How does it work? Try it and test again.

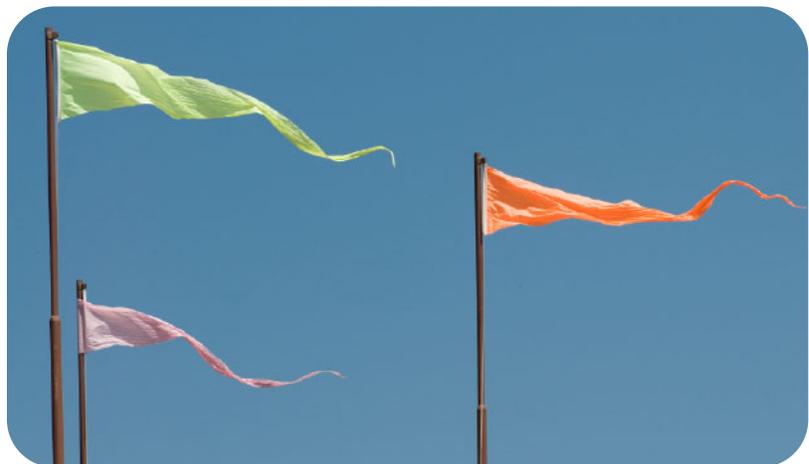
After the prototype is built, it must be tried and tested. Engineers will do several tests to ensure reliability. During the testing phase they will note what works well and what parts of the product need to be improved. They observe and record carefully.

STEP 7: How do you learn from the designs of others?

It is likely that others are working on similar problems or challenges. By sharing those problems and challenges with other engineers, they can get additional ideas for their design and products.

STEP 8: How can you use your new ideas to improve your design?

Looking closely at the initial prototype, data records from initial trials, and learning from others, engineers will redesign and refine to make their products better.





HANDOUT Engineering Design Process

Remember that the engineering design process is always a circular process like the chart in the Facilitator Guide. This handout merely gives you a place to record your thoughts and progress.

Engineering Design Process	Pinwheel
What was the challenge?	
How have others solved this same challenge?	
What were the design criteria and constraints? How did you brainstorm possible solutions?	
What possible solutions did you choose?	
How did you go about building your prototype?	
How did it work? How did you test it and try it again?	
What did you learn from the design of others?	
How can you use your new ideas to improve your design? ⁴	

4 Sebestick, J. *The Power of the Wind Youth Guide*. University of Illinois, 2008, p. 8.

