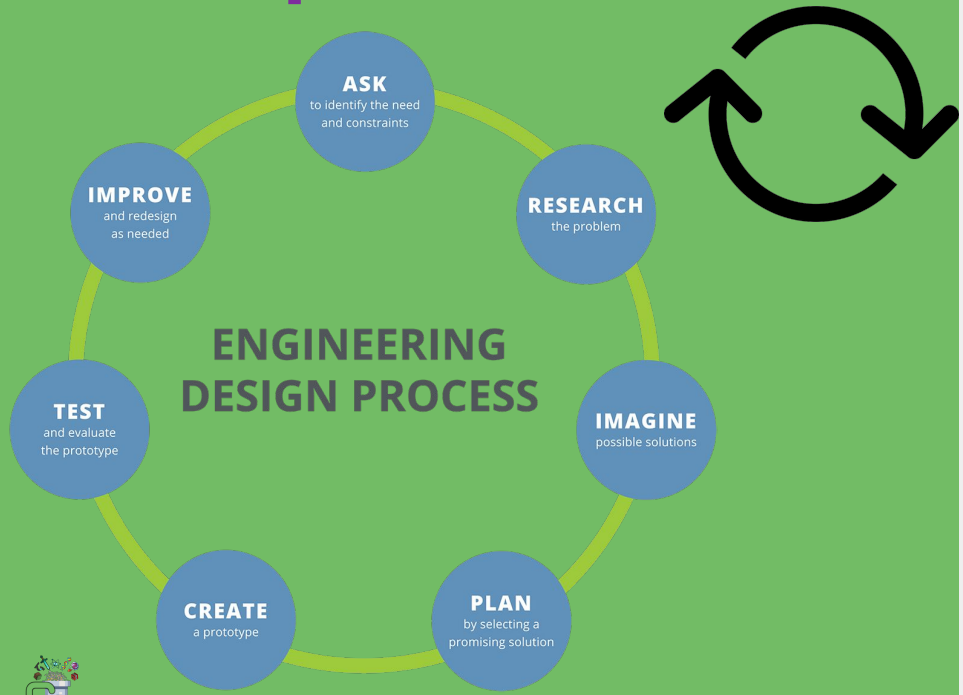
ScienceCraft

Engineering Design Process

What is the engineering design process?



- A series of steps that **engineers** use to help solve a **problem**
- A defined **process** to solve a particular problem by creating a product or solution
- Example prompt: You live in a world where the only writing instrument is a pen. However, you want to design an instrument where you can remove mistakes you make when writing.

Ask

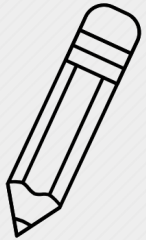
- ✘ Engineers ask **critical questions** about what they want to create, whether it be a skyscraper, amusement park ride, bicycle or smartphone.
- ✘ These questions include: What is the problem to solve? What do we want to design? Who is it for? What do we want to accomplish? What are the project requirements? What are the limitations? What is our goal?

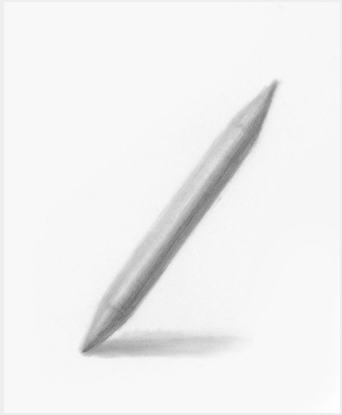
Research

- ✘ What solutions already exist?
- ✘ What is wrong with your existing solutions?
- ✘ Who can you talk to that is **specialized** in the field?
- ✘ What **technologies** might be adaptable to your needs?
- ✘ For example, to create the instrument in question you can consult a materials scientist.
- ✘ You may want to consider erasable pens and their faults
- ✘ White-out may be another faulty alternative

Imagine

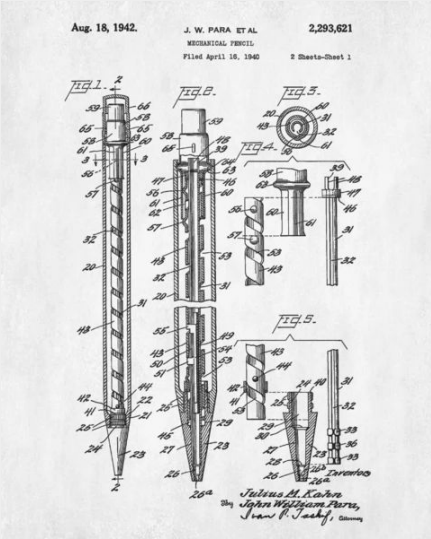
- Work with a **team** to brainstorm ideas and develop as many solutions as possible
- This is the time to encourage wild ideas and defer judgment
- Build on the ideas of others
- Stay **focused** on topic, and have one conversation at a time





Plan

- ✘ Revisit the needs, constraints and research from the earlier steps, **compare** your best ideas, select one **solution** and make a plan to move forward with it

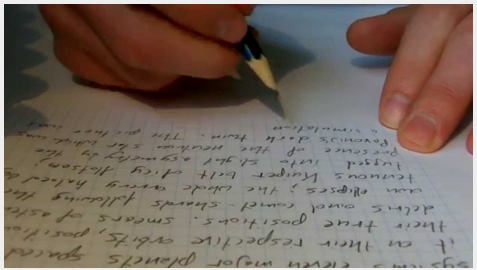


Create

- Building a **prototype** makes your ideas real
- These **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

Test

- ✘ 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**



Improve

- ✘ Discuss how you could **improve** your solution
- ✘ Make **revisions** and draw new designs
- ✘ Iterate your design to make your product the best it can be
- ✘ **Repeat**

Review

- ✘ Ask
- ✘ Research
- ✘ Imagine
- ✘ Plan
- ✘ Create
- ✘ Test
- ✘ Improve

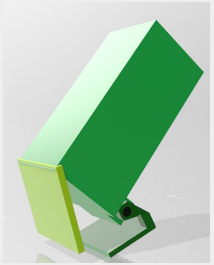
The Problem

In windy areas such as the Antelope Valley, there are times when powerful wind storms are capable of knocking over tall trees and powerlines. Trash cans are often caught in the mix, toppling over and releasing large clusters of waste. Not only is this a pressing issue for homeowners, but the trash released by unfastened lids is also subject to being blown away. This makes the process of managing and sorting trash far more difficult while also bringing up the risk of unnecessary pollution. Animals that encounter the trash or live near trash bins can be seriously affected as well. Raccoons and bears, for instance, are known for knocking over trash cans and getting in contact with the trash that spills out. This affects many animals and causes severe health problems that can easily be prevent

Materials:

- Trash can (regular sizing)
- Metal rod
- Plastic attachment made from recycled material
- Hinge

HDPE 15 cents/lb
970 kg/m3
Rod: 22in rod, diameter 1 inches =
Extension outwards: Plastic piece goes out 2.5 inches by 20 inches x .25inches =
Up Piece: .33 x 12 x 20 inch piece =
Over piece: 7 inches over x 22 inches x 1 inch =



Build Challenge: Build Anything!

- ✘ Build whatever you would like, explaining each step of the engineering design process.
- ✘ You could build something multiple times to indicate each step or you could simply explain how you executed each step
- ✘ We will look to see who followed the process closely but also give points to creativity and building skill