

Engineering Mindset:

Use a Systematic Engineering Design Process



The engineering design process is systematic, iterative process that engineers use to generate solutions to problems. Engineers work in many different fields (such as mechanical, biomedical, or chemical engineering) to design a wide array of technologies. While the products of engineering may vary, the problem-solving process used to create them is similar. In professional engineering settings, an engineering process may have dozens of phases.

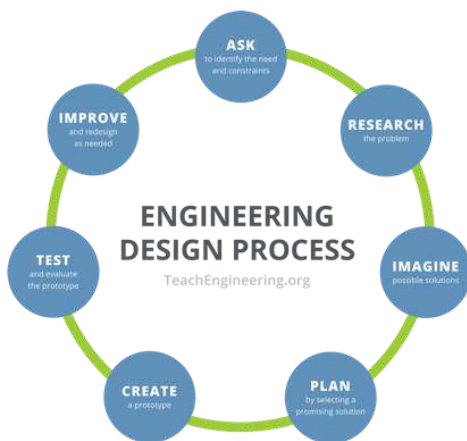
Each part of the process is important and guides engineers through problem solving.

Although the number of steps may differ, processes generally include the following basic phases:

- Defining the problem
- Brainstorming ideas
- Developing a plan
- Constructing a model
- Testing and analyzing performance
- Improving the design

Engineers can be inspired by flashes of insight or tinkering but designing a functioning product requires structured, data-driven design, analysis, and testing. Engineering experiences, therefore, should encourage youth's ideas and creativity but also help them engage in methodical, planned approaches that break down the process into manageable components.

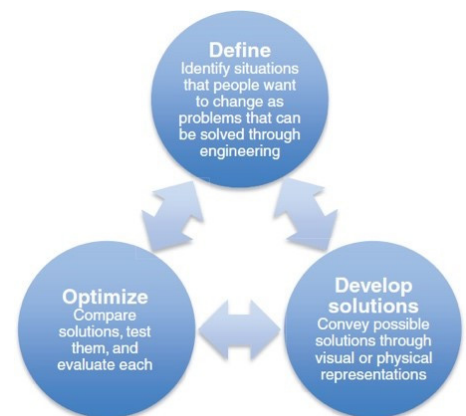
Most K-12 engineering education programs use a specific engineering design process. Three examples include:



Teach Engineering Process



Youth Engineering Solutions (YES) Process



NGSS Process

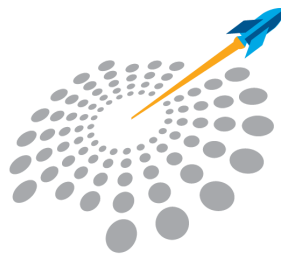
The engineering design process serves as a tool to guide and structure activity. It orients and focuses youth on the goal of the activity. And it also helps situate that day's work in the larger project.

It is important to recognize that the phases are guideposts, not rigid steps. In reality, youth will likely move back and forth between the phases. As they design, additional questions might arise that need to be researched, mini investigations might be needed to bolster understanding or decision-making, criteria and constraints might need to be reviewed or revised.

Engineering design processes are cyclical and iterative. Designs often do not function well initially—redesigns and tweaks are needed to improve or optimize them, launching another cycle of design. Technology itself evolves and changes over time. Many new products begin with an idea about how an existing technology might be modified to perform slightly different or better.

Introducing youth to a structured way to solve problems, equips them with a tool they can use not only to address engineering challenges but also to systematically approach problems that arise in their lives.

Written by: Christine M. Cunningham



MILLION GIRLS MOONSHOT