

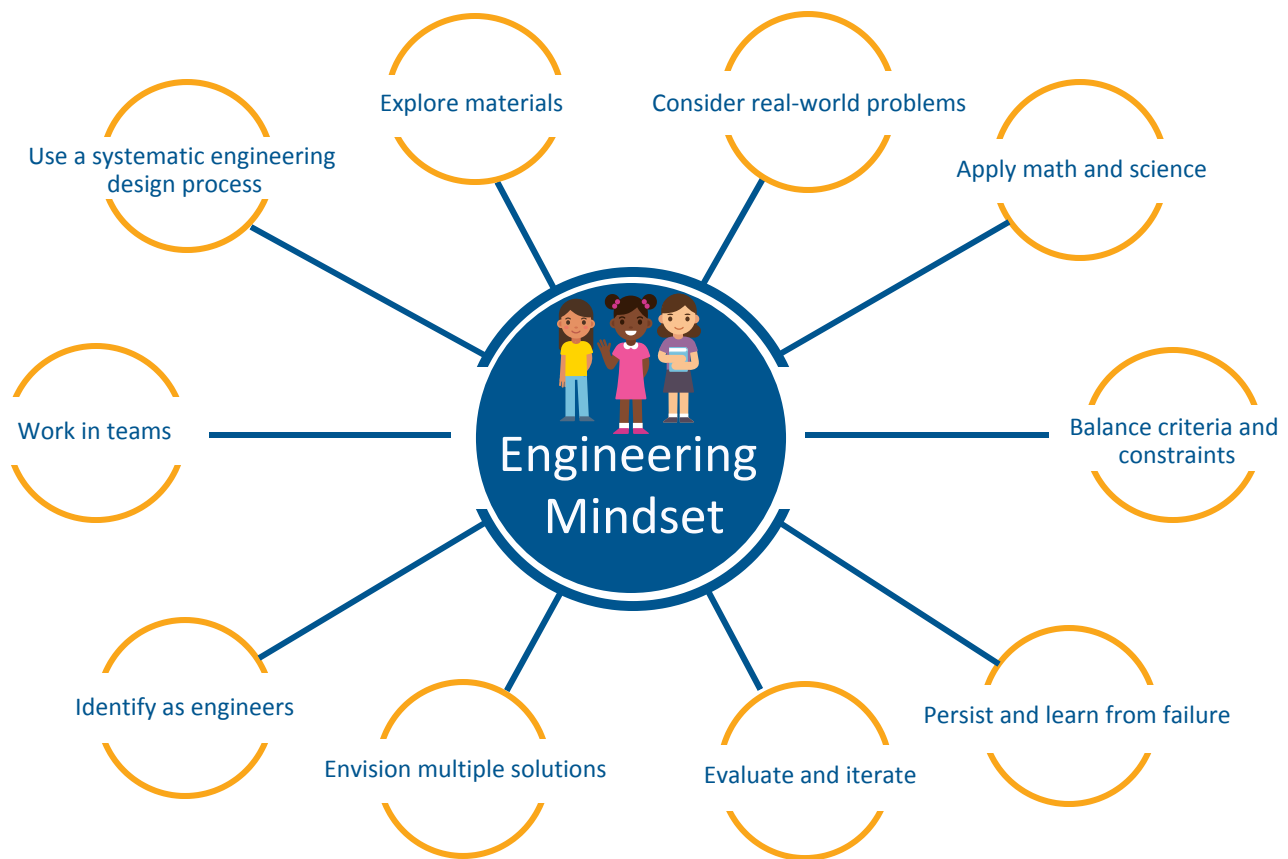
# Engineering Mindset

One of the primary goals of engineering education is to promote development of an engineering mindset. An engineering mindset refers to the values, attitudes, and thinking skills associated with engineering.

Engineers solve problems using systematic, iterative processes. The technologies (objects, systems, or processes) they design address the needs and desires of people, animals, society, and the environment. Engineers shape the world we live in. The clean water, toothbrushes, traffic pattern, smart phones, stain-resistant materials, and electric vehicles we use have all been developed by engineers. Though the products of engineering are diverse, engineers approach their work using a common set of engineering practices. High-quality engineering experiences that engage youth in these practices help them develop and strengthen an engineering mindset.

Million Girls Moonshot is highlighting 10 engineering practices. An overview of each follows. Subsequent briefs will explore each one individually. These practices are also more fully described in educational research articles (Cunningham, 2018; Cunningham & Kelly, 2017).

## 10 Practices for an Engineering Mindset



Practice	Overview
Use a systematic problem-solving process	Engineers solve problems using a systematic, iterative process called the engineering design process.
Explore the properties and uses of materials	Engineers consider the properties of materials as they select those that most appropriate for the task.
Consider real-world problems	Engineers design solutions to specific, real-world problems. They consider the context, background information, needs of the client, and the implications of solutions.
Balance criteria and constraints that require trade-offs	Engineers design to specifications that detail criteria for success and limiting constraints. Oftentimes, balancing these entail trade-offs.
Apply science and math knowledge to problem solving	Engineers use knowledge of science and math to solve problems.
Envision multiple solutions	Engineers think innovatively, brainstorm and analyze multiple solutions, compare the effectiveness of various designs, and make informed recommendations about open-ended problems.
Evaluate designs and iterate	Engineers test their designs to see how well they work. They collect and analyze data to revise and improve solutions in an iterative process.
Persist through and learn from failure	Engineers learn from failure to revise and improve the designs. This requires perseverance and improving through multiple iterations.
Work effectively in teams	Engineers work together to bring a diversity of knowledge and perspectives to the problem. Communicating and negotiating effectively are important skills for teamwork.
Identify as engineers	When youth engage with engineering practices to solve meaningful problems, they begin to envision themselves as engineers.

Students need multiple scaffolded experiences over time to develop this mindset. As they gain experience and maturity, use of the engineering mindset will become more routine and more complex.

#### References

- Cunningham, C. M. (2018). *Engineering in elementary STEM education: Curriculum design, instruction, learning, and assessment*. New York, NY: Teacher College Press.
- Cunningham, C. M., & Kelly, G. K. (2017). Epistemic practices of engineering in education. *Science Education*.101, 486–505.