Engineering Mindset:
Consider Real-World Problems

Engineers design solutions to specific, real-world problems. Oftentimes the problems are raised by a client. Sometimes a particular situation surfaces a need that engineers address. Envisioning a new technology that solves a particular problem or imagining how an existing technology could be improved to better serve its purpose are the primary goals of engineering. As they design, engineers need to identify the specific problem and solve it in context.

Early in the process, engineers need to define the problem they are going to work on. This is often called "problem scoping." As part of this phase, engineers work with their teams to identify needs and preferences of the end user and any other considerations that must be met.

For instance, engineers often need to learn more about the problem and the larger context in which it functions. A new technology often has to integrate into a larger system. A fan developed to cool an engine needs to work in concert with the existing engine. And new technologies always have to be designed to be compatible with human behaviors and preferences. For example, as when redesigning a road intersection, transportation engineers need to know how it functions. They may research how residents have historically crossed the intersection, where they prefer to cross, and why they make those choices. Statistics about traffic accidents, injuries, and safety at the intersections provide important data. Engineers may also assess how the intersection connects with larger traffic patterns and the road system. To consider contextual variables, engineers often collect a range of types of information—technical, social, cultural, economic, environmental, ethical—and weigh these factors as they design solutions.

Contextual factors are also important as engineers weigh the implications of their designs. The engineered devices, processes, and systems will have consequences for people, communities, the environment, and societies. It is the job of engineers to understand the various impacts (both positive and negative) that their new technology will have on existing systems.

To help youth develop the practice of thinking of problems in context, the engineering challenges they are asked to solve should focus on real-world problems. Compelling, relevant contexts can motivate youth by helping them to connect the work they are doing with real life. Engineering solutions for problems youth personally have encountered, or that exist in their communities can be particularly meaningful. Highlighting the significance of the problem and encouraging youth to consider both how their proposed solution functions across a range of domains (e.g., technical, cultural, economic, etc.) and its implications for the future can pique youth's interest and engagement.

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MILLION GIRLS MOONSHOT