

# Engineering Mindset:

## Envision multiple solutions



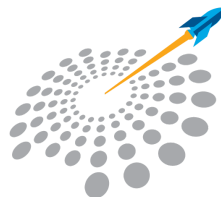
Engineers tackle open-ended problems that rarely have one unique solution. Instead, engineers creatively generate a variety of ways they might approach or address the problem—envisioning multiple solutions an important part of their work. During brainstorming, engineers engage in out-of-the-box thinking to foster the flow of innovative ideas. Rapid generation of numerous and diverse ideas results in a wealth of possibilities to draw from. Oftentimes new ideas are sparked from an existing idea and concepts may be combined to create novel approaches. The brainstorming process is strengthened by intentionally assembling teams that bring diverse strengths, perspectives, and experiences.

Once an array of possibilities exists, engineers weigh the criteria and constraints and consider the context and needs of the client to select the best elements they will include in the various approaches they will further test and iterate.

Even when an engineering team finally produces a design, it is not the only or the “final” design. Other groups (in other companies) may engineer different solutions. For example, consumers have a choice about which phone or fertilizer best meets their needs. And designs also continue to evolve. As new materials, uses, and ways of thinking come to be, a particular technology is re-imagined or improved. Most technologies have a history—for example, the smart phone came from the flip phone from the portable phone, from the rotary phone from the candlestick phone. Constantly envisioning a next generation of possibilities is what engineers do.

As they engineer, youth also need the opportunity to address open-ended problems that allow for an array of solutions. A diversity of solutions should be encouraged, shared, and celebrated. Generating original solutions can result in youth developing agency for and ownership of their designs and investment the performance of their technology. Because designs are unique, youth need to carefully consider next steps for their projects, what they need to know, and claims they can make—they cannot turn to other groups or an educator the answer. Youth will often devote hours to creating and improving technologies—designing and redesigning them so they better meet the criteria. Such engagement and dialogue result in stronger solutions and deeper thinking. Design challenges with many different solutions foster creativity, problem solving, and innovative thinking.

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