

Engineering Mindset: Persist through and learn from failure

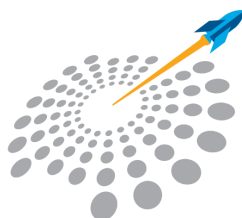


A successful solution to an engineering problem is often reached only after persisting through a number of failed attempts. Failure is part of and plays an important role in engineering. Engineering designs and ideas may “fail” by not meeting required criteria or constraints. In such cases, engineers analyze why the design did not perform as expected. They make changes and test and evaluate the solution again. Through such iterative attempts, they learn from the failure to improve subsequent designs. The lubricant WD-40 is so named because it was an engineer’s fortieth attempt at creating a formula for water displacement. Engineers understand that persisting through failure is an essential part of generating innovative solutions.

Once engineers create a successful solution that meets the specified requirements, they may also employ failure in another way—by creating computer or physical models that test a particular design’s outer limits to understand conditions in which it might fail. By understanding these conditions, they better understand the technology. For example, after designing a bridge, engineers might use computer models to understand how much weight it could support before collapsing. They might also test what strength and types of wind forces cause it to become unstable. Testing to the point of failure allows engineers to define parameters and make predictions about how their technologies will perform in normal conditions.

For many youth, “failure” has negative connotations and should be avoided. Engineering lessons should help youth understand that failure in engineering is unavoidable and expected. Including a phase of the design process labelled “Improve” or “Iterate” can signal youth that they will be expected to iterate a design. Giving youth time to redesign at least once allows them to analyze failed designs and improve a subsequent design. It is important that educators communicate that the individual or group are not failing, the design is failing, which means it’s time to figure out why and try again. Educators can use engineering activities to destigmatize failure by re-orienting youth toward a mindset of persisting through the failed attempt and learning from it. Youth often find this stance very liberating. With educator support and encouragement, youth can come to accept, expect, and even embrace failure as part of the problem-solving process.

Written by: Christine M. Cunningham



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