

## Engineers and Entrepreneurial Thinking

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“The world as we have created it is a process of our thinking. It cannot be changed without changing our thinking.” ~Albert Einstein~

This GIFTS presentation acknowledges that engineering studies coupled with exposure to entrepreneurship training develops a mindset that contributes to innovation and creative solutions to complex problems.

Through exposure to entrepreneurial thinking, engineering students are encouraged to identify needs and solve problems that create positive change. Although engineering design is a part of most engineering programs through the US where the use of new knowledge is applied, such courses do not always encourage a creative mindset. Constructing models and possibly incorporating an additive manufacturing course helps a great deal to engage students in engineering courses but may not go far enough to incorporate questions such as: When is an idea an opportunity? Engineers often struggle with ideation or creative pursuits.

We know that the mindset of an engineer develops very early in life with a passion to figure out how existing things work--or do not work for that matter. Studying complex STEM subjects in depth over time develops a mindset quite different from students who are not engineering majors. It is easy to see why some linear-thinking students see courses outside of their engineering major simply an annoying distraction and something merely required to graduate.

By including entrepreneurial thinking within engineering courses or taking a technology-based entrepreneurship course, students can begin to apply their skill set and think beyond the required learning formatted in a text book/lecture/test engineering course can provide. Some of these incorporated entrepreneurial skills include:

- Ideation
- Assessing and managing risk
- Understanding the concept of pivoting
- Creating a customer-centric value proposition
- Understanding qualities of entrepreneurial leadership
- Developing cross-team effectiveness

- Social capital
- Manufacturing logistics
- Resourcefulness
- Intrapreneurship

Job satisfaction includes being competent in meeting work expectations. But there is more to it than that. Engineers who are also creating value and using their specialized knowledge to advance society can gain an added sense of accomplishment. Possessing an entrepreneurial mindset along with a solid foundation in STEM courses creates an engineer who's capable of impacting the world.

Lastly, B.L.Ramakrishna, Director of Grand Challenges Scholars Program Network at the National Academy of Engineering has said, "We need entrepreneurial engineers: Those who recognize great opportunities in addressing Grand Challenges and who take calculated risks to make a lasting positive impact on society."