

Better Integrating of Engineering Design and Analysis into Engineering Education

by
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The future of engineering design education lies in empowering students with critical-thinking skills, creativity, and purpose.

Engineering design is a staple of engineering and needs to be better integrated into engineering education. Being an engineering design student, I did not realize until my senior proposal class that others in my department were not familiar with engineering design and the engineering design process. Our class advisor had to take two class periods to explain the process to the class. This was alarming to me as I would eventually be placed in a group with these students. This meant the difference between a successful senior project or a failing one. In industry, the failure of integrating proper engineering design can mean the difference between life or death. In this essay, I want to talk about the effect of integrating engineering design more widely throughout the curriculum, the benefits of teaching engineering design before analysis, how integrating design can reduce rigorous coursework by providing the tools students need, and how to effectively teach engineering analysis by providing more open-ended projects. I believe that engineering design has a rightful place in all engineering education courses.

To effectively teach students about engineering design, it needs to be taught in all aspects of engineering. The engineering design process is critical in all things in engineering. This process guides engineers to a solution that not only solves a problem, but does so in a way that works to cover future possibilities. Having knowledge of engineering design would give students more than just a knowledge of their field, but give insight into the other fields of engineering they will be working with.

Understanding engineering design encompasses more than just one field of study. For example, in order to design a new plastic product that's going to withstand heavy stress, plastic, manufacturing, mechanical, and design engineers must all come together to complete the task. The engineering design process gives all engineers common ground upon which to work.

As an engineering design student, I have used the engineering design process both throughout my entire college career and in industry. My projects, presentations, and studies have been greatly improved and I am more likely to take lead on challenging projects. My designs are more thorough, I conduct deeper research, and I always have a better end product. I thoroughly enjoy myself while designing.

While design is fun and challenging, analysis is truly my favorite part of the engineering design process. Analysis is critical to design. Analysis' gives an engineer data on whether or not a selected design will or will not fail. If a design fails, a redesign must occur, or a fix must be

applied. Learning how to design the end product for success by utilizing the engineering design process saves time, money, and stress.

Teaching engineering design before analysis would not only stress the importance of analysis, but give students a better understanding of what they should be analyzing. To streamline design processes in industry, engineers in the field first must understand the application of the part. This allows engineers to anticipate stress that the part is going to undertake. The same should be said for engineering students. Understanding the engineering design process helps students thoroughly understand any problem they are solving and helps decrease error.

While adding a little bit of coursework to some engineering courses, integrating engineering design would relieve stress on students by giving them the tools they need to succeed in the classroom. With the current system of education, students do not commit anything to memory that is not required to pass. More often, students memorize information for tests, regurgitate said information, and proceed to quickly forget that information. Obviously, this works on a course to course basis, but in industry it will not make the cut. If the information is applied in another class students can subconsciously memorize the material through repetition.

Students are inherently more interested in problems they feel they can solve on their own. Engineering design teaches several critical thinking skills that students lack due to curriculum focused on bookwork. This creates a confidence that allows students to thrive. This doesn't end with coursework. Students would also be able to catch on faster in industry, making them valuable to employers.

Projects are learning tools that needed to be utilized more in engineering courses. I've found that students without knowledge of engineering design are more opposed to course projects. These need to be focused on strictly on designing personal items. The best way to help a student understand how analysis connects to design is by allowing them to analyze their own designs. By doing this, they are developing connections that they never would have thought of before because they are invested.

Projects of this sort should be chosen by the students. Projects should range from improving existing items with a list of specific analysis criteria to choosing their giving a problem to solve with an open criterion as long as it can be analyzed for function. Projects like these allow students to be creative while gaining valuable knowledge about design and analysis.

In conclusion, engineering design is important in all engineering education courses. The implementation of engineering design provides many benefits such as critical thinking skills, higher confidence, and real-world knowledge. Teaching engineering design before analysis puts more focus on analysis by teaching students to design for application. Engineering design provides students with the tools to succeed in their course work by giving them all the tools they need. Lastly, open-ended analysis projects can provide an in-depth look at how analysis can be applied. Engineering design is critical to the success of engineering education and engineering in the field.