of safety efforts and recognizes that educating students encompasses excellence in the classroom and education about safe research in the lab. More information, including the names of the many "safety champions" at Penn State, can be viewed online at http://live.psu.edu/story/56194#nw63.

While numerous safety resources exist, I hope this provides a challenge for you to carefully evaluate what the safety culture is in your workplace. Then, take steps to improve the safety culture within your group and organization as a whole.

About the author

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Quality education: Teaching students to optimize experiments

By Ashley Durrbeck

Virginia Tech's Materials Science and Engineering department is constantly looking for ways to improve its curriculum to prepare its students for what is coming next. One of its more recent additions includes the class, Materials Optimization through Designed Experiments. The department developed this class to better prepare seniors for their design projects by examining ways to refine their experiments as well as to prepare the students for challenges they will face in the work place.

The goal of the class is to understand how to make experimentation more efficient, more powerful and more predictive, according to instructor Gary Pickrell. More efficient experiments require fewer trials to produce meaningful data, saving time and money. The more powerful the experiment, the better the understanding that will be obtained from it. The more predictive an experiment, the easier it is to optimize and improve the performance characteristics. With these goals in mind, Pickrell introduced the students to concepts such as Six Sigma, Statistical Process Control Charts and the Taguchi Method.

Lectures include interactive building of Statistical Process Control Charts, where students gather data over the course of several class periods, and the data were entered into an $\bar{x}$ chart and an R chart. Through examining these charts — $\bar{x}$ chart for analyzing the average and R chart for analyzing the variation — students are able to determine if the data is in an acceptable range for the given experiment. Students also learn how to determine when changes in a system over time are significant and what to do when the system does not behave as expected.

(Credit: Durrbeck; Va. Tech.)

An example of a projectile system created and optimized for this class. The factors that were varied include board angle, elastic pull back position, ball position and peg location.

A real world perspective from prior industry experience often is shared with the students, as concepts that are important, such as the Six Sigma method for quality control. The Taguchi Method was discussed in depth, as it utilizes loss functions, system design, the interaction of data and outcome analysis to improve the quality of the product. The Taguchi Method is heavily used for the group project assigned to each class.

To put the lessons into practice, students work in groups to build a projectile system that has four variables with three levels each. These four variables were peg height, pin location, draw-back position and ball position (the photograph shows an example projectile system). Once this system is built, the groups are given different target distances to achieve, and they have to optimize the system to decrease variance from the target. By creating and analyzing these systems, students are able to better absorb the information presented in their lectures.

The Materials Optimization through Designed Experiments course provides invaluable information to students that is applicable to many real-world situations. By learning about Six Sigma, students will increase their career marketability and will be able to become valuable members in any company because of their ability to design efficient experiments, analyze the results of data and determine when the changes in a process have occurred.

About the author

Ashley Durrbeck is a junior at Virginia Tech. ■