



Student Teacher Outreach Mentorship Program

Guidelines and Tips

for fostering a positive environment in an engineering classroom

- **Engage boys *and* girls.** Make sure that all of the students will be engaged and excited about the activities. Try not to focus all of the engineering sessions on building cars, but rather try to make various activities that both boys and girls will be excited about. Also, same-sex partners tend to work better on engineering activities as they have the same goals and ideas about the project.
- **Allow for ridiculous brainstorming.** Many projects begin with a class or group brainstorming session. Remind students that there are no bad ideas during brainstorming. Even silly ideas can sometimes inspire good, creative solutions.
- **Encourage sharing of ideas.** Collaboration is an important aspect of engineering. While students typically view sharing answers as “cheating” or “copying”, the idea of sharing strategies is encouraged in an engineering environment.
- **Ask thought-provoking questions.** Ask a student how or why something does or does not work instead of giving them the solution. Also, allow students to test and build on their own rather than completing tasks and fixing problems for them.
- **Stress that there is no “correct” solution.** In engineering, there are always multiple solutions to each problem. Discuss how and why one solution may accomplish the goal more or less effectively than the other.
- **Recognize innovation.** While sharing ideas is encouraged, a student may feel upset if someone else gets credit or praise for an idea that they developed first. Encourage the students to recognize each other’s work and how they were able to share ideas. In that way, students who find an innovative technique are recognized, while other students are able to benefit.
- **Make student experts.** When a student has come up with an innovative solution, make them the “expert” at that topic. Did Suzy find a good way to attach the sensor to her car?

Call it the “Suzy method” and encourage other students with the same problem to ask her for advice.

- **Embrace failure and redesign.** Tell the students that it is not only okay if things don’t work instantly, but that it is expected. At the same time, encourage students to reflect on *why* something isn’t working, and ask if they can’t figure it out. Each trial should lead to a way to improve the design, and each design change should be motivated by the result of a trial. This tactic encourages students to think about their building while relieving some of the frustration when things don’t work correctly.

- **Competition vs. Collaboration.** Some students thrive in competitive challenges. Other students may become shy if they have to compete with classmates, or will be less willing to share their ideas. With the right environment, a friendly classroom competition can be fun and motivating for the students. If grades or big prizes are on the line, a competition can quickly make a classroom unwelcoming. However, if the challenge is just for fun, students may embrace it. Also, students may prefer a competition where they are facing a standard or a goal rather than facing off with another student. This way, the success of one group doesn’t hurt the success of another, but there is still a final goal to achieve.

- **Emphasize the end of class discussion.** While it may sometimes seem like it would be easier to just end a lesson, the end of class discussion and reflection is critical to developing students’ understanding and ability to describe their design. It also allows the teacher a chance to assess the progress of the class. Additionally, it gives students a daily motivation to make progress on their project if they know they will have to show it to the class.