Apr 16th, 11:00 AM - 2:00 PM

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The Scholarly Role of Faculty Advisors in Student Engineering Competition Projects

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Abstract

ENGINEERING FACULTY ADVISORS at Cedarville University work closely with senior engineering students on the Solar Boat team to improve the boat’s performance each year and continue the team’s legacy of 7 wins in the last 10 years at the Solar Splash Competition. The faculty-student relationship is, at times, similar to that of a mentor and apprentice and at other times similar to that of an engineering manager and an engineer. These relationships allow us to maintain technical continuity from year to year between student teams, develop and maintain an increasingly sophisticated team knowledge base, coach the students through design issues beyond the scope of their in-class instruction, and model the diligence, effort, and attention to detail that are essential to be successful at the international level in student engineering competitions.

Each year the team seeks to improve several aspects of the boat’s performance. They follow a Design Process that has a large emphasis upon the manufacturing and testing of their designs. Throughout the project phases the role between the faculty and student can change.

• THE DESIGN PROCESS – A MEANS TO AN END
  • Background research – building upon prior years’ knowledge and experience
  • Proposal development – the new team’s contribution
  • The Power Budget – an analysis method that defines the capability of the system and sets individual system specifications for the boat to perform as needed
  • Design and model components and circuits – beyond the classroom to details that stretch and develop engineering skills
  • Manufacture components – a well equipped shop, skilled guidance, hands-on work
  • Component and system testing – a key to reliability in the field
  • It is the design – it’s not done until each component meets the performance specifications

• THE MANUFACTURING PROCESS – BUILDING IS LEARNING
  • The unique nature of the project leads to design solutions that are not generally available for purchase off-the-shelf. This includes most major components such as the solar panels, electronics, motors, propellers and hull.
  • The team builds as much as possible in-house to give students experience in manufacturing – many things are learned best by doing.
  • Some components require facilities or technology which we do not have – we coach the students in working with vendors to develop custom solutions.

• THE FACULTY / STUDENT RELATIONSHIP – SCHOLARSHIP IN A NEW CONTEXT
  • As faculty advisors we demand close adherence to the Power Budget because it ties together the individual performance specifications and work of each student.
  • Scholarship through Oversight: In the design, manufacturing, and testing phases, we encourage students to develop their own solutions and have frequent faculty/student meetings where the advisor’s role is similar to an engineering manager, and the student’s role is much like an engineer (Manager/Engineer Model).
  • Scholarship through Example: When the complexity of the project goes beyond the capability of the student, the advisor works side-by-side with the student, sometimes for hours-on-end, demonstrating the technical knowledge, problem solving capability, diligence, and attention to detail necessary to master the problem and bring the project to a successful completion. In these times the faculty/student relationship is more like that of a Master and Apprentice (Master/Apprentice Model).
  • Scholarship that Bears Fruit: Students often develop expertise beyond that of their advisor and contribute greatly to the team’s knowledge base, doing great scholarship in the context of an engineering competition project.