Changes in Student Perceptions of Engineering Design During the Completion of a Solid Modeling Course

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For several years, we have used evaluations of students’ work in a solid modeling course as part of an assessment and evaluation method for ABET learning outcomes C and K; the ability of students to design a system, component, or process, and to use modern engineering tools necessary for successful engineering practice. Our evaluation process focuses on the students’ ability to apply a specific software package (NX, formerly known as Unigraphics) in a sophomore-level course entitled “Computer Aided Design and Integrated Manufacturing CAD/CAM/CIM” where they work on assignments and a self-selected project that involve using the software efficiently, creating the correct geometry in both shape and size, and employing constraint-based solid modeling to transfer design intent from drawing to model. The creation of part models, assemblies, and layout drawings is covered. While it is clear and measurable that students come a long way towards mastering these concepts, what we have not known is how their perceptions of engineering design have changed during the semester in which they completed the solid modeling course.

In this study, we follow a cohort of students through a fifteen-week solid modeling course. The identical web-based survey is administered during the first week and after the fifteenth week of classes. The survey is composed of several open-ended and multiple-choice questions that ask students what they feel are important attributes in solid modeling and engineering design. There were 36 students enrolled in two sections of ETM 260 at the end of the course in Spring 2012. Of the 36, two students had not officially withdrawn but had discontinued attendance, did not submit the self-selected project, and did not take the final exam. Of the 34 active students in the course at the end of the course, 26 students completed the week 1 survey and 29 students completed the week 15 survey. Because we were interested in perception changes of a small group of students, we retained only the surveys for those who completed both the week 1 and week 15 surveys. A total of 22 students completed both parts of the survey for a 65% survey response rate. Because of the integrated error checking in the web-based survey, all surveys were complete and thus the survey completion rate was also 65%.

Among our priorities as instructors in an engineering program is to foster the design mentality at an early academic stage. Such an approach will definitely have an impact on the way students’ approach towards the solution of engineering problems in general, and design problems in particular. In order to quantify the students’ understanding of the engineering design process we need a tool to measure their perceptions of engineering design. Our goal is the development and refinement of a tool that can measure the progress of students as their understanding of engineering design evolves from a relatively immature state to a more advanced understanding.

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