

Implementing SolidWorks Certifications into an Engineering Technology Curriculum

Abstract

The job market for recent and perspective Engineering Technology graduates is more competitive than ever. Increasing unemployment numbers, more and more manufacturing operations moving overseas and slower than average employment growth is feeding this competitive fire. Not only are prospective graduates competing against each other for employment, they are also competing against out-of-work engineers that have recently lost their jobs due to the failing economy. How do budding young engineers make themselves more attractive to potential employers? How can they prove that they are capable of performing at a respectable level without having had an opportunity to actually work in an engineering environment? Industry-recognized certifications can give these young engineers an edge.

The objective of this paper is two-fold: 1) to express the need and importance of industry-recognized certifications in the undergraduate ET curriculum, and 2) to set up the framework for implementing certification exams in the undergraduate ET curriculum.

Data and reactions from industry surveys, advisory boards and other constituents will be presented to validate the importance of introducing certifications. It is also important to note the significance of the certification content and how it is conveyed in the classroom. The intention is not to “teach to the exam”, but rather to find out what information is important enough for industry to put in a certification exam, and then include that material in the curriculum. The object of an Engineering Technology program is to prepare students for the workplace. This is another tool that students’ can pull out of their toolbox and prove to a potential employer that they are qualified for the job.

Introduction

Imagine the following two scenarios that recently occurred during job searches for two students. In both of these scenarios a graduating student is in a job interview and the interviewer sees the SolidWorks certification number proudly displayed on their resume: 1) Before the student returned home the company called to offer him the job, 2) the company automatically gave the student a dollar per hour increase on his starting salary. Both of these events actually occurred for two of our students during this past semester, and both students stated that the interviewer’s decision was based heavily on the industry certification.

Curriculum Implementaion

During the fall semester in 2009 a survey was sent out to 100 regional companies in an effort to determine which parametric modeling software should be taught at this university. Of the 100 survey requests sent out, a response of 65 companies was received. Of those responses 70.4% said SolidWorks should be the primary software in the Engineering Technology program. The majority of the responders also felt that certifications were beneficial for new hires (56.1%). Based upon this survey, and other research the ETECH program switched from Pro Engineer to SolidWorks as the primary teaching tool.

While negotiating the purchase of the SolidWorks Education Edition Software it was discovered that as a part of this deal the students of the university were allowed to download the latest version on their personal computer, and were allowed one free Certified SolidWorks Associate (CSWA) exam voucher (\$99 value). Shortly after implementing the software change, our university was established as an official CSWA testing site. Since becoming a testing site, PSU has given 1175 students an opportunity to take a SolidWorks certification exam.

Faculty discussions ensued as to which SolidWorks certifications should go into what courses. A recommendation is made by David Planchard that students should have 6-9 months of SolidWorks experience and at least 45 hours of classroom time before attempting the CSWA exam (Planchard, 2017). The first Engineering Graphics course is structured to expose students to the design process, engineering graphics fundamentals, and exposure to the software. The majority of the software training included learning how to create models, and toward the end of the semester students were introduced to simple assemblies and drawings. The second course continues with advanced modeling, advanced assemblies and drawing creation. Many parts are created and several quizzes are given. Assessment of these activities by the instructor include visual inspection, following specifications and orientation of the parts.

A decision was made to hold off on offering students the free CSWA certification exams until the students became more proficient with the software. It was decided among faculty to offer the certification as the final exam during the second-level graphics course MECET 226 Computer-Aided Design. This would give students time to become familiar with Engineering Graphics practices while also learning the software. No curriculum changes were made before administering the first CSWA exam in the spring of 2011. The results for the initial offering of the exam were not very promising. Figure 1 shows that only 26% of the students passed the exam. It was quickly determined that some form of exam preparation was needed to help students succeed.

After the disappointing results of the first round of certification exams, a few questions arose within the department. How can we send our students into industry like this? What can we do to increase the pass rate? *Should we teach to the test?* The last question has always been a touchy subject within academia. Why not teach to the test, should be the reply. Students come to college for one reason, which is the same reason we should be here. We are here to ensure that our students are equipped to go out and get a job. Who is responsible for creating certification exams...industry (in association with SolidWorks in this case)? What better way to prepare a student to enter industry than to give them the set of skills requested by industry? So yes, we

decided to modify a portion of our curriculum in order to prepare for the CSWA. We didn't change the content of the course, but we did present it in a way that is consistent with the exam itself.

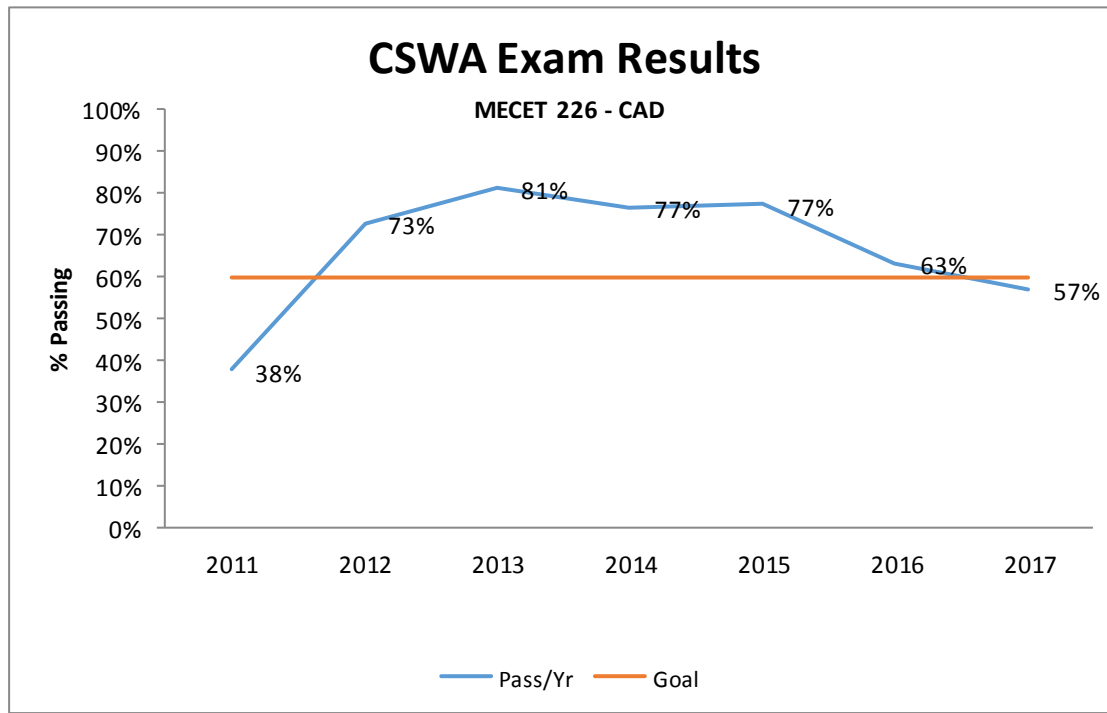


Figure 1. CSWA exam results by year.

To better understand the changes made to the curriculum, it would be helpful to understand how the CSWA exam is laid out. The exam is broken down into three primary sections: Modeling, Drawings, and Assemblies. The drawing section is a very small portion of the exam and only has three multiple choice questions based upon a drawing. “What type of view is this” for example. The modeling section requires the user to create a Basic model based upon a given drawing and then choose the overall mass from a set of multiple choice questions (see Figure 2). Then the user is asked to make certain modifications to the model, and then type in the new overall mass (no multiple choice this time). If the user is not within 1% of the correct answer, no credit is given. This process is continued with an Intermediate part and an Advanced part. The final section asks the user to create very specific assemblies with parts that are provided in a .zip file. The same process of multiple choice and fill in the blank are followed, but this time based upon the center of mass of the part. A score of 70% on the three hour exam is considered passing.

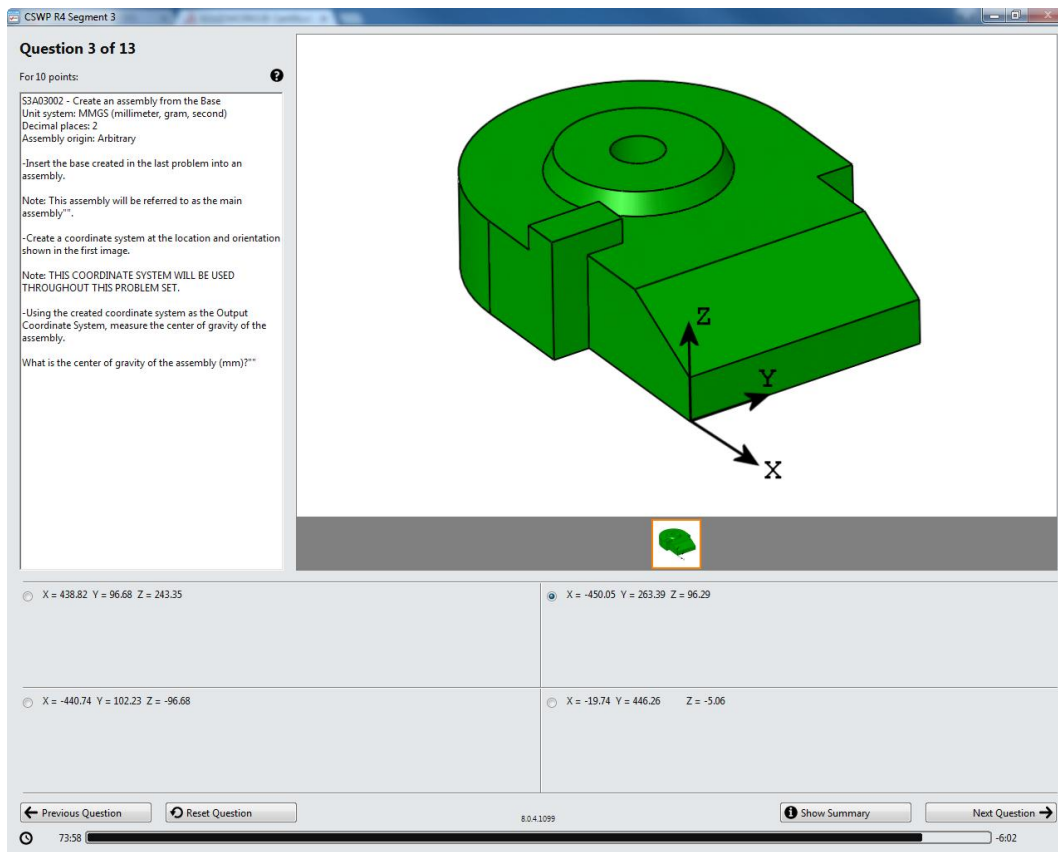


Figure 2. Screenshot of CSWA exam format.

To better prepare the students for this intense 3 hour exam, the format for quizzes was changed to mimic the CSWA. Students were asked to create a certain model within a 40 minute time period to help them hone their time management skills. Upon completion of the model, they had to determine the overall mass from a set of multiple choice answers. Then they were asked to make modifications to the model and then enter their new overall mass as a fill in the blank answer. This process was also followed for assembly quizzes. As you can see in Figure 1 this method of instruction has helped the students become more successful test takers, while still learning the material set forth in our course objectives.

[Include other Solidworks certifications and their location in our curriculum] Rough Draft

Assessment / Accreditation

This type of exam is the perfect tool to be used in an Engineering Technology program's ETAC of ABET accreditation process. The exam is provided by a third-party, the data is laid out nicely, and it is easy to retrieve the data. The data is broken down by exam topics so you can see where the instructor needs to improve instruction. For the CSWA the exam results are charted by Advanced Part Problem, Assembly Problems, Drafting Competencies, Intermediate Part Problems, and Basic Problems. Figure 2 shows the exam breakdown of a student who ended up passing the exam with a score of 170 points. In this case the chart shows that the student is strong in the assembly process, but needs work on drafting competencies and advanced part creation.

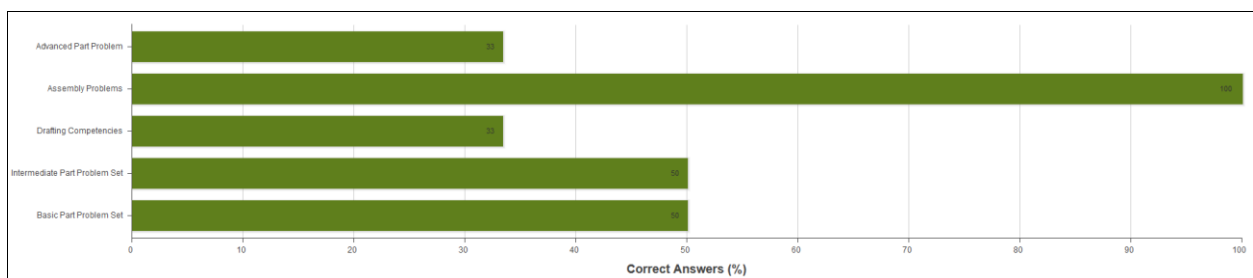


Figure 3. CSWA Competency Breakdown.

[Insert certification data screen-shots and how we use in ABET Self-Study] Rough Draft

Future Work

Our ETECH department is comprised of 4 major areas of study including Electronics, Manufacturing, Mechanical and Plastics. The majority of our SolidWorks certifications occur in the Mechanical program, but there are plans in place to include certifications in all programs. There are certifications for Mold Tools, Electrical, Weldments, and Sheet Metal that will enhance the student's credentials in these areas.

[Explain exactly where these certifications would be inserted] Rough Draft

[More detail to come] Rough Draft

References

www.solidworks.com/sw/education

PLANCHARD, D. (2017). *OFFICIAL GUIDE TO CERTIFIED SOLIDWORKS ASSOCIATE EXAMS: cswa, csda, cswsa-fea solidworks 2015 -... 2017*. S.l.: SDC PUBNS.

Biography

[Author name here] is the chair of the Engineering Technology Department in the College of Technology at **[School Name here]**. He previously served as the coordinating professor for the Mechanical Engineering Program at **[School abbreviation]**. Mr. **[Last Name]** holds a Bachelor of Science in Engineering Technology degree with a major in Plastics and a Master of Science in Technology degree from Pittsburg State University. He also earned a Master of Business Administration degree from Wake Forest University.

Prior to his academic career Mr. **[Last Name]** spent 14 years in the plastics manufacturing, and natural gas distribution industries. While at Tyco Electronics in Greensboro, NC he designed mold tooling and injection molding processes for electrical connectors used in the automotive and communications industries. As the Service Supervisor and Engineer for Kansas Gas Service in Pittsburg, KS he was responsible for designing commercial and residential distribution systems for all of SE Kansas.

[Names removed for Double Blind submission]