

Shaping Up Engineering Career Prospects

William Fremd High School engages more students with project-based curriculum, real-world tools

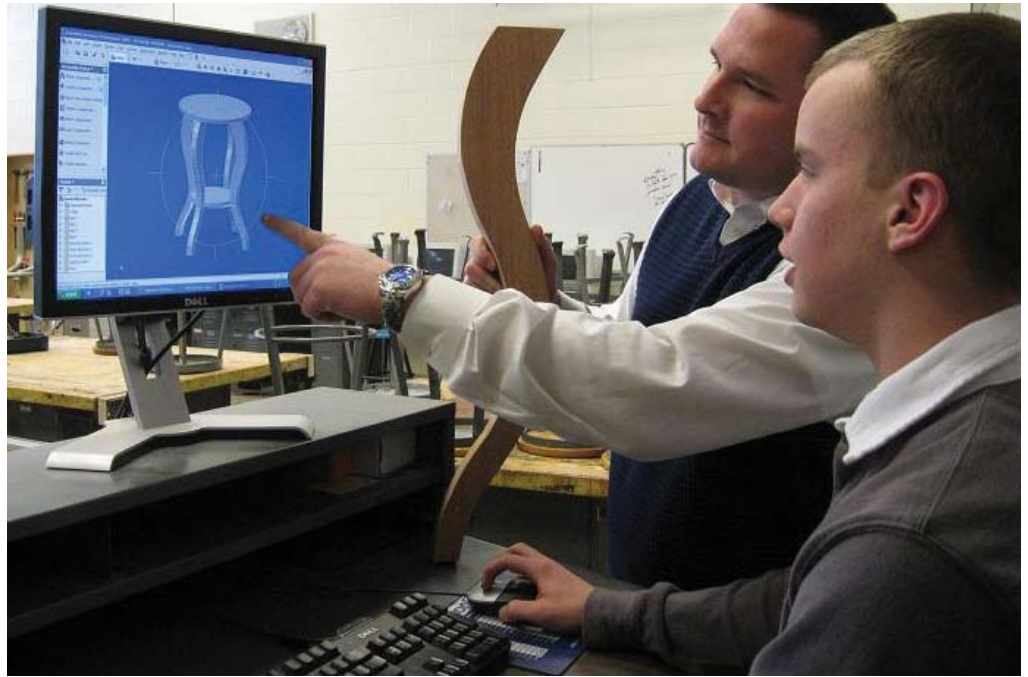
William Fremd High School

Customer Success Story

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Students are most likely to encounter Autodesk software at our local community college and state universities, and we want to equip them for the next stage in their preparation for successful careers. The same fact holds true outside of academic instruction: Most state drafting competitions use Autodesk software, and now our students will be equipped to compete.

—Paul Hardy
Applied Technology Department
Chairman and Instructor
William Fremd High School
Palatine, Illinois



Project Summary

William Fremd High School is one of five high schools and two alternative schools that serve approximately 13,000 students in Township High School District 211, Cook County, Illinois. Many of the industrial technology classes offered at the schools are very traditional by nature; at William Fremd High School, these courses include automotive technology, building construction, computer-aided design, computer repair, and electronics and woodworking technology.

To give graduating students an advantage in their college-level engineering studies and in future careers as engineers, all of the high schools in the district will implement Project Lead the Way (PLTW), a program that reinforces students' understanding and application of science, technology, engineering, and math (STEM) skills through project-based learning. Paving the way for students' participation and sparking interest in the program, Paul Hardy, chairman of the Applied Technology Department at William Fremd High School, implemented the Autodesk® Design Academy curriculum in winter, 2008.

Using the curriculum, Hardy has been introducing his students to real-world engineering challenges and student versions of tools the professionals use, such as Autodesk® Inventor® Professional. He and his colleagues hope that the software and curriculum included in Autodesk Design Academy will appeal to students who have pursued only academic math and science studies, as well as those—including female students—who had not considered taking applied technology courses.

The Challenge

While instructors and administrators were pleased that 15 percent of the William Fremd High School class of 2007 said it planned to enter an engineering-related field, they also were concerned. District-wide, educators have observed the struggles and drop-out rates of former students who enrolled in college-level engineering studies.

Hardy wants more students and parents to understand the value of pre-engineering and architecture courses in addition to academic instruction in science, technology, engineering, and math subjects, in preparation for students' future success.

The Solution

Hardy brings the perspective of an engineer to the classroom. With a degree in industrial technical education with an emphasis on computer-aided design (CAD) and construction, Hardy also runs a small construction business during summer and winter breaks, and brings real-life examples into his classroom.

In 2007, Hardy and the Township School District made the decision to adopt PLTW and Autodesk Design Academy. In addition to educators' interest in their students' future academic and professional success, Hardy cites two more reasons for the choice. "Students are most likely to encounter Autodesk software at our local community college and state universities, and we want to equip them for the next stage in their preparation for successful careers," explains Hardy. "The same fact holds true outside of academic instruction: Most state drafting competitions use Autodesk software, and now our students will be equipped to compete."

Gaining Insight

Working with Autodesk software, Hardy's students are able to identify and solve problems by applying their knowledge of math and science—and by using the tools for visualization just as professional engineers do. Hardy gives the example of a student who designed a catapult with an arm made of a 2-by-3-inch piece of lumber that looked fine as a sketch on paper. When the student animated his design in 3D with Autodesk® 3ds Max®, however, he could see that as the pitching end of the catapult arm rose, the squared-off shape of the other end would not properly clear the ground, stopping short the thrust of this simple machine.

"We also use Autodesk Inventor Professional to illustrate mathematics concepts such as geometric formulas that are the foundation of industrial design," says Hardy. "It's easy to calculate the volume or mass of cylinder when the dimensions are even numbers, but when they are fractional metrics, as is often the case with real objects, students can use the software to make short work of mass calculations and focus on the design problem they're trying to solve."

He expects student learning to advance as William Fremd High School integrates PLTW and the Autodesk Design Academy curriculum. PLTW is designed to make math and science relevant for students by presenting real-world, hands-on assignments that require the use of knowledge they've acquired in the classroom. Students are introduced to mechanical and electrical engineering, and the engineering disciplines within building and construction, and civil infrastructure.

Learning on a Fast Track

Combined with other resources, Autodesk software helps put student projects—and learning—on a fast track at William Fremd High School. Hardy's industrial design shop is outfitted with a state-of-the-art computer numerical controlled (CNC) router that fabricates components from sheets of wood and other materials. The machine is capable of cutting 4-foot by 8-foot shapes in 2D and 3D, and Autodesk Inventor Professional integrates seamlessly with the software used to operate the CNC router. Hardy recounts one example, in which a local vacuum forming company sent his class a sample mold to replicate: "A professional engineer had taken two and one-half days to build the mold by hand, and we can do it with CAD data in about two hours."



Hardy says, "I've seen students make incredible strides through project-based learning and tools like those the professionals use. Even students who are not intrinsically artistic are able to express their ideas as sketches and use Autodesk Inventor Professional software along with our CNC equipment to bring their ideas to life in physical materials. And they are using the software as they would a common tool like a hammer or a saw."

This capability also helps build students' confidence in their work. Using Inventor software, they create accurate assembly drawings of a woodworking project with confidence that the pieces cut from the wood they have purchased will fit together without any problems. If pieces are cut incorrectly, Hardy's students use the software to modify their existing drawings and visualize the effectiveness of their changes in a 3D model. He notes that this capability makes it easier and less frustrating for the student to get his or her project back on track, in most cases without wasting materials.

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“Students find it really rewarding to be able to think of an object, go to the computer, draw it, and send that drawing to another software program that controls the production equipment, and have a finished part by the end of the period or the end of the day,” says Hardy.

Hardy also observes the satisfaction that comes from others’ recognition. His industrial design class projects are exhibited in the main entrance to the school and in the administrative offices, where the students are proud to have their work on display. “Other students’ parents’ and teachers have expressed interest in buying these handcrafted items, and that makes students feel great about their efforts.”

Parents recognize the impact of Hardy’s instruction as well, when they visit the Applied Technology Department classrooms and see the work that their children have produced using state-of-the-art software and equipment. “This isn’t your father’s shop class,” says Hardy. “Parents are glad that their kids have access to these opportunities and tools, and I think some parents wish they had been able to learn in this kind of environment, as well.”

The Result

Hardy envisions a future role for Autodesk Design Academy in other areas that normally are not associated with CAD software. For example, the Art department could incorporate Autodesk 3ds Max into photography classes, where lighting and shadow features in the software can help instructors teach concepts that otherwise would be difficult to simulate effectively in the lab. The English department’s theatrical productions use polystyrene backdrops, and Autodesk 3ds Max software could speed the design and animation of stage sets, which in turn can be quickly and easily formed using the Applied Technology Department’s CNC router.

As part of the introduction of PLTW at William Fremd High School, Hardy will pursue program certification by the PLTW National Affiliate/PLTW Exemplary Student Recognition program. Colleges and universities that are PLTW National Affiliates award college credits or may waive pre-requisites to college courses for students who enroll in PLTW courses, meet the university’s requirements for PLTW course grades, and meet its requirements for performance on the PLTW college credit examination.

But foremost in Hardy’s mind is the impact of project-based learning based on exercises and tools that reflect the real world. He says, “Our students are doing more than preparing for college entrance and placement exams. Whether or not they pursue engineering degrees, they are learning to solve real-world challenges. They have to infer data and interpret charts and graphs—the tasks that professionals in a variety of fields have to complete every day.”

To learn more about Autodesk’s academic solutions and programs, visit www.autodesk.com/education.

Middle- and high-school educators can now access the Autodesk Student Engineering and Design Community to download free* student versions of Autodesk 2D and 3D products such as Autodesk Inventor Professional or Revit® Architecture; network with peers; participate in online software tutorials and more. Register today at www.autodesk.com/edcommunity.

To learn more about William Fremd High School, visit <http://www.fhs.d211.org/>.



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