

Frances Harper Junior High

Education Success Story

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—Brian Donnelly, Chair, Industrial Technology  
Frances Harper Junior High School  
Davis, California

# Project-based curriculum propels students' interest.

From bridges to skate ramps, Autodesk® DesignKids® projects transport Harper Junior High students to a world of possibility.



## Project Summary

Brian Donnelly runs the engineering technology program at Frances Harper Junior High School, which opened its doors in 2004 in Davis, California. An educator since the mid-1970s, Donnelly has held several positions at institutions of higher learning, including the University of California, Los Angeles; Southern Illinois University; and San Francisco State University.

Donnelly is an educator—and more. Formerly president of a company in Taiwan and a senior design manager at a Silicon Valley design firm, as well as the owner of nine patents, Donnelly knows what it takes to succeed in the real world. While he works on a doctorate in educational leadership at the University of California, Davis, Donnelly pursues his true passion at Harper Junior High: helping seventh-, eighth-, and ninth-graders realize their potential and excel in engineering and technology.

Donnelly's program reflects the school's innovative approach to science, technology, engineering, and math (STEM) education. At Harper Junior High, students investigate a broad spectrum of design disciplines, including manufacturing, energy, and transportation—real-world applications that help them to understand their academic instruction.

## Challenges

Donnelly's primary classroom challenge is not unfamiliar to educators. "Middle-school students often don't realize that what they learn in math and science classes can actually help them in the future—for academic, professional, and personal success," says Donnelly.

Donnelly also sought to help his students use technology to bring their ideas to life. "Kids can be at a disadvantage if they can't draw well," says Donnelly. "I want students to have the tools they need to communicate their ideas, and it's much easier for them to express their ideas with the aid of a computer rather than just paper and pencil." Nevertheless, he found his students could become overwhelmed by advanced technology applications without proper guidance and instruction.

## The Solution

Donnelly regards his prior career experience as providing a two-fold advantage in his role as an educator. "I know firsthand how technology can help you come up with innovative ideas and figure out whether they're workable. I also know how much more compelling a digital simulation is than a mathematical formula. It's a joy to put those aspects of

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technology to work and watch my students discover a world of possibility.”

His past experience with Autodesk® design software also gave Donnelly a good idea where to turn for a possible solution in the classroom. When he started his teaching career, Donnelly integrated Autodesk® DesignKids® software and curriculum into his classroom instruction. The education solution includes AutoCAD® and Autodesk® Inventor™ Professional software applications for 2D design and 3D simulation, as well as a project-based curriculum. Harper Junior High students apply their math and science skills to solve real-world problems with student versions of the popular software used by professionals.

Donnelly teaches his program in two labs: one where students design and visualize their ideas using Autodesk technology in a computer lab, and the other where students can bring their drawings to life by building real-life models using actual specifications. “My students are more engaged when they have the opportunity to actually build out their designs and receive hands-on experience,” he says.

He provides basic, easy-to-follow projects to avoid frustration and failure. Autodesk products also help Donnelly level the playing field in his classroom. “Kids don’t have to be great at hand drawing to quickly create complex models and idea visualizations.”

### From Bridges to Ramps for Gravity-Defying Skateboard Stunts

In the first lab class, Donnelly guides students through Autodesk DesignKids tutorials for AutoCAD and Inventor software, and lessons in design principles, sketching, and visualization. Then students advance to the second lab course, where they put their software skills to the test by designing and simulating a variety of projects. Over the course of instruction, Donnelly strives to impress upon his class the connections between theory and application, as well as the relationship between each assignment and STEM principles.

“I like the Autodesk DesignKids curriculum and modules’ ‘cookbook’ format and flexibility. The projects are fun and meaningful to the kids, such as designing a dream room, jewelry, a skateboard park, or a bridge,” he says.

His students particularly enjoy the bridge design assignment. During this lesson, they use their computers to construct digital scale-model bridges and simulate destructible load tests. They refine their designs based on the digital prototypes’ performance, and produce final drawings and specifications. Then they put their work to the test by building a physical model of their bridge.

Donnelly says the skate park learning module is a favorite for its fun and fascinating exploration of physics in action. Students use Autodesk Inventor Professional software to design 3D models of skate parks. Then Donnelly builds a physical scale model and shows students how they are defying the laws of physics when skating through the ramps in the park. “This blows their minds,” he says. “It’s a memorable exercise for students, who get to build their own skate park models and present their ideas to the class.”

In addition to classroom exercises, real-life opportunities bring home the students’ lessons. Donnelly asks his students to apply what they learn to life at Harper Junior High. One class took charge of decorations for the annual holiday dance. Donnelly’s students designed (and later built) signage and props, including a full-size candy-cane house and a life-size sled, using their computer and design skills and Autodesk tools.

### A Taste for Tech Careers

When textbooks and lectures are the primary teaching tools, the classroom experience can be limited in terms of contributing to students’ technology literacy. A December 2006 *Time* magazine article, titled “How to Bring Our Schools out of the Twentieth Century,” drove this fact home for Donnelly, by juxtaposing conventions in U.S. education, the nation’s workforce needs, and the global economy.

“Given the opportunity, students may become extremely proficient and savvy tech users at home. But they’re not being taught how to use technology in productive, meaningful ways by their teachers,” says Donnelly. “Some form of automation technology can take the place of many ‘routine’ jobs, even eliminate some, and I feel that now teachers need to focus on design and creativity to ensure our students are successful as the next generation of professionals.”

So Donnelly makes an effort to shape and focus the technology proficiency that his students acquire out-

side the classroom. In addition to showing students how their academic studies apply to real problems, he makes a concerted effort to relate class projects and concepts to real-world professions. Donnelly finds that Autodesk DesignKids software engages students’ imagination and exposes them to creative design and engineering-related careers.

When a student expresses interest in a particular subject or skill, Donnelly is quick to provide career guidance and encouragement. “My hope is that kids—especially young women—are inspired by modules like the jewelry design project and develop a keen interest in engineering and design-related careers,” he says.

### The Result

Donnelly adds that the project-based curriculum and exposure to software tools used by industry professionals help empower his students. They become much more engaged in learning important STEM concepts, and assignments such as the holiday dance decorations let students express their creativity using STEM subject knowledge. These exercises also use the power of technology to help save time and materials before construction—whether a bridge or a gingerbread house.

Harper students are learning how design can positively affect society, as well. When a local homeless shelter asked Donnelly to design and fabricate its lockers, Donnelly asked one at-risk student to be his teacher’s aide on the project. “This young man was failing all of his courses, but he became really engaged in the shelter project,” says Donnelly. “It was really rewarding to see him excel in school and learn the importance and satisfaction of giving back to the community.”

To learn more about Autodesk’s academic solutions and programs, including Autodesk DesignKids, visit [www.autodesk.com/education](http://www.autodesk.com/education) or [www.autodesk.com/adk](http://www.autodesk.com/adk).

To download free\* student versions Autodesk 3D products, including Autodesk Inventor Professional, and access sample curricula, join the Autodesk Student Engineering and Design Community today at [www.autodesk.com/edcommunity](http://www.autodesk.com/edcommunity).

To learn more about Frances Harper Junior High School, go to [www.djUSD.k12.ca.us/harper](http://www.djUSD.k12.ca.us/harper).



Using Autodesk DesignKids in my classroom allows my students to explore a variety of technology-based approaches to applying STEM concepts to real-world problems. Plus the Autodesk DesignKids format actually makes learning these subjects fun, relevant, and engaging.

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