

Autodesk® Design Academy  
Autodesk® Inventor™ Professional  
Revit® Architecture  
Autodesk® 3ds Max®

“We have thousands of students in MPS using Autodesk Inventor Professional. Kids love what they can do with the software because it’s so user friendly. Working with this program opens doors for our kids to a variety of technical careers.”

— Lauren Baker, Coordinator of Career and Technical Education  
Milwaukee Public Schools  
Milwaukee, Wisconsin

# Engineering a Path from Poverty to Potential

Project Lead the Way curriculum and Autodesk software open doors to new career options for students in Milwaukee Public Schools.



## Background

Lauren Baker, coordinator of career and technical education at Milwaukee Public Schools, has devoted much of her professional career to establishing new educational programs and providing students, especially women and minorities, with the skills they need to succeed in the workforce.

When she joined the Milwaukee Public School System (MPS) almost five years ago, Baker was eager to take on a new challenge. The large, urban school district with 200 schools and more than 90,000 students, 87 percent of whom are students of color, is in one of the poorest cities and is one of the poorest school districts in the United States. Eighty percent of the student population qualifies for free or reduced-cost lunch, a federal indicator of financial need.

Baker faced high-school dropout rates and poor math and science test scores. Plus, like many school districts, MPS had seen technical programs end over the past 20 years because of budget shortfalls or staff retirements. Nevertheless, by introducing a project-based curriculum and software tools that demonstrate real-world applications for science, technology, engineering, and math (STEM) skills, Baker has opened students’ eyes to greater possibilities for their futures.

## The Challenge

As director of the Milwaukee Graphic Arts Institute (MGAI) for 10 years, Baker led the Institute in establishing new programs with special emphasis on helping unemployed women and people of color build skills that would allow them to pursue careers with greater earning potential.

Drawing on her experience from MGAI, Baker undertook a study of the labor market in the Milwaukee area. Her research showed that the top four fastest-growing occupations in the Milwaukee area were jobs that did not require even a high-school education, such as cashiers, restaurant servers, food preparers, and retail clerks. Young people do these jobs while in high school. Therefore, Baker realized there was little incentive for the students to graduate. Even so, when she looked at the top 20 jobs in Wisconsin by growth, all but three of them required a background in STEM skills. Not only did MPS students need to graduate, but they also needed to graduate with a foundation in technology, math, and science if they were going to rise out of poverty-level jobs.

# Students use Autodesk 3D solutions to address the same challenges faced by engineers every day



## The Solution

Baker knew that the right high-school programs could lead her students to better jobs, which could enhance quality of life for the community. According to the U.S. Department of Labor, more than 70 percent of jobs in the nation's labor market require a solid foundation in STEM concepts, so the overwhelming question for Baker and her colleagues was how to keep Milwaukee's teenagers in school to earn a high-school diploma and advance to post-secondary education and/or skill-based careers.

## Forging New Paths to Learning

Baker sought a program that would motivate students to build STEM skills and stay in school. After evaluating a number of options and tools, MPS adopted Project Lead the Way (PLTW), a project-based learning program built on a foundation of Autodesk® 3D solutions such as Autodesk®

Inventor™ Professional®, Revit® Architecture, and Autodesk® 3ds Max® software products. PLTW programs engage middle- and high-school students with software tools and challenges like those solved by engineers every day.

“PLTW includes the software, curriculum, and training that a teacher can implement without having to be an engineer,” says Baker. “I visited the Minneapolis School District, where they had implemented PLTW, and saw kids using the software and really getting engaged with math and science through the curriculum—while having a great time.”

The PLTW curriculum 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. Courses expose students to mechanical and electrical engineering, and student versions of the Autodesk software used in those fields, as well as other engineering disciplines, including civil engineering and architecture, computerized integrated manufacturing, bio-engineering, and aerospace.

Since PLTW was introduced to MPS, the K-8, middle schools, and high schools have become very engaged in the program and with the Autodesk software.

## Exercises Sharpen Understanding

For example, at Kosciuszko Middle School, Luis Veloz directs his eighth-grade students to use Inventor software to design a race car “dragster.” Using Inventor, among other tasks, they learn about design and aerodynamic concepts and add, subtract, and convert fractions into decimals and percentages. Once their designs are complete, students build the dragsters and race them in the class. Observing and notating on the race, they put their math and science skills to use as they calculate average speed and delve into the concepts of friction and accelera-

tion. Critical concepts are taught and learned while students engage in a fun and tangible activity.

Meanwhile, in Eric Losin's geometry class at South Division High School, students work on geometry lessons included in the Autodesk® Design Academy curriculum, a comprehensive and challenging pre-engineering, pre-architecture, and project-based program. Losin is no stranger to the tools: “Ever since I was trained on Inventor software, I wanted to use it to teach geometry. To me, it is a wonderful way to develop and deepen students' understanding of math concepts and provide them with the connections to see how geometry is used in technical fields.”

Instead of using textbooks and problem sets, Losin's students use Inventor to construct shapes such as cones, cylinder, semispheres, and congruent triangles. Then they determine the surface and volume of each object. More advanced lessons in the curriculum direct students to construct and understand the trigonometric ratios of sine and cosine, a parallelogram, kite, rhombus, and an isosceles trapezoid, and a pattern that tessellates (breaks down into tiles) in two dimensions. Losin says that Inventor software helps make the connection between geometry and engineering clear to his students.

Another example is at Washington High School of Information Technology, where Janice Udovich is the lead teacher for the math department. Udovich wanted to teach her students a reverse-engineering project that involved an assembly. She purchased birdhouses online, then taught her students to use Inventor to sketch and create the measurements for the seven parts of the birdhouses. Next, the students went to the wood shop, where they used what they designed in Inventor for assembly. If the surfaces and parts didn't quite match, they would go back into the lab and edit their measurements in Inventor so they could accurately fix the problem in the shop.



# Use of Autodesk software helps Milwaukee Public Schools improve test scores and teach valuable career skills

## Inspiring Further Study and Careers in Engineering

Eight of the district's K-8 or middle schools have implemented the PLTW curriculum and Autodesk software. Consequently, sixth-, seventh- and eighth-graders in these schools are working on projects and using tools as the professionals do—including students who traditionally might not have been exposed to pre-engineering skills.

Since Baker's department is committed to motivating students and helping them prepare for occupations with promising futures, she has determined that engineering stands out as a significant opportunity for MPS students. The PLTW program helps make it easier for MPS to make engineering an option for career education, with coursework and software tools to support students' pursuits. In addition, the pre-engineering program unleashes students' potential for exploring many different technical career paths, not just engineering.

"Project-based learning using the latest software tools gives our kids a foothold out of poverty. PLTW is a best practice in STEM education," says Baker. "It's not just about becoming an engineer. It's about having the confidence, motivation, and technical and communication skills necessary to go into a variety of careers."

## The Result

Much to Baker's delight, the decision she made four years ago is producing the desired, positive impact on Milwaukee's community, as its children and teenagers become interested in putting their math and science skills to work. Baker says that the curriculum and software are ideal for teaching middle-school-aged students. "It isn't too complex and provides them with basic math skills," she says. "By the time they go to high school,

they are more comfortable with math and science because they have built a solid foundation."

Bob Lee, an Introduction to Engineering Design instructor at Hamilton High School, agrees. He says, "In my 11 years of teaching, the students entering high school who have been part of a PLTW program and used Autodesk Inventor were the best-prepared students I've ever seen."

MPS enters its fourth year in the PLTW program with the largest concentration of schools using the curriculum in any district, nationwide. More schools in the district are clamoring to participate in the program. The 2007-2008 school year also is seeing the introduction of Revit Architecture, giving students the opportunity to learn about architecture and construction using software that represents a building's design and engineering information in a 3D digital model.

Participation in PLTW and the use of Autodesk Inventor Professional in the classroom are aimed at helping the district achieve its goals, including increasing test scores, particularly in math and science; increasing numbers of MPS students entering post-secondary schools; and strengthening education programs in K-8, middle, and high schools.

Local employers are impressed as well. To date, Rockwell Automation, the Society of Manufacturing Engineers, CH2M HILL, Badger Meter, and the Kern Family Foundation—which grew out of the commitment of local businessman Robert Kern of the Generac Corporation—all have supported MPS in PLTW. And, several other local manufacturers are also looking to get involved.



To learn more about Autodesk's academic solutions and programs, visit [www.autodesk.com/education](http://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](http://www.autodesk.com/edcommunity).

To learn more about Milwaukee Public Schools, visit [www.milwaukee.k12.wi.us](http://www.milwaukee.k12.wi.us).

To learn more about Project Lead the Way, visit [www.pltw.org](http://www.pltw.org).



"It's not just about becoming an engineer. It's about having the confidence, motivation, and technical and communication skills necessary to go into a variety of careers."

— Lauren Baker, Coordinator of Career and Technical Education  
Milwaukee Public Schools  
Milwaukee, Wisconsin