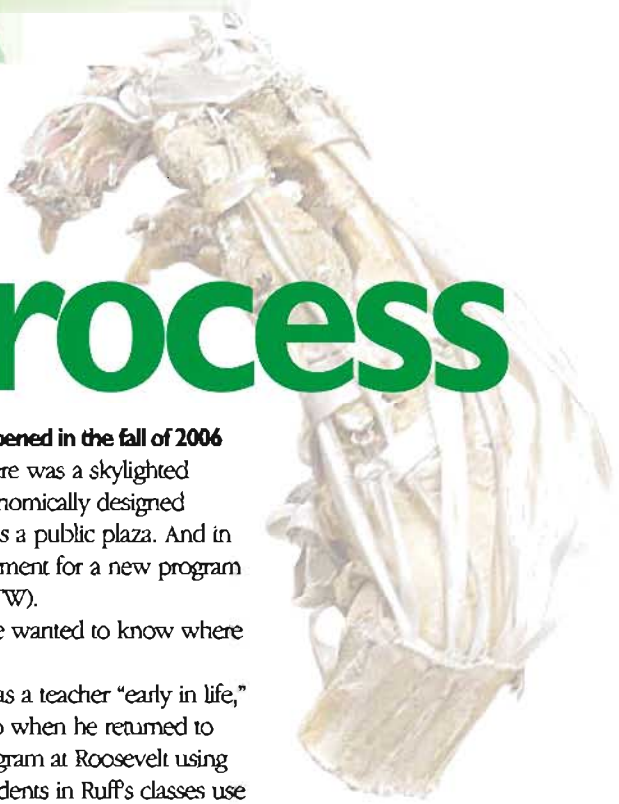
Roosevelt High School, Seattle, Washington

Transparent Process



PROFILE

Roosevelt High School
Seattle, WA 98115

- **PLTW start date: 2006**
- **2007–08 PLTW students: 89**

Info:
Karl Ruff
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Seattle's historic Roosevelt high school reopened in the fall of 2006 after a two-year, $80 million remodel. There was a skylighted library, a performing arts center with ergonomically designed seating, and a synthetic playing field. There was a public plaza. And in two classrooms, there were boxes full of equipment for a new program at Roosevelt called Project Lead The Way® (PLTW).

Teacher Karl Ruff remembers it well: "People wanted to know where the woodshop went."

Ruff was new then, too. He had started out as a teacher "early in life," but then left education for the private sector. So when he returned to teaching, he was able to launch the PLTW program at Roosevelt using 16 years of real-world process engineering. Students in Ruff's classes use the Inventor software Ruff encountered while a training manager at Boeing, along with a host of other tools and approaches Ruff has introduced from the business world. Ruff's colleagues in the Seattle School District say his teaching reflects the unique perspective that a teacher from outside the mainstream of education can bring to a school via the innovative curriculum that is Project Lead The Way.

Ruff is ideally positioned. Technology education is being reinvented. Academic standards increasingly reflect workplace expectations. Problem solving, critical thinking, and conflict resolution are becoming as valuable as industry-specific skills. PLTW is considered a "flagship program" of the Seattle public schools' career and technical education efforts. Even so, in 2006

Like the approach of PLTW teacher **Karl Ruff** (*inset*), this robotic hand replica involves many disciplines within the field of engineering—including Roosevelt student **Ariel Green's** favorite: "programming stuff on the computer."

> *"I love this class because you get a lot of freedom. Everyone has to figure stuff out for themselves. Mr. Ruff doesn't limit us."*
>
> **—BEN CARPENTER**
> **PLTW Student, Roosevelt High School, Seattle, Washington**

there was only one technical education teacher training program in Washington state, and only one engineering teacher for the courses at Roosevelt.

Initially, the yearlong PLTW courses conflicted with some half-year courses at Roosevelt. Ruff recalls, "I would have 25 students sign up and, because of scheduling conflicts, only 11 be able to take both the first and second halves." Even so, the teacher doubled up on PLTW's Summer Training Institutes—"a baptism of fire," he calls them—so as to be able to offer more PLTW courses. This past year, Ruff taught a sequence of two CAD drafting courses along with Introduction to Engineering Design (IED), Computer Integrated Manufacturing (CIM), and Digital Electronics (DE). In order to solve the difficult scheduling issues, rather than placing the students himself, Ruff used a technique from his management background that allowed students to come to their own agreement about who would take which classes. "I took signups," he says. "Then I held a caucus of the students, stipulating minimum total enrollment for each class. Students sorted it out themselves."

Roosevelt High School PLTW students **Margaret Burke** (*above*), **Ben Carpenter** (*far left*), and **Adrian Bardue**, riding Seattle public transit to a University of Washington robotics lab, are among the first in the state to enjoy the unique real-world STEM learning opportunities PLTW offers.

Ruff praises the liberating design of the PLTW curriculum. "It's put together by teachers—you can just tell," he says. "Because PLTW is so hands-on, students are more engaged. I just don't spend a lot of time talking. They have access to the PowerPoint. They go for it. I don't have to be 'the sage on the stage.'"

Instead, says Ruff, he's free to facilitate work in progress. "When you're stuck, that's when I'm available," he says. "Beginners need constant attention. In the more advanced classes, you give them the tool—but when they need you, be there immediately. They'll want to know not 'what,' but 'which of these three?' PLTW frees me to help both kinds of students at the same time."

Ruff believes the value of discussion—as opposed to lecturing, for example—can't be overestimated in engineering. "At Boeing, the conversations we had about design challenges were extremely important. They would lead, for example, to changes in certification requirements. One thing employers want is something that can be modified later. You don't want to paint yourself into a corner. A student's attitude is more like 'ready, fire, aim.' Once they realize, 'I should've used a revolute instead of a prism,' I can have that high-level conversation with them."

Roosevelt plans to add another PLTW class this fall. It will strain the available resources, but Ruff is philosophical. "To have learning take place, you need a critical mass," he says. "You need that in order to get energy and momentum." Storage space, and room for everyone to see firsthand how projects come together, are also of the essence. Roosevelt High School might have replaced its woodworking area, but Ruff says his PLTW room still resembles a shop. "It has to," he says. "I have to have a transparent process. When the students come into my room, I want them to know exactly what to do."

Scientist **Yoky Matsuoka** opens her University of Washington lab—and a window onto the future—to PLTW students from Seattle's Roosevelt High School.

Show of Hands

PARTNER PROFILE

One of Roosevelt High School's urban Seattle neighbors is the University of Washington. Early in 2008 Karl Ruff and his PLTW students paid a visit to the university's unique Neurobotics Laboratory.

The lab's director, Associate Professor Yoky Matsuoka, was named a MacArthur Fellow in 2007 for her research in neuroscience and robotics. Among other projects, she is currently developing a prosthetic hand that would respond to the brain's neural signals. Her research is closing the gap between advanced technology and the needs of people whose mobility is restricted. As Matsuoka oriented students to the "robot–human closed-loop system," they got glimpses of how the scientist's work—and her mind—combined mechanical engineering and bioengineering, computer science and neuroscience, and robotics with altruism and a love of learning.

"Best of all," says Ruff, "they got to touch stuff."

The students got a feel for the research through hands-on interaction with the ingeniously developed equipment at three lab stations. Progressing from a high-speed photography station that captures locations in 3D space, to the anatomically correct robotic hand, to a lever-based feedback-distortion simulator— to the city bus back to Roosevelt—some central questions took shape: What do we know? How do we learn it?

Michael MacAuley (*left*) and **Dorrika Marczak**, Roosevelt High School, Seattle, Washington