

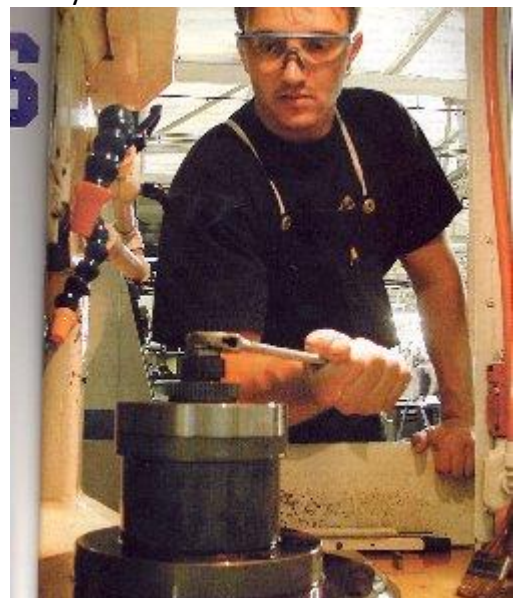
**T**hink of something. Anything. An airplane or a CAT scan. A telescope or an engine. The plastic that molds and holds your computer. Or maybe even that Harley you spend more time daydreaming about than riding.

Where did all that stuff come from anyway? More than likely, a machinist had something to do with its creation. "In some way, a machinist makes everything you see, hear, and touch," says Ron Smith, department head for the past twelve years of Cerritos College's machine tool technology department. "Machinists either fabricated the metal object you're thinking of, or they fabricated the tool that formed the metal object you're thinking of, or they were in some way involved fabricating the machinery that fabricated the object you're thinking of."

And now they're in short supply. So who's going to make all this stuff? According to a study released by the National Manufacturing Association, the average machinist is 50+ years old. A majority of manufacturers—75 percent, in fact—are reporting a shortage of qualified machinists. In the meantime, the United States is training only one for every five that are lost.

Where did they all go? Outsourcing has significantly contributed to the problem, according to Richard Hollingsworth, president and CEO of Gateway Cities Partnership, an economic development corporation formed to deal with the decline in employment in the region. The Gateway cities—27 of them—are located on the southeastern border of Los Angeles County. The partnership works with the private sector to revitalize the economy.

"Most of the machinists retiring today [initially] joined large companies, got their white coat, their toolbox, and became apprentices. Most stayed and worked with those companies; some left and went to work elsewhere; others eventually opened their own companies. But some time back, large manufacturers decided to



outsource everything. They outsourced the manufacturing but not the training.”

And how about shop classes? Does anyone even remember those? Hollingsworth notes there’s been a flight from vocational and technical education. A “myopic view of education” prevails, he insists, that focuses on a college education and not on a technically proficient workforce.

“In fifteen years,” warns Hollingsworth, “we’ll be in a world of hurt.” There will not be nearly enough machinists ready for work as there are jobs available. Steve Skardenzan, president, PMD, Inc., has already felt the pinch.

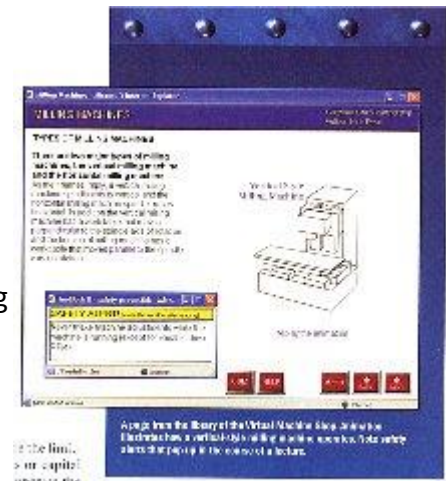
“My company manufactures aerospace and commercial components. We make components for hydraulic valves, turbo chargers for locomotives, and airframe components for military and commercial aircraft. It got to the point where the limiting resource was no longer customer contracts or capital equipment; it was finding qualified people to operate the equipment. If I had five more machinists, I could increase my sales without spending another penny in any other way.”

While a substantial number of people in the region work in special effects for the movie industry, machinists in the Gateway cities are more often involved in aerospace, producing such things as gears and actuators, the intricate parts that go into aircraft and missiles.

“The problem is, it takes a long time to get a machinist ready,” points out Hollingsworth. “It takes a couple of years.”

### An idea is born

Gateways Cities Partnership came up with an idea. Phil Jakobi, president of Delco Machine and Gear and a partnership board member, approached Cerritos College in Norwalk, California, with the intention of finding a way to develop effective training for machinists. Why not put together some training videos, he asked, that could be used at the shop or in school? Jakobi put his money where his mouth was and funded the first set of machine modules.



One company talking with one school eventually broadened into several companies talking to several schools. The training program, which was organized to run two years, received an H1-B grant from the Department of Labor in January 2001. An H1-B grant uses funds employers are required to pay when they import labor they cannot find locally. This required payment, in turn, is used to train U.S. workers.

“What we set out to do with the grant,” says Hollingsworth, “was to get to high school counselors, to the kids, and to their parents. One of our jobs was to get kids into the classroom.”

As part of the grant, Gateways Partnership put together an industry advisory panel. The panel was shown a list of topics the schools proposed to develop modules around, and industry was given an opportunity to edit these ideas, indicating if something worked, or was too advanced, or not advanced enough. Then the schools responded.

Scardenzan, a member of Cerritos College's advisory committee, participated in the industry advisory panel. "I thought it a good opportunity to develop a curriculum that would be available industrywide for individual companies like mine to handle training."

The panel was composed of educators at community colleges—Cerritos College and Long Beach City College, among others—and people who represented a cross section of manufacturers from the region. Such sectors as aerospace, foundries, commercial pump companies, and wood products were represented. Panel members brainstormed topics appropriate for the training curriculum. "We tried to cover everything that would have been discussed in a traditional apprenticeship program," said Scardenzan, "had they still been in existence in our area. Once we agreed on the topic for the different modules, the academics got involved and started developing the actual course material."

### **The Virtual Machine Shop**

And thus was born the Virtual Machine Shop. Initially for Cerritos students, the program was developed under the H1-B grant for use by the general public. "Anyone can long on," says Smith, who was responsible for producing the modules. Lessons provide history and background and explain the major parts of the machine in question. Quiz buttons test the student for comprehension: What happens, for example, when you get a quill out too far? Or what are the properties of metals? Video clips and animations clearly illustrate how things work, and alerts pop up pointing out common safety issues. Each lesson ends with a review.

The Virtual Machine Shop library is composed of 180 different modules divided into six different segments:

- Milling machines covers such topics as vertical mill heads, work holders, table-clamping systems, and squaring a block on the mill.
- Engine lathes covers functions and controls, three- and four-jaw chucks, grooving, and boring, among other topics.
- Other machines discusses hacksaws, bandsaws, grinding machines, and electrical discharge machining (EDM).
- Cutting tools cover hand tapping, lathe cutters, and twist drills.
- Computer numerical control (CNC)/computer-aided manufacturing (CAM) covers such topics as fixed cycles on the mill, tool length offset, CNC control software and hardware, and turning programming fundamentals.
- Measurement includes information on micrometers and optical comparators.
- Engineering tackles such topics as surface finish, heat treating, and tooling.

So far, 1,100 students have participated in the program, and approximately 500 are currently in stages of completion. The 180 multimedia modules are available as a CD or over the Web at [www.kanabco.com](http://www.kanabco.com). Macintosh users can access the modules at [www.jjjtrain.com](http://www.jjjtrain.com).

Most vocational people, according to Smith, insist you can't use multimedia to teach machining. It's hands-on, they say, and it requires practice. "But what we've proven," says Smith, "is nothing could be more vocational than machine tools, and everyone teaches about the same way—they lecture, they go out in the lab and demonstrate, and then they let the students practice. What

we've done in the Virtual Machine Shop is lecture and demos. Of course, we can't give them an actual machine to run, so they still need that practice, but we've circumvented a lot of time."

And they've provided something else that's scarce in a machine shop class—an unobstructed view. Smith alludes to his classes, which normally have approximately 30 students. When he would do a demonstration on how to bore on a milling machine, he explains, not everyone could see. "And you can't rewind," he adds. "For another thing, it's a little unsafe because so many people are crowded around the mill."

### **A multi-purpose resource**

The Virtual Machine Shop may have a good long life after funding ends. The modules are being used with other training programs at various high schools and community colleges. Smith suggests another use. "Take a mechanical engineer at a university. The university doesn't have a machine tool department. Machine tooling used to be required for a mechanical engineering degree, but machine tools programs have vanished. Now it would be really helpful for this engineering student to go on line and see how this stuff works."

The Virtual Machine Shop was also created in view of providing employees the opportunity to train in house. Finding time for training in the midst of producing a product has always been a challenge for manufacturers, and training after hours is unpopular—people are just too tired. With the Virtual Machine Shop, a manufacturer can pick and choose among modules and have employees watch those relevant to their work. And since modules are only minutes long, employers can easily slip in some much-needed training. The lessons also help in those environments that require ongoing training to meet various industry standards such as ISO 9000. The quizzes painlessly satisfy some of those requirements.

Graduates from the two-year program will be qualified in various operations. While no certification is offered, the students will have a portfolio of work they can show to potential employers.

"We got a lot of trainees into the industry who would never have been there otherwise," notes Hollingsworth. "That was one of the big successes of the program."

How does industry pair up with education to create these types of programs? Hollingsworth has a word of advice. "You have to have leadership from industry. If industry pushes for these needs to be met, generally the community colleges can oblige. People in industry must actively participate on boards. Business leadership must use its own personal political capital to pick up the phone to call people and get things done."

And this is one community that did just that.

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