Viewing the Future of Manufacturing at Desert View

CESAR GUTIERREZ
Precision Manufacturing Teacher
Desert View High School

TEACHING AT DESERT VIEW HIGH SCHOOL in this close-knit area of Tucson, Ariz. can be quite a challenge. Our student body is about 90 percent Hispanic, and in many households both parents have to work.

At our school, we have taken on the responsibility of creating a program strong enough to compete with the many distractions for the attention of teenagers. Our success can be reported in numbers; in our NIMS accredited program we have about 320 students attending the drafting and machining program, with engineering students bringing the precision manufacturing department total to more than 400.

Our goal is to develop skills in our students that will be appreciated by manufacturers, resulting in job offers, and by colleges and universities that will enroll our graduates in their manufacturing engineering programs. In this way, our students' success will help them, their families and their communities. In addition to myself, our program has an engineering teacher and an aide. It takes a lot of outside support to help the three of us succeed in providing quality education within the classroom shop setting.

Support from Manufacturing Partners

That support began with input from more than three-dozen manufacturing companies in and around the Southwest region. They banded together in an organization known as the Southern Arizona Manufacturing Partners. Prominent among them are machine shops and plants of all sizes producing precision components and assemblies for aerospace firms such as Honeywell, Raytheon, and Boeing.

As demand for their products continue to climb, these firms need a source of skilled workers to program and run their expanding banks of advanced manufacturing equipment. We meet every month to discuss our courses and project needs and while they have always helped us out with donations of tooling and materials for our students' projects, the most far-reaching example of support from these manufacturers came when they put us together with NIMS (formerly known as the National Institute for Metalworking Skills).

Students (left to right) Yersemi Mayralee Gutierrez, Lizbet Cardenes Pachero, and Yahir Alonso Diaz Medina work on a machining operation. (All images provided by Desert View High School)

The NIMS organization developed skills standards for dozens of metalworking operations, including CNC machining, industrial technology maintenance (ITM), and computer-aided manufacturing (CAM). Through the NIMS program, our students become thoroughly versed in each operation and earn certifications for each that are recognized by the industry as proof they have learned those skills. We became totally involved with the NIMS program about four years ago after they performed a thorough vetting process.

It became obvious to me that I had to become a much better educator if I were to help my students secure NIMS credentials. These are not only tests of theory, but also have a hands-on

component to objectively validate students' performance. I had to know everything NIMS demanded of the students, which meant it was also demanded of me as their teacher.

So, I developed a backwards model, taking a good look at what the NIMS skills were, familiarizing myself with the skill sets and coming up with hands-on projects that incorporated all the aspects of those machining skill sets. Dave Morgan, senior advisor at NIMS, has worked tirelessly as my mentor.

Because of NIMS, we have been able to push our kids to achieve high levels of programming and machining. This, in turn, has allowed us to bring local industry into our classroom. Having urged us to incorporate the NIMS courses in the first place, these manufacturing companies now trust us to make parts for them. We have established an actual business within our program that allows students to earn money needed to cover expenses incurred on trips we take to colleges and universities and to manufacturing companies that let our kids see many machining examples.

While our part runs can exceed 1,000 pieces, a recent run, for example, called for 200 each of two precision components put together as an assembly. Our students worked with the company's drawings, programmed the toolpaths, performed all the CNC machining operations and then used a press in our shop to complete the assemblies. They were delivered on time, to spec, and at a competitive manufacturing cost.

Sometimes, a company will also provide the tooling as well as the material for a contracted part run. What is important is that the parts conform to the operations and goals that NIMS has set forth in their skill set certification requirements.

Internship Program Provides a Paycheck

We have also started an internship program for seniors, providing them with a paycheck for producing contract parts. It goes beyond the programming and machining operations of the shop, because they are also responsible for such tasks as sales, invoicing, and keeping the books, just like any small business. This gives them a sense of pride, as well as an income not available to them elsewhere. It also makes them more attractive to prospective employers.

Thanks to the generosity of our local businesses and the faith of our district superintendent, career and technical education (CTE) coordinator, and our school's principal, we have an extensive array of equipment for our students to learn on. Our district has invested nearly $2 million in the program over the past four years.

We have more than a dozen manual mills and lathes, seven CNC mills, four CNC lathes and twelve 3D printers, with 40 seats of Mastercam and SolidWorks in our CAD/CAM lab. We also have a coordinate measuring machine. While it is highly unusual for a high school to have a measurement program, we have one that is so thorough that we are applying to nearby Pima Community College for college credit upon our students' successful completion of our course.

Reyes Curiel (foreground) and other students learning CAD/CAM on a workstation.

Students graduating from Desert View have good career options. They can go on to Pima Community College, where they have an excellent CAD/CAM program based on both SolidWorks and Mastercam, or on to a four-year college or university for an engineering degree. Many of our students have gone on to such universities as University of California-Berkley, Arizona State University, University of Arizona and Cal Poly.

They can also go directly into industry, even well beyond our own local firms. Our school held a job conference recently and prospective employers came from around the country to recruit our graduates. Many of our kids continue working part time at manufacturing companies while they attend Pima Community College. They wind up with an associates degree, their NIMS certifications, a great career, and no student debt.

To date, we have had 100 percent of our graduates go on to college or directly into the manufacturing industry. I am so proud of them, their achievements and their work ethic. They are a great example of the quality of our future workforce.