

LEARNING

HOW TRAINING AND WORKFORCE DEVELOPMENT ARE CHANGING IN THE ERA OF COVID-19

By David Holthaus



Building and maintaining a pipeline of talented and qualified workers was always a priority for manufacturers. Cultivating a skilled workforce able to adapt to changing technical needs is critical to staying competitive and continuing to grow.

Always a challenge, finding and training qualified engineers and others who can thrive in high-tech manufacturing environments became significantly more difficult over the past few months with the spread of the coronavirus SARS-CoV-2 and the COVID-19 disease around the world.

The hands-on experience so essential to training the manufacturing workforce suddenly became something to avoid as schools and workplaces closed, limits on gatherings were advised, and physical distancing became the norm.

The need for qualified talent never stopped, however, and now colleges, technical institutes, employers, and others are figuring out how to nurture the talent pipeline in the era of COVID-19.

For all of them, it's been an exercise in adapting on the fly to a problem they have never encountered before and being prepared to revise plans as conditions change.

Corning Inc. traditionally maintained a strong internship program, with 60 to 80 interns a year, composed of both graduates and undergraduates, just in its research, development, and engineering areas, says Eduardo Bascaran, the lead human resources manager for those business units.



Eduardo Bascaran
Corning Inc.

Those units also developed a co-op program, employing five students every quarter. In the spring, the co-op program came to a halt, and internship offers had to be rescinded, as they were at so many other employers.

The loss of these opportunities, even temporarily, will affect how Corning evaluates prospective employees, Bascaran says.

TO FLY



When the COVID-19 pandemic hit, Missouri S&T students designed and 3D printed face masks for local health care providers and first responders.
Credit: Missouri University of Science and Technology

"A lot of our research and development and engineering work involved hands-on experience, and general experience with processing and characterization of glasses and ceramics," Bascaran says. Without that experience, "It's more difficult to assess whether a person has the potential for hands-on work in the laboratory," he says. "We do believe this is going to have an impact. It's really a lost opportunity."

While employers like Corning are becoming reconciled to new workforce conditions that changed almost overnight, engineering schools are also adjusting on the fly to new safety guidelines and requirements while trying to continue to meet the ever-evolving needs of those employers.

One of the hallmarks of the ceramics engineering program at Missouri University of Science and Technology is the hands-on experiences that both undergraduate and graduate students receive.



Richard Brow
Missouri S&T

"They make the powders, consolidate materials, they know how to make glass," says Richard Brow, a longtime professor of ceramic engineering at Missouri S&T. "When they go off to internships or co-ops with companies, our kids are ready to contribute because they've had these experiences."

Graduates of the Bachelor of Science program in ceramic engineering typically go to work at ceramic manufacturers such as O-I or Kohler, or at companies that use ceramic materials in their products, such as GE or Caterpillar.

The laboratory experience at Missouri S&T and elsewhere had to change radically in the spring. In Brow's glass class in March, he asked graduate students to walk through the lab exercises and had them videotaped and made available to undergrads. However, "Looking at a computer screen is a heck of a lot different than putting on protective equipment and going in a furnace and pulling out molten material and making a glass," Brow says. "You need that physical experience to fully understand a process."

Improve your materials science knowledge with an ACerS short course

The American Ceramic Society offers a series of short courses online that expand on foundational topics and are geared to engineers, scientists, operations professionals, and students looking to improve their materials science knowledge. Go to www.ceramics.org/courses for details on these courses:

- Introduction to Ceramic Science, Technology, and Manufacturing
- Drying of Ceramics
- Introduction to Refractories
- Glaze Manufacturing for Industry
- Firing of Ceramics
- Fundamentals of Industrial Glass Melting Processes
- Dispersion and Rheology Control for Improved Ceramic Processing
- Statistical Process Control in Ceramic Processing
- Additive Manufacturing of High-Performance Ceramics
- Glass Corrosion
- Nucleation, Growth and Crystallization in Glasses—Fundamentals and Applications
- Sintering of Ceramics
- Introduction to Machine Learning for Materials Science

Although conditions were still evolving in late summer, Brow says Missouri S&T was planning to run labs in shifts to maintain adequate physical distancing. Students could opt out and take online versions, he says.

Colorado School of Mines also enjoys a reputation as a hands-on materials science engineering school whose graduates have received jobs in the auto industry, aerospace, refractories, semiconductors, as well as at hometown ceramics manufacturer Coorstek in Golden, Colo.

Geoff Brennecka, an associate professor and assistant director of the materials science program, is teaching a ceramics class at Mines this school year, and although things were subject to change, was moving ahead with plans to conduct labs on campus and in person.

He said the school is prioritizing the lab experiences by asking instructors to conduct lectures remotely so the labs can remain on campus.



Geoff Brennecka
Colorado School of Mines

"The hands-on lab stuff, where you really have to get in and work with the equipment that not everybody has in their kitchen or in their garage, we want to make sure as few people are on campus as feasible, so those experiences don't suffer," he says. "It's better to push those things off campus that can be done remotely. That way we can preserve the on-campus environment and experience for the things that can't be done remotely."

He plans to run the labs in shifts so fewer students are present at any one time and distancing can be maintained.

"Our great challenge now is how to we bring that experience to students under conditions that are much different than they were in February," Brow says.

It's a work in progress as conditions are changing rapidly, and school policies and procedures are stressing flexibility and change above all else.

Brennecka says he's mostly concerned about how the experience of working in teams will change as smaller lab sizes and remote, virtual learning become the norm.

Employers, he says, "are always looking for people who have demonstrated that they can work in teams and can solve problems. Those are skills that engineering students develop through the entire experience on campus. It's a much more holistic experience."

"How does the very concept of working in teams change moving forward?" he asked.

That's a question that can't be answered yet, but if virtual meetings and professional interactions become the new normal, today's students will be prepared for that, he says.

"The default is that we're all going to be using the same kinds of tools for that kind of engagement, so the students that come out of here in a couple of years, they're working in Zoom or have been doing that already for years," Brennecka says.

Brow also sees educational value in students and teachers creating virtual experiences. Creating a virtual reproduction of a lab exercise was instructional, he says. "It's an opportunity for us to provide a deeper description of the chemistry and physics that's going on," he says.

"To the kids who can't come back or who don't want to come back, we will have these elements available," he says.

Two-year technical colleges are also dealing with rapid change in how training is delivered to future manufacturing employees. Providing job-specific training remotely was already challenging, and employers are asking for it to be accelerated, says Vicki Maple, vice president of economic development and innovative workforce solutions at Central Ohio Technical College.

“One of the great changes has been: how can very specific training be delivered remotely but also in an accelerated fashion,” she says.

“Before, we were looking at one-year certificates and two-year degrees,” she says. “Now, we’re having to look at hours and weeks where we have to deliver intense training and development programs to advance the labor force to where they need to be.”

Maple, who also heads the college’s Workforce Development Innovation Center, says employers are also looking for help in identifying people with leadership skills and getting them trained so their careers can advance and step up to more responsible roles at their workplaces. Her organization has provided leadership training to about 800 people just since the pandemic emerged, she says.

The pandemic and the shift to working at home actually created opportunities for professional development. At Corning, with more time available due to no commuting and fewer meetings, experts within the company were willing to volunteer their time to create training opportunities, Bascaran says.

Employees created a glass class that included 14 30-minute sessions over seven weeks that were recorded for later review. Online attendance ranged from 150 to 300 people, and 600 people attended at least one module, he says.

Corning also connected employees to other online development opportunities offered by Massachusetts Institute of Technology and other organizations.

“It was not a grand strategy, we just took advantage of the opportunity,” he says.

When the time comes to return to the office, “We may continue to take advantage of those opportunities,” Bascaran says.



Colorado School of Mines foundry and lab in pre-pandemic times.
Credit: Colorado School of Mines



Vicki Maple
Central Ohio Technical College



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A holistic approach to developing a modern manufacturing workforce

This article was first published on the National Institute of Standards and Technology's Manufacturing Innovation blog. It was edited for length. The full version can be found at <https://www.nist.gov/blogs/manufacturing-innovation-blog/holistic-approach-developing-modern-manufacturing-workforce>.

By Mary Ann Pacelli

The Oregon Manufacturing Extension Partnership's (OMEP) Smart Talent methodology was launched in 2015 to help small and medium-sized manufacturers (SMMs) address workforce challenges with systematic approaches to recruitment, hiring, onboarding, and early career development.

OMEP has used the methodology with 95 organizations, in engagements ranging from 16 weeks to 18 months. It has responded to client needs by expanding the program to become an integrated holistic approach called Workforce Solutions, which includes managerial training, organizational development, and executive leadership.

Smart Talent has been adopted across the MEP National Network by Centers in Hawaii, Montana, Tennessee, and Puerto Rico. Several others are considering the methodology.

Smart Talent was developed to help manufacturers with the increasingly common—and growing—issue of finding talent to replace an aging workforce. Staffing issues often resulted in quality, productivity, and morale issues, according to OMEP consultants Paola Castaldo and Russ Gaylor.

In many cases, SMMs were trying to quickly onboard new employees for productivity's sake. They struggled with developing effective processes and the people skills required for training, often opting for hiring an experienced technical expert. Entry-level turnover was high, and tribal knowledge was difficult to translate to new employees.

The Smart Talent methodology thrived with its end-to-end approach to recruitment and training. Elements included:

- Expanding the prospect pool by rewriting job descriptions to be more attractive to tech-oriented candidates and broadening recruiting outlets.
- Moving the burden of onboard training from team leaders to the staff, which creates more of a knowledge-sharing culture and repeatable process.

- Using proven adult-learning approaches for more structured on-the-job training, which provided more clear career paths.
- Creating a learning culture in the organization.

OMEP has continued to tweak its methodology, working with its partner MEP Centers to develop new processes, apply best practices, and absorb lessons learned. Smart Talent now encompasses the entire lifecycle of an employee and scope of the company, from entry-level positions to organizational alignment. It is customizable and scalable.

Gaylor offered up a current success story in which CabDoor, a cabinet maker in Salem, Ore., was experiencing high attrition for entry-level hires, some of whom were in their first full-time job. New employees were expected to be at an 80% production level by the end of a third shift. Some of them were overwhelmed from the start.

Of those that made it through the onboarding process, only half were completing the competency test to advance to the next level of employment.

In response, OMEP and CabDoor designed a three-day bootcamp for new hires. Half of the group was on the floor learning job duties, while the other half was in a classroom setting learning about the company, its products, compliance issues, and more. The groups changed places at midday. At the end of three days, the integration of new employees was more effective, and 95% of the new hires had passed the measurement test to become eligible for the next job level.

For more information about how the Smart Talent program works, contact Mary Ann Pacelli at mary.pacelli@nist.gov or your local MEP Center.

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