

# Advanced Manufacturing Career Readiness Report



## **SHORTAGE OF CAREER-READY CITIZENS**

### **ABSTRACT**

***Eighty-four percent of manufacturing executives agree the nation is now facing a “skills gap” crisis.***

***Once this country loses its ability to make and build things, we will have lost what made America great!***

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## Benchmarking Summary

By 2020, [65 percent of jobs](#) will require postsecondary education and training, while only 36 percent of jobs expected to be open for high school graduates.

The United States will need nearly 3.5 million manufacturing jobs over the next decade and 2 million of those jobs are likely to go unfilled due to the skills gap, according to new research from Deloitte and [The Manufacturing Institute](#).

To make the task more challenging, the [2015 National Assessment of Educational Progress](#) (NAEP) shows an estimated only 37 percent of 12th-graders are prepared for college-level coursework with only 25 percent of grade 12 students in math and 37 percent in reading scoring at or above *Proficient* level.

## Career Path Selection

Parents and their students do not view working in manufacturing as an acceptable career path. As more emerging good paying manufacturing jobs are becoming available, most parents still want their kids to get a college degree and get a white-collar job.

In many cases, earning power is more a [function of occupation](#) than degree level. Workers with just a two-year degree can out-earn graduates of four-year universities who go into less lucrative fields.

Students and parents need to take into consideration the cost and the return on the investment of the different levels of a postsecondary education degrees and credentialing will afford them. In fact, [27 percent](#) of people with post-secondary licenses or certificates—credentials short of an associate's degree—earn more than the average bachelor's degree recipient.

Manufacturing careers are lucrative. In 2014, the [average manufacturing worker](#) in the United States earned \$79,553 annually, including benefits, while average compensation for workers in other industries was \$64,204. Looking specifically at wages, the average manufacturing worker earned nearly \$26.00 per hour, according to the latest figures, not including benefits.

Manufacturing employs a higher share of workers without a college degree than the economy overall. On average, non-college-educated workers in manufacturing made [10.9 percent more](#) than similar workers in the rest of the economy.

The Reshoring Initiative President, Harry Moser states “A strong [skilled workforce](#) is key to bringing jobs back home and manufacturing growth. Similarly making reshoring's success visible is key to motivating recruitment of the next generation of skilled workers.”

## Career Pathways Programs

Communities are collaborating with leading learning organizations to benchmark and then deploy best practices to replenish their talent pipelines and recruit the next generations of makers. To that end, [National Manufacturing Day<sup>SM</sup>](#) is a celebration of modern manufacturing meant to inspire the next

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generation of manufacturers and increase the graduation rates of students who are career and college ready.

A proven best practice to close the skills gap is outlined following the guidance of 27 national experts on Career Technical Education (CTE), Career Pathways, and Programs of Study in the book titled [The Career Pathways Effect](#). The book is designed as a how-to guide for administrators, faculty, counselors, and business partners to link education to economic prosperity.

Students in [Career Technical Education programs](#) graduation rate is 90.18 percent. Eighty percent of students who take [CTE courses](#) along with their core courses are prepared for both college and a career, compared to just 63 percent of students who take only core courses.

[SkillsUSA](#) provides educational programs, events and competitions that support career and technical education (CTE) in the nation's classrooms and reaches over 300,000 students, teachers, and industry members.

[Haas Technical Education Center](#) (HTEC) Network is an industry and education led initiative to advanced training and teacher certification, so the students will become highly skilled engineers, CNC programmers, machinists and operators." The program aims to integrate a "real-world" lean flow-cell manufacturing environment to prepare graduates to hit the ground running the first day on the job.

[Danville Community College](#) (DCC) in Virginia offers credit and non-credit programs designed to meet occupational, professional, and personal interests and needs. Courses are designed to help clients upgrade technical skills, improve employability skills, acquire new skills, and meet educational requirements for job certification. They fully support economic development efforts in the region.

[Alamo Academies](#) in Texas through their partnership with the San Antonio Manufacturers Association (SAMA) they are able to provide through this unique career pathway program. Alamo Academies, through mentorship, skill building and more, provides high school students with a pathway into advanced manufacturing careers.

### **Benchmark Findings – Successful Career Readiness Program Requires:**

- The full support of the community and its need community champions along with passionate CTE teachers and program directors makes a "big difference"
- The high school CTE program must be in sync with college and industry requirements to include CTE shops with like equipment to that at the community college
- Linking education to economic prosperity and economic development of the region
- Industry leaders need to provide timely and authentic feedback on program graduates and CTE initiatives must maintain a high public awareness profile
- The leveraging of SkillsUSA, Haas Technical Education Center (HTEC) Network, SME, Reshoring Initiative, and others to graduate career-ready citizens to retain and bring jobs back home
- National skills certifications to validate the teacher has taught and the student has learned
- Competency based educational lets students learn and demonstrate career readiness skills

***The goal for communities is to continuously refine the Career Pathways programs to graduate career-ready citizens for making "Made in America" and the "American Dream" a reality, again!***

Glenn Marshall, Newport News Shipbuilding (retired) Career Pathways Volunteer at [marsh8279@aol.com](mailto:marsh8279@aol.com) sharing best practices to close the skills gap and [Reshoring Initiative](#) to retain and bring jobs back home

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## Benchmarking Report

Manufacturing drives about 32 percent of U.S. employment with a multiplier effect of 3.6, not the 1.4 previously believed, per recent [research by MAP](#). That means for every new manufacturing job, 3.6 other jobs are created that wouldn't have existed otherwise.

### Career Readiness

Every community should look at how best practices and lesson learned can be used to close the skills gap faster by following the guidance of 27 national experts on Career Technical Education (CTE), Career Pathways, and Programs of Study in the book titled [The Career Pathways Effect](#). The book is designed as a how-to guide for administrators, faculty, counselors, and business partners linking education to economic prosperity.

Students who concentrate on [Career Technical Education programs](#) has a graduation rate of 90.18 percent. Over 70 percent of CTE concentrators pursued postsecondary education. High-risk students are 8 to 10 times less likely to drop out if they are in a CTE program.

Combining CTE with core courses prepares more students for success beyond graduation. Eighty percent of students who take rigorous CTE courses along with their core courses are prepared for both college and a career, compared to just 63 percent of students who take only core courses alone, the Southern Regional Education Board concluded in its 2012 ["High Schools That Work"](#) assessment.

These successful programs are linking education to economic prosperity by adopting and deploying Career Pathways programs. A proven best practice model is Newport News Shipbuilding (NNS) [Career Pathways program](#). NNS has over 300 volunteers working with Hampton Roads Public Schools to mentor students and provide opportunities to experience rewarding future careers.

This partnership provides a unique opportunity for the business to be a good corporate citizen and contribute directly to the school experience of the youth who are just beginning to formulate their dreams for the future.

### Danville Community College Career Readiness Program

[Danville Community College](#) (DCC) is a two-year institution of higher education under the state-wide Virginia Community College System. DCC's service area includes the City of Danville, Pittsylvania County, and Halifax County.

Services include custom training programs for small or large groups of employees, as well as various other business services and outreach programs. The DCC vision is committed to providing quality comprehensive higher education and workforce programs and services to promote student success and to enhance business and community development.

The Gene Haas Center for Integrated Machining at the [Institute for Advanced Learning and Research \(IALR\)](#) in Danville, Virginia, opened Friday, May 15, 2015 with a ribbon cutting ceremony. The Integrated Machining Technology program at the [Gene Haas Center for Integrated Machining](#) is a progressive third year precision machining training model that answers industry expressed needs for a highly skilled 21st century workforce.

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A key component of this project is a revolutionary concept that incorporates workplace experiential learning in an educational setting by enabling students to train in a full-scale manufacturing work flow cell to support a realistic, fully-integrated learning experience. Students implement lessons in Lean and Six Sigma, along with business and manufacturing principles to solve complex problems.

The program aims to integrate a “real-world” lean flow-cell manufacturing environment with such skills as tool management, quality control, process optimization, manufacturing economics, organizational behavior, and how to be a part of a high performance organization.

“A critical issue of delivering quality CNC education to students is the ongoing development of CNC teachers,” adds Bob Skodzinsky, Manager – HTEC network of schools, HTEC members have access to a wide variety of contacts, benefits, and services. These include equipment discounts, training conferences, teacher training, educational and online training software, and many HTEC Technology partners.

As an HTEC location, DCC will offer instructors training in CNC milling and CNC turning and the opportunity to earn [National Institute for Metalworking Skills \(NIMS\)](#) certifications. NIMS is the metalworking industry’s premier standards and skills certification body. Its certifications are recognized on a national and global level. The CNC classes are offered in a blended delivery format, combining hands-on, textbook and online training.

Becoming a CNC teacher training center builds upon the DCC Precision Machining Technology program’s success and ongoing partnership with Haas Automation. The Gene Haas Foundation recently awarded a \$1 million grant to the Institute for Advanced Learning and Research to support the new Gene Haas Center for Integrated Machining which houses the third-year Integrated Machining Technology capstone program for graduates of precision machining technology programs throughout the region.

“We are honored that Haas has chosen DCC to be one of their Train the Trainer partners,” says Troy Simpson, Director of Advanced Manufacturing. “Being selected speaks volumes for the ability of our precision machining instructors, who have worked tirelessly to deliver quality CNC instruction on a national level.”

As a CNC teacher training center, DCC will play a role in equipping instructors with the skills and expertise necessary to prepare students for today’s highly technical jobs in advanced manufacturing. “We look forward to secondary and postsecondary instructors from throughout the United States coming to our campus and participating in the CNC training activities,” Simpson says. Gene Haas Foundation is providing scholarships to assist CNC instructors with the cost of training.

The program has received endorsements from such industry partners as Haas Automation, Mitutoyo Corporation, Sandvik Coromant, Rolls Royce, BWX Technologies, North American Mold Technology, and Master Gage & Tool, as well as commitments from these industries.

The DCC Integrated Machining Manufacturing Cell shown below:

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DCC currently has over 150 students enrolled in these programs. The goal for Precision Machining is to have 300 students in the workforce pipeline within the next few years. In addition to the Precision Machining pipeline of students, Danville Community College recently expanded these programs with a new Dimensional Inspection/Metrology program aimed at producing ASQ certified quality inspectors.

This new program currently has 15 students enrolled and is currently the only one in the state of Virginia. Once the \$7 million expansion of the Advanced Manufacturing training facility is complete, this program will boast a capacity of 40 students.

The Capstone Integrated Machining Technology project is the first of its kind in the United States. Other recent accomplishments of the Precision Machining Technology program include expansion of the CNC lab in the Charles R. Hawkins Engineering and Industrial Technologies Building and the earning of over 350 [NIMS certifications](#) by DCC students since 2014.

For more information, visit [www.machiningindanville.com](http://www.machiningindanville.com)

### **Benchmark Career Readiness Programs**

[SkillsUSA](#) improves the quality of America's skilled workforce through a structured program of citizenship, leadership, employability, technical and professional skills training. They enhance the lives and careers of students, instructors and industry representatives as they strive to be champions at work. These educational programs, events and competitions that support career and technical education (CTE) in the nation's classrooms and reaches over 300,000 students, teachers, and industry members.

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programmers, machinists and operators. The program aims to integrate a “real-world” lean flow-cell manufacturing environment to prepare graduates to hit the ground running the first day on the job.

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[Vocademy](#) in California offers makerspaces, school shop classes, trade schools, R&D labs, and dream garages, all in one place. They have classes that can take anyone from absolute beginner, all the way to expert, and anywhere in between. They can help bring a full size Vocademy to your community or discuss smaller Turn-key Makerspace solutions for schools, libraries, organizations, or companies.

The [Manufacturing Institute](#) launched the Skills Certification System to address the skills gap challenge and to promote a renaissance of manufacturing education across the country. The Skills Certification System is designed by and for industry, and endorsed by the National Association of Manufacturers. The Manufacturing Institute has developed a variety of toolkits to help communities implement skills certifications to build a skilled manufacturing talent pipeline.

The Manufacturing Institute launched the [Dream It. Do It.](#) It works to change the perception of the industry and inspire next-generation workers to pursue manufacturing careers. Members of the Dream It. Do It. program gain access to national support and resources to aid their pro-manufacturing efforts and join a network of industry leaders that implement activities to meet local, regional and statewide workforce needs.

[Tooling U-SME](#) supplies manufacturers, high schools and technical colleges with in-house and online training resources that are translatable to both certificate programs and associate degrees. Tooling U-SME has aligned curriculums critical for combatting the current and pending talent gap and building high performance teams.

### Virginia Peninsula Career Readiness Program

[Denbigh High School - Aviation Academy, Newport News, VA](#) was selected for PRIME® (Partnership Response in Manufacturing Education) designation. PRIME® is an educational initiative designed to bring together organizations, businesses and exemplary high schools in a community-based, partnered approach to advanced manufacturing/STEM education. Through PRIME®, the SME Education Foundation provides the conduit to engage students, teachers and schools in the real world of industry and business.

[Warhill High School](#) in Williamsburg-James City County, Va. using [Project Lead the Way](#), a curricular and professional development program related to science, technology, engineering and math. Under the program, students involved in Warhill’s engineering classes practice “design thinking,” to plan out solutions to complex problems.

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The new [Pathways Project](#) at Warhill High School allows students to work at their own pace to demonstrate mastery of course content – while earning credits toward graduation. Students will experience flexibility through personalized learning opportunities. Pathways Project participants will meet with a mentor and develop a personalized learning pathway. Students will incorporate blended and online courses into their schedules.

[New Horizons Regional Education Centers \(NHREC\)](#) provides career and technical education services to the students of Virginia Peninsula high schools. The center currently serves over 920 high school juniors and seniors in 23 career and technical programs. NHREC is launching a new Academy for Advanced Technical Careers with a business driven structure by integrating academics & technical training.

[Thomas Nelson Community College \(TNCC\)](#) offers Dual Enrollment Programs which include On-Campus Dual Enrollment, In-School Dual Enrollment, and Early College programs. Dual enrollment is restricted to high school juniors and seniors and home school students studying at the high school junior or senior levels.

TNCC offers [Mechatronics Technology Career Studies Certificates \(CSC\)](#) designed to graduate students with the skills in operating complex manufacturing systems that integrate electrical, mechanical and computer engineering with responsibility for their efficient operation and preventative maintenance.

Newport News Shipbuilding (NNS) [Career Pathways program](#) and Association for Manufacturing Excellence (AME) [AME Corporate member](#). NNS has over 300 volunteers working with Hampton Roads Public Schools to mentor students to experience rewarding careers. This partnership allows businesses to be good corporate citizens and contribute directly to the school experience of the youth and help close the skills gap in the region.

### Benchmarking Team

Benchmarking teams made up of representative from across the community and includes leading learning organizations, economic development, educators, industry leaders, career technical education (CTE) principals and counselors, colleges, policy makers and others.

These members are task with finding and deploying best practices to close the skills gap while accelerating making individuals more productivity and their organization more competitive for retaining and bringing jobs back home to win the global economic marathon.

### Recommendations

Across the country and on the Virginia Peninsula there are other best practice programs that were not addressed in this report, needs to considered in planning programs to graduate the next generation of makers.

The report outlines best practices and lessons learned for communities, schools, businesses, and leading learning organizations to join together and deploy Career Pathways programs to insure the career readiness of every student and the ongoing re-tooling of the workforce for 21<sup>st</sup> century success.

### Moving Forward

*Linking education to economic prosperity of individuals and the community by competitively retaining and bringing good paying jobs back home!*

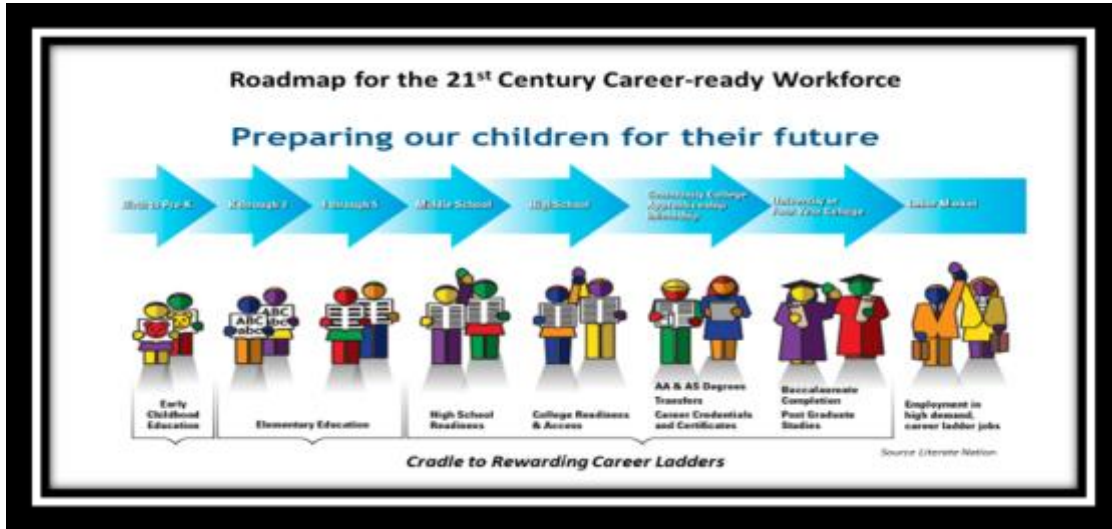
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## Community Collaboration - Cradle to Rewarding Careers



## Filling the Talent Pipeline with Next Generation of Makers

