



Career Clusters Prepare All Students for College, Technical Training, Apprenticeships and Careers

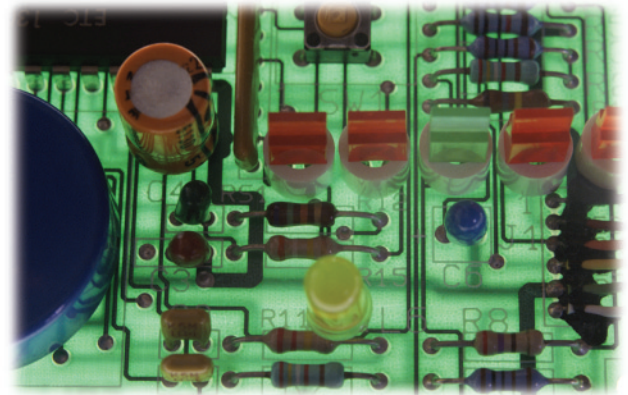
Career Clusters prepare learners of all ages for the information age as schools, colleges and employers strive for higher achievement in science, math and communication. One key to improving learner achievement is providing learners with relevant contexts for studying and learning. Career Clusters offer these contexts by linking school-based learning with the knowledge and skills required for continued success.

The Concept of Career Clusters

Career Clusters identify the knowledge and skills learners need as they follow a pathway toward their career goals. The knowledge and skills identified form a strong basis for learner success whether the learners are in high school, college, technical training, an apprenticeship program or in the workplace.

How to Pursue Education and Training in Manufacturing

There are thousands of challenging educational and training opportunities within the high-skilled world of Manufacturing. Learners need a solid background in math, science and technical skills. Education and training can be obtained in high schools, technical colleges,



two-year community colleges, four-year colleges/universities, apprenticeship programs and career technical schools/institutes.

Along the way, career guidance professionals assist learners in assessing their educational goals, interests, abilities and skills to facilitate a good match to the cluster's many pathway options. Learners participate in relevant educational opportunities framed in the context of the cluster. They gain knowledge and skills through coordinated workplace learning experiences such as site visits, job shadowing and internships. If they choose, they may achieve valuable skill certifications that lead to employment. Colleges and universities offer advanced degrees and industry

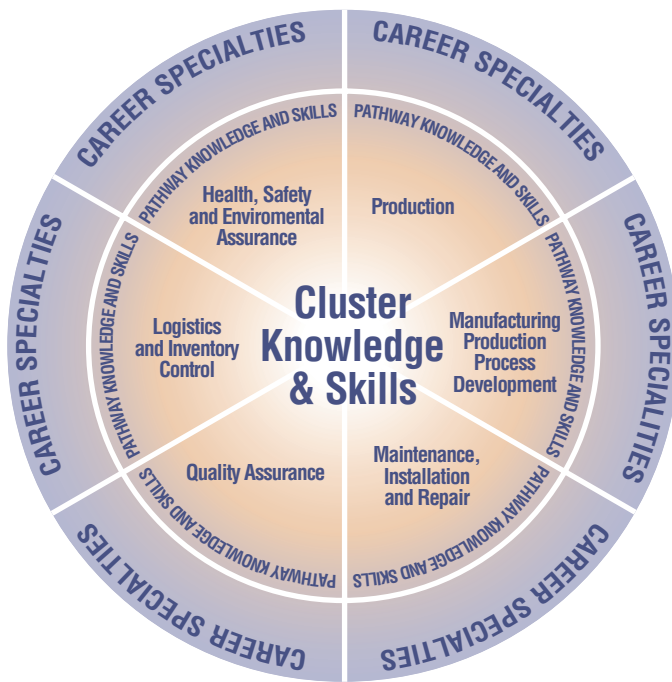
certifications that prepare learners for professional and technical careers. Apprenticeship programs prepare learners for journeyworker status.

Industry plays a major role in training and career development by supporting apprenticeships, training, joint industry/school programs and industry training leading to certification and college credit.



Career Pathways at a Glance

The Manufacturing Career Cluster is divided into six pathways. Pathways are grouped by the knowledge and skills required for occupations in these career fields. Each pathway provides instruction as a basis for success in an array of careers and educational pursuits.



The Six Pathways

- Production
- Manufacturing Production Process Development
- Maintenance, Installation and Repair
- Quality Assurance
- Logistics and Inventory Control
- Health, Safety and Environmental Assurance



What Is the Manufacturing Career Cluster?

This diverse Career Cluster prepares learners for careers in planning, managing, and performing the processing of materials into intermediate or final products. Careers also include related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.



Employment Outlook

Despite improvements in production technology and rising imports, manufacturing employment is expected to

increase slightly as strong demand continues for high-tech electrical goods and pharmaceuticals.

Production

Overview

People with careers in production work on the shop floor making parts or assembling them. They work with machines, making or assembling electronic parts, constructing or assembling modular housing, performing welding jobs, or printing various materials.

Sample Occupations

- Assemblers
- Automated Manufacturing Technicians
- Bookbinders
- Calibration Technicians
- Electromechanical Equipment Assemblers
- Extruding and Drawing Machine Operators
- Machine Operators
- Medical Appliance Makers
- Tool and Die Makers



Credentials

- Most postsecondary schools and institutions offer certificates, associate degrees, or higher degrees related to manufacturing specialties.

- Some certificates include specialties recognized by the
 - National Institute for Metalworking Skills
 - Society of the Plastics Industry
 - American Welding Society
 - American Electronics Association
 - Electronics Industry Association
 - National Council for Skill Standards in Graphic Communications.



Employment Outlook

Some occupations in this category, such as assemblers and machine operators, are going to grow more slowly than the average as manufacturing plants continue to move toward more automation of their processes.

However, those individuals with a broad range of skills or a specific skill that cannot be automated will experience job growth and find their services in demand. Welders, tool and die makers, and multiple machine operators are examples of these growth occupations.

Manufacturing Production Process Development

Overview

Employees in Manufacturing Production Process Development are responsible for product design and design of the manufacturing process. They work with customers to ensure the manufacturing process produces a product that meets or exceeds customer expectations. They also monitor the manufacturing process and the materials used to manufacture the product.



Sample Occupations

- Design Engineers
- Industrial Engineers
- Labor Relations Managers
- Manufacturing Engineers
- Power Generating and Reactor Plant Operators
- Precision Inspectors, Testers and Graders
- Process Improvement Technicians
- Production Managers

Credentials

- Both secondary and postsecondary schools offer engineering-related courses and credentials ranging from high school graduation to certificates, associate degrees, baccalaureate degrees and graduate degrees.
- Some certificates include specialties recognized by the
 - Society of Manufacturing Engineers
 - National Society of Professional Engineers



Employment Outlook

Some of the occupations in this pathway are going to grow more slowly than the average because of increasing automation in the manufacturing sector. This is particularly true for industrial engineers and production

managers. Labor relations manager positions will grow about as fast as the average, but the overabundance of qualified applicants will make those jobs highly competitive. Electrical engineering positions will also grow about as fast as the average.

Maintenance, Installation and Repair

Overview

People with careers in Maintenance, Installation and Repair perform preventive maintenance procedures on machines, tools and equipment. These are performed routinely and on a regular basis. They also troubleshoot and repair electrical, electronic and mechanical systems. This will include mechanical repair as well as using computer-based inventory control systems, retrieving information histories on each machine from computer records, and recording repair activities on the system to keep accurate records of repairs performed on each machine.

Sample Occupations

- Biomedical Equipment Technicians
- Communication System Installers/Repairers
- Computer Installers/Repairers
- Instrument Control Technicians
- Job/Fixture Designers
- Laser Systems Technicians
- Meter Installers/Repairers
- Security System Installers/Repairers

Credentials

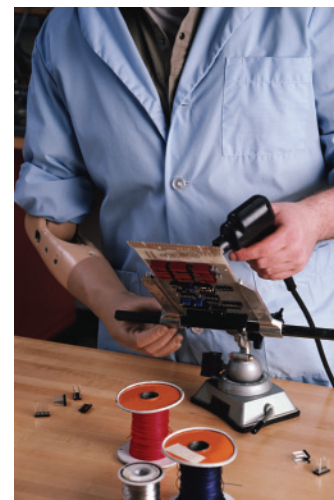
- Education required for this career area includes machine and tool repair,

die, jig and toolmaking as well as courses in programmable logic controllers and other similar devices. Entry level can be from high school, but postsecondary education and training will be required.

- Some credentials include
 - BAT Apprenticeship
 - Society for Maintenance and Reliability Professionals—Certified Maintenance and Reliability Professional
- There are specific certifications in such areas as boilers, hydraulics, pneumatics and pump repair.

Employment Outlook

In this pathway, computer technician and repair positions will experience growth on pace with the average growth for jobs across all sectors. In addition, job opportunities will be



plentiful because of a shortage of qualified applicants. This will, in part, be due to the increasing complexity of computer equipment. Increased automation and more reliable machinery will cause job growth in other types of maintenance, installation, and repair to remain the same or be slower than average. The best job prospects will be for those with broad skill sets.



Quality Assurance

Overview

Quality Assurance employees assure that standards and procedures are adhered to and that delivered products or services meet performance requirements. They may have responsibility for monitoring and maintaining the quality of parts and manufacturing processes. This could include identifying the raw product to ensure it meets specifications, as well as measuring or otherwise testing products and parts to ensure they meet required customer specifications.



Sample Occupations

- Calibration Technicians
- Inspectors
- Lab Technicians
- Process Control Technicians
- Quality Control Technicians
- Quality Engineers
- SPC Coordinators

- Both secondary and postsecondary schools offer quality assurance courses and credentials ranging from high school graduation to certificates, associate degrees, baccalaureate degrees and graduate degrees.
- Certifications are available through the
 - American Society for Quality



- Quality Certification Bureau, Inc.
- ISO 9000 Certification for Organizations

Employment Outlook

Similar to many of the jobs in other manufacturing pathways, quality assurance jobs are either going to grow more slowly than the

Credentials

- For workers who perform relatively simple tests of products, a high school diploma is sufficient; experienced workers fill more complex precision inspecting positions.

average or are going to decline in growth. Increasing automations of quality inspections and building quality into the production process mean that these positions are not in demand as they once were.

Logistics and Inventory Control

Overview

People with careers in Logistics and Inventory Control work with an inventory of raw materials and finished parts. They move raw materials to the production line, unload trucks with raw materials, wrap pallets of finished products for shipment, and communicate with traffic managers.



Credentials

- Many jobs in Logistics and Inventory Control require education beyond high school. Individuals may start at the entry level but will need to continue their education as they pursue this career pathway.

Sample Occupations

- Dispatchers
- Freight, Stock and Material Movers
- Industrial Truck and Tractor Operators
- Logistical Engineers
- Logisticians
- Material Handlers
- Process Improvement Technicians
- Quality Control Technicians
- Traffic Managers

- Associate and B.S. degrees are available in Business, Marketing, Logistics, Engineering and Transportation.
- Available certificates include
 - Certified Professional Logistician (CPL)
 - Certified in Transportation and Logistics (CTL)



Employment Outlook

Positions in this pathway are plentiful and will continue to be so in the foreseeable future. Material movers, dispatchers and schedulers make up 3.5 million jobs

alone. The majority of the jobs in this pathway are slated for growth on pace with the average; this, coupled with high turnover, means that job prospects for new entrants will be excellent.

Health, Safety and Environmental Assurance

Overview

Employees in Health, Safety and Environmental Assurance ensure that the equipment is being used safely in the workplace; plan for safety in new production processes; conduct health, safety and/or environmental incident and hazard investigations; conduct preventive health, safety and/or environmental incident and hazard inspections; and implement health, safety and/or environmental programs, projects, policies or procedures.

They may train workers in health, safety and/or environmental issues and provide event documentation.

Sample Occupations

- Environmental Engineers
- Environmental Specialists
- Health and Safety Representatives
- Safety Coordinators
- Safety Engineers
- Safety Team Leaders
- Safety Technicians

Credentials

- Community colleges, technical institutes and career technical schools offer training programs from one to two years in length, including some associate degree programs.
- Four-year colleges and universities offer degree programs in business, engineering and engineering technology.
- Most safety engineers, safety technicians and environmental compliance inspectors require specialized certification.

Employment Outlook

The job outlook in this pathway is slated for growth on pace with the average. For environmental engineering positions, growth will be faster than the average. These positions will be

increasingly focused on prevention of environmental problems rather than treatment. Health and safety specialist jobs will grow about as fast as the average and, with most of these positions in local, state and federal government, job security will be excellent.





Career Clusters link what students learn in school with the knowledge and skills they need for success in college and careers.



The 16 Career Clusters

- Agriculture, Food & Natural Resources
- Architecture & Construction
- Arts, A/V Technology & Communications
- Business, Management & Administration
- Education & Training
- Finance
- Government & Public Administration
- Health Science
- Hospitality & Tourism
- Human Services
- Information Technology
- Law, Public Safety & Security
- Manufacturing
- Marketing, Sales & Service
- Science, Technology, Engineering & Mathematics
- Transportation, Distribution & Logistics





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Arts, A/V Technology & Communications
Business, Management & Administration
Education & Training
Finance
Government & Public Administration
Health Science
Hospitality & Tourism
Human Services
Information Technology
Law, Public Safety & Security
Manufacturing
Marketing, Sales & Service
Science, Technology, Engineering & Mathematics
Transportation, Distribution & Logistics



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