



2015

What's made in your backyard?

TEACHER'S GUIDE

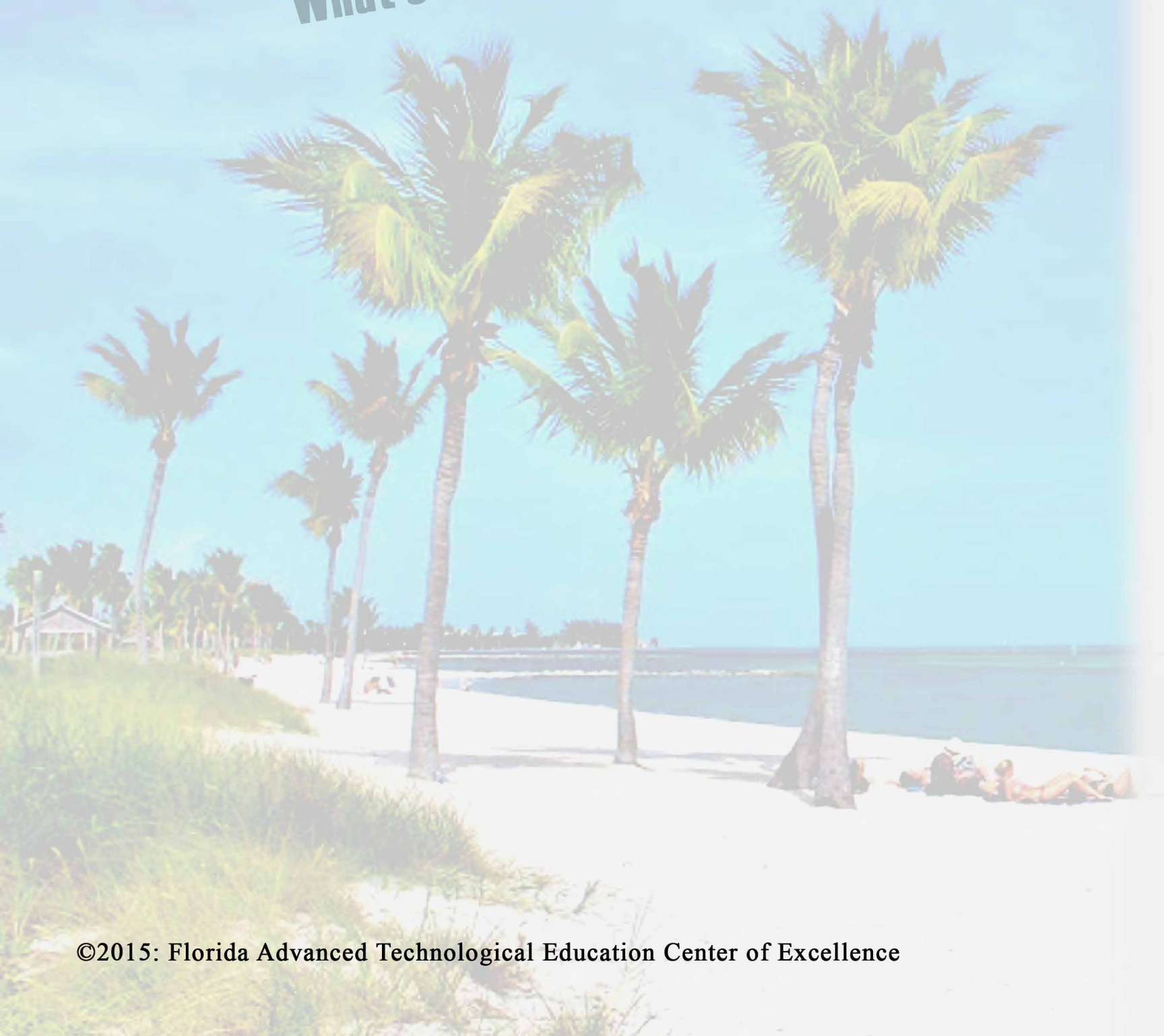


A Curriculum Focused on Florida Manufacturing

**Made in
FLORIDA**



What's made in your backyard?





WELCOME TO THE

Made in Florida 2015 Teacher's Guide!

Do you know what's made in your backyard?

Dear Instructor,

Welcome to the Made in Florida 2015 Teacher's Guide. The Made in Florida 2015 video was produced in part by the Florida Advanced Technological Education Center (FLATE) for use in the Made in Florida initiative. The video and this guide are designed to provide you with a broader understanding of manufacturing in Florida. These teaching aids are aligned to the new Florida Standard SP.PK12.US.3.3b: Students will be able to participate effectively in academic and career planning, including, but not limited to, the IEP, course selection, course of study, post-secondary goals, and the transition process.

To many people the word manufacturing brings to mind dark, dirty, and dangerous work environments that offer low paying jobs. Made in Florida 2015 addresses these concerns and shows students that manufacturing is done in a clean, safe work environment, offering lucrative pay and the opportunity to immerse one's self in a highly technical and productive career.

Manufacturing is an important part of Florida's economy and plays an important role in our state's future. Florida offers a variety of opportunities for manufacturers from its intricate and multi-modal distribution channels to its tropical location which draws employers and employees alike. As of 2015, Florida is home to more than 18,000 manufacturing companies who manufacture products from jet engine components to contact lenses. These manufacturers, as well as Florida's ability to draw more industrial companies to the state in the future, rely heavily on the availability of skilled workers who have a passion for creating and producing the products that we are currently using and will use in the future.

Made in Florida 2015 is designed to enlighten students of the vast manufacturing infrastructure that is around them while demonstrating the numerous benefits of seeking careers in Florida's manufacturing sector. There are many opportunities for those interested in manufacturing. As time moves on, more and more of the older manufacturing workforce is retiring, leaving a significant number of available jobs that companies are eager to fill. Join us as we explore the world of manufacturing in Florida. This guide will take you and your students on a tour through 6 regions of Florida where they will be introduced to companies including: Johnson & Johnson Vision Care, Harris Corporation, HOERBIGER Corporation of America, Shaw Development, Sun Hydraulics, Southern Manufacturing Technologies, Heat Pipe, Jensen Group, and Danfoss TURBOCOR. Viewers will learn about the vital products that these companies produce and meet some of their employees who share their experiences working in manufacturing and the roles they play in the production of these important products. They will also learn about important technologies and skills which are commonly utilized in manufacturing such as computer numerical controls (CNCs), automation, robotics, and welding.

Together, we have what it takes to encourage the future skilled workers that Florida and America needs.

Sincerely,

Marilyn Barger, PhD, P.E.

Principal Investigator & Executive Director, FLATE

Florida Advanced Technological Education Center of Excellence

www.madeinflorida.org

Made in Florida 2015: What's Made in Your Backyard Teacher's Guide

A Publication of the
Florida Advanced Technological Education Center of Excellence (FLATE)

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Special Thanks to:

Johnson & Johnson Vision Care

Shaw Development

Heat Pipe Technology

Harris Corporation

Sun Hydraulics

JENSEN-GROUP

HOERBIGER

Southern Manufacturing Technology

Danfoss TURBOCOR



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Florida Department of Economic Opportunity

www.floridajobs.org

The Manufacturing Institute

www.themanufacturinginstitute.org

U.S. Bureau of Labor Statistics

www.bls.gov

National Association of Manufacturers

www.nam.org



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Made in Florida 2015 Activity Sheets (download student handouts at www.madeinflorida.org/MIF2015)

Manufacturing Perception Survey: Assesses student perception about manufacturing pre and post lessons.

Attention Questions: Questions available for most lessons designed to be completed by the students as they watch the Made in Florida 2015 video or video segments.

Combined Minds: Open-ended thought exercises for students to complete in groups of 2-5. It is suggested to host a classroom discussion and have students share their responses with the class. Combined Minds activities include:

- “**The Evolution of Manufacturing**” – Students research and compare old factories to modern factories.
- “**Florida Manufacturing**” – Students explore manufacturing sectors, products, and product manufacturing.
- “**Exploring a Manufacturer**” – Students explore a company in Florida and their products and production methods.
- “**Manufacturing and You**” – Students identify a company in their area that they would be interested in working for.
- “**Exploring a Technology**” – Students select a manufacturing technology and explore how it is used in manufacturing.
- “**Product Development**” – Students identify an object and diagram how they think it was manufactured.
- “**Planning a Career**” – Students discuss the characteristics they are looking for in a career.

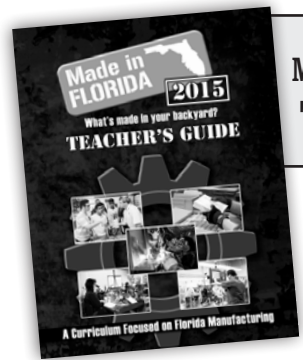


Guide to using Made in Florida 2015

Welcome to Made in Florida 2015. This curriculum was designed to introduce Florida manufacturing to students and educate them on the variety of manufacturing careers available and their prevalence throughout the state. These materials highlight manufacturing as a viable career option and intend to spark student interest in learning more about the technologies and skills associated with various manufacturing jobs, encouraging them to explore education options that make entering the field a smooth and financially lucrative option.

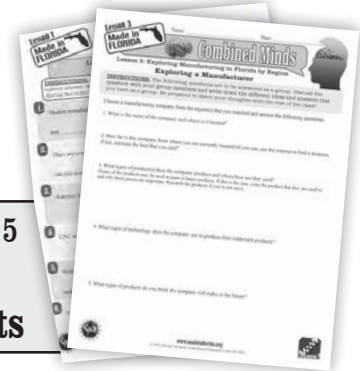
About Made in Florida

The Made in Florida 2015 materials are comprised of three primary components:



Made in Florida 2015
Teacher's Guide

Made in Florida 2015
Downloadable
Student Handouts



These materials are designed to be used in the introduction and instruction of Florida manufacturing and consist of video segments coupled with lessons which include background information, and student-ready activity sheets. This curriculum is organized such that you can use the entire video (Lesson 1) or portions of the video (Lessons 2-5) alongside the corresponding lesson. Each lesson provides a purpose, expected student outcomes, a reference to related video segment(s), estimated classroom time, and background information.

The Made in Florida 2015 DVD

The DVD associated with this curriculum has been designed for flexible use in an instructional setting. Provided below is a breakout of the DVD menu and the options provided to you:

Made in Florida 2015 DVD Main Menu

Play Plays primary video

FL Regions

- Northeast (NE) • Southwest (SW)
- Central East (CE) • Central West (CW)
- Southeast (SE) • Northwest (NW)

Segments

Introduction to Manufacturing

- Manufacturing in the U.S.
- Manufacturing in Florida
- Careers in Manufacturing

Manufacturing Technologies

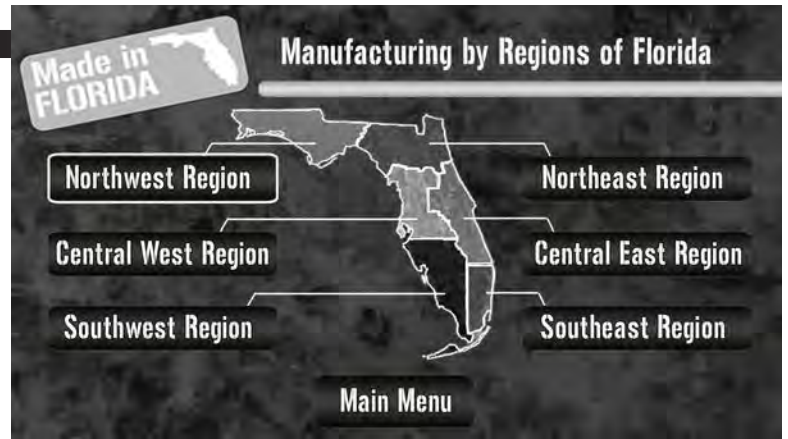
- Robotics and Automation
- Computer Numerical Controls
- Welding

Set Subtitles Turn English subtitles on and off

FL Regions

In the Made in Florida 2015 video, Florida has been separated into 6 distinct regions. Segments for each region can be accessed through the FL Regions button on the DVD main menu to facilitate a lesson designed to specifically focus on a single Florida region (see page 9 for a lesson on this topic).

The regions are divided as shown below. For a list of the manufacturing companies featured in each region refer to page 10.

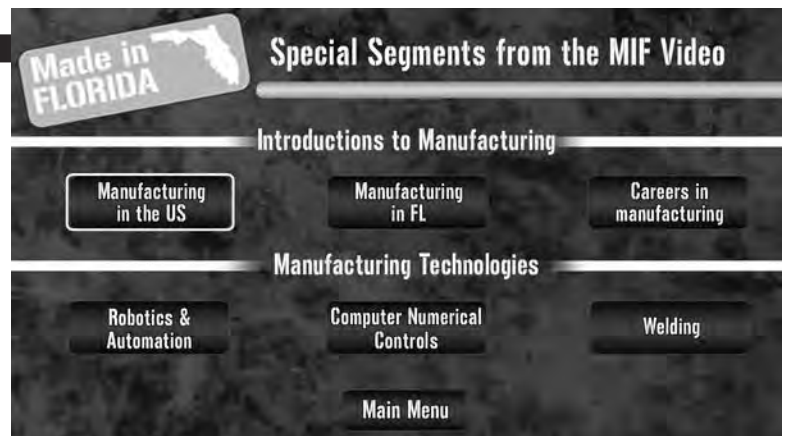


Regions Covered in Made in Florida 2015

Region	Counties within the Region
Northeast (NE)	Nassau, Duval, Saint Johns, Putnam, Alachua, Gilchrist, Dixie, Taylor, Madison, Lafayette, Suwannee, Hamilton, Columbia, Union, Baker, Bradford, and Clay
Central East (CE)	Flagler, Volusia, Seminole, Brevard, Indian River, Saint Lucie, Martin, Okeechobee, Osceola, Orange, and Lake
Southeast (SE)	Palm Beach, Broward, and Miami-Dade
Southwest (SW)	Monroe, Collier, Hendry, Lee, Glades, Charlotte, Sarasota, DeSoto, Highlands, Hardee, and Manatee
Central West (CW)	Pinellas, Hillsborough, Polk, Sumter, Pasco, Hernando, Citrus, Levy, and Marion
Northwest (NW)	Escambia, Santa Rosa, Okaloosa, Walton, Bay, Washington, Holmes, Jackson, Calhoun, Gulf, Franklin, Liberty, Gadsden, Leon, Wakulla, and Jefferson

Segments

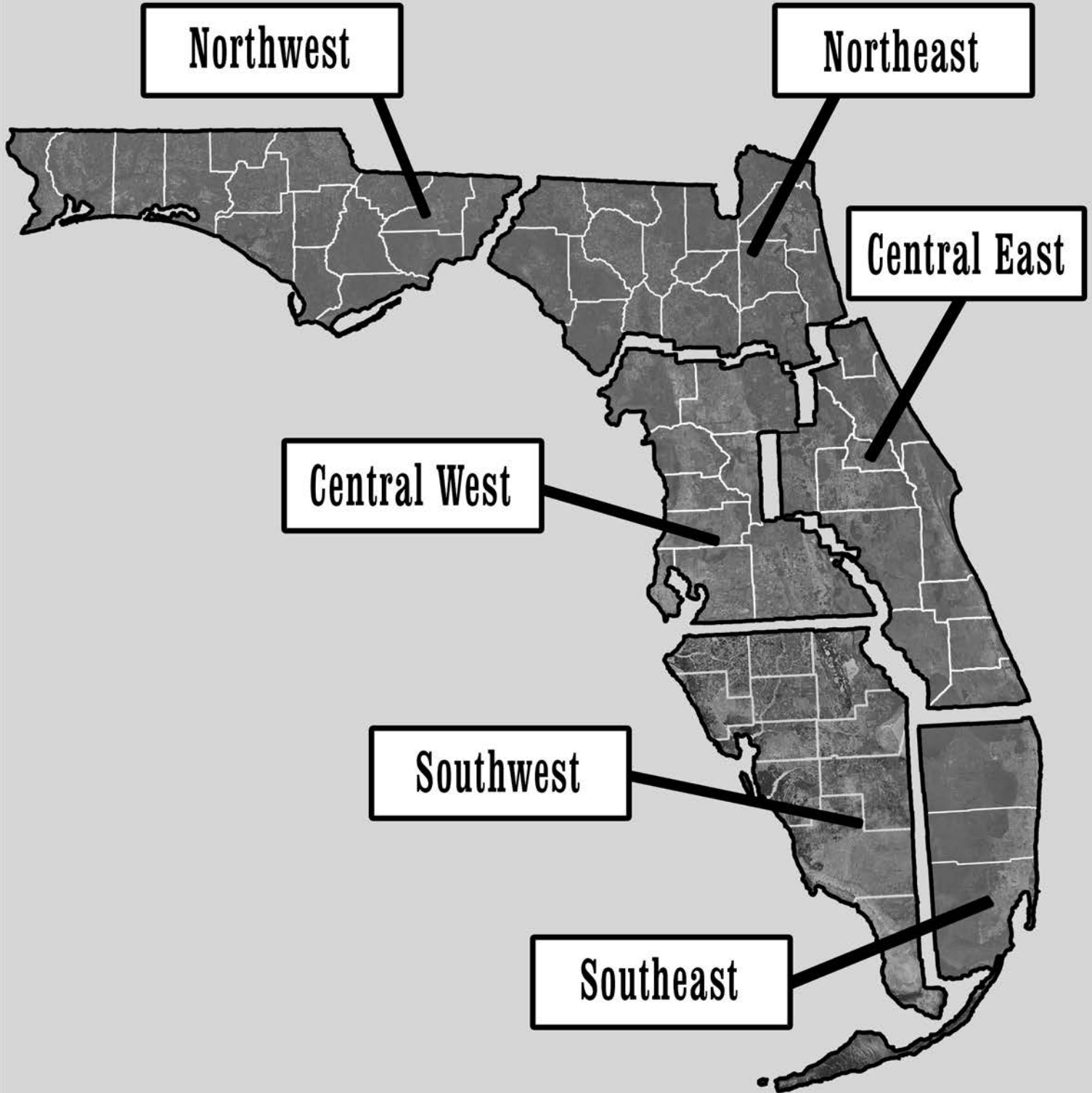
Additional segments addressing manufacturing in general (see page 7 for a lesson on this topic), careers in manufacturing (see page 13 for a lesson on this topic), and common manufacturing technologies (see page 11 for a lesson on this topic), are separated and can be accessed under the Segments button on the DVD main menu.



Thank you for taking the time to explore Made in Florida 2015. We hope these tools prove useful in your quest to educate the next generation of Florida's workforce!

Manufacturing Regions from Made in Florida 2015

Do you know what's made in your backyard?





Student Perception Regarding Manufacturing

It is not often that we slow down and think about the fact that many of the things that we are using and benefiting from everyday are manufactured by a company, or a series of companies, for our benefit. When we do, we may think that they were manufactured by underpaid unhappy employees in dirty, unsafe work environments. This is an outdated mentality. Much of today's manufacturing is done in clean, safe work environments by individuals who are earning competitive salaries and benefits.

While encouraging your students to consider careers in the manufacturing industry it is important to assess and address their preconceptions and concerns about the manufacturing work environment. The Made in Florida 2015 video, and accompanying Teacher's Guide, are designed to challenge the mentality that manufacturing is a dangerous career choice by highlighting manufacturing companies located throughout Florida. Students receive an inside look at the facilities that make the products that we use and benefit from everyday and the high-skill, high-paying careers that they offer. Through these materials, students will see that manufacturing has become an industry that offers career opportunities to individuals of all ages, genders, and abilities. Students will also see that, contrary to popular belief, the U.S., and Florida in particular, is still a leader in manufacturing products.



Prior to going through the lessons outlined, or watching the Made in Florida 2015 video, we encourage you to have your students complete the Manufacturing Perceptions Survey that can be found on our website.

**To download the Manufacturing Perceptions Survey visit:
www.madeinflorida.org/MIF2015**

Once your students have completed the survey, briefly discuss their answers as a group to uncover any misconceptions that they may have and to obtain a general idea of their thoughts regarding manufacturing. This will help you to identify areas that can and should be addressed as you proceed through the lessons.

If it is possible, you can further enlighten your students by taking them on a tour of a manufacturing facility near you. Many facilities are happy to provide tours and if you need help locating a potential company or scheduling a tour, contact us or your local state, community, or technical college.



After teaching lessons from Made in Florida 2015, have your students retake the survey to see if their opinions regarding manufacturing have changed. You should see that your students have a heightened awareness of the manufacturing field and the opportunities that it presents.

Lesson Overview

Purpose: This lesson encompasses the entire Made in Florida 2015 video and aims to introduce students to the manufacturing industry in Florida. Each of the topics covered in this lesson are broken out into shorter elaborated lessons in this guide. You can refer to these lessons for additional background information. In this lesson students will learn about manufacturing in the U.S. and Florida (elaborated in Lesson 2, page 7), manufacturing companies in 6 regions of Florida (elaborated in Lesson 3, page 9), the technologies used in manufacturing (elaborated in Lesson 4, page 11), and manufacturing careers (elaborated in Lesson 5, page 13). The goal of this lesson is to introduce students to the manufacturing industry and the benefits of working in manufacturing as a career choice.

Expected Outcomes: After completing this lesson, students should understand that:

- U.S. manufacturing represents a significant portion of the U.S. and Florida’s economy.
- Manufacturing companies are located throughout Florida and employ many Florida residents.
- Manufacturing is not a dark, dangerous, and dirty career option.
- Manufacturing companies use a variety of technologies to produce their products.
- Manufacturing offers many different career opportunities with competitive wages and benefits.

Classroom Application: Start this lesson by having your students watch the Made in Florida 2015 video. After watching the video separate your students into groups to complete the associated activities that you have chosen. Use the background information provided to have a class discussion encouraging students to share the ideas that their groups discussed while completing the activities.

Related Video Materials:

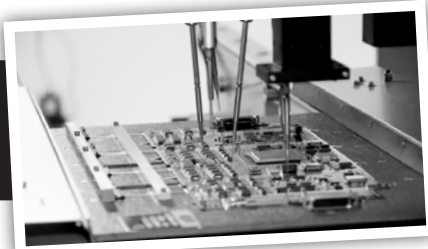
- Main Video: Made in Florida 2015 entire video (length - 27:13 min.)

Estimated Length of Lesson:

- Video: 27:13 min. (includes active participation in “Attention Questions” activity)
- Discussion: ~25 minutes
- Activity: Class time required for activities will vary based on the activities you assign.

Associated Activities: **Attention Questions** are available for this lesson and are meant to be used while watching the video. **Combined Minds** are group-oriented activities available online including “The Evolution of Manufacturing”, “Florida Manufacturing”, “Exploring a Manufacturer”, “Manufacturing and You”, “Exploring a Technology”, “Product Development”, and “Planning a Career”. For the Combined Minds activities, separate your students into groups (2-5 per group recommended) to complete the activities you choose. Once complete, have some or all groups present their answers and facilitate a discussion.

To download the student handouts associated with this lesson visit: www.madeinflorida.org/MIF2015





The Complete Made in Florida 2015 Background Information

Manufacturing Overview (see page 7 for a lesson on this topic)

It is a common misconception that much of today's manufacturing is outsourced and that few products are made in the U.S. In 1793 the first U.S. manufacturing facility was opened. By 2012, U.S. manufacturing had grown tremendously accounting for 12% of the gross domestic product (GDP) and employing approximately 9% of the U.S. workforce. In Florida alone there are over 18,000 manufacturing companies employing over 300,000 Florida residents earning an average of \$22/hour, not including benefits. Florida is ranked the 7th highest exporter of U.S. goods with approximately \$85 billion in merchandise exports in 2013. This comes as no surprise considering Florida's expansive multi-modal transportation infrastructure including 19 commercial airports, 2 spaceports, 15 deep water seaports, 3,000 miles of freight rail tracks, and over 12,000 miles of highway. The manufacturing industry in Florida is an important aspect of the state's economy and in order to sustain this robust industry the availability of skilled workers is essential.

Manufacturing in Florida by Region (see page 9 for a lesson on this topic)

In the Made in Florida 2015 video, manufacturing companies are explored in six regions of Florida including the Northeast, Central East, Southeast, Southwest, Central West, and Northwest. Each region offers a unique aspect that attracts companies, from the beautiful beaches in Miami to the state's capital in the Florida Panhandle. After your students have watched the video, discuss the regions covering questions such as:

- ▶ What are the unique features of each region and why would they lure companies to that area?
- ▶ What region are you from and what manufacturing companies are near you?
- ▶ Did you know these companies existed in your area of Florida?

Manufacturing Technologies (see page 11 for a lesson on this topic)

A variety of technologies are used in manufacturing to create usable products from raw materials including automation, robotics, welding, and computer numerical controls (CNCs) which are used to control a variety of equipment such as plasma cutters, drills, grinders, routers and more. Discuss these technologies with your students covering questions such as:

- ▶ How do these technologies aid in manufacturing?
- ▶ What are the benefits of using these technologies in terms of time, safety, and product quality?
- ▶ What types of skills would employees who utilize these technologies need?

Careers in Manufacturing (see page 13 for a lesson on this topic)

There are many factors involved in selecting a career such as the level of responsibility, the education required for entry level positions, salary, and job satisfaction. Manufacturing offers numerous career opportunities for individuals who are interested in working in a field that is always changing, offers growth opportunities, and offers a sense of satisfaction. Have a discussion with your students about what they are looking for in a career and the path that they will take to reach their goals. Discuss things such as:

- ▶ If you were to choose a career based on something you love, what would it be?
- ▶ Why is it important to enjoy your career?
- ▶ What do you think is a reasonable salary to support yourself and your future goals?
- ▶ What type of education do you plan on pursuing?
- ▶ Would you be interested in a career in manufacturing? Why or why not?

Lesson Overview

Purpose: This lesson is designed to introduce students to the prevalence and importance of manufacturing in the United States (U.S.) with a specific focus on the robust manufacturing infrastructure in the state of Florida.

Expected Outcomes: After completing this lesson, students should understand that:

- U.S. manufacturing represents a significant portion of the U.S. economy.
- Manufacturing is not a dark, dangerous, and dirty career option.
- Florida manufacturing companies employ a large number of Florida residents.
- Florida is a top 10 exporter of goods in the U.S.
- Manufacturing is a viable career opportunity that pays very well.

Classroom Application: Start this lesson by having your students watch the Manufacturing in the U.S. and Manufacturing in FL sections of the DVD. After watching the video segments, separate your students into groups and have them complete the associated activities. Use the background information provided to have a class discussion encouraging students to share the ideas that their groups discussed while completing the activities.

Related Video Materials:

- From Main Video: [0:09-3:04] (length - 2:55 min.)
- Also available in the Segments section on the DVD's main menu (2 videos)
 - Manufacturing in the U.S. (length - 1:22 min.)
 - Manufacturing in FL (length - 1:33 min.)

Estimated Length of Lesson:

- Video: 2:55 minutes (includes active participation in "Attention Questions" activity)
- Discussion: ~25 minutes
- Activity: 10-20 minutes

Associated Activities: **Attention Questions** are available for this lesson and are meant to be used while watching the video segments. There are also two **Combined Minds** activities ("The Evolution of Manufacturing" and "Florida Manufacturing"). For the Combined Minds activities, separate your students into groups (2-5 per group recommended) to complete the activities. Once complete, have some or all groups present their answers and facilitate a discussion.

To download the student handouts associated with this lesson visit: www.madeinflorida.org/MIF2015



Lesson 2 Made in FLORIDA



Florida: A Hotspot for U.S. Manufacturing Background Information

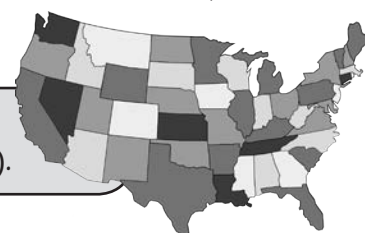
Manufacturing involves the use of human labor, machines, tools, and raw materials for the production (or manufacture) of goods. It is the cornerstone of our modern world leading to an increase in our quality of life. Ancient manufacturing began hundreds, if not thousands, of years ago with skilled artisans working alongside apprentices to manufacture goods using learned skills such as blacksmithing, carpentry and glass blowing.

In 1793, the first U.S. factory was opened. Workers required education because the factory needed skilled machine operators and mechanics. Over 100 years later, a key component of modern manufacturing was born: the automated assembly line. This revolution in manufacturing allowed for fast and efficient production of goods and a significant increase in workers' salaries throughout the U.S. manufacturing industry.



The notion that manufacturing plants are dark, dirty, and dangerous places to work may have been true decades ago but modern manufacturing facilities are well lit, clean, safe places to work with state-of-the-art equipment and processes designed to increase productivity and safety for workers.

U.S. manufacturing in 2012 accounted for approximately \$2 trillion dollars, or about 12%, of the gross domestic product (GDP) and employed about 9% (12 million) of the U.S. workforce. The average wage for American manufacturing workers is about \$22/hour (\$33.93/hour including benefits), 9% greater than the average U.S. worker.



Interesting Fact: If the U.S. manufacturing sector was its own country, it would be the 8th largest economy in the world (2014).

Although Florida is typically regarded as a vacationing destination, it is also a manufacturing powerhouse. Florida's vast transportation infrastructure aids in its rank as the 7th highest exporter of goods produced in the U.S. With over 18,000 manufacturing companies employing over 300,000 workers, Florida manufacturing represents over 5% of Florida's GDP (\$39.6 billion of \$750.5 billion in 2013).

Florida manufacturing can be broken into 8 primary sectors:



**AVIATION AND
AEROSPACE**



**Medical Devices &
Equipment**



**Transportation &
Logistics**



Electronics & Electrical



**Food, Beverage,
Pharmaceuticals &
Packaging**



**Machining &
Product Fabrication**



**Leisure &
Entertainment**



**Product Design &
System Integration**

Each sector specializes in the manufacture of products that we use everyday such as contact lenses (Medical Devices), orange juice (Beverage), and aircraft (Aviation). Although each sector specializes in a specific type of product, many use similar technologies that require specialized training (see page 11 for a lesson on this topic). Working in manufacturing is a diverse and exciting career with many types of jobs for a worker to choose from such as: welder, computer numerical control (CNC) machine operator, assembler/fabricator, food processing operator, machinist, and various specialized technicians, technologists, and engineers.

Finding a job in Florida manufacturing can be easy with the right tools. While many manufacturing jobs require no more than a high school diploma, a year or two of training makes it easier to get started. Contact FLATE, or the many other resources throughout the state, that can assist your students in enhancing their skill set in a short period of time (see page 13 for a lesson on this topic).



Lesson 3:

Exploring Manufacturing in Florida by Region

Lesson Overview

Purpose: This lesson provides students with a heightened awareness of the manufacturing that is happening in their backyard. They will also have the opportunity to see some of the robust manufacturing infrastructure and companies located in Florida and meet satisfied employees that work for them.

Expected Outcomes: After completing this lesson, students should understand that:

- There are manufacturing companies located in their backyards.
- Each region of Florida offers a unique opportunity for manufacturers and employees.
- Manufacturing companies use a variety of technologies to produce their products.

Classroom Application: In each region a company, or two, is highlighted and their products and techniques are discussed. Start this lesson by selecting the region(s) you will be covering and show the related video materials. In some cases, you may choose to focus on the region that you live in. You may also choose to cover the region next to yours, or select regions based on the companies that are highlighted in them (for a list of companies associated with each region visit page 10). After watching the video segment(s), separate your students into groups and have them complete the associated activities. Use the background information provided to have a class discussion encouraging students to share the ideas that their groups discussed while completing the activities.

Related Video Materials: The video material pertaining to this lesson can be accessed through the main video or the FL Regions button on the DVD’s main menu. You may choose to watch one, several, or all regions.

Region	Video Segment Information	Region	Video Segment Information
Northeast	Segment Length - 02:34, Main video: 03:00-05:34	Southwest	Segment Length - 03:08, Main video: 12:11-15:19
Central East	Segment Length - 02:22, Main video: 05:32-07:54	Central West	Segment Length - 02:48, Main video: 16:11-18:59
Southeast	Segment Length - 02:04, Main video: 09:00-11:04	Northwest	Segment Length - 04:28, Main video: 20:27-24:55
Total video length for all regions - 17:24			

Estimated Length of Lesson:

- Video: The length of this lesson will vary depending on which region(s) you cover.
- Discussion: ~20 minutes
- Activity: 15-20 minutes

Associated Activities: Attention Questions are available for this lesson and are meant to be used while watching the video segment(s). There are also two **Combined Minds** activities (“Exploring a Manufacturer” and “Manufacturing and You”). For the Combined Minds activities, separate your students into groups (2-5 per group recommended) to complete the activities. Once complete, have some or all groups present their answers and facilitate a discussion.



To download the student handouts associated with this lesson visit: www.madeinflorida.org/MIF2015



Exploring Manufacturing in Florida by Region Background Information

Have a discussion with your students about the following concepts presented in the video segment(s):

- ▶ **Each region in Florida is unique.** Each region has a unique allure that attracts residents, visitors, and manufacturing companies alike. Have a discussion with your students about the region(s) they watched and why they would attract companies. A location may be appealing due to its ability to attract skilled employees. Companies are more likely to choose Florida if we can supply the employees they need or if employees will move to Florida based on the personal satisfaction they may be able to find here.
- ▶ **Highlighted Companies.** The highlighted companies manufacture products that we benefit from everyday. These are just a few of the 18,000+ manufacturing companies located throughout Florida. Here is a summary of the companies, their products, and a few more companies that were not highlighted in the video. If your students are interested in manufacturing, encourage them to research these other companies!

Region	Company	Products/Services	Other Companies in Region (not highlighted in video)
Northeast	Johnson & Johnson Vision Care	ACUVUE Brand contact lenses	Coca-Cola, Hunter Panels, WhiteWave (Silk soy milk)
Central East	Harris Corporation	Telecommunication systems including wireless equipment, electronic systems, and antennas for use on Earth and in space	Frito Lay, Lockheed Martin, Mitsubishi Hitachi Power Systems, Piper Aircraft
Southeast	HOERBIGER Corporation of America	Technology leader in compression technology, automation technology, and drive technology	RL Schreiber Spices, Nipro Diagnostics, Nature's Products
Southwest	Shaw Development	Custom fluid management solutions for heavy duty vehicles	Air Products, Tropicana, Black Diamond Strings, Pelican Wire
	Sun Hydraulics	High-performance screw-in hydraulic valves and manifolds	
Central West	Southern Manufacturing Technologies	High precision components and assemblies for the aircraft, aerospace, and defense industries	Publix, Florida's Natural Growers, CONMED, Lockheed Martin, Jabil
	Heat Pipe Technology	Energy recovery and dehumidification systems for commercial use	
Northwest	Jensen Group,	Industrial sized laundry equipment	Hitachi Cable Automotive Products USA, General Electric Wind Energy
	Danfoss TURBOCOR	Compressors for commercial heating, ventilation, and air conditioning	

- ▶ **Techniques used by the highlighted companies.** Discuss the technologies and skills that the companies utilize to make their products. Ask your students how they think these help the company build their products. Have your students discuss the skills that employees need in order to operate these technologies.
- ▶ **These companies' products impact our lives.** Lead your students in a discussion about the products of the companies they saw in the video. In some cases they may have never heard of the company or their products before. Have them discuss the impact that these products have on our daily lives.
- ▶ **Employee Satisfaction.** Students should understand that manufacturing offers excellent career opportunities (see page 13 for a lesson on this topic). Not only do careers in manufacturing offer competitive pay and good benefits, but employees are often very satisfied with their jobs. Have your students discuss the individuals interviewed in the video. How do they think that these people feel about their jobs?



Lesson Overview

Purpose: This lesson is designed to introduce students to a sample of the various technologies and techniques used in modern manufacturing facilities.

Expected Outcomes: After completing this lesson, students should understand that:

- Various technologies are used in the manufacturing industry.
- Automation allows for faster, safer, and higher quality production of goods.
- A variety of machines can be digitally controlled resulting in increased precision due to modern advances in computing.
- Pay from jobs that utilize these technologies can be lucrative.

Classroom Application: Start this lesson by having your students watch the sections of the Made in Florida 2015 DVD that cover manufacturing technologies including Robotics and Automation, Computer Numerical Controls, and Welding. After watching the video segments, separate your students into groups and have them complete the associated activities. Use the background information provided to have a class discussion encouraging students to share the ideas that their groups discussed while completing the activities.

Related Video Materials:

- From Main Video: [7:53-9:00], [11:03-12:10], [15:16-16:09] (length - 03:11 min.)
- Also available in the Segments section on the DVD’s main menu (3 videos)
 - Robotics and Automation (length - 1:07 min.)
 - Computer Numerical Controls (length - 1:07 min.)
 - Welding (length - 0:57 min.)

Estimated Length of Lesson:

- Video: 3:11 min. (includes active participation in “Attention Question” activity)
- Discussion: ~30 minutes
- Activity: 5-10 minutes

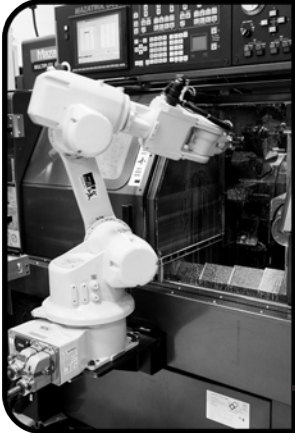
Associated Activities: **Attention Questions** are available for this lesson and are meant to be used while watching the video segments. There are also two **Combined Minds** activities (“Exploring a Technology” and “Product Development”). For the Combined Minds activities, separate your students into groups (2-5 per group recommended) to complete the activities. Once complete, have some or all groups present their answers and facilitate a discussion.

To download the student handouts associated with this lesson visit: www.madeinflorida.org/MIF2015



Manufacturing Technologies Background Information

Modern manufacturing uses numerous technologies and processes to make products with the level of precision and quality expected in today's economy while ensuring safety for workers. Advancements in computer technology and material science have fueled an explosion of new technologies allowing the manufacture of products that would not have been possible a few decades ago. One of the most important advancements was the development of the Ford Motor Company's automated assembly line. This process helped a handful of workers mass produce cars in record time. Advancements like these have led to high paying wages due to increased efficiency and the need for skilled laborers.



Automation and Robotics

Automated machines are essential to the production of most goods. These machines use mechanical, pneumatic, hydraulic, and electrical components to increase precision, efficiency, and safety while producing goods at record rates. Some automated machines are considered robots, although most do not look like the humanoid robots most people envision. A robot is defined as a machine capable of carrying out a complex series of actions automatically, especially one programmable by a computer. These machines require training to operate and using them involves a year or two of education. Experience in this field can be lucrative as workers in the top 10% make over \$82,000 per year. Workers who program and operate this equipment are referred to as Electro-Mechanical, Mechatronic, or Robotics Technicians.

Some manufacturing processes are so automated that products are made without ever touching a human hand!



Computer Numerical Control

Computer numerical control systems, or CNCs, are machines guided by instructions from a computer controller. CNCs control tools such as plasma cutters, drills, grinders, routers, and embroidery machines. CNC machines are extremely common in manufacturing facilities and require training to operate. CNC operators read blueprints, have a working knowledge of computer systems, and adjust program variables and functions. An important part of CNC operation is monitoring the quality of the output. A CNC machine can repetitively perform a task with little variation. If there is an error in the program, a mechanical issue, or imperfections in the raw material, products from the machine may be flawed. CNC operators and CNC machinists are important to manufacturing companies, as the reputation of the company's quality lies in their hands.



Welding

Welding involves methods used to join two or more pieces of material including metals, glass, and plastics. Welding is one of the most common methods used in manufacturing explaining why there are more than 350,000 welders in the U.S. Welding is a highly regarded skill that can be learned in a technical college program, or an apprenticeship. For more information about welding and career opportunities visit the American Welding Society (aws.org).

Technology	Average Salary (2014)	U.S. Employment (2014)
Electro-Mechanical Technicians	\$55,600	14,430
CNC Operators	\$50,200	24,960
Welders, Cutters, Solderers, and Brazers	\$40,040	369,610

Lesson 5: Careers in Manufacturing

Lesson Overview

Purpose: This lesson is designed to encourage your students to think about their personal goals for the future and to provide you with the opportunity to evaluate their expectations and determine if they are reasonable. This lesson highlights careers in manufacturing compared to other career paths and discusses the various benefits of working in the manufacturing industry.

Expected Outcomes: After completing this lesson, students should understand that manufacturing careers offer:

- Many different opportunities with competitive wages and good benefits.
- Opportunities for advancement, specialized training, and continual growth.
- A career that is empowering, productive, and satisfying.

Classroom Application: Start this lesson by having your students watch the Careers in Manufacturing video segment. After watching the video, separate your students into groups and have them complete the associated activity. Use the background information provided to have a class discussion while encouraging students to share the ideas that their groups discussed while completing the activity.

Related Video Materials:

- From Main Video: [18:56-20:29] (length - 1:33 min.)
- Also available in the Segments section on the DVD's main menu (1 video)
 - Careers in Manufacturing (length - 1:33 min.)

Estimated Length of Lesson:

- Video: 1:33 minutes
- Discussion: ~20 minutes
- Activity: 10 minutes

Associated Activities: This lesson includes a **Combined Minds** activity ("Planning a Career"). For this Combined Minds activity, separate your students into groups (2-5 per group recommended) to complete the activity, but have each student complete their own worksheet. Have them discuss their thoughts with their group and compare their ideas. Once complete, have some or all students present their ideas and thoughts regarding their plans for a future career.

To download the student handouts associated with this lesson visit: www.madeinflorida.org/MIF2015





Careers in Manufacturing Background Information

The manufacturing industry offers an array of career opportunities and manufacturing companies are always seeking skilled employees. A 2014 survey by Accenture and the Manufacturing Institute found that, while more than 50% of the companies surveyed plan to increase their production in the U.S. in the next five years, 75% of them reported moderate to severe difficulties in finding workers with the skills they need.

Manufacturing careers are challenging, change with time, offer advancement opportunities, and offer a high salary compared to jobs with similar education requirements. Individuals who work in manufacturing walk away with a higher skill level making them more valuable in an industry that is desperate for skilled workers. While these are important components in a career, one of the most important things is job satisfaction. Many workers in manufacturing are proud of what they do and are motivated by seeing the products they worked on being used throughout the world. Each manufacturing facility has a unique culture and feeling of comradery among employees.

Although there are entry level jobs in manufacturing that only require a high school diploma, most production jobs today require post-secondary education from a two year college or technical school. Here are a few of the great careers that are typically offered to individuals with a 2-year Associate in Science (AS) degree.

Electrical Engineering Technicians

(Average salary: \$57,850/year, AS Degree, jobs in the U.S.: 146,500)

Responsibilities: Assembling electrical and electronic systems and prototypes, building and repairing electrical equipment, and inspecting designs for accuracy and feasibility.

Mechanical Engineering Technicians

(Average salary: \$51,980/year, AS Degree, jobs in the U.S.: 47,500)

Responsibilities: Preparing layouts for parts, designing manufacturing techniques and assembly processes, reviewing blueprints, proposing methods for improving equipment performance, and assisting in quality control.

Industrial Machinery Mechanics

(Average salary: \$45,840/year, AS Degree, jobs in the U.S.: 447,600)

Responsibilities: Care and maintenance of manufacturing equipment, setting up equipment, and performing repairs and adjustments.

Drafters (CADD Programmers)

(Average salary: \$49,630/year, AS Degree, jobs in the U.S.: 199,800)

Responsibilities: Constructing plans using computer-aided design and drafting (CADD) software (see page 11 for a lesson on this topic) using sketches from engineers and architects, specifying dimensions, selecting materials, and helping design products and techniques.

Industrial Production Manager

(Average salary: \$89,190/year, Bachelor's Degree and work experience, jobs in the U.S.: 172,700)

Responsibilities: This is a higher level career in manufacturing that one can work towards through education and by gaining experience working in manufacturing facilities. These jobs are high paying and carry a significant amount of responsibility. Industrial Production Managers oversee the day-to-day operations and help plan the development of the company's products.



For more information about the manufacturing industry, careers, and technical education opportunities have your students contact a local state college from the list below:

Broward College
www.broward.edu

Chipola College
www.chipola.edu

College of Central Florida
www.cf.edu

Daytona State College
www.daytonastate.edu

Eastern Florida State College
www.easternflorida.edu

Florida Gateway College
www.fgc.edu

Florida Keys Community College
www.fkcc.edu

Florida State College at Jacksonville
www.fscj.edu

Gulf Coast State College
www.gulfcoast.edu

Hillsborough Community College
www.hccfl.edu

Indian River State College
www.irsc.edu

Lake Sumter State College
www.lssc.edu

North Florida Community College
www.nfcc.edu

Northwest Florida State College
www.nwfsc.edu

Palm Beach State College
www.palmbeachstate.edu

Pasco-Hernando State College
www.phsc.edu

Pensacola State College
www.pensacolastate.edu

Polk State College
www.polk.edu

Santa Fe College
www.sfcollege.edu

Seminole State College
www.seminolestate.edu

St. Petersburg College
www.spcollege.edu

State College of Florida
www.scf.edu

Tallahassee Community College
www.tcc.fl.edu

Valencia College
www.valenciacollege.edu



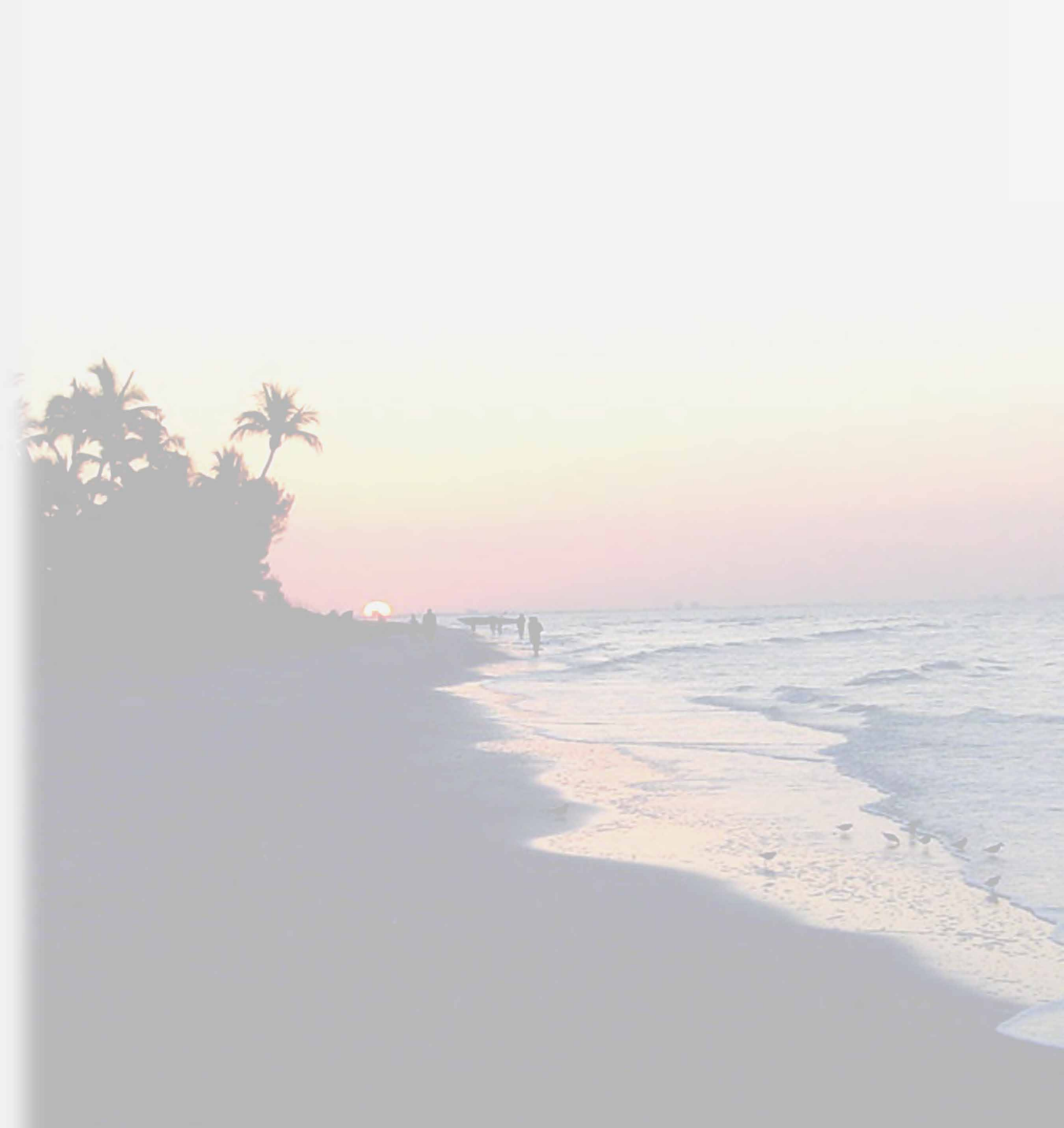
NOTES

Use the space below to make notes regarding the Made in Florida 2015 materials and their use in the classroom so you can refer back, reflect on your experiences, and get ideas for future use!



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