



YOUR FUTURE is made in
MANUFACTURING

AN INTRODUCTION TO MANUFACTURING IN MINNESOTA

Teacher Guide
Recommended for grades 6-12



A publication of:



DEAR TEACHER,



Dream It. Do It. Minnesota is a campaign dedicated to changing the perception of manufacturing and providing advanced manufacturing career information. Along with 360, a manufacturing-based Center of Excellence, we have created this guide to promote manufacturing as an innovative field that uses advanced technology to effectively create the products for today and the future. We also know that the industry offers great career opportunities. We want students to be aware of the opportunities manufacturing can offer them.

We also want this guide to be relevant and useful to you, so in each chapter we have included applicable educational standards, including science and technology, and teaching objectives. We've also included information you can use as talking points, things students can listen for in the videos, and activities designed to engage students' different learning styles.

Manufacturing is the backbone of Minnesota's economy. In fact, according to the Minnesota Department of Employment and Economic Development,

- Minnesota has more than 307,200 manufacturing careers statewide.
- Manufacturing contributes \$43.7 billion to the state economy.
- The average manufacturing salary is around \$59,000.
- Many top manufacturing brands are based in Minnesota, including Land O' Lakes, General Mills, and Cargill.

This is just a little bit of the information we've developed for you to share with your students, and we hope you find this guide and disc to be effective tools in sharing manufacturing information in your classroom.

We also encourage you and your students to check out Minnesota's Dream It. Do It. website at dreamitdoitm.com, which is full of up-to-date information about manufacturing careers. If you have any comments or questions, please contact us.

Sincerely,

Karen White
Executive Director
360

Jaimee Meyer
Executive Director
Dream It. Do It. Minnesota

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Dream It. Do It. Minnesota works with many people and organizations across the state to promote modern manufacturing. We thank our sponsors for their support!

ALL VIDEOS REFERRED TO IN THIS GUIDE CAN BE FOUND ON THE DISC INCLUDED WITH THIS GUIDE AND ONLINE AT:

Dream It. Do It. MN:

<http://dreamitdoitm.com/more-videos-on-manufacturing-in-minnesota/>

OR

YouTube:

<https://www.youtube.com/user/DreamItDoItMN/featured>

Click on playlists



WHAT IS MANUFACTURING?



HOW TO DEFINE MANUFACTURING:

According to O*NET, manufacturing involves: “Planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.”

IN SHORT, MANUFACTURING IS MAKING STUFF.

Manufacturing has a range of fields, including designing machinery, developing products, knowing how to fix robots, working in software, and developing green technology. Later in this guide, we’ll provide career information about the many fields in manufacturing.

“We make, or help make, or help our customers make, pretty much anything... The range of what we can do is endless.”

Rebecca Gramse, *MRG Tool and Die* — Faribault, MN

MANUFACTURING REQUIRES SKILL AND ABILITY: DO YOU LIKE...

 FIXING CARS, SNOWMOBILES, OR BIKES?

ROBOTICS? 

ASSEMBLING MODELS?

 BUILDING WITH LEGOS?

SOLVING PUZZLES? 

These skills, and more, all relate to manufacturing — being able to visualize, design, program — all of those are skills you use to develop products. Just think, instead of fixing a car, you could design the parts for a car.

The manufacturing industry requires other areas of expertise too, offering careers from customer service to marketing to finance.

WHAT IS MANUFACTURING?

APPLICABLE EDUCATION STANDARDS:

SCIENCE: (GRADE 6-12)

- Strand 1:** Nature of Science and Engineering
- Sub strand 1:** The practice of Science (grade 7-12)
- Sub strand 2:** The practice of Engineering (grade 6, 9-12)
- Sub strand 3:** Interaction among science, technology, engineering, mathematics, and society

TECHNOLOGY: (GRADE 9-12)

- Strand 1:** Inquiry, Research, and Problem Solving: The student will learn a continuous cycle of questioning, gathering, synthesizing, evaluating, and using information individually and collaboratively to create new knowledge and apply it to real world situations.
- Strand 2:** Expanding Literacies: Read, view, listen, and communicate in any format for a variety of purposes.
- Sub strand 2:** Collaboration

LANGUAGE ARTS: (GRADE 6-12)

Anchor Standards for speaking, viewing, listening, & media literacy:

- Strand 1:** Comprehension and Collaboration
- Strand 2:** Presentation of Knowledge and Ideas
- Strand 3:** Media Literacy

Anchor Language Standards:

- Strand 4:** Conventions of standard English

Anchor Standards for Writing:

- Strand 5:** Text types and purposes
- Strand 6:** Research to build and present knowledge

HELPFUL TIP

Introduce your students to manufacturing by showing them one of the following videos:



[DOUGLAS SCIENTIFIC](#)
[Alexandria, MN](#)



[PEQUOT TOOL & MANUFACTURING](#)
[Pequot Lakes, MN](#)



[JONES METAL](#)
[Mankato, MN](#)



[GRAPHIC PACKAGING](#)
[Crosby, MN](#)



[WSI INDUSTRIES](#)
[Monticello, MN](#)



OBJECTIVES:

STUDENTS WILL BE ABLE TO:

- Place parts of a story in the appropriate order to represent the manufacturing cycle.
- Understand and identify 12 manufacturing terms with their definitions.
- Contrast the phenomenon of reality vs. perception.
- Appreciate machining and welding in Minnesota.
- Apply the manufacturing cycle to a product they create.
- Differentiate steps of the manufacturing cycle.
- Apply research from different manufacturing companies into a creative jingle or slogan.

WHAT IS MANUFACTURING?

EXERCISE:

1. INSTRUCTOR:

Review terms using the PowerPoint for Activity 1.

2. STUDENTS:

Complete Chapter 1, Activity 1: *What is Manufacturing? Manufacturing Terms & Definitions.*

3. INSTRUCTOR:

Explain The Manufacturing Cycle Diagram using the PowerPoint for Chapter 1, Activity 2. Provide students with Chapter 1, Handout 1.

4. INSTRUCTOR:

Show students the Maxbat video to introduce students to another manufacturing company in Minnesota.

5. STUDENTS:

Complete Chapter 1, Activity 2, *What is Manufacturing? The Manufacturing Cycle.*

REALITY VS. PERCEPTION:

Often, when we think of manufacturing, we think of how it was in the Industrial Revolution, but that's not what manufacturing is today. Now, manufacturing uses technology and robotics—it's clean, safe, and innovative.

Additionally, while there is a lot of talk about manufacturing jobs moving overseas, there are many manufacturing companies who have stayed and will continue to stay in the United States. The reasons are many, including being able to better manage intellectual property and quality control—things that affect the overall cost. Today's manufacturing jobs are all about being innovative and creative to meet consumer needs—like you hear about in the videos.

QUOTABLE

“Manual equipment is the equipment that sits in the corner now. We have gone to CNC and that is all you will do, and the machine tools are very, very high-tech machine tools.”

Seth Anderson, *Douglas Machine*



EXERCISE

1. INSTRUCTOR:

The next exercise focuses on Machining and Welding in Minnesota. Students should focus on the manufacturing cycle.

2. STUDENTS:

Complete Chapter 1, Activity 3, *What is Manufacturing? Applying the Manufacturing Cycle.*

3. INSTRUCTOR:

Show students the Clow Stamping Profile video. Students should focus on the manufacturing cycle.

4. STUDENTS:

Complete Chapter 1, Activity 4 or the Optional Activity 4, *What is Manufacturing? Applying the Manufacturing Cycle.*

ACTIVITY 1:

MANUFACTURING TERMS & DEFINITIONS

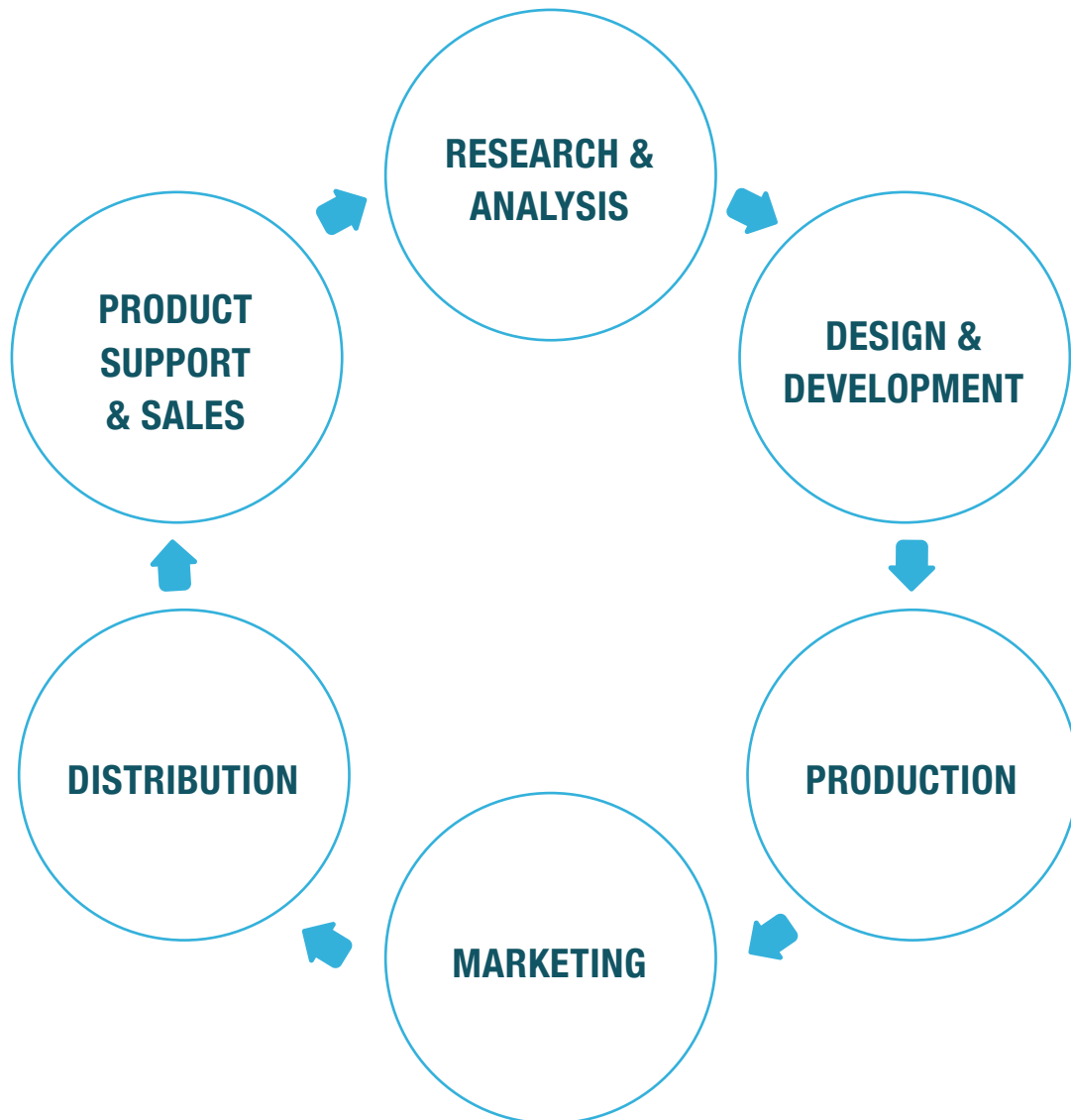
Student Name: _____

DIRECTIONS: Match each term with their definition on the other column by letter.

- | | |
|-------------------------------|--|
| 1. _____ Market Research | a. Taking a concept through the process of making a configuration, drawing, model, or plan that serves as the basis for the actual product and making sure the product meets specific needs or wants. |
| 2. _____ Prototype | b. An original model on which something is patterned and used to develop a product. |
| 3. _____ Raw Material | c. Being creative. |
| 4. _____ Hang Tag | d. A company that provides another company with goods or services, also called a vendor. |
| 5. _____ Warehouse | e. Amount of energy, work, products, or services produced in a given period by a company, individual or machine. |
| 6. _____ Production | f. Process of assessing a new product or service through research (like surveys, focus groups, or product testing) to test reactions to a product or service before making it available to the general public. |
| 7. _____ Design & Development | g. Make the actual product: usually includes technology, advanced machines, robotics and assembly lines. |
| 8. _____ Innovation | h. Something attached to a product (like a piece of clothing) that shares information about the manufacturer & the product. |
| 9. _____ Supplier | i. A material or substance used to make something. |
| 10. _____ Outputs | j. Taking an item after it has been manufactured and getting into the hands of a consumer. |
| 11. _____ Distribution | k. The expense of materials, labor, and other components of the manufacturing process to create an end product. |
| 12. _____ Manufacturing Costs | l. Where products can be stored before distribution. |

HANDOUT 1:

THE MANUFACTURING CYCLE



RESEARCH & ANALYSIS: Research and analyze your product as well as other products that are out there

DESIGN & DEVELOPMENT: Prototype

PRODUCTION: Includes testing, production costs

MARKETING: Includes marketing analysis and product marketing

DISTRIBUTION: Includes delivery methods

PRODUCT SUPPORT & SALES: Return policies, equipment failure

ACTIVITY 2:

THE MANUFACTURING CYCLE

Student Name: _____

DIRECTIONS:

Apply what you have learned about the manufacturing terms and the manufacturing cycle to organize information about how MaxBat got started manufacturing baseball bats. Information about how Jim Anderson began MaxBat was found on their website and online.

Some parts of the manufacturing cycle have multiple answers. Match the following terms with the MaxBat descriptions.

- A. Research & Marketing Analysis (2)
- B. Design & Development (2)
- C. Production (Testing & Production Costs) (2)
- D. Marketing (3)
- E. Distribution (Delivery) (2)
- F. Product Support & Sales (1)

1. _____ Mr. Anderson's son, Max, helps pack the bats for shipping.
2. _____ Following the many steps to create a custom MaxBat, 5 – 10% of the bats do not pass inspection because of their "attention to detail and commitment to the customer."
3. _____ Owner, Jim Anderson, found his first client, Joe Mauer, the Minnesota Twins' #31 overall pick in the 2001 draft.
4. _____ MaxBat began and was able to take advantage of the fact that aluminum bats were banned in Minnesota's adult leagues.
5. _____ The owner's wife used her graphic design skills to create the company brochures, flyers, and website.
6. _____ After making the first bat, which was "okay," people asked Jim if he could make them a bat.
7. _____ Jim contacted Major League Baseball to learn the rules and regulations for making bats and made a prototype.
8. _____ Jim sent his prototype to MLB, and to his surprise, it wasn't approved. He learned that everything was correct except the logo was $\frac{1}{4}$ inch too high. He had two days to fix the problem and finish 6 bats to send in for approval.
9. _____ MaxBat is a division of Glacial Wood Products (custom wood turning).
10. _____ Bats are usually shipped by ground transportation.
11. _____ When six bats are ordered, bats can be customized.
12. _____ MaxBat offers various packages such as the "MVP Package," which includes a bat, shirt, and gloves.