

# Engineering, Manufacturing and Technologies

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## Career Explorations

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# HOW TO USE THIS SUPPLEMENT



**PIONEER PRESS**  
KNOW MORE

Dear Teachers:  
The Pioneer Press, through our Pioneers in Education program, invites our community of business, cultural and civic organizations to collaborate with our educators to enhance the nurturing of our most valuable resource: our children.

This supplement is just one of many such efforts. It combines our ability to package, print and distribute information with the commitment of our company to improve students' workforce readiness. The Department of Children, Families & Learning, the Department of Economic Security and the Minnesota State Colleges & Universities, along with countless business volunteers, have contributed to this effort to provide additional learning resources that help teachers help students explore many exciting careers.

It is our hope that the lessons shared among students, teachers and community volunteers through the use of this supplement inspire a greater sense of purpose in our educational efforts.

Sincerely,  
Marji Raney  
Senior Vice President of Sales and Marketing  
Pioneer Press

MINNESOTA DEPARTMENT OF

*Children,  
Families &  
Learning*

Dear Career Explorers:

What an exciting time for you! You can use this career discovery paper to explore some of your very own interests as they relate to Engineering, Manufacturing and Technologies. You will be able to explore different jobs and you can have fun doing it.

As you work through the activities, you will be preparing for your presentation at a career fair. At the career fair you will share with your class what you have discovered. You will research businesses that employ people in this field. You will learn about tools, jobs and the education needed to get those jobs.

Enjoy your trip of self discovery. Keep an open mind and see if any of the information and jobs appeal to you. Dream a little, enjoy your journey and remember to discuss your thoughts and feelings with your parents.

Sincerely,

Diane Miller  
Career Development Specialist

## Careers in Engineering, Manufacturing and Technologies

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As you and your classmates grow you will discover many things about each other. You will discover what you enjoy doing and what you do well. Your parents and teachers will introduce you to many new experiences so you can discover more about your interests. Eventually you will use these experiences and self-knowledge to determine what to do with your lives.

There are other people in addition to your parents and teachers who are willing to help provide a way to discover more about your skills and interests. In this supplement you will find information about people that work in different occupations. When you read about them you may discover that you share some of their likes and dislikes. You can also be helpful to your classmates by sharing what you know and learn with them.

We hope you will explore and discover the careers shared in this supplement and share what you learn with your classmates through your own career fair! Work with your classmates to make what you share interesting and fun!

Oh yes – and be sure to listen well to what your classmates share with you about careers they research. It may be just the information you need!

The Pioneers in Education staff wishes to thank Catherine Vennewitz for her design, Peter Stumme and Andrew Brown for their consultation, Eric Luoma for his writing, Diane Miller and Jim Mecklenberg for their guidance.

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# DISCOVER

Engineering,  
Manufacturing &  
Technologies where you  
can express your:

Occupations Related to Engineering,  
Manufacturing and Technologies...

## Building skills

## Design Skills

## Technical skills

Mason

Graphic Designer

Computer Engineer

Bridge Engineer

Set Designer

Master Mechanic

Wood Worker

Web Designer

Plumber



# Occupations

**Engineering-** The designing and building of products. The use of science and math for construction, design and building.

**Manufacturing-** The making of goods by hand or with machinery. Usually it refers to making a lot of products.

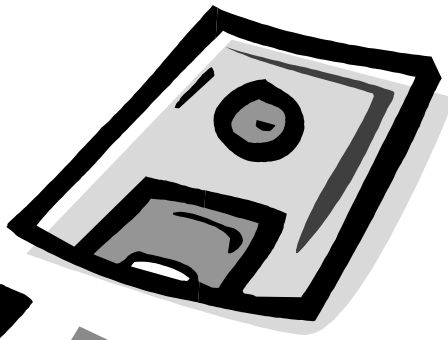
**Technology-** The applying of mathematics, engineering and industrial arts to make machinery and devices. It refers to the device or machinery itself.

These fields put science and math to a practical use. People use the sciences to manufacture a product, build a structure or road, or design something. They are constantly faced with problem solving. An engineer must understand the physical or scientific properties they are dealing with as well as the technologies that can help get a job done. For example, a bridge engineer must understand the laws of physics and science so a bridge is strong and lasts a long time.

The rewards in the Engineering, Manufacturing and Technologies industry are many. It's exciting to apply knowledge when building or fixing something.

- Aeronautical Engineer
- Aircraft Engine Specialist
- Ambulance Driver
- Printer
- Assembler
- Audio-Visual Specialist
- Battery Assembler
- Bridge Engineer
- Carpenter
- Civil Engineer
- Communications Programmer
- Woodworker
- Drywall Installer
- Dredge Operator
- Computer Engineer
- Electrical Engineer
- Civil Engineer
- Design Engineer
- Elevator Inspector
- Apparel Pattern Maker
- Drill Operator
- Electrician
- Plumber
- Drafter
- Professor
- Mason
- Highway Maintenance
- Computer Programmer
- Development Scientist
- Locomotive Engineer
- Web Designer
- Laser Technician
- Micro machinist
- Radio Operator
- Set Designer
- Operator
- Mechanic
- Painter
- Technical Writer
- Scanner Operator
- Subway Operator
- Process Designer
- Transportation Manager
- Geological Technician
- Machine Assembler





# DISCOVER

## RELATED TO ENGINEERING,

Fill In These Occupations: Answer The Riddle:

ENGINEERING

MANUFACTURING

C\_V \_ \_ E \_ \_ I N \_ E R.

Designs and maintains public works, roads, bridges, dams, harbors, etc.

\_ O \_ O M \_ T \_ V \_ E \_ \_ I N \_ E R.

Operates a train locomotive.

E \_ \_ C T \_ I \_ A \_ E \_ \_ I N \_ E R.

Works with the application and principles of electricity.

A\_R \_ \_ \_ U T \_ C L E \_ \_ I N \_ E R.

Works with the science of motion or travel in the air.

C \_ \_ M U \_ \_ C A T \_ \_ \_ \_ E \_ \_ I N \_ E R.

Works with the way information is communicated.

B \_ \_ D \_ E E \_ \_ I N \_ E R.

Designs and maintains bridges.

Answers: Civil Engineer, Locomotive Engineer, Electrical Engineer, Aeronautical Engineer, Communications Engineer, Bridge Engineer



1. I construct things made of brick and mortar. I am a \_\_\_\_\_.

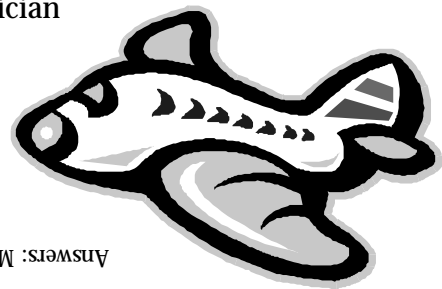
2. I work in a factory putting goods and products together. I am an \_\_\_\_\_.

3. I maintain and use laser technology. I am a \_\_\_\_\_.

4. I use a sewing machine in a factory. I am a \_\_\_\_\_.

CHOICES: Sewing Machine Operator  
Assembler  
Mason  
Laser Technician

Answers: Mason, Assembler, Laser Technician, Sewing Machine Operator



**Technology:** refers to people working with technical devices or the devices and machinery itself.

What are they doing? Circle the correct response or responses.

A helicopter pilot:

transports    fixes    designs

A plumber:

transports    fixes    designs

An exhibit designer:

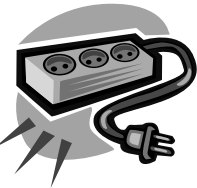
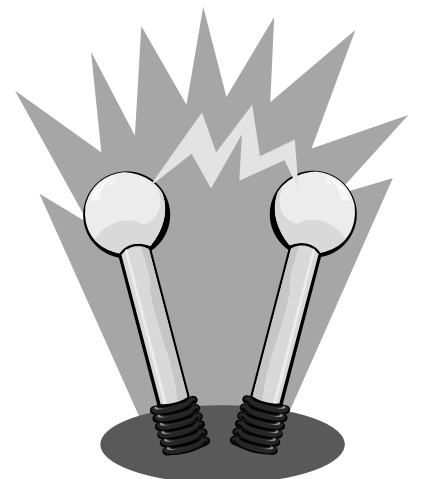
transports    fixes    designs

An ambulance driver:

transports    fixes    designs

**Name** a technology that can help people

What feelings do you have about this technology?



# OCCUPATIONS

## MANUFACTURING AND TECHNOLOGIES...

### Match the Word to Its Meaning: **Technologies**

- Assayer \_\_\_\_\_
- Technical Writer \_\_\_\_\_
- Web Designer \_\_\_\_\_
- Roustabout \_\_\_\_\_
- Polygraph Examiner \_\_\_\_\_
- Graphic Designer \_\_\_\_\_
- Mason \_\_\_\_\_
- Mathematician \_\_\_\_\_



### Definitions

- 1 Maintains and uses laser technology.
- 2 Works on an oil rig.
- 3 Solves problems and finds solutions by using formulas and numbers.
- 4 Works on the machine that monitors changes in pulse rate and breathing. The machine is called a lie-detector.
- 5 Creates products that are interesting to the eye.
- 6 Determines the strength and ingredients of metal by testing the metal.
- 7 Designs web sites or home pages for the internet.
- 8 Writes for science and technology brochures, manuals and companies.

Answers: 6,8,7,2,4,5,1,3

### Did you know?

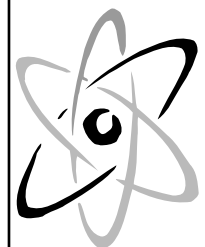
\_\_\_\_\_ is one of the nation's largest technology companies. The headquarters for the company is located here in Minnesota. They invented the Post-it note. They also produce many other products such as tape, mouse pads and reflective materials.



### Grouping

Group these occupations into the three categories below: Micro machinist, Aeronautical Engineer, Scanner Operator, Master Mechanic, Laser Technician, Computer Engineer, Web Designer, Electrician, Civil Engineer, Machine Assembler, Master Mechanic, Computer Programmer and Design Engineer.

Engineering	Manufacturing	Technologies
Civil _____	Heavy Equipment Operator _____	Radio Operator _____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

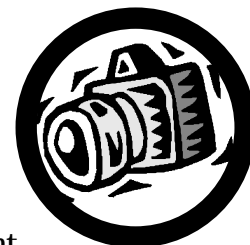


# DISCOVER BUSINESSES & RELATED TO ENGINEERING, TECHNOLOGIES IN

Look around you. It's likely you'll see something being built or that was recently built in your neighborhood. Is someone getting a new roof or is the city fixing the sidewalk? These would be one of the many examples of Engineering, Manufacturing and Technologies in your community. It's likely that some of your neighbors work in this industry and it's possible they don't work very far away from home.

## Discover Businesses and Organizations Related to Engineering, Manufacturing and Technologies in My Community

**Cut** out a photo of someone employed in this field from today's newspaper.



**Find** an article about Engineering, Manufacturing and Technologies in this week's newspaper.

**Explain** what the article is saying:

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**Identify** an activity you participated in at your school, or find one in today's paper that you would like to participate in, that is related to this field:

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**Paste** your photo to the right.

**List** Jobs related to Engineering, Manufacturing and Technologies that you can find in today's newspaper.

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**Look** in your local phone book. Find three businesses in the Yellow Pages that employ people in this career field. List the businesses below:

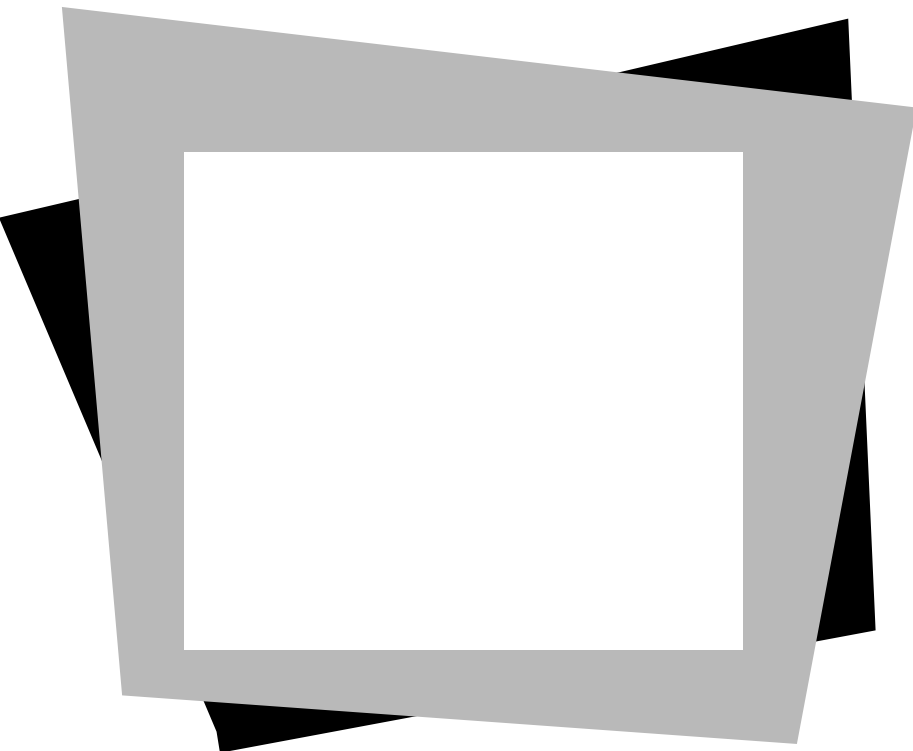
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# ORGANIZATIONS MANUFACTURING AND YOUR COMMUNITY



**Develop** a bibliography of the books you find to share with others.

**Name of book:** \_\_\_\_\_

**Author:** \_\_\_\_\_

**Brief description of content:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Name of book:** \_\_\_\_\_

**Author:** \_\_\_\_\_

**Brief description of content:** \_\_\_\_\_

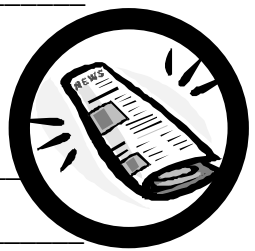
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Name of book:** \_\_\_\_\_

**Author:** \_\_\_\_\_

**Brief description of content:** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



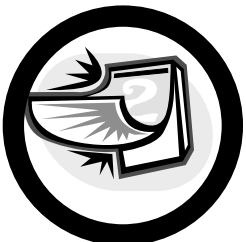
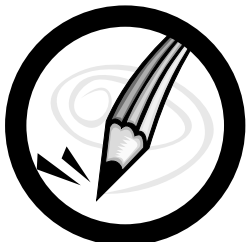
**Visit** your local library. Notice the counter and wall displays. What is happening in your community that relates to this field?

**Identify** three occupations from this career field that were involved in developing what you see.

Is there anyone you know in this career field?

**Find** and list three books that teach you about some of the skills needed in this career field.

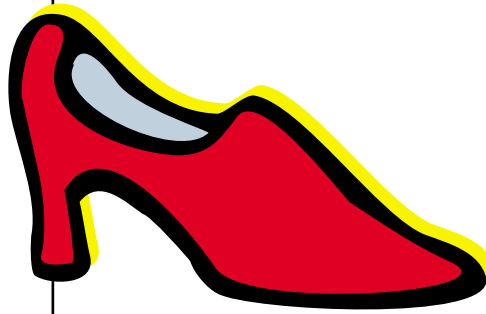
1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_



# DISCOVER CAREERS



PROFILE #1



PROFILE #2



PROFILE #3

**Careers in Engineering,  
Manufacturing and Technologies**

**What do you do?**

Printer

**How did you get started?**

Working in the shipping and receiving department in a print shop.

**What are your most valuable skills?**

- I am able to understand instructions.
- I know how to drive a forklift.
- I am a good listener.

**What did you enjoy doing when you were young?**

I liked to go swimming, sailing, skiing, and horseback riding.

Map Maker

Talking to my college advisor to learn about potential jobs. Observed people making maps.

- I have knowledge of mapmaking.
- I have excellent research skills.
- I am able to work on a team.

I liked to play basketball, football, and golf.

Model Pattern Maker

Building models when I was younger. I looked for jobs where models were used.

- I understand statistics.
- I am an excellent problem solver.
- I have fine motor skills. I can design and build models.

I loved playing with Lego building blocks and building models of cars and airplanes.

## PERSON SEARCH

Find someone in your life who has a job in this field. Interview that person and create a profile of that person. Record your information here.

**What do you do?**

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**How did you get started?**

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**What are your most valuable skills?**

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# CAREER PROFILES



PROFILE #4

Web site designer

In high school I learned a lot about the Internet and Web sites.

- I know HTML coding.
- I have excellent writing and proofreading skills.
- I am able to work on computers and learn new programs.

I liked to read, draw, and play video games.



PROFILE #5

Environmental Planner

Earned a degree in economics.

- I am eager to learn and develop new technical skills.
- I am a very hard worker.
- I have an aptitude for electronics.

I liked to use my telescope and look up into the night sky.



PROFILE #6

Mechanical Engineer

I talked to teachers about different jobs and worked in an auto repair shop during high school.

- I have very good problem solving skills.
- I am creative.
- I am well organized.

I enjoyed fixing and repairing small electronics.



**What did you enjoy doing when you were young?**

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**What skills?**

**What training and education did you need for this job?**

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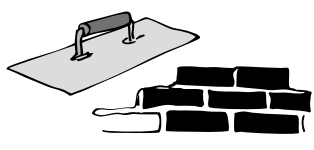


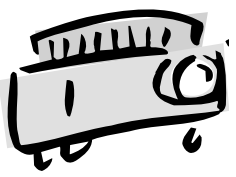
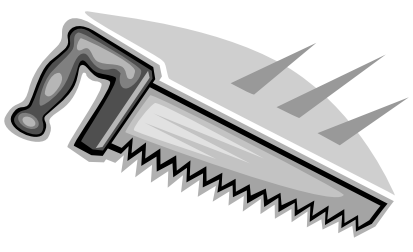

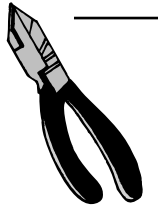



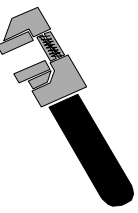


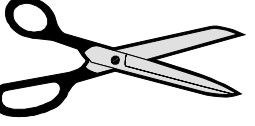

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# DISCOVER THE TOOLS ENGINEERING, TECHNOLOGIES JOBS

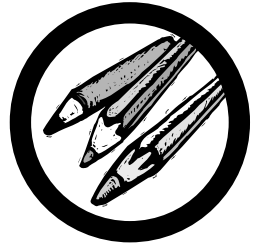
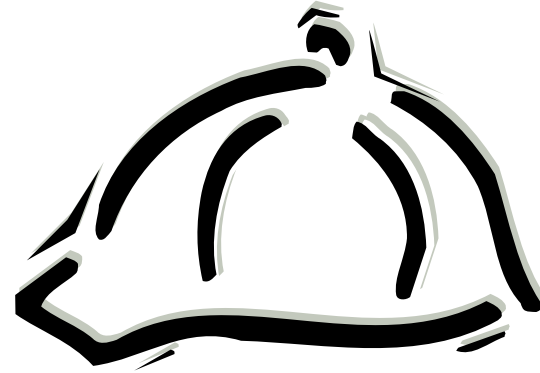
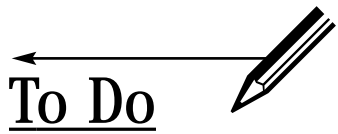
TOOLS

JOBS

Careers in Engineering, Manufacturing and Technologies

			<u>carpenter</u>
Calculator	Airplane	Trowel	<u>professor</u>
_____	_____	_____	<u>electrician</u>
_____	_____		<u>mathematician</u>
		Drafting tool	<u>master mechanic</u>
			<u>aeronautical engineer</u>
Hammer	Projector	Saw	<u>audio-visual specialist</u>
_____	_____	_____	<u>mason</u>
_____	_____	_____	<u>drafter</u>
			<u>woodworker</u>
Tool box	Wire Cutter	Computer	<u>painter</u>
_____	_____	_____	<u>graphic designer</u>
_____	_____	_____	<u>heavy equipment operator</u>
			<u>printer</u>
Paint brush	Safety Glasses	Wrench	<u>apparel pattern maker</u>
_____	_____	_____	<u>aircraft engine specialist</u>
_____	_____	_____	<u>helicopter pilot</u>
			<u>technical writer</u>
Wool jacket	Press Operator	Scissors	
_____	_____	_____	Dictionary
_____	_____	_____	_____
_____	_____	_____	_____

# AND JOBS IN MANUFACTURING AND



**1. Assign** a job name that may use the tool or device shown. Tools may be used more than once.

**2. Circle** the job names you have used.

**3. Decide** if you've ever used the tool. If you've used it write a "Y" for yes by it.

**4. Put** an "x" on any tool you would like to learn how to use or become more skilled at using.

**5. Collect** pictures for jobs not assigned.

**CLASSIFIED ADS**

**Cut** out five classified ads from your Pioneer Press listing jobs in this field.

**Fill** in the missing information in the boxes on the projection chart below based on the following information (this is a 10 year projection):

**Architects**- Design and plan both look and function of constructions and environments for other people to build. Includes: buildings, landscapes, open areas or communities.

**1996 Employment** 2,030 **Openings per year:** 120

**Carpenters**- Build or repair things made mostly out of wood. Work on structural projects such as housing or shelving and may also have the building skills to do detail work.

**1996 Employment** 20,370 **Openings per year:** 510

**Electricians**- Install, maintain and repair electrical wiring for buildings and structures. Understand how to source power. May work with phone or power companies, factories, film production companies or building contractors etc.

**1996 Employment** 9,780 **Openings per year:** 390

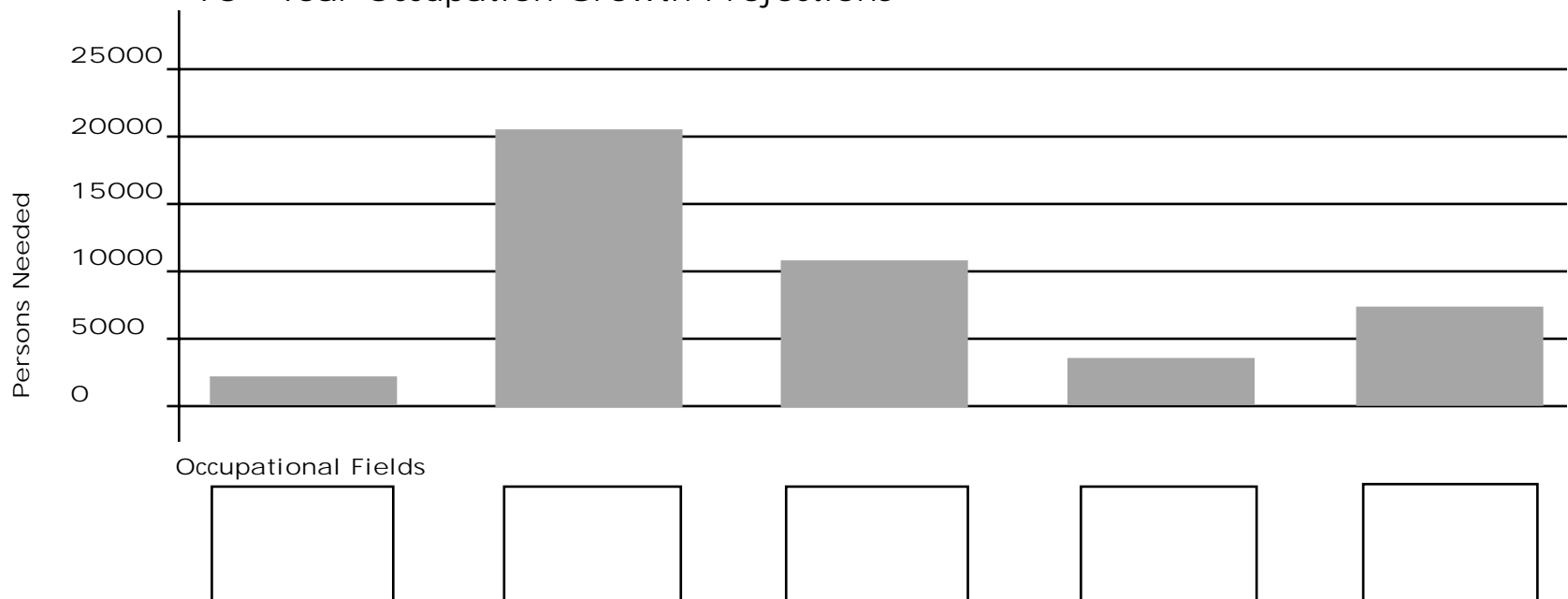
**Civil Engineers**-Design and supervise construction of public works such as: roads, dams and harbors. Work with city planners to consider traffic flow, function and look of city projects.

**1996 Employment** 2,630 **Openings per year:** 140

**Drafters**- Make mechanical drawings or designs (like blue-prints) which help map out ideas and communicate plans to contractors. Work with an attention to detail and a sense of geometry.

**1996 Employment** 6,450 **Openings per year:** 200

" 10" Year Occupation Growth Projections



# PREPARING FOR A FUTURE MANUFACTURING AND

## MATCH SUBJECTS TO CAREERS

One way to explore careers is to connect them to your school subjects. What subjects do you enjoy the most? Name an occupation that would utilize your favorite subject.

How much training and education do the careers in this field require?  
How much training and education are you willing to consider?

Subjects

Occupation

_____	_____
_____	_____
_____	_____

Can one subject apply to more than one occupation? \_\_\_\_\_

Can one occupation require understanding more than one subject? \_\_\_\_\_

MIDDLE SCHOOL → HIGH SCHOOL → COLLEGE/TRADE SCHOOL

Once you determine the occupations you are interested in exploring, you can plan to take classes in middle, junior and senior high school that will help increase your knowledge and skills in those career.



Now that you are familiar with occupations in the Engineering, Manufacturing and Technologies field, you can begin to plan the classes you will choose in junior and senior high.

**Find** the school subjects that will help someone prepare for a career in Engineering, Manufacturing and Technologies. Match the scrambled word in the column on the left with the correct word in the column on the right



GOETRYME	Biology
MICSOcone	Math
TRESCINOCEL	Science
GNITACCNUO	English
MTNEMEANAG	Speech
YHISTRO	Tech Ed
SSSTTTIICA	Computer
AALGEBR	Business
YIOBLOG	Algebra
CSIYPSH	Physics
ECNIECS	Chemistry
ERMPUCOT	Electronics
TSIMEHCYR	Technical Writing
SSSUBINE	Art
LACINETHC GNITIRW	Geometry
CEEHPS	Drafting
GLENSHI	Composition
AMHT	Economics
ETHC DE	History
TRA	Statistics
FTRDANGI	Management
SOPIMOCITNO	Accounting

Careers in Engineering,  
Manufacturing and Technologies



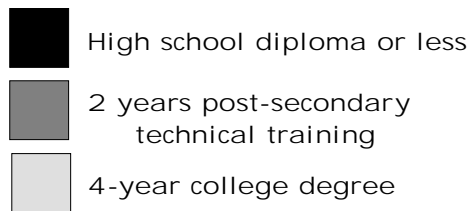
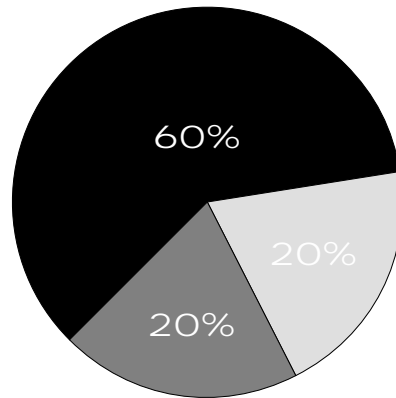
# IN ENGINEERING TECHNOLOGIES

What can you learn from these two "pie" charts?

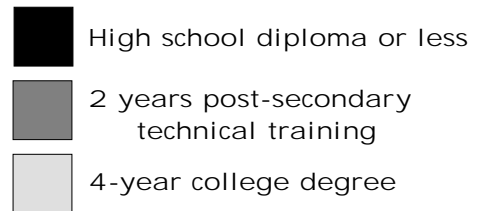
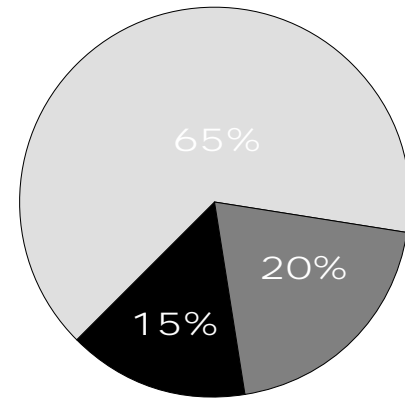
**Fill** in the blank.

**In 1959 \_\_\_\_\_% of all jobs required a high school diploma or less and \_\_\_\_\_% required at least 2 years of post-secondary technical training or a four-year college degree. By 2000 \_\_\_\_\_% of all jobs will require at least 2 years of post-secondary technical training or a four-year college degree.**

1959



2000

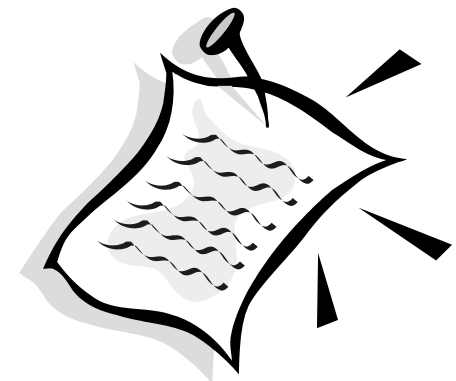


Source: Bureau of Labor and Statistics

What are the minimum high school requirements of most colleges and universities?

**Fill** in the number 1,2,3 or 4 for the number of years you think a student should successfully complete in high school to be prepared to get into a Minnesota four-year state university.

- \_\_\_ years of English (including composition and literature)
- \_\_\_ years of math (2 years of algebra and 1 year of geometry)
- \_\_\_ years of science (including 1 year each of a biological and physical science)
- \_\_\_ years of social studies (including 1 year of U.S. history and geography)
- \_\_\_ years of a single world language
- \_\_\_ years of either world culture or fine arts



**If you do not meet these requirements you may still be considered for admission, but you may be required to take specific course work designed to improve your opportunity to be successful at a four-year college level.**

**Minnesota state two-year colleges have a policy of "open admission", which means that anyone with a high school diploma or a GED may enroll.**



# WHAT I LEARNED AND CAREERS AT

Listen to the presentations of all six career fields from your classmates and use these pages as a tool to record your own personal discoveries. Remember, you have your entire life to plan and develop. This is just a snapshot for now. Be sure to share your thoughts from these pages with your parents.

**Choose** occupations that match your interest areas!

- Adventure -----
- Sports -----
- Art -----
- Science -----
- Business -----
- Talking -----
- Computers -----
- Travel -----
- History -----
- Writing -----
- Music/Dance -----
- Math -----

Favorite Subjects/Best Subjects

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Do one or more subjects appear in both columns? If you like a subject and do well in it, then it may be worth exploring occupations that involve them!

**Check** the boxes of your highest interest areas. Identify occupations from this field that match your interests.

**Write** the occupation on the line following the interest area.

A hobby or favorite activity can become a career!

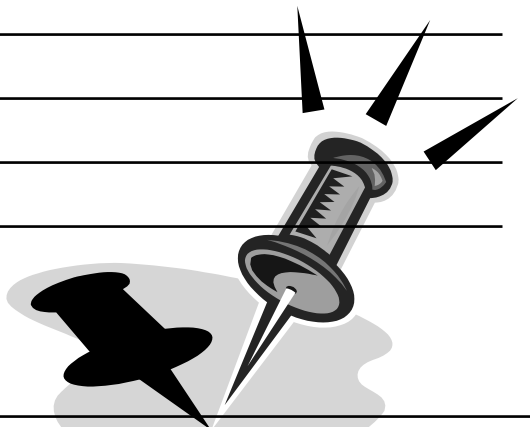
What hobbies or activities have you participated in that relate to occupations:

Hobbies/Activities

Occupations

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Can one hobby or activity apply to more than one occupation?  
Can one occupation apply to more than one hobby or activity?



# ABOUT ME

# THE CAREER FAIR

What would be a good career choice for you and why?

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What career would be a good match of the needs in your community and your personal skills or interests?

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What are your feelings about growing up and earning a living?

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Use the answers to these questions for starters

**I could be a...** \_\_\_\_\_

**Because I am...** \_\_\_\_\_

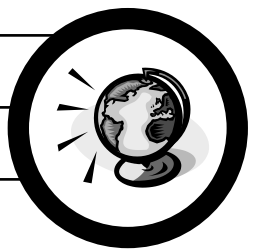
**Because I can...** \_\_\_\_\_

**Because I like...** \_\_\_\_\_

## Planning Your Education

Pick three occupations that interest you and list them on the chart vertically. For each job draw a horizontal line to the number of years of education you feel you'll need.

Occupation List							
My Education Goal	High School	Special Training	Associate Degree (2 years)	Bachelor's Degree (4 years)	Master's Degree (6 years)	Doctorate Degree (8 years)	



## Years of Education

- How many years of education do you plan on getting after you graduate from high school?
- Draw a line that shows your educational goal on the chart above.
- Pick three occupations in this field that you are interested in at this time.  
List these jobs on the chart vertically. For each job, draw a horizontal line to the number of years of education that it requires.
- Which of the occupations match your education and training goal? List these below:

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Parent Signature and Date

# CAREER FAIR

CAREER FAIR PLANNING:



## Overview

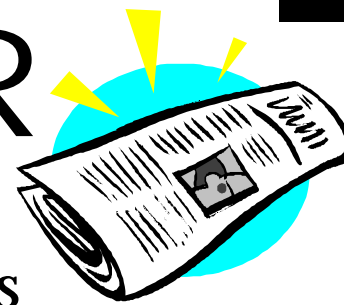
A career fair is your opportunity to share what you have learned about the occupations in this field and others. You will decide what you want to share and how you will do that. Your class/school will plan the event and you will decide what role you will play in preparing for the event.

**Prepare a visual display of the information your team found so that you can share what you learned with your school mates.**

## Requirements

An important part of the career fair will be your career display which is an opportunity to share your learning, and at the same time, demonstrate your skills in the Agriculture and Natural Resources field (ex: mechanical aptitude, planning, writing, speaking, interest in science, love of outdoors etc.). Your career display will include:

1. Career Investigation Information
2. Career Field Summary: five statements stating what you learned about occupations in this field
3. Personal Reflection: A paragraph that explains if any of the occupations in this field could be part of your future and why.



## IN YOUR DISPLAY:

Here is a list of things you have done that can be included in your display.

1. You can share a general definition of the jobs in your field.
2. You can list and describe some of the occupations in this field. (You may want to create sub-categories of occupations within your field.)
3. You can share pictures of people working in your field.
4. You can identify activities related to this field in your school and in your community.
5. You can share actual jobs and companies that employ people in your field (through classified ads, yellow page listings and personal contacts).
6. You can share some of the tools used in this field.
7. You can display a chart that projects the growth of certain jobs and the education they require in your field.
8. You can share classes students might want to take in secondary school that relate to your field.
9. You can provide a bibliography of certain books in your school's library related to your field.



Celebrate  
Your Success!