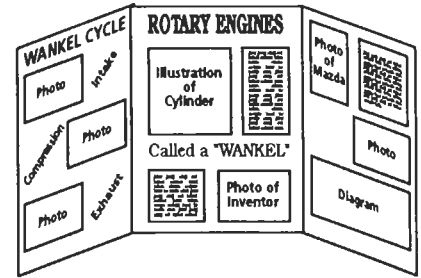


# Research: Technology Process Display



## Introduction

Have you ever wondered how a satellite dish "tracks" a satellite; how a laser can be used to cut material; or how fiber optics are used to transmit telephone conversations? Perhaps you are curious as to how a computer modem works, or what process is involved in creating manmade fibers such as polyester. Very often, engineers, research scientists, company executives, managers, and others are called upon to explain, demonstrate, and illustrate the concepts involved in new and innovative processes such as these.

If you have ever attended a trade show or conference, you have probably seen a display that was used to illustrate or explain what the company produces and the processes involved. These displays offer the consumer a chance to understand very complicated processes using simple, visual presentations. Models, demonstration devices, video presentations, charts, diagrams, and photographs are often included as a part of these presentations.

## Job Description

The purpose of this activity is to provide a means to demonstrate your knowledge of an industrial or technological **process** which you have researched either individually or as a member of a group. You will have to do some basic **research** on a topic you and your group members select; then you will design and fabricate a display that will illustrate the researched process. Known as a **technology process display**, your display will be very much like a science project. In fact, you may want to identify a subject that you could use as an interdisciplinary project for both your science and technology courses.

The Technology Student Association offers a Tech-

nology Process Display competitive event at the state and national level. If you have a chapter at your school, you may want to enter your display in the competition. However, this is a chapter entry, and is limited to one entry per chapter. Be sure to obtain a copy of the contest rules from the *TSA Curricular Resources Guide*.

## Materials and Supplies

3" x 5" index cards	triangle
display board	compass
railroad board	colored pencils
construction paper	rubber cement
colored markers	transparent tape
lettering stencils	colored border tape(s)
T-square	or colored yarn

## Selecting Your Topic

Your first responsibility will be to identify an industrial or technical process that is of interest to you and your group members. This may be a process you have used in the technology lab, such as forming, separating, or combining a material, or you may decide to investigate a process you may be unable to perform in your laboratory, such as explosive forming, electrical discharge machining, holography, or the use of fiber optics as a communication process. The processes you can investigate are limitless, so use your imagination! A good source of information on new processes and manufactured products are magazines such as *Popular Science* and *Popular Mechanics*. Check out some recent editions from your library.

As a group, use the **brainstorming** process; this will allow you to generate as many topics as possible in a short period of time. Identify a member of your group to record the ideas as they are presented. Before you begin, review the following

guidelines:

- Quantity, not quality, is what is important. The goal is to generate lots of ideas from which you can later choose!
- Don't judge ideas during the brainstorming process. The recorder writes the ideas down as quickly as possible for later evaluation.
- Brainstorm aloud and encourage members to expand on the ideas of others.
- Use your imagination to come up with a wealth of diverse ideas. Remember that there are no wrong or bad ideas at this point!

Once you have an extensive list of topics, discuss these as a group and identify the topic you will research for your display.

## Getting Organized

The first step in the research process is learning how to organize information so that you can readily review, organize, sort, and evaluate your research.

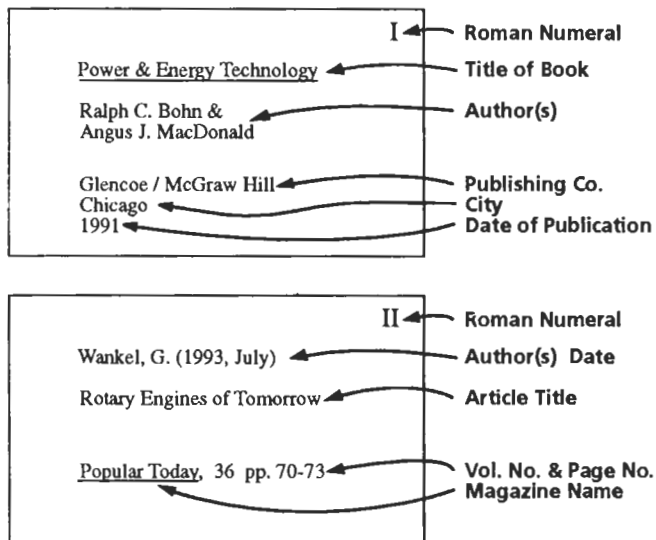


Figure 1 - Sample Bibliography Cards

1. Obtain a package of 3"x5" index cards. Begin by creating a series of **bibliography** cards. These will identify the source of your information. Prepare one bibliography card for each book, magazine article, or other source in which you find information relevant to your topic. (See Figure 1 for sample bibliography cards.) Bibliography cards are identified by Roman numerals (I, II, III, IV).

2. Now prepare topic cards; there should be one card for each topic you identify. For example, as

you read articles about your subject, you may find topics such as materials used; resources required; step-by-step procedures used; or scientific principles applied to the process. Make a topic card for each new subject as you identify it. (See Figure 2.) Each subject title (topic) card is identified with a letter (A,B,C,D).

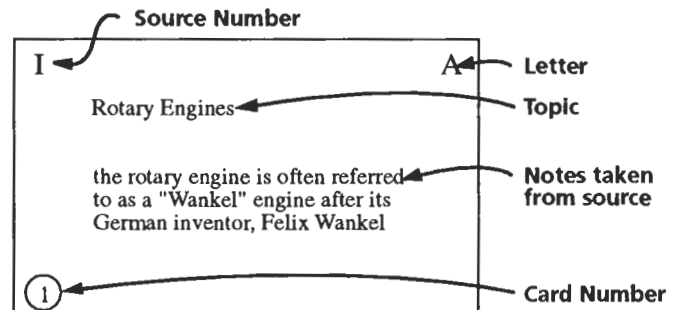


Figure 2 - Sample Topic Card

3. As you add new bibliography cards for additional sources or new topic cards (for further information about your process), you simply identify the source by a Roman numeral and the topic by a letter. You do not have to rewrite the bibliographic information for each single entry; rather, you need only indicate the source by the Roman numeral. (See Figure 3.)

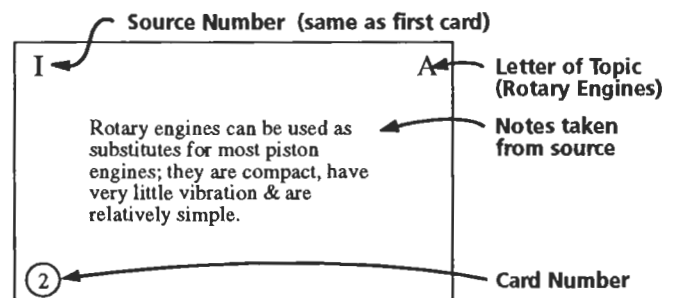


Figure 3 - Sample Second Topic Card

4. After you have collected a great deal of information and used several sources, you will have a series of cards that will be very helpful to you. These cards can be used to organize your material; prepare a written report; identify what you want to illustrate; and prepare your display captions. (See Figure 4.)

## Creating Illustrations

Most technology process displays contain illustrations to explain, clarify, and identify segments of the process, as well as add visual interest. It has been said that a "picture is worth a thousand words"; in the case of a process display, the use of

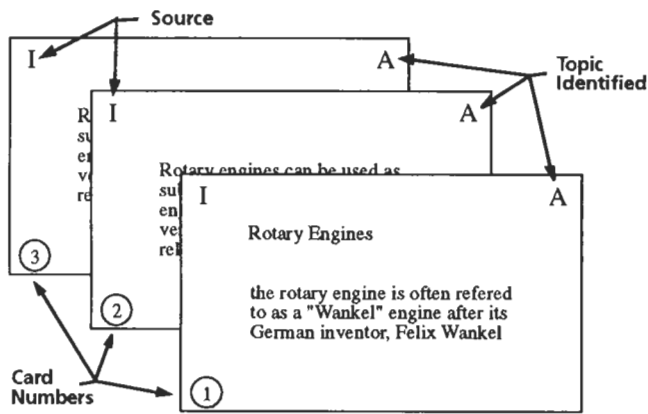


Figure 4 - Sample Set of Topic Cards

pictures is an important and integral part of the display.

Illustrations may take the form of photographs, charts, or graphs. Photographs may be obtained by contacting industries who utilize the process being researched. If possible, you may want to visit a local industry to take your own photographs. Technical illustrations may be drawn by hand and inked, or created on the computer using a computer-aided drafting program or graphics drawing program.

If you have tables of facts and figures (statistics), these are often expressed best as charts or graphs. There are a number of computer programs that will create charts and graphs from your statistical information. Printed out on a laser printer, these will make excellent illustrations for your display.

### Making Models or Demonstration Fixtures

Often a **model** or demonstration fixture (**mock-up**) will help explain the researched process. In some cases, models are more useful than the actual item in a display because they can be built to **scale**, either smaller or larger, or cut apart (sectioned) to show interior detail. Also, models are often less expensive than actual production fixtures. If your process contains fixtures that are in motion, a demonstration fixture can help explain what is going on in your display.

### Fabricating the Display

If your school has a Technology Student Association chapter and you plan on entering your display in the Technology Process Display competition, you

should first obtain a current copy of the *TSA Curricular Resources Guide*. Carefully review the rules for your entry. In general, you will have to fabricate a display fixture (display board) that must fit inside a four foot cube (4' x 4' x 4').

Traditionally display boards for this event have been built as three panels, to form a three part display board similar to the one shown in Figure 5. To be competitive, the display board needs to be fabricated to look very professional. Wood frames, plastic covers and panels, fabric, or painted panel inserts can all be used to make the display board itself an impressive part of your display.

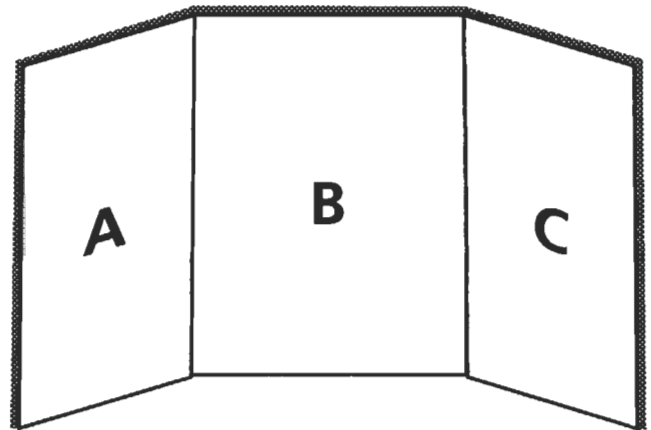


Figure 5 - Sample Display Board

For this activity, however, your group will use a corrugated cardboard display board found in most art or school supply stores. If your project is selected to represent your chapter in competition, you will need to consider redoing the display using these more expensive materials.

### Completing the Display

Creating the display itself; assembling the illustrations, headlines, captions, and diagrams; and building models and fixtures will require the use of the **design process**. Begin with some **thumbnail sketches** of the display. Locate the position of the various elements of the display. **Rough layouts** are done full size (or at least to scale). For this activity, a paper layout should be used. Plan where you will put all of the elements. Include headlines and captions, and any other elements that will be found on the display. (See Figure 6.)

The final mount work is very important. The final appearance of the project will depend on your neatness and accuracy in the display construction.

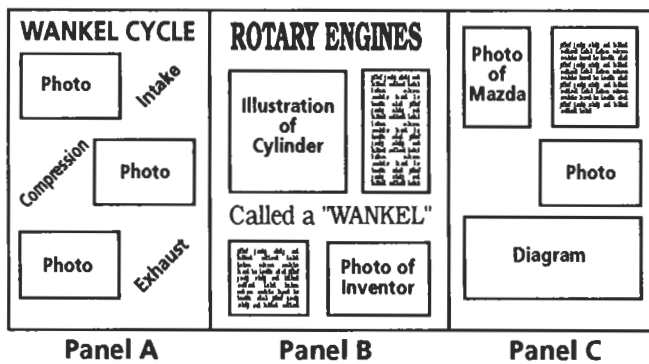


Figure 6 - Sample Rough Layout

To improve the appearance of the display, most people will mount the work before attaching it to the display. Mounting is a simple process of attaching your photos, illustrations, or the written material to a colored backing sheet. Once the work is attached to the backing sheet, it can then be trimmed to form a nice border. Be sure to take the time to be very accurate when trimming the backing sheet. Use your drafting tools to insure the neatness and accuracy of your work.

Once all of your materials are mounted, the next step is to place everything in the proper location. Do not use glue at this point; this is just a "test fit". When everything looks good, you need to remove the items one at a time. Be sure to draw light layout lines using a T-square and triangle so that each item can be easily relocated in the next step.

The final step is to attach each item in its proper place. This will be easy if the previous steps were carefully followed. Be careful when working with adhesives. Adhesives have a way of finding dirt everywhere (i.e., your hands, the counter top, etc.) and then depositing the dirt in the middle of your hard work. Keep your hands clean during this process and be sure you have the appropriate solvent to keep your tools and work surface clean and free from extra adhesive.

### Safety

When working in the technology laboratory, observe all safety rules. Always wear eye protection when required. Be careful when using art knives or

other sharp tools. Always observe safety rules when handling such tools. Never work with power equipment without the permission of your instructor.

### Vocabulary

- process
- technology
- brainstorming
- models
- mock-up
- illustrations
- bibliography
- topic
- statistics
- research

### Ecology

Now that your project is completed and you have your grade, what do you do with the display? Many students simply deposit their work in the trash only to become part of some mountainous landfill. Stop; take a few extra minutes to dismantle the project, and recycle those parts which can be recycled. Recycling is not just putting cardboard in the "cardboard dumpster"; it also might include saving good photos or illustrations in a class file for use by next year's class. Think about your future and recycle today.

### On Your Own

1. Another Technology Student Association competitive event is the Technology Research contest. This is an individual event in which the student must prepare a research paper on a selected topic. Obtain a copy of the contest rules from the *TSA Curricular Resources Guide*. Use the knowledge you have gained about the research process to write a paper on a topic which you select.
2. Ask your teacher and other TSA members about past state and national entries in the Technology Process Display contest; they may have slides, photographs, or videos of these displays.

## **TEACHER GUIDE**

### **RESEARCH: TECHNOLOGY PROCESS DISPLAY**

**Objectives:** Upon completion of this assignment, students will be able to:

- Identify and research a technology process.
- Perform a data search of a topic and prepare bibliography and topic cards.
- Prepare illustrations, charts, graphs, photographs, and line illustrations that will illustrate the process.
- Design and construct a technology process display within stated criteria.

#### **Helpful Hints:**

1. This is a good activity to promote cooperative learning. Assign the project to teams of three or four students.
2. Very often the technology selected includes the application of some scientific principle(s). This is an excellent opportunity to involve your science department. Perhaps you might consider a combined Science & Technology Fair where your students could display their finished projects.
3. *Popular Mechanics* and *Popular Science* magazines are excellent sources for subjects for this activity. Most librarians "discard" old issues at the end of the year. Ask for them and make them a part of your technology laboratory library.
4. If you attend a Technology Student Association state or national conference, take some photographs (or slides) of the process displays entered in this competition. The best way of explaining this activity is by showing examples!
5. Select a topic yourself. Make a series of sample bibliography and topic cards to use as examples.
6. Prepare a topic outline from your research. You might make a photocopy; then transfer it to an overhead transparency for classroom use.
7. Create a few "sentences" from your sentence outline, forming a complete paragraph. Explain the process of unifying sentences into complete thoughts.
8. You might enlist the help of your Language Arts Department to assist your students with the written portion of the project.
9. Contact your media specialist and enlist his/her help before you begin the assignment. You might have the media specialist demonstrate the proper procedures for using the resources in the media center, such as card catalogs, periodical files, ERIC files, and CD ROM files.

## **TEACHER GUIDE**

### **RESEARCH: TECHNOLOGY PROCESS DISPLAY (Cont'd.)**

10. The language arts application is designed to help you implement the written research report. While not required for competition, you might consider having students prepare a written report to go along with the process display.
11. The use of a computer word processing program may make the writing process less tiresome for your students.
12. If you want professional lettering, dry mounting, or help with illustrations, work with your graphic arts or art teacher.

## LANGUAGE ARTS APPLICATION RESEARCH: TECHNOLOGY PROCESS DISPLAY

\_\_\_\_\_

Student Name

In all types of jobs you will find that you need the ability to communicate your ideas effectively. Writing skills are necessary in all occupations. Here are a few examples of how writing skills are related to this activity.

A written report is often done to accompany the process display. To help you prepare a written report, begin with a **topic outline**. This will make it easier to get started writing.

1. Organize your "topic" cards, determining the order by most important to least important information. You can number the cards in the order that you think the information should be presented.
2. Complete a topic outline on a sheet of notebook paper, utilizing the following format. On each Roman numeral line (I, II, III, etc.), write down the topic that will be discussed. On each subhead line (A, B, C, etc.), write down what information would be included with this topic item.

### Example:

I. \_\_\_\_\_

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

3. Prepare a rough draft of your report using the topic outline. Begin with a sentence that introduces the topic you are going to talk about. Then write additional sentences for each subhead. Continue until all topics have been completed.
4. Combine your sentences into paragraphs that produce complete statements.
5. Edit your rough draft. Check spelling, punctuation, and sentence structure. Have your Language Arts teacher help you with this.
6. Rewrite the rough draft into the final draft, making changes as necessary.
7. Research the proper format for bibliography listings. You will find that there are specific formats for books, magazines, and other source listings.
8. Prepare a proper bibliography for your research paper.

## MATH APPLICATION RESEARCH: TECHNOLOGY PROCESS DISPLAY

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Student Name \_\_\_\_\_

In all types of occupations you will need the ability to apply mathematics effectively. Here are a few examples of how math skills are used in relation to this activity.

After completing the research on the technological process you have chosen, you will need to locate the position of the various elements of the display. Thumbnail sketches should be done as the first step. After choosing the best layout, you need to begin the rough layout. It is important to space your materials evenly on your board, using a ruler to measure out and place each element in a way that captures the viewer's interest.

The areas that you have to work with may need to be divided into 2, 3, 4, or more parts. To accomplish this, you must be able to divide measurements. The problems below are similar to those you may encounter while doing your display.

In this exercise you will be asked to divide measurements that have like and unlike denominators. When dividing a mixed number, change it to an improper fraction. Multiply the denominator by the whole number and add the numerator; place this number over the original denominator.

**Example 1:**  $4 \frac{2''}{3} = 3 \times 4 = 12 + 2 = 14$ (new numerator) place this over 3(denominator).

**Solution:**  $\frac{14''}{3}$  (improper fraction)

**Example 2:** You have an  $8 \frac{3''}{4}$  wide area that must be divided into 2 sections. How wide will each area be?

**Solution:**  $8 \frac{3''}{4} \div \frac{2}{1} = ?$  change to improper fraction  $\frac{35''}{4} \div \frac{2}{1} = ?$

When you divide fractions, you can change the division problem into a multiplication problem using the reciprocal of the divisors.

**Solution:**  $\frac{35''}{4} \div \frac{2}{1} = \frac{35''}{4} \times \frac{1}{2}$

You can now solve the problem by multiplying the numerators and multiplying the denominators.

**Solution:**  $\frac{35''}{4} \times \frac{1}{2} = \frac{35''}{8}$  reduce to a mixed number  $\frac{35''}{8} = 4 \frac{3''}{8}$

**Answer:** Each area will be  $4 \frac{3''}{8}$  wide.



**MATH APPLICATION**  
**RESEARCH: TECHNOLOGY PROCESS DISPLAY (Cont'd.)**

**Try these:** Use this method to complete the following problems.

1.  $10 \frac{1''}{2}$  divided into 3 sections      Answer \_\_\_\_\_

2. 7" divided into 2 sections      Answer \_\_\_\_\_

3.  $22 \frac{1''}{2}$  divided into 3 sections      Answer \_\_\_\_\_

4.  $17 \frac{1''}{4}$  divided into 4 sections      Answer \_\_\_\_\_

5. 15" divided into 4 sections      Answer \_\_\_\_\_

6.  $9 \frac{1''}{8}$  divided into 4 sections      Answer \_\_\_\_\_

7.  $35 \frac{3''}{8}$  divided into 2 sections      Answer \_\_\_\_\_

8. 11" divided into 4 sections      Answer \_\_\_\_\_

9.  $18 \frac{3''}{4}$  divided into 5 sections      Answer \_\_\_\_\_

10.  $42 \frac{1''}{4}$  divided into 4 sections      Answer \_\_\_\_\_

**QUIZ**  
**RESEARCH: TECHNOLOGY PROCESS DISPLAY**

\_\_\_\_\_

Student Name

**Fill in the blanks:**

1. A careful or systematic hunting for facts or truth about a subject or process is known as \_\_\_\_\_.
2. The process that will allow you to generate as many topics as possible in a short period of time is known as \_\_\_\_\_.
3. The \_\_\_\_\_ cards will be used to identify the source of your information.
4. The cards that are used to collect information on, organize your material, prepare your written report, and identify what you want to illustrate are called \_\_\_\_\_ cards.
5. Photographs, charts, graphs, and drawings are known as \_\_\_\_\_.
6. Tables of facts and figures (statistics) are often expressed best as \_\_\_\_\_ and \_\_\_\_\_.
7. When beginning the design process, start with the first step by drawing some \_\_\_\_\_ sketches.
8. A \_\_\_\_\_ is often used as a demonstration fixture because it can be built to scale and is often less expensive.
9. The design process that is done to full size (or scale) where all the elements are included is called a \_\_\_\_\_ layout.
10. To help the environment, you should \_\_\_\_\_ any photos or illustrations that may be used by the class in the future.