

**GITEA**  
**PROBLEM**  
**SOLVING**  
**COOKBOOK**  
**VOLUME 2**

**Compiled by:**  
**The Georgia Industrial**  
**Technology Education Association**

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This book of Problem Solving Activities has been compiled by the Georgia Industrial Technology Education Association. Members of our professional organization have contributed ideas and activities that work in their classrooms and laboratories. We hope that these activities will be beneficial to you in your classroom or laboratory situation.

Please feel free to reproduce any portions of this booklet or the entire book to use in your classes or to share with other Technology Education professionals. GITEA is working to improve and enhance Technology Education in Georgia. We appreciate this opportunity to share our ideas with you.

For additional information or if you have ideas and activities that you would like to and are willing to share with us please send to:

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# Special Thanks

We would like to thank the members of GITEA who have contributed their knowledge, time and resources to the production of this 3rd edition of the GITEA Problem Solving Cookbook. Without your help and support this endeavor would not be possible. It is our hope that this book will be beneficial to all Technology Educators.

Through your help and support we will continue to be able to produce quality documents that will enhance the efforts of the classroom instructors. Your continued support is greatly appreciated.

The 1995-96 GITEA Executive Committee

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# Build A Better Opossum Trap

Ronnie Cheek - East Coweta High School

## Assignment:

Design and construct a trap that will be triggered by rolling a basketball into the trap.

## Requirements:

- The trap must automatically latch.
- Use of the most materials in a functional manner will be a crediting factor.

## Materials:

You may use only the materials listed and you have to use all of them.

- 2 - Pieces of cardboard 24" x 36"
- Chicken wire (approximately 15 square feet)
- 10 - Rubberbands
- 8 - Wood strips 1/2" x 1" x 3'
- Baling twine (approximately 20 feet)
- Duct tape (approximately 10 feet)
- Rubber hose 1 foot
- Glue
- 2 - 8" balloons
- 12 - straight pins
- 2 - Clothes pins
- 6 - Paper clips
- 2 - Marbles
- 25 - 6d nails

## Tools:

- Hammer
- Hand saw
- X-acto knife
- Wire snips

## Documentation:

- Provide all necessary sketches for the manufacture of the trap, including but not limited to: front, top, and side orthographic views; isometric views; and sectional views.
- You should be able to explain the functionality of any materials used.

# Can This Idea

Scott Brown - Carrollton High School

## Scenario:

The board of directors of your soft drink company has just listened to the projected sales report from the marketing department—and it's not good. Your two main competitors have been outselling you over the last seven months. Something has to be done—and soon.

## Assignment:

The task of coming up with a new soft drink has been turned over to your Research and Development (R&D) department. The new drink is ready for production and distribution; all you need is an exciting name and design for the can.

## Requirements:

- You must work individually on this assignment.

## Materials:

- scratch paper
- pencil or pen
- one empty soda can
- 4.5" x 8.5" paper for final design
- colored pencils or markers
- tape

## Label:

- Think of an exciting name for your new soft drink.
- On the scratch paper, sketch three possible "eye-catching" designs. Remember Visual impact (how attractive and appealing your design looks) will influence first time buyers.
- Select the best design and draw it FULL SIZE on the 4.5" x 8.5" paper.
- The design, sure include all of the following
  - ingredients
  - bar code
  - canning authority (canned under the authority of your name).
- Finished label should be taped around an empty soda can.

## Presentation

A 2 to 3 minute oral presentation of your product. Include the following information.

- Explain what shapes and colors seem to be the most eye catching.
- Explain how and why you choose this design for your soda.
- Develop a sales slogan for your soda.

# Career Interviews

Angela H. Powell - Morrow High School

## **Scenario:**

There are numerous career opportunities that are related to technology. Learning about careers is an important part of the curriculum in Technology Education. One method for learning about careers that interest you is to read about them, however, reading about these careers does not provide the insight that speaking to someone in that area would give.

## **Assignment:**

Find a person who has a career related to an area of technology that interests you. Ask that person if they would participate in a five to eight minute interview which will be either videotaped (preferred) or recorded on cassette. Develop a list of questions that will guide you during your interview. Create questions that are open ended questions and not questions that require only one or two word responses. Be sure to ask about the good and the not so good aspects of the job.

## **Requirements:**

### *Interview tape:*

- The interview must be recorded either on VHS Video Tape or cassette and should be at least five minutes, but no more than eight

### *Presentation:*

- You will give a one minute introduction of the interviewer before the class watches/ listens to your interview.

### *Paper:*

- You will turn in a one page typed evaluation of your interview. Describe why you thought this career was interesting. After the interview, how did your feelings toward this profession change? Are you more interested or less interested in this career?

# The Castle

Alton E. Bell, Jr. - Holcomb Bridge Middle School

## **Scenario:**

It is the year 1428. The Hundred Years War between France and England is building to a war ravaged end. However, spies for King Charles VII of France, report that within a year the English will make a final attack on the French city of Orleans. The King has made you the Lord of this area of France, and expects you to defend it to the end. To do this, you must create a castle that is impenetrable, and that can withstand the siege engines of the English invaders.

## **Assignment:**

Research the styles of castles for the period of time stated. Draw a floor plan of a castle based upon your research. The castle design may be imaginary. All rooms must be functional and true to the period. Construct a model of the castle using any household material that your parents approve

## **Requirements:**

You must make a bibliography of your sources. The castle drawing must have lines that are straight and accurate. Each room must be labeled. The model must be able to fit on a piece of material that has a maximum size of 12" x 16", smaller is acceptable. The height is not to exceed 12". List some tools that could have been used to construct a castle from this period.



# Egg Catapult

Billy L. Millican - Dade County High School

## Scenario:

You are one of the Knights of the Round Table. King Auther has just embellished you with the task of redesigning a portion of the Castles defense system. You are to redesign the catapult system so that you can clear castles walls from a greater distance.

## Assignment:

You are to design and construct a device that will catapult a Grade A Large egg (your mortar) over a 1 meter high wall. You may only set or “cock” the device. You cannot in anyway aid the egg catapult system.

## Requirements:

### Materials:

You may use only the following items. Amounts are unlimited unless otherwise specified.

- Soda bottles (1 or 2 liter size)
- Egg crates or containers
- String
- Popsicle sticks
- Drinking straws
- 6 rubber bands (given by the teacher)
- Scotch tape
- Paper clips
- Coat hangers
- Glue or adhesive
- Plastic eating utensils

### *Design Criteria:*

Any design will be acceptable as long as it is functional and performs the assigned task within the design specifications.

### *Testing:*

- Each competitor will have three attempts each round.
- Rounds will continue until all devices cannot throw their egg over the wall.
- Wall height is 1 meter.
- The devices will begin at a distance of one meter from the wall.
- All successful devices will be moved and additional 12 inches from the wall each round. Testing will continue until a winner is declared.

# Kite Design

Dwayne Belcher - Camp Creek Middle School

## **Scenario:**

The Marketing Department of Krazy Kite Kompany's has just presented a sales report to the President of the company. The figures look bleak, at the present time your major competitor Kite Surfers is out selling you 2 to 1. If this continues your company is in jeopardy of bankruptcy. Changes must take place immediately to forgo this disastrous outcome. As the head of Research and Development of the Krazy Kite Kompany's you are challenged to create a new kite.

## **Assignment:**

Design and build a flying object, kite, that will fly in the wind when held by a string.

## **Requirements:**

- Flying object can not be larger than 36" x 24"
- Use only materials listed above.

## *Materials:*

- Newspaper
- Glue (white)
- Plastic soda straws
- Clear tape
- Kite String

## *Tools:*

- Ruler
- Scissors

# Marble Roller Coaster

Pamela J. Brown - Central Middle School

## Scenario:

You are president of an engineering firm that designs and builds roller coasters. Six Flags has just commissioned you and your team of highly trained and specialized engineers to design their new roller coaster. This is to be the premier roller coaster in the world. It is to be faster and more thrilling and any other coaster.

## Assignment:

You are to design and construct a roller coaster that can change levels at least 7 times. A minimum of two of these level changes or drops must consist of a some type of loop. Your prototype coaster is to be built only of poster board and glue. A marble will be used as the vehicle for your prototype coaster.

**NOTE:** Marbles will begin at the top of the coaster and end at the bottom level of the coaster. The Marble does not have to return to the starting point.

## Requirements:

### *Materials:*

You may only the following items. Amounts are unlimited.

- Poster boards
- Glue

**NOTE:** Masking tape may be utilized to hold things in place until glue has time to dry, but it must be removed from the prototype prior to testing.

### *Design Criteria:*

Any design will be acceptable as long as it is functional and safely performs the assigned task within the design specifications.

### *Testing:*

- Each design team will present their coaster and demonstrate it for the class.

# My Life in Space

Scott Brown - Carrollton High School

## Scenario:

The year is 2040 and you are somewhere between the ages of 60-70. You have just retired after 40+ years of service with Space Bases, Inc. Space Bases, Inc. is a construction firm which specializes in designing and building entire lunar bases and open-space space stations.

## Assignment:

Put yourself into the above scenario. Use your creativity, allow your imagination to run free. Describe "What it was like to live and work in space during your lifetime". Tell about some of the adventures you encountered while working for Space Bases, Inc. Describe the different technological advancements that were made in the areas of medicine, jobs, discrimination, salaries, money, government, communications, machinery, food, entertainment, sports, shopping, travel, transportation, etc... Tell about your experiences while building lunar colonies and space stations. Tell about the living conditions you encountered and how you adapted to the various situations.

## Requirements:

Paper must include the following items:

- A title page. (Include: Title, Name, Class Period, and Date)
- Five page double space typed report. (Page margins - 1" top, left, right, and bottom)
- One freehand colored drawing of a space station that you worked and lived on.
- One freehand colored drawing of a space transportation vehicle you used for traveling.
- One freehand colored drawing of a lunar base you designed.
- One freehand colored drawing of one the businesses within a space station or lunar colony.

# Purchasing a Personal Computer

Angela H. Powell - Morrow High School

## **Scenario:**

In our highly technical society, almost everyone uses a computer either at home or work. Chances are, in your lifetime, you will own at least one personal computer. The purpose of this assignment is to allow you to use information gained in class and media resources to hypothetically purchase a computer system.

## **Assignment:**

Using advertisements from television, magazines, or newspapers, you will hypothetically spend no more than \$2700 on a computer, software, and peripheral devices. You may, if you prefer, visit a store. You will create a portfolio containing information about your purchase.

When making the decision about purchasing the hardware and software there are several things that need to be considered. The first thing you will need to decide is why you need a computer. What you plan to do with your computer will dictate the type of computer, software, printer, and other peripherals that you will have to purchase. You will need to decide if you want an DOS based or Macintosh platform. Do you want a desktop or laptop? How much memory does the computer come with and will you need to purchase additional memory? What software will you need? Do you need a color printer or only black and white? If you have extra money, could you use a scanner?

## **Requirements:**

The portfolio must contain:

- A three page minimum typed report (12 point 1" margins on top, bottom, and sides) which explains what hardware and software you purchased, the features of each, and why you chose that piece of hardware or software
- A chart listing the hardware and software, the price paid, and the store and location purchased.
- Either an original copy or a photocopy of the advertisements in which you located your information. If you visited a store, you should provide the store name, location, date visited, and the person with whom you spoke. If the advertisement was on television or radio, tell the station and the date aired as well as the store, the product, and the price.

All purchases must be less than \$2700.

No sales tax will be included.

You may not use employee discounts.

# Space Station 2021

Scott Brown - Carrollton High School

## **Scenario:**

You are working in NASA's Research and Development Division. In the past you have developed various space stations that are now orbiting the Earth. Your development team's has now been assigned to design a space station that can orbit the planet Saturn.

## **Assignment:**

Your team is to design and construct a space station that can house a minimum of 25 people for at least 6 months. The space station should have a minimum of 15 levels, including: living quarters, control center, recreation, working, food services, experimentation, transportation, etc...

## **Requirements:**

### *Space Station:*

- Must be make from biodegradable and/or recyclable materials.
- Materials should be common household items.
- Must not be any larger than 18 inches in any direction (length, width or height).
- Must be at least 12 inches in any direction.
- Should be painted and detailed appropriately.
- Space station does not have to be openable (the floor plans will outline the interior).

### *Documentation:*

- A floor plan showing each level of the space station. The floor plan should be labeled, identifying the function or purpose.
- A materials list of all items used.

### *Presentation:*

- A 1 to 2 minute presentation will be given highlighting the features of the space station.

## **Additional Option:**

To design and construct a scaled reusable space vehicle that can be docked at the space station. This should also be made of biodegradable and/or recyclable materials.

# Technology Brochure

Angela H. Powell - Morrow High School

## **Scenario:**

Technology Education is a relatively new discipline. There are many people who are very curious about what is taught in the technology center. While it is interesting to verbally explain the technology program, it is not always practical. Sometimes it is better to have something that people can read and take with them.

## **Assignment:**

On a 8.5 X 11 sheet of paper, you are going to lay out the design for a brochure which promotes the technology program. The sheet of paper must be folded at least once, but can be folded as many times as you desire. The brochure must contain the names of the classes taught, an overview of the modules available, an explanation of why someone should enroll in the class. You may choose to include information about TSA.

This will not be a completed brochure, only a layout. You will briefly sketch out what should be on the paper, but you will not write in every word on your layout. However, you must also turn in the written parts of the brochure typed on 8.5 X 11 paper with 1" margins on sides, top, and bottom.

You will make a two to three minute presentation to the class explaining why your brochure should be the one chosen to produce to give out to individuals who are interested in the technology program.

## **Requirements:**

### *Documentation:*

- A sketch of your idea on a folded 8.5 X 11 sheet of paper.
- A typed overview of the modules available in the technology center.
- A typed explanation of why individuals should study technology education in the middle school and high school.

### *Presentation:*

- Must be at least two minutes long, but not more than three
- Must be persuasive in nature

# Thermal Insulation Challenge

Andy Peryam - Newnan High School

## **Scenario:**

Global warming is a top priority for your engineering firm. You have been given a tentative contract to develop a method of improving insulating properties of conventional construction methods. In order to win the contract, which will mean millions of dollars for your company, you must prove that you can develop a device which will adequately bring about the proper results. Several other companies are also bidding on the job. The most efficient entry will win the contract.

## **Assignment:**

Using any type of material, you are to build a square container in which a thermocouple will be placed. The volume of the container must be 900 cubic centimeters or less. There must be a 5 millimeter (minimum) diameter hole into the center of the container through which the thermocouple can be inserted.

## **Requirements:**

When exposed to a 150 watt heat lamp at a distance of 30 centimeters for 20 minutes, the winning container will be the one with the highest internal to external temperature ratio.

## **Warning:**

Do not use any materials which will be easily combustible!



# **COMMUNICATION TECHNOLOGY ACTIVITY**

## **Creating Business Cards for School Personnel**

### **An Individual or Mass Production Activity**

Pamela J. Brown - Central Middle School (Newnan)

As in any profession, teachers are constantly networking and sharing information with others who have common interests. Most professionals have business cards that they exchange with others in order to increase their personal and professional contacts. However, most teachers do not have business cards to exchange with others. The reasons are various. Teachers may:

- 1) have to cover the cost themselves,
- 2) feel that they do not have a need for personalized business cards, and
- 3) lack the confidence to design and create their own business card.

As a school service project one may consider having your Technology Education class design and create business cards for the teachers in your school. This could be a project for National Education Week, Christmas, or any time throughout the year. If the Technology Education program is unable to assume the cost of this project one may be able to charge a nominal fee to cover the cost of materials. Another alternative would be to use this activity as a fund raising project for your Technology Student Association (TSA) Chapter.

This Communication Technology Activity can be undertaken as a class assignment with everyone involved in each aspect of the production, or the individual tasks may be distributed to various groups, with each group completing a different aspect of the production. Another possibility would be to have a portion of the students working on this assignment while another portion is working on an entirely different assignment. These students may even be studying an entirely different area of Technology, as Communication Technology may be the strong suit for some individuals while others may excel in Energy Power or Bio-Technology. The instructor should make the ultimate decision as to how many students need be involved and how the assignments are to be made.

### **Overview of the Communication Technology Activity**

- Step 1:** Teacher should review the basic design principles, specifically: balance, contrast, unity, proportion and color.
- Step 2:** Teacher should provide students with various business cards and have students critique the cards based on the design principles previously studied.
- Step 3:** Teacher should review layout methods: thumbnail sketches, rough layouts and comprehensive layouts.
- Step 4:** Student should individually create four thumbnail sketches of possible business card designs.
- Step 5:** Students should select a partner and discuss the various thumbnail sketches that each developed. Students should discuss the pros and cons of each sketch by using the basic design principles. Teacher should remind students that they are working to develop the best possible design and that critique is not slander. Teacher should also remind student that they may combine ideas from various designs to create the best possible design.
- Step 6:** Students should develop a rough layout of the best business card design. The teacher should provide students access to a printed listing of graphics (clip art) that can be used on business cards. Access should also be provided to a printed listing of all fonts (type faces) that are available on the computer.
- Step 7:** Students will be using a Computer Aided Publishing system to create business cards. The teacher should take time now to review how a Computer Aided Publishing system operates. If students have previous Computer Aided Publishing experience this will be a brief review, however, if they have not yet encountered Computer Aided Publishing the teacher will need to have detailed explanation of how to operate the

Computer Aided Publishing software such as PageMaker, Quarks, etc. Specific instructions will vary depending on the software used. One should be sure to cover page set-up; use of guidelines; placement of text and graphics; editing processes such as cut, copy, and paste (multiple paste if available); and how to save and print. Students should take notes of the processes so that they can use the notes while working with the computer system.

**Step 8:** Students should begin work on the creation of the business card on the Computer Aided Publishing system. The ideal situation would be to have an individual computer system for each student or two students per computer.

**Step 9:** Now that the business card have been created by each student, the teacher should bring the class back together and have the students critique the designs. Allow the students rank their top four choices. Select the top eight designs and have the faculty in the school vote for the three best designs. From this information select the design that will be the school business card or select three designs and allow the teachers to order the card of their choice.

**Step 10:** Now that the design has been chosen, and approved by the administration, begin generating the cards for each teacher.

There are many ways to enhance this activity and build upon students' creativity and knowledge of Computer Aided Publishing. For example, art students could design a logo or a drawing of the school mascot to be used on the business cards instead of using clip art. This would increase the interdisciplinary connections within this activity and it would allow students to utilize scanners and scanning software along with the Computer Aided Publishing software. Another idea would be to utilize presentation paper which has preprinted color already on the business card stock. By using presentation paper students must have accurate and precise placement of all printed information, making sure that the text and graphics can be

read and are located within the card boundaries. This type of paper usually comes with ten cards per page and is perforated to make separation easier. Presentation paper is readily available from a wide variety of sources ranging from catalogs to office supply stores.

The development of business card for the professionals within a school is a relatively simple task that can be undertaken by either the Technology Education classes or a TSA chapter. This activity not only teaches students about Computer Aided Publishing, it also provides students with an opportunity to learn about Mass Production. As students enhance the professional appearance of the school by providing business cards to the faculty, they gain a better understanding of Graphic Communications and gain a sense of pride in their work. Not everyone can say that they were a part of the design and creation of their schools' business cards. This is an opportunity to allow Technology students to excel and be recognized for a substantial contribution to the overall school.

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