DOCUMENT RESUME

ED 105 169 CE 003 439

| | |
|---|---|
| AUTHOR | Soper, Joan, Ed. |
| TITLE | Career Education--An Idea Book for Science Teachers. |
| INSTITUTION | East Providence School Dept., R. I. |
| PUB DATE | [72] |
| NOTE | 27p.; For related documents, see CE 003 437-441 |
| EDRS PRICE | MF-$0.76 HC-$1.95 PLUS POSTAGE |
| DESCRIPTORS | Career Awareness; *Career Education; Elementary Secondary Education; *Guides; *Instructional Materials; Integrated Activities; *Integrated Curriculum; Interdisciplinary Approach; Learning Activities; Occupational Clusters; Science Curriculum; Science Instruction; *Sciences; Teacher Developed Materials; Vocational Development |
| IDENTIFIERS | Career Exploration; Rhode Island |

ABSTRACT

The book contains a series of career-oriented ideas for science teachers, contributed by teachers in the East Providence Career Education Project. The ideas are the basis of the interdisciplinary contracting system for grades 7-12 in three pilot schools. They are classified by occupational clusters, which the teachers can use to incorporate their academic skill development with career exploration and development. The ideas are meant to be adapted to any grade level and incorporated into the teacher's particular teaching style, classroom organization, and student needs. The occupational clusters integrated into the science curriculum are: agribusiness and natural resources, business and office, communications and media, construction, consumer and homemaking, environment, fine arts and humanities, health, hospitality and recreation, manufacturing, marine science, marketing and distribution, personal service, public service, and transportation. Each idea is numbered separately and is presented in a one- or two-sentence format. (BP)

# Career Education—

# an idea book for

# Science Teachers

Ideas Contributed By:

Peter Allen
George Brown
Laura Camac
Fred Ferrara
Frank Floor
Alex McDonald

Joan Soper, Editor

Teachers - East Providence, R. I.
Career Education Project





East Providence School Department

Edward R. Martin
Superintendent

## Introduction

Career Education is a system which attempts to integrate career awareness and exploration activities with traditional academic learning. It is, most simply, a motivational technique which uses a student's interests in occupations and the world outside of school to teach him the basic communication and cultural skills for which the schools are responsible. Of course career education has its own set of career development objectives. However, the academic teacher who becomes adept at integrating the exploration of careers with the learning of his subject will attain both his academic objectives and his career development objectives.

Most teachers have been trained in the traditional approach of giving direct information to the students about their subject with little or no relation of its application to the world outside of school or to the adult life of the student. As such, many teachers who enter career education programs ask, "How can I integrate my academic area with career activities?"

The integration process is a fairly simple one. There are two elements to the integration. The first is the selection of the particular academic skill which is to be taught. This can be determined by group or individual needs. The English teacher may want to teach outlining or punctuation; social studies may be teaching cause and effect relationships; science, data collection techniques of the scientific method and math may be teaching the use of percents. The second step is to help the student(s) select a career related activity through which the skill can be learned.

Most teachers know the list of skills for which they are responsible, but do not know career activities with which to integrate these skills.

This book contains a series of career oriented ideas, classified by occupational cluster which teachers can use to incorporate their academic skill development with exploration and career development.

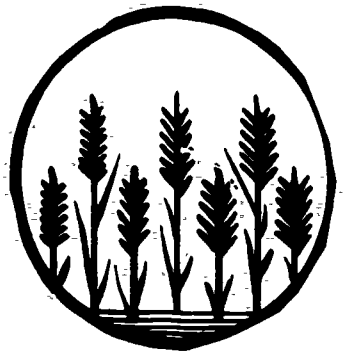
The ideas included in the booklet are not stated in behavioral objective form, they do not include criteria, or conditions for measurement as they are meant to be seed ideas which teachers can adapt at any level to their particular teaching style, classroom organization, and the needs of their students.

If you are wondering what to do to integrate transportation occupations, read through the transportation section until you find those that you feel best meet your needs, then develop your own method of delivery and evaluation.

The ideas in the booklet were contributed by teachers in the East Providence Career Education Project, East Providence, Rhode Island. They are the basis of an interdisciplinary contracting system for grades 7-12 in three pilot schools. For further information about this system write to:

James F. Ryan
Project Director, Career Education
East Providence School Department
255 Taunton Avenue
East Providence, Rhode Island 02914

We hope that this booklet and the series of which it is a part, will be a useful resource to you in developing a successful career education program.



Agri-Business & Natural Resources

1. You see a dead animal in the woods decomposing. Report on the microscopic organisms which perform this function.

2. You are a soil analyst. Analyze a soil sample and report what type(s) of crops might profitably be grown in it.

3. Plant two plots of land with identical crops. In one plot, use commercially produced "growth aids" and in the other use only natural materials. Compare quality of your crops.

4. Send for a soil-testing kit from your state agricultural agency and test the soil in your yard. Report on your findings.

5. Construct a chart or graph which shows the major insects and fungi (at least 5 of each) which affect plant crops in this state.

6. You love working with plants. Conduct an experiment to determine if demonstrating affection to plants helps them grow better. (Make sure this is a controlled experiment)

7. Set up an experiment showing how different foods or vitamins affect the growth rate of chickens.

8. Write a report on how to determine if chickens are sick and how they can be treated.

9. Set up a habitat for snakes (one male and one female) and maintain for one generation.

10. Set up a laboratory experiment showing how milk is pasteurized and how bacterial count is determined.

11. Set up a laboratory experiment to show how fish are stripped.

12. Set up and maintain a 3' x 3' mushroom colony.

13. You are to develop a small scale earth core. Make a replication of the earth's layers and using your earth core, show these layers. Label them.

14. Obtain the seeds and grow at least five different types of vegetables.

15. Set up a lab experiment to show the constituent parts of two unknown ore samples.

16. Demonstrate the effects of wind on a sand dune. Demonstrate the effects of heavy rain on land.

17. Set up a herbarium with at least 10 different types of plants.

18. Do a distillation experiment simulating how crude oil is cracked into many of its components.

19. Set up a lab experiment showing the basic principles of genetics.

20. Draw and label the parts of a plant. Grow a plant from seeds. Grow a plant from cuttings.

21. Set up a lab experiment to show how beans are grown.

22. Design a cranberry bog including proper procedures and schedule for irrigation, fertilizing and harvesting.

23. Sod farmers grow grass--for landscaping. Visit a sod farm or nursery, get information on how the grass is grown, but, transported, and replanted without its dying. Collect samples of different types of grass and label them.

24. Let's raise chickens! Using an incubator, hatch and raise some chickens.

25. Demonstrate how the following affect plants: (1) drought, (2) loss of light, and (3) too much rain.

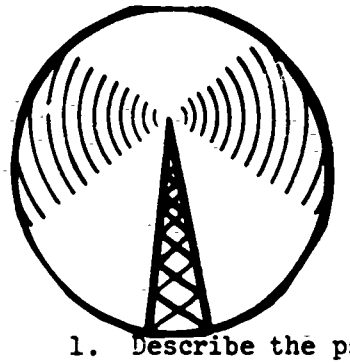
26. Do an experiment on the effects of heat and cold on plants. Report your results.

27. You've just bought some acreage to start a farm. The soil has a lot of salt in it. Determine the Ph of the soil and how you will treat the soil so you can grow healthy plants.

28. Do a controlled experiment to determine if fish are healthier in water with plants than in water without plants.

29. Start your own rock collection. Do an experiment showing how sedimentary rock is formed.

30. What are the earth's most common elements? How would <u>you</u> use them? Bring in samples and explain.



Communications & Media

1. Describe the psychological impact that mass media and instant communications have had on man.

2. Carefully remove the glass from a triode radio tube. Draw a sketch of how it works.

3. Design and construct a simple model telephone.

4. Construct a simple galvanometer. (A detector of small amounts of electrical current flow).

5. Draw a block diagram of a T.V. set. Explain operation.

6. Draw a simple block diagram of a radio. Explain operation.

7. Take apart a dry and an electrolytic capacitor. Explain operation.

8. Show how sound travels from its source to the ear using the molecular theory.

9. Using at least ten (10) substances, identify those that carry sound waves well and those that do not. Demonstrate and explain why with several of these.

10. Design a diagram that illustrates the principles of sound.

11. Take slides of foliage, explaining the reasons for the variety of colors.

12. Demonstrate in terms of electron movement the behavior of conductors and insulators. Give examples.

13. Draw and label an open circuit and a closed circuit.

14. You're tired of riding the pony express. So, you've thought of a way of sending messages by wire. Make and demonstrate your telegraph.

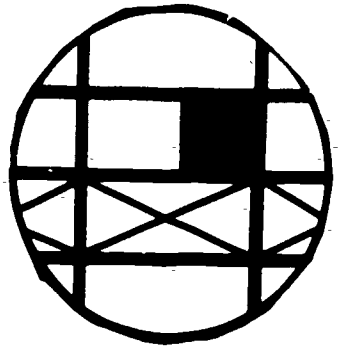
15. Go to the phone company for permission to see the master line connections. Determine how a call is traced.

16. Demonstrate how a satellite is used for radio and television broadcasts.

17. Make a telegraph line from one room to another to transmit your own signal code.

18. Debate the need for electrical power in the future vs. the fact that electrical power increases pollution.

19. Tape 10 minutes of your favorite records identifying constructive and destructive interference.



## Construction

1. Devise a system that will demonstrate why and how a roof is lifted from a house during a severe windstorm. How could you help remedy this situation?

2. Go to a paint store. Read the labels on the paint cans and list the chemicals that are in each paint. Tell if they are harmful or not.

3. By performing 5 different tests, determine if you would prefer a house made of steel, plastic or glass.

4. Perform tests on a wooden board and a piece of plywood. Which is preferable in building, and why?

5. Make 5 different concrete blocks. Perform tests to find which is strongest. Decide on mixtures of cement, sand, and anything else you wish to include in the block.

6. Test 5 different kinds of wood for strength and flexibility. Also devise a test for hardness and comparable weight.

7. Make a small amount of paint using ferric oxide and linseed oil. Paint a stick and devise some tests for your paint. Compare it to commercially prepared paint.

8. Devise some tests to compare the strengths of a small "beam" made out of strips of wood glued together and of a solid beam of the same wood.

9. Design a simple series and parallel electrical circuit for a house. Which would you use? Why?

10. Design and build an electromagnet which will work.

11. Design a modern and functional science laboratory for a junior high school.

12. Interview an engineer; find out the requirements of his job.

13. Building a bridge depends on the strength of materials. If you build one, what materials would you use and for what reasons?

14. How are abrasive rocks used in woodworking?

15. Visit a stone mason's supply yard. Ask owner to point out various kinds of stone. Ask for samples and then label and demonstrate their uses.

16. In construction many kinds of metals are used. Determine which metals are malleable and which are not and list advantages of both. Bring in samples and demonstrate.

17. Interview an electrician, then simulate his job and some of the problems he might encounter to the class.

18. Make a chart of several different woods, describing where they're found, how they differ and how each might be used most effectively.

19. Interview a lumber dealer to find out at least 10 different types and sizes of wood needed to build a house.

20. Build a scale model house of cardboard or plywood which includes switches and parallel circuits.

21. Write or interview a glass manufacturer. Find out what materials make plate glass stronger than regular window glass.

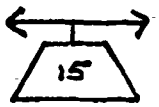
22. Report on the advantages and disadvantages of astroturf by interviewing an athlete who has played on this surface.

23. Build three small paper house models, one with a white roof, one red, and one black. Insert thermometers in each house and compare temperatures when these houses are placed in a beam of bright light. Explain the differences.

24. Build a model three-way switch. This is the type used in a stairway so that a light can be operated from a switch at the top and one at the bottom of the stairs.

25. Devise a test to determine the insulating properties of thermopane as compared to ordinary glass.

26. Explain why or why not a 15 lb. weight can be lifted by pulling sideways on two ropes attached to it. Try 10 different weights.




27. Design and build a model of a solar hot water heater.

28. Construct a simple working thermostat (the type found in houses).

29. Design and construct a simple electrical fuse. How does it work?

30. Design and construct a working model of a hydraulic lift.

31. How much do different surfacing materials used in road building expand or contract? What is meant by "grade"? What are the effects on each material of ice, salt, and heat?

32. Conduct a demonstration showing you understand the principles of conduction, convection, and radiation.

33. Demonstrate how each of the following makes work easier: (1) inclined plane, (2) fixed pulley, (3) level, (4) wheel and axel, (5) wedge, and (6) screw.

34. You are building a _____ in an area where there is extreme heat. What materials would you use? Design a demonstration to support your choice of materials.

35. You are building a home in a wilderness area. Water is not piped into your area so you need an artesian well. Diagram an artesian well to show how you would get water.

36. Before constructing a building, your land must be given a percolation test. How is this test done? Demonstrate this test using several different soils.

Consumer and Homemaking

1. Devise an experiment to show which type of ice is better to use in drinks-cube or crushed. Explain the reasons for your choice.

2. Prepare a menu for a week that would have to be eaten by a person to (1) gain weight, (2) lose weight. Indicate whether each food is carbohydrate, protein or fat.

3. Many of our foods today are treated with preservatives. What are preservatives? How do they preserve food? List the chemical composition of several preservatives. Indicate how they can be harmful.

4. Visit a supermarket. Read labels of several different detergents. Tell what chemicals they contain. Determine whether they are harmful to the soil and/or water.

5. Demonstrate why soft water is better for home use than hard water. Describe several ways hard water can be made soft and demonstrate one in class.

6. Stain some fabric with various materials (dirt, oil, grease, paint, grass, etc.) Demonstrate how you would remove the stain and explain the chemical action on the stain.

7. You've just moved into your own apartment and have old hand-me-down furniture. Refinish an old piece of furniture using different chemicals. Explain how these chemicals work to strip and revitalize the wood.

8. Demonstrate a way to boil water without using heat.

9. Take apart a toaster and draw a simple sketch of how it works.

10. Set up an experiment showing how different foods or vitamins affect the growth rate.

11. Test 2 household cleansers. Find out which one works best and explain why it does.

12. Baking soda is a very useful item. Perform several experiments with it.

13. You are buying furniture for your home. The salesman is giving you the big pitch. Determine what grade of synthetic material is the best.

14. Make a collage of all the known household cleaning supplies, dividing them into pollutants and non-pollutants.

15. You are canning your favorite fruits and vegetables. What should you do to prevent spoilage?

16. In the home, you may use cleansers that contain harsh chemicals. List those you would use with caution, and give reasons for your decision.

Environment

1. Prepare a scientific report comparing the chemical content of water samples taken from various locations.

2. Describe programs which are currently in progress to combat the following types of pollution: air, water, and land. Discuss any possible harmful effects of each program.

3. A lot of good minerals are wasted. Develop a process of mineral recycling.

4. You suffer from hayfever. Explain the causes of this, how your body is affected, and what can be done to minimize your discomfort.

5. What makes a swamp a swamp? How is a swamp a hazard? How can a swamp be eliminated?

6. Collect and identify local rock samples.

7. Visit "Mother Nature". Identify at least 10 plants and/or animals by genus and species.

8. Visit an agency involved in ecology. Interview someone there. Collect and display pictures of land, air, water, noise and mind pollution.

9. We know that noise affects people emotionally. Do an experiment to determine the effects of loud noise on a plant, an animal or a person. How can we control noise pollution?

10. Construct a chart or graph which shows the major insects and fungi (at least 5 of each) which affect plant crops in this state.

11. Report on the duties of a fire lookout person.

12. Lockheed Aircraft assigns you to find several ways to curb pollution from jets. What are you going to do?

13. As a meteorologist demonstrate your ability to read weather charts and explain high and low pressure areas and relative humidity.

14. Interview a meteorologist to find out what education and training were necessary to be employed in that field.

15. You are working for General Motors and must sell the idea that the Wankel engine is better in all respects than the conventional gas engine. Prepare and deliver your arguments.

16. If you are in charge of a forest area, you must know what steps to take if a fire starts. Explain what you would do using your knowledge of the topography and weather conditions.

17. You're a geologist examining rock and soil specimens. Bring in several samples of each, analyze them, and report the results.

18. You're looking for uranium. Show how to use a geiger counter and identify different types of radioactive materials.

19. Plan a way to produce more power as inexpensively as possible.

20. Construct a simple device which will measure relative humidity.

21. Construct a simple device which can be used to measure wind velocity.

22. Record at least five sounds which illustrate the doppler effect.

23. Set up a pictorial display showing how various insect pests destroy vegetation.

24. Set up a pictorial display showing how evergreen plantations are reforested.

25. Describe three weeds that are detrimental to man and ways to control them.

26. Estimate the force that the atmosphere exerts on you. (You can estimate your surface area by measuring your clothes).

27. The Ph in our environment is important for growth. Demonstrate a test for PH in water and soil.

28. Grow mold. Is it helpful or harmful? Explain.

29. Our environment is in danger because pollution has killed the trees. List reasons for the importance of trees.

30. You're man's answer to "Smokey the Bear". Demonstrate how forest fires affect wildlife.

31. Visit a recycling plant. Describe the process which occurs and also why only certain colors of glass can be recycled.

32. Illustrate who would happen if every person were twice as big as he is now. Relate to strength, food supply, etc.

33. Pick one industry in the area and compare its waste disposal system to the standards set up by the state.

34. Set up an oil spill (upon water) in the lab. Use this to predict the polluted area involving the wreck of a 5 million gallon tanker.

35. Design a model city that would be environmentally safe.

Fine Arts and Humanities

1. You are an interior decorator furnishing an apartment in ecological decor. What types of plants would you use to dramatize a jungle setting?

2. Make a mural of an ecosystem, showing the balance of life.

3. Make a filmstrip of flowers, showing the differences between monocots and dicots.

4. Construct a model of the human eye or a flower.

5. Physical coordination is a must for a performer, and exercise is essential for coordination. Explain how certain muscles are used for ballet, modern dance, or the latest dance rage.

6. You are there!! You are Michelangelo Buonarroti, and you are doing over your famous chapel painting. Explain how you will do this in much less time than it originally took by using the scientific principles of simple machines.

7. As a photographer, you must develop your own film. Take several snapshots and develop them.

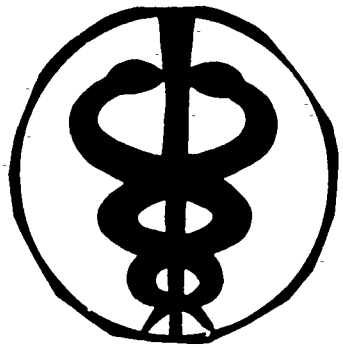
8. Use a camera to show the kinds of images that are made by concave lenses and convex lenses.

9. You are in charge of designing the lighting for a stage set. Illustrate how white light is bent (refracted) as it passes through (1) concave and convex lenses, (2) prisms, and (3) water.

10. You want to play the best sounding electrical guitar in the area, so you must understand sound. Demonstrate the relationship between the force of a sound and the amplitude (height and depth) of its waves.

11. In the humanities you are dealing with people, so you must understand human traits. Identify traits that are the result of heredity and traits that are a result of the environment.

12. Take a photograph of the night sky at regular shutter speed and a time exposure on the same section of sky. Compare the number of stars. Explain any differences you find.



Health Occupations

1. Doctors and nurses should have some ability to deal with the psychological aspects of the cases they encounter. Describe at least five techniques they might use in dealing with patients.

2. Report on advances in medicine which have lowered infant mortality rates.

3. Write a step-by-step scientific report covering a specimen dissection you have performed.

4. Set up a pictorial display of at least 10 X-rays and their interpretations.

5. Take a bone, decalcify it and prepare a slide of the bone tissue.

6. Set up a pictorial display on how to develop an X-ray and develop one yourself, if possible.

7. Visit a hospital accident room on a weekday morning and again on an evening on the weekend (or a full moon). Stay a few hours. Was there a difference in the activity there on these two visits? Make notes of what was going on and report to class. Do not interfere with the work of the doctors or nurses.

8. Visit a blood bank at a hospital. Find out about blood typing, rare bloods, storage, etc.

9. Very, very carefully dissect a frog so that the organ systems can be recognized.

10. Take an inventory of your home medicine cabinet, both prescription and non-prescription. Determine the chemical composition, and the effects and side-effects of each. (Ask your pharmacist if you can use his P.D.R.)

11. Since you want to work with emotionally disturbed people, you should understand behavior characteristics. Make a list of 20 of your own behavior characteristics and indicate if they are due to heredity or environment.

12. For most medical and dental careers, you have to have a steady and precise hand. Take a piece of chalk and carve an intricate object using the tools in the dissecting kit.

13. You know a diet of good food is essential for good health, but you're not sure whether a certain food is carbohydrate, protein, or fat. Do the tests for these.

14. In medical research, scientists grow and experiment with disease causing organisms. You, too, can grow them. Design an experiment that shows how germs spread.

15. Make a slide of a cell from your body, examine it under the microscope and make an understandable drawing. (That's not too easy!!)

16. Cancer spreads, but it starts with one cell. Demonstrate how cancer cells multiply, and how the cancer spreads. Contact the American Cancer Society for information.

17. Make a reproduction of the following cells: (1) muscle (2) skin (3) stomach gland.

18. Set up a lab experiment for testing blood, urine, saliva and gastric juices for the purpose of identifying diseases.

19. Set up five slides on blood, protozoans, bacteria and fungi utilizing proper microscopic techniques.

20. Taking a piece of liver or heart, prepare it for microscopic examination using microtome embedding and staining techniques.

21. Set up a lab experiment showing the various uses of a centrifuge.

22. Report on the duties of a lab equipment cleaner.

23. Set up a lab experiment to show how milk is pasteurized and how the bacterial count is determined.

24. Report on the duties of an E.C.G. or E.E.G. technician.

25. Set up a pictorial display on how blood gets from a person's body to the storage freezer.

26. Set up a lab experiment demonstrating aseptic techniques and cultivation of bacteria.

27. Analyze a urine specimen for proteins and disease.

28. Obtain a blood sample and determine the blood count.

29. List and define at least 20 common medical terms you would encounter if you worked in a hospital.

30. Grow, isolate, and identify the three main forms of bacteria.

31. Set up three slides of living fungi and identify them.

32. List and describe 10 of the most commonly used anesthetics.

33. Set up a pictorial display of how catheters and tracheatomy tubes work.

34. Outline and describe five methods of treatment for physically disabled people.

35. Make several petri dishes of agar and grow your own bacteria. Identify them and their functions.

36. Bacteria are sometimes a problem, but sometimes they help us. Report on ways in which bacteria help man.

37. Keeping fit is important all through life. What happens internally when one doesn't keep physically fit?

38. List and describe the dosage, usage and effect of ten common pharmaceutical drugs.

39. Plan a low fat diet, a low protein diet and a low carbohydrate diet. Explain the circumstances under which each would be used.

40. Draw a model of the human ear showing all parts of outer, middle and inner ear.

41. Make a model of a human tooth.

42. Prepare two slides utilizing the techniques of tissue embedding, slicing and staining.

43. Report on first aid procedures for victims of shock, bleeding, and poisoning.

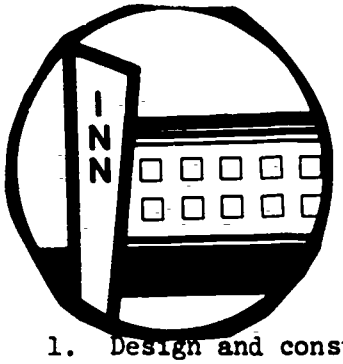
44. Demonstrate the proper treatment of superficial wounds.

45. Set up a display showing how to administer first aid to victims of smoke inhalation or severe burns.

46. Chart the blood pressure of different age groups.

47. In a hospital, it is necessary to determine the blood type of a patient. Take a blood test of several people and identify their blood types.

48. An emergency victim needs help. Describe the condition of the patient and what tests the doctor would conduct in making a diagnosis.




Hospitality & Recreation

1. Design and construct a model tramway. Considerations should include safety of operation.

2. Design a simple hand loom.

3. Design the angle(s) of banked turns for a car traveling 150 mph. on a racetrack.

4. Design and construct a simple model to illustrate the reason rail dragsters have such a long wheelbase.

5. You are working in a zoo. You are to take a zoo animal, explain its diet, its natural habitat, and then design the ideal cage (or pen) which is most like the animal's natural environment.

6. You have to know how to read a compass--and understand it--so you won't get lost while on safari. Using a map, tell the difference between the North Geographic Pole and the North Magnetic Pole.

7. You like little children and want to have the best day care and recreation center. List ten (10) activities you would plan for children aged 2-5 years and explain how these activities will help them develop physically and mentally.

8. Develop a game for children using any kind of science equipment. Be original!

9. You are setting up a travel agency especially for people who are interested in famous buildings. Collect (or take) pictures of ten (10) local or nationally famous buildings and describe the material(s) used to construct the exterior.

10. You are going to build a hotel in Mexico to simulate an adobe house community. Explain how adobe brick is made. Make a small scale adobe house.

11. You want to create an unusual tourist resort. You've decided to build a replica of Old Pompeii--volcano and all. Construct a model of a volcano and label parts.

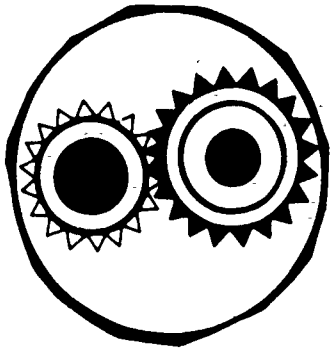
12. Since you are involved in outside recreation you have to know a lot about the weather. Set up a demonstration, a project, or an experiment showing weather patters.

13. You are supervising an excursion to a canyon and acting as a guide. Collect pictures of several well-known canyons and explain the rock formations.

14. You want to develop a surf riding lake. Explain how you will do this and what special considerations are necessary (re: the physical set-up of the lake).

15. You are designing a resort in a northern state and must use materials that withstand extreme hot and cold temperatures. Create a demonstration showing how heat and cold can affect matter differently. Use both °F and °C, the freezing and boiling points. (Hint--use solutions)

16. Explain what first-aid measures should be taken when a person has been poisoned, as in the following: snake bite, food poisoning, drinking gasoline, and two (2) instances you choose.



Manufacturing

1. Set up an experiment to test the durability of lab glassware.

2. Devise a demonstration to show how metals are plated in jewelry shops.

3. Build a thermocouple (sensitive thermometer) and demonstrate how it operates. What are 2 uses for this device?

4. Design and build a solar grill. (A way to cook using the energy of the sun directly).

5. Design and construct a model electric light bulb that works. Illustrate ways to improve it.

6. Observe different colored pieces of cloth under different colored lights. Use same kind of materials each time. Explain what happens and why.

7. Set up a test to determine which metal is the better conductor of heat; iron, copper or aluminum.

8. Explain and demonstrate why large molecules are used as a perfume base.

9. Design and construct your own thermos bottle.

10. Set up a lab experiment to show how antibiotics are produced.

11. Set up a lab experiment showing the various tests conducted on sugar while it is being refined.

12. Set up a lab experiment to show the various tests conducted on sythetic fibers.

13. List and describe the functions of at least 10 chemicals used in manufacturing explosives.

14. Set up a lab experiment showing the basic principles of distillation, condensation or reflexing.

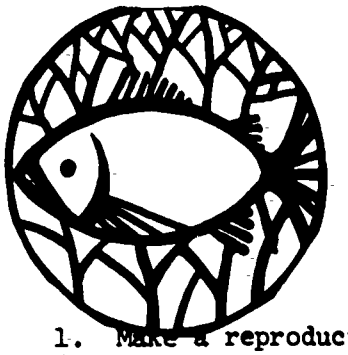
15. Describe the process for recycling cloth.

16. Make a small sausage.

17. Make a pound of cheese.

18. Make a one ounce sample of perfume.

19. Set up an experiment to show how chlorophyll is extracted from leaves.



Marine Science

1. Make a reproduction of a single-celled plant or animal found in the water. (Use as many different materials as you can).

2. You are stranded on an island and there is nothing except seaweed. What seaweed is best to eat? How will you collect it?

3. List four disease agents and their effects on shellfish.

4. Set up a demonstration to show what would happen if a man were to row out to the middle of a lake with a large rock and throw the rock overboard. Would the level of the lake rise, fall, or stay the same? Why?

5. Collect some pond water. Examine several different drops under the microscope. What do you see?

6. As a deep sea diver, you are concerned about the bends. Explain what the bends are and how the condition can be treated.

7. Design a tool that can be used to take samples of the ocean's bottom.

8. A beautiful lake is loaded with algae bloom. You see many dead fish in what was once your own private fishing hole. What is happening here?

9. Your lobster pots are being invaded by everything except lobsters. What type of fish would steal the bait from your lobster pots?

10. You are swimming and discover that a shark is in the area. You're cool and don't panic. List reasons why you shouldn't become excited.

11. Dissect a crayfish and a frog.

12. Prepare five photomicrographs of microscopic water life.

13. Differentiate between two types of fish by dissection.

14. Take several fresh water samples; test for content, and compare your results.

15. You own a fishery, and many of your canned products are spoiling. What are some of the chemical preservatives that you can legally use to prevent this?

16. Draw a map showing the ocean currents and describe the method used to locate these currents.

17. Diagram the gulf stream.

18. Write to the Department of the Navy for information about scientific jobs available in that branch of the service.

19. Submit a plan which will show the best route to use in sailing from Spain to New York.

20. Plan and construct a model of a jetty (break-water). Show three negative effects that this jetty might have upon the shoreline.

21. Plan and construct a model of a summer beach and a winter beach. Point out differences.

22. If a bottle were dropped into the ocean at Miami, where would it most likely be found by someone on land? Illustrate, showing reasons.

23. Design and construct an apparatus to demonstrate the non-feasibility of a Panama Canal without a system of locks (gates in the canal).

24. Design and build an apparatus which will demonstrate buoyancy in fresh water as compared to buoyancy in salt water.

25. Construct a model shoreline along with a wavemaking apparatus. Demonstrate, using this equipment, 3 properties of waves.

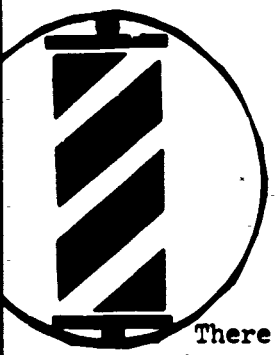
26. Construct a model of a beach which will illustrate "undertow" or rip current.

27. Design and construct a model of earth, sun, and moon which will illustrate causes of high, low, spring and neap tides.

28. Design and construct a model of a submarine vehicle which would allow you to explore the bottom of the Marianas' Trench in the Pacific ocean.

29. Design and construct a model of a section of ocean floor containing 7 distinct undersea features.

30. Construct a working model of a power or hand winch which will lift 10 lbs. Illustrate physical principles involved.



## Personal Services

1. There are many advertisements for lotions and creams on the market which claim to keep your skin "baby" soft. Examine at least five of these products and determine their composition. Determine if the claims are valid.

2. Using charts, show how the genealogy of dogs is determined.

3. Visit a funeral home to see where and how a body is prepared for viewing. What chemicals are used? Find out how accident victims are treated so that they look natural.

4. Set up a cage containing at least one male and one female canary and breed them.

5. Set up the equipment needed to care for mice, gerbils or hamsters.

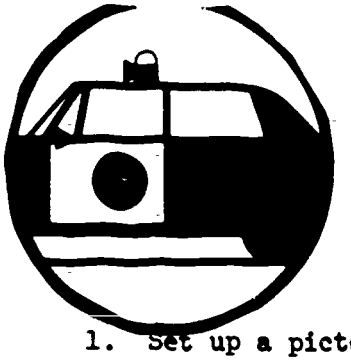
6. Barbers and hairdressers must study the structure and function of the scalp and hair follicles. Draw a cross-section of the scalp. Label and give a brief explanation of each level.

7. Visit an animal hospital. Explore the facilities and their functions. List five common animal diseases and the treatment for each.

8. Training an animal involves learning by conditioning. Set up an experiment that involves a stimulus and a response. Show what variables are controlled and which are changed.

9. There are many overweight people. Determine the causes of obesity by interviewing various people--doctors, exercise teachers, and people who are overweight.

10. Visit a local health spa. Tour it with the eye of a scientist. What are some of the principles of the simple machines used and what are their purposes?



Public Service

1. Set up a pictorial display to show how water is purified.

2. Interview the man who takes kilowatt readings and find out how the kilowatt time is kept.

3. Visit a local water treatment plant and list the operational procedures.

4. Interview someone at a blood bank to determine the sources of the blood supply, the rare types of blood, and the procedure for giving blood.

5. Call the Board of Health and find out its procedures in cases of epidemic and quarantine.

6. Design and construct a simple water turbine.

7. Design and construct an apparatus to purify river water.

8. Design and build a simple electric generator.

9. Design and build a scale model dam.

10. Construct a working step-up or step-down transformer.

11. Make a list, with accompanying charts or graphs that demonstrate the various tests drinking water goes through before it reaches your faucet.

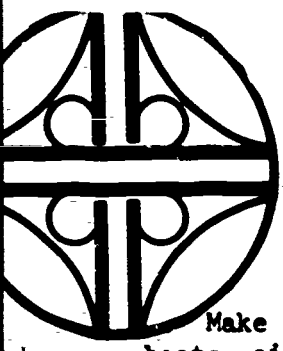
12. Your community has been flooded, and all the drinking water is impure. Describe the correct process to make the water safe to drink again.

13. You are teaching little children ages 2-5 years. Set up a demonstration that you would use to teach a child about a particular area in science (i.e. parts of the body, nature, drugs, etc.)

14. Compile a list of at least 12 everyday acts which involve a stimulus and response and indicate which is the stimulus and which is the response. Explain the reasons for your choices.

15. You have responsibility of caring for someone who has taken a drug. Describe how you would find out what the drug was and then prescribe the proper treatment.

16. You are working for an electric company. Demonstrate the nature and behavior of light.



## Transportation

1. Make a list of the various fuels used by trucks, buses, cars, trains, boats, airplanes, rockets, etc. Give the chemical composition (and formula) of each.

2. Every large airport has a control tower. Visit a control tower. Explain how a plane is guided onto the landing strip in a thick fog.

3. All fuel trucks have ground wires. Explain why and demonstrate the principles involved.

4. The 747 is as big as some apartment houses, yet it can fly. Demonstrate how planes get off the ground, stay in the air, and then land.

5. "In 1492, Columbus sailed the ocean blue". How did he find his way? Demonstrate how sailors stay on course by using the stars.

6. Hooray! You're a space pilot! Make a chart of the solar system or construct a model.

7. All transportation requires some kind of engine to move the vehicle. Show you understand an internal-combustion engine by correctly using the terms potential, kinetic, electrical, chemical and mechanical energy in describing its functions.

8. The earth is a magnet, so in aviation and space travel, this magnetic force has to be overcome. Determine what materials are magnetically transparent by using such things as: paper, cardboard, plastic, glass, tin, aluminum and any other materials you wish.

9. You've been six days on the road and you want to get home on time, but you have engine difficulty. Be able to diagnose ten problems and tell what you must do to correct them.

10. A mechanic should know the parts of an engine. Taking along a drawing of an engine, visit a mechanic and ask him to identify the parts and their functions.

11. Draw a picture of your dream motorcycle with a list of engine specifications.

12. Draw a model of a battery.

13. Design a model which illustrates one advantage and one disadvantage of very large rear tires mounted on the average "street" automobile.

14. Illustrate and explain the principles of a gyroscope using a bicycle wheel.

15. Design and build a simple solenoid.

16. Design and build a model cross section of a highway roadbed.

17. Design and build a simple steam engine.

18. Illustrate the differences between diesel and gas engines in operation and efficiency.

19. Illustrate why ships do so much damage to one another when they collide at relatively slow speeds.

20. Could you build a helicopter without the small propeller at its tail? Illustrate why or why not.

21. Calculate the force with which you would hit the dashboard of your car if you ran into a bridge abutment at 50 mph. Compare this to jumping off a multi-storied building.

22. Design and construct a model which shows at least one advantage and one disadvantage of reversed rims on a car.

23. Iron is much denser than water, and so it sinks. How does an iron ship stay afloat? Set up a model to show this.

24. Design a model "wing" that would keep a downward pressure on the rear tires of an automobile at high speed. How does this wing differ from that of an airplane?

25. Construct a homemade sextant using a protractor. Use this and the pole star to determine the latitude of your city or town.

26. Construct a piece of safety glass of the type used in automobiles.

27. Construct a model which illustrates why a flywheel is used in an automobile engine. How and why would you modify a flywheel in a racing car?

28. Design and build a working model of a disc brake. Use this model to show two advantages of disc brakes as compared to drum brakes.

29. Design and build a simple electric motor.

30. Design and building a simple working rocket.