DOCUMENT RESUME

ED 089 008 CE 001 046

AUTHOR Calhoun, Olivia H.
TITLE Agri-Business, Natural Resources, Marine Science; Grade 7. Cluster V.
INSTITUTION District of Columbia Public Schools, Washington, D.C. Dept. of Career Development.; Metropolitan Educational Council for Staff Development, Washington, D.C.
SPONS AGENCY Bureau of Adult, Vocational, and Technical Education (DHEW/OE), Washington, D.C.
PUB DATE [72]
NOTE 123p.; For the Washington, D.C., Career Development Exemplary Project itself see CE 000 906

EDRS PRICE MF-$0.75 HC-$5.40 PLUS POSTAGE
DESCRIPTORS *Agribusiness; *Career Education; Curriculum Guides; Ecology; *Grade 7; Landscaping; *Natural Resources; Occupational Clusters; Oceanology; *Units of Study (Subject Fields)
IDENTIFIERS *Career Development; District of Columbia; Marine Science

ABSTRACT

A curriculum guide for grade 7, the document is devoted to the occupational clusters "Agri-business, Natural Resources, and Marine Science." It is divided into five units: natural resources, ecology, landscaping, conservation, oceanography. Each unit is introduced by a statement of the topic, the unit's purpose, main ideas, quests, and a list of career opportunities (positions) available in that area. Next, the areas of language arts, mathematics, science, social studies, home economics, industrial arts, music, and physical education (when applicable) are subdivided into purpose, objectives, activities, materials, and notes with a statement relating these categories to the unit topic. The document is one of ten curriculum guides at the seventh and eighth grade levels presenting a career education emphasis. The teacher's manual for the series is available as CE 001 041. The other guides are: consumer and homemaking (CE 001 042); communications and media (CE 001 043); fine arts and humanities (CE 001 044); construction and environment (CE 001 045); public service occupations (CE 001 047); health occupations (CE 001 048); manufacturing, marketing and distribution, business and office occupations (CE 001 049); transportation (CE 001 050); and hospitality, recreation and personal service occupations (CE 001 051). (AG)

GRADE 7: CLUSTER V
Agri-Business, Natural Resources, Marine Science

AGRI-BUSINESS
NATURAL RESOURCES
MARINE SCIENCE

PUBLIC SCHOOLS OF THE DISTRICT OF COLUMBIA
Presidential Building
415 Twelfth Street, N.W.
Washington, D.C. 20004

CAREER DEVELOPMENT EXEMPLARY PROJECT

Curriculum Guides Prepared by

THE METROPOLITAN EDUCATIONAL COUNCIL FOR STAFF DEVELOPMENT

Curriculum Writer/Editor: Olivia H. Calhoun
Executive Director: Elaine C. Melmed

MEMBER INSTITUTIONS

American University, Department of Education
Antioch-Putney Graduate School
Catholic University of America
District of Columbia Public Schools
District of Columbia Teachers College
Federal City College
Gallaudet College
The George Washington University, School of Education
Howard University, School of Education
Trinity College
University of Maryland, College of Education
Washington School of Psychiatry
Washington Technical Institute

CAREER DEVELOPMENT EXEMPLARY PROJECT

An
Interdisciplinary
Course of Study
for
Grades Seven and Eight

Public Schools of the District of Columbia
Hugh J. Scott, Superintendent
James T. Guines, Associate Superintendent
for Instructional Services
Paul E. Cawein, State Director
for Vocational Education

Inquiries:

Mrs. Bessie D. Etheridge, Director
Career Development Exemplary Project (K-12)
Carver School
45th and Lee Streets, N.E.
Washington, D. C. 20019

These materials were designed and tested under the provisions of Part D of Public Law 90-576 of the Vocational Education Amendments of 1968.

A C K N O W L E D G E M E N T S

The Career Development Curriculum Guide was developed cooperatively by the following persons:

Olivia H. Calhoun. . . . . .Curriculum Writer
Joyce C. Page. . . . . Assistant Curriculum Writer
George Galloway. . . . . Principal, Evans Junior High School
Marguerite J. Pettigrew. . . . . Principal, Browne Junior High School
Ellen F. Datcher. . . . . .Assistant Director for Junior High Schools

CONSULTANTS

Donald H. Bullock, Ph.D.....Technical Writer.....Catholic University
Effie B. Crockett.....Home Economics.....Howard University
Rose Ann W. Elliott.....Art.....Browne Junior High School
Barbara Gregory.....Home Economics.....Federal City College
Louise C. Iannone.....Guidance.....The American University
Peter J. McCarthy.....Music.....Trinity College
Edna W. McClellan.....Social Studies.....University of Maryland
Martha Mead.....Business Education.....University of Maryland
Mary C. Rodgers, Ph.D.....Language Arts.....D. C. Teachers College
Laura Smith.....Instructional Specialist....Federal City College
Howard S. White.....Science.....McKinley High School
Lynwood F. Williamson....Industrial Arts....Browne Junior High School
Walter M. Young.....Mathematics.....Federal City College

TEACHERS

BROWNE

Annie U. Beard
Elizabeth S. Childs
Rose Ann W. Elliott
Zelmar S. Gordon
Nancy I. Harris
Lillian H. Jones
Roger B. Kyles
Nell M. LaBeach
David A. Lyons
Donald R. Moore
Evangeline S. Moore
Elnora Oxendine
Joseph M. Stills
Lynwood F. Williamson

EVANS

David J. Briles
Izzetta C. Callahan
Geraldine Cooke
Faye M. Dixon
Margaret J. Fenner
Modestine Gaynor
Edna V. Holliday
Jewyll Holliday
Marilyn Levitt
Harold B. Plummer
Harriet L. Richardson
James W. Vaughn

GRADE 7

CAREER CLUSTER MODULE

V

AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

UNITS/TOPICS - 1. Natural Resources
2. Ecology (Pollution and Recycling of Waste)
3. Landscaping
4. Conservation
5. Oceanography

Numbering System

7 = Grade Level
V = Cluster Number
405 = Page Number in Total Series

CAREER DEVELOPMENT CURRICULUM GUIDE: GRADE 7

CLUSTER/MODULE: AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

PURPOSE:

To develop an awareness of how the natural resources play an important role in our daily lives.

To make students aware of the influence of landscaping on the prices of homes and other properties.

To broaden the students' knowledge of exactly what ecology is and its short and long-term effects on people and the environment.

To give the students more knowledge about the role and importance of conservation and to develop a positive attitude about the preservation of natural resources.

To show the students that oceanography provides an additional frontier to aid in plant and animal survival.

SYNOPSIS:

This cluster extends the children's knowledge in agri-business, natural resources, and marine science. It further develops positive attitudes of respect for nature and nature's laws so that man can continue to live comfortably and harmoniously on earth.

It is hoped that through the study of natural resources, ecology, waste disposal, waste recycling, conservation, and oceanography, also landscaping, the student will become aware of some of the careers related to this module.

Since man responds both mentally and physically to his environment, we need to know to what degree technological interference may impede or disrupt nature's self-regulating mechanism -- or, indeed, even threaten our own welfare or survival. The points of interest are: water; land; living, energy, marine and human resources; minerals; animal and other natural resources.

For many years, environmental pollution has been tolerated as a disagreeable, but acceptable, price of progress. Only when confronted in recent years by the irreversible damage of pollution has man

SYNOPSIS -- CONTINUED

begun to become concerned and less tolerant. The collection and disposal of municipal refuse is one of the major problems of American cities. Special disposal problems arise no matter what kind of collection and disposal methods are used. However, much progress has been made. It is felt that the students need to become more knowledgeable about the many methods used in the disposal of waste.

Nearly everything we need to live comfortably comes from a natural resource. Conservation prevents their waste and makes sure of a supply for the future. It is, therefore, necessary that the students know that their very existence depends upon using our natural resources wisely.

With the ever-present threat of a population explosion on earth, man must find avenues of escape. The oceans of the world have presented themselves to be such avenues. Therefore, a knowledge of the habits and ways of life of its various life forms is necessary. Considered in this topic are the following points: how the ocean benefits man; what possibilities the ocean offers in the future of man; careers in oceanography; the land beneath the sea; and, relationship of the moon to the ocean.

The topics in this cluster are:

1. Natural Resources
2. Ecology (pollution and recycling of waste)
3. Landscaping
4. Conservation
5. Oceanography

HIGH IMPACT ACTIVITIES:

1. Visit to MacMillan Water Plant
2. Visit to Nature Center in Rock Creek Park
3. Visits to Luray Caverns, Skyline Drive, and National Zoological Park.
4. Hike through the National Arboretum.
5. Tours to Blue Plains Recycling Plant and the Mount Olivet Incinerator.
6. Tour to Department of Commerce Aquarium.
7. Invite a SCUBA Diver to school to speak at an Assembly.

HIGH IMPACT ACTIVITIES -- CONTINUED

8. Visit to oceanographic centers
   a. National Geographic Society
   b. Naval Academy (Annapolis, Maryland)
   c. Floating Classroom at the Navy Yard.

COMMON RESOURCES:

1. D.C. Public School Film Library
2. National Wildlife Federation
3. Department of the Interior
4. Tennessee Valley Authority
5. D.C. Public Library
6. National Park Service

TECHNICAL TERMS:

Ecology, pollution, conservation, hydroelectric, pollutants, deterioration, oceanography, natural resources, maritime, nautical, aeronautic, aerospace, hydrospace, septic tank, reprocessing, forestry, horticulture, agriculture, agronomy, and filtration

GRADE 7

CAREER CLUSTER MODULE

V

AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

Unit/Topic - 1 - Natural Resources

Topic: Natural Resources

Purpose: To develop an awareness of how the natural resources play an important role in our daily lives.

Main Ideas:

1. Man responds both physically and technically to his environment.
2. Both animal and human life are dependent on natural resources.
3. Technological progress helps to destroy the balance in nature of some of our natural resources.

Individual and Small Group Quests:

1. Trace the origin of some resource back to its original state.
2. Make a chart of the uses of living resources, energy resources, marine resources, or nonfuel minerals and their geographic location.
3. Make a bulletin board on the uses of different natural resources.
4. Find out some of the laws that govern the extraction of natural resources.
5. Find out how water is purified.
6. Research and report on the dependency of animals on some natural resources.

Career Opportunities:

1. Unskilled

   laborer
   maintenance man
   refining and smelting worker

2. Semiskilled

   arborist
   fisherman (commercial)
   florist
   gardener
   lumberjack
   nurseryman
   tree surgeon
   turf manager

Career Opportunities -- Continued

3. Skilled

county agricultural agent
Fish, Game and Wildlife manager
food technologist
game warden
horticulturist
miner
oil driller
parks director
plant physiologist
prospector
range conservationist
soil conservationist

4. Professional

agricultural engineer
botanist
demographer
entomologist
farmer
forester
forestry scientist
geographer
geologist
geophysicist
inorganic chemist
landscape architect
metallurgical engineer
microbiologist
mineralogist
organic chemist
petrologist
rural sociologist
soil scientist
vocational agriculture teacher
zoologist

LANGUAGE ARTS

Purposes:

To appreciate the wealth of natural resources in the United States of America.

To realize that nature's gifts require careful use.

To learn about career opportunities related to resource management.

To develop new proficiency in reading/listening skills.

To enjoy intellectural competition.

To learn about some of the practical things which every citizen can do to preserve our natural resources.

Objectives:

At the conclusion of this unit, students should demonstrate the following behaviors:

1. Speak and write positively and effectively about the rich natural resources of the United States of America.
2. Explain why our natural resources require prudent use.
3. List and explain 5-10 abuses to natural resources; list also the opposite, positive action.
4. Answer fact questions on careers in resource management.
5. Show grade-level competence in speaking/writing skills: show above-grade proficiency in reading/listening modes.
6. Participate in unit tests and activities with identifiable success.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. See and summarize as "film flips" the following films which have been particularly selected to provide information and insights related to the objectives of this unit and of this cluster of units.

   a. America - On the Earth (Encyclopedia Britannica Films, 11 mins.; explains erosion).
   b. America - On the Edge of Abundance (Indiana University, 60 mins.; shows the growth of America from an agricultural base to a manufacturing society; helps children understand why today's natural environment is in trouble).
   c. Animals Unlimited (Films of the Nations, 20 mins.; photographic of animals in South Africa; shows how wildlife enhances man's environment.).
   d. Conservation Road (Films Incorporated, 22 mins.; advocates following balance in nature to preserve resources; examines such resources as land, coal, oil and metals).
   e. Conservation of Natural Resources (Encyclopedia Films, 11 mins.) explains the problem of depletion of forests, effects of wind and water erosion; wastage of mineral resources, and wasteful killing of wildlife; presents plans for preserving natural resources).
   f. Coronet Series in Natural Resources (Coronet Films, all 11 mins.; develops respect for what nature has given man; shows ways of prolonging life of our resource reserves).
   g. The Cry of the Marsh (Bill Snyder Films, 12 mins.; tells what happens when natural marshland is not appreciated as a resource; effects of drainings on total environment).
   h. The Enduring Wilderness (Sterling Educational 28 mins.; Canada's parks; why so much effort is made to preserve lakes and forests unspoiled).
   i. Face of the Earth (Encyclopedia Britannica Films, 11 mins.; erosion and other geological processes in terms appropriate for junior

Activities -- Continued

high students).

j. Heritage of Splendor (Alfred Higgins Productions, 18 mins.; explains the value of scenery as a natural resource and the responsibility of citizens as caretakers).
k. Multiply and Subdue the Earth (Encyclopedia Britannica Films, 67 mins.; examines problems caused by unplanned use of the natural environment).
l. Priceless Water (Washington Suburban Sanitary Commission, 12 mins.; describes value and use of public water supplies).
m. The River (Department of Agriculture, 32 mins.; traces history of Mississippi River; shows how destruction of forests leads to erosion and other evils).
n. Water Bill U.S.A. (Isaac Walton League, 28 mins.; shows why water is a prime natural resource; explains how to prevent waste in water usage).
o. Water Birds (Walt Disney Productions, 32 mins.; how birds adapt to the environment, both giving and receiving benefits).
p. Watermen of the Chesapeake (Bureau of Commercial Fisheries, Interior Department, 28 mins.; shows how a body of water provides rich harvests of clams, oysters, fish).
q. Wild Wings (International Film Bureau, 35 mins.; discusses the habits of wildfowl; shows wildlife as a valuable natural resource).

2. Type up and paste onto colored poster paper all "film flips" produced in this unit. (A film flip is a 50-100 word summary of a film: it is equivalent to a book blurb or a composition précis: it captures the central message of a film presentation in colorful, cryptic English.). Tie-in with Art.

3. Participate in creating a wall display unifying this unit and this cluster. Lettering might announce the entire range of topics for this cluster; then students build the display unit by unit. Film flips will show the range of information included in a study of natural resources, the first unit of the cluster. Tie-in with Art.

Activities -- Continued

4. Present film flips orally to the class. A contest arrangement with appropriate prizes will stimulate and reward effort. Evaluate by applying grade-level standards for speech/ listening activities.

5. Accept challenge of on-the-spot essay contest (in-class writing after key films have been reviewed). Create a personal essay showing appreciation of America's rich natural resources. Suggested title might be "The Land I Love."

6. Following each film, work with the teacher in identifying (inductively) the careers in resource management which are suggested by the film.

7. At an appropriate time in this unit, take a teacher-made objective test to determine accuracy of information on careers discussed in the unit.

8. Cooperate in a series of lessons on "Writing the Research Paper."

9. Individual Quest: Write a two-page research paper with a minimum of three footnotes on a possible career, for example "A Career in Resource Management: Forest Ranger."

10. Do individual library reading from the list of books presented here which are closely related to the objectives and activities organized for this unit:

    a. Atwater, Montgomery. Hank Winton, Smokechaser. Random House, Inc., Order Department, Westminster, Md. 21157, 1956.
    b. Atwater, Montgomery. Trouble Hunters. Random House Inc. See above for address, 1958.
    c. Bauer, Helen, Water: Riches or Ruin. Doubleday & Co. Inc. 501 Franklin Avenue, Garden City, N. Y. 22530; 1959.
    d. Bixby, William. A World You Can Live In. D. McKay Co., 750 3rd Avenue, New York, N. Y. 10017; 1971.
    e. Boy Scouts of America. Forestry. Boy Scouts

Activities -- Continued

of America, New Brunswick, New Jersey. 08906; 1971.

f. Boy Scouts of America. Soil and Water Conservation. Boy Scouts of America, New Brunswick, N. J. 08906; 1959.
g. Boy Scouts of America. Wildlife Management. Boy Scouts of America, See above; 1952.
h. Buehr, Walter. Timber, Farming Our Forests. Wm. Morrow & Co., Inc., 105 Madison Avenue New York, N. Y. 10026; 1960.
i. Colby, Carroll B. Fish & Wildlife. The Story of the Work of the Fish & Wildlife Service. Coward, McCann & Groghegan Inc., 200 Madison Avenue, New York, N. Y. 10016; 1970.
j. Colby, Carroll B. Soil Savers: The Work of the Soil Conservation Service of the U. S. Department of Agriculture. Coward, McCann & Groghegan; 1957.
k. Davies, Delwyn G. Fresh Water: The Precious Resource, Natural History Press, Division of Doubleday, 277 Park Avenue, New York, N. Y. 10017; 1969.
l. Dodd, Ed. Careers for the Seventies: Conservation. Macmillan, subsidiary of Crowell & MacMillan, 866 Third Avenue, New York, N. Y. 10022; 1971.
m. Graham, Ada and Frank. Puffin Island. Cowles Corp., 114 West Illinois Street, Chicago, Illinois 60610; 1971.
n. Green, Ivah. Wildlife in Danger. E. M. Hale Co., 1201 S. Hastings Way, Eau Claire, Wisconsin 54701; 1960.
o. Hannanburg, D. H. Your Future in Forestry. Rosen, Richards Press, Inc., 29 East 21st Street, New York, N. Y. 10010; 1969.
p. Hyde, Wayne. What Does A Forest Ranger Do? Dodd, Mead, & Co., 79 Madison Avenue, New York, N. Y. 10026; 1964.
q. Lauber, Patricia. Dust Bowl: Story of Man on the Great Plains. Coward-McCann & Groghegan Inc.; 1969.
r. Laycock, George. Our Endangered Wildlife. W. Norton and Co. Inc., 55 Fifth Avenue, New York, N. Y. 10003; 1969.
s. Van Dersal, William,R. Land Renewal: The Story of Soil Conservation. Henry Z. Walsh, Inc.,

Activities -- Continued

19 Union Square West, New York, N. Y. 10003; 1968.

11. Write a book blurb on one library reference read for this unit as part of Activity 10.

12. Take an oral English test by presenting the written book blurb to the class.

13. Cooperate in unit culmination, Research Report Day. (Each student prepares a two-minute brief on the research he did; presents to class).

14. Take timed reading tests to determine if any new efficiency was gained from individualized reading program.

15. Respond to written check-up (one question) on book chosen for individual reading.

16. Cooperate with teacher in administration of test on natural resources (home-made instrument).

17. Create a unit summary chart for wall display: include the following data in diagram arrangement on 18" x 24" paper (4 columns): RESOURCE, ABUSE, CREATIVE USE, CAREER.

Materials:

1. Films (see Activity #1 above)
2. Colored poster paper; several sheets per student
3. Paste, scissors, 18" x 24" white paper for summary charts, pins, letters, typewriters
4. Books (see list presented in Activity 10)
5. Prizes for film flip contest
6. Materials (hand-outs) for how to write a research paper with footnotes
7. Prizes for essay contest
8. Teacher made objective test on careers studied
9. Reading tests, standardized, to determine individual efficiency.
10. Evaluation question (one per book) on individualized list
11. Magic markers in various colors
12. Yardsticks, rulers, for individual summary charts

Materials -- Continued

13. Teacher-made test to demonstrate Objective 6.

Notes:

Tie-Ins with Specific Career-Related Skills

Self-confidence through speech activities; self-assurance through writing activities, especially in creative work required by film flips and personal essay. Greater poise through socialization required by this unit; Greater knowledge of careers in resource management; More autonomous behavior - encouraged by independent reading program; Self-discipline - developed via assignments and tests required by this unit; Improved verbal behavior and greater self-direction- encouraged by options presented in working out unit activities.

MATHEMATICS

Purpose: To show the student the ever-increasing usefulness of mathematics in developing our natural resources.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Construct line, bar, and circle graphs.
2. Determine the mean, median, and mode of a given set.
3. Convert decimal and common fractions to a percent, and conversely.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Provide the students with the percent of food fuel, and raw materials produced by Canada, Russia, and the United States. The students are to make picture graphs of the percent of the world's wild animals, fish, oil, coal, metals, stone, and sand that are found in Canada, Russia, and the United States. Ask the Social Studies teacher for this information.
2. Ask the Social Studies teacher to furnish you the information on the number of people employed in the game industry, fish industry, oil industry, coal industry, metal, stone, and sand industries for Canada, Russia, and the United States. The students are to calculate the average number of people employed in these natural resources for each country.
3. Given the data on how much food is needed to feed the world per week and how much food the world produces per week by the Social Studies teacher, determine if Thomas Malthus' Theory is valid against the data presented.
4. Given the information on death rates, deaths by malnutrition, death by tuberculosis,

Activities -- Continued

death by cancer for 10 different countries, both developed and underdeveloped, and the natural resources available in the country by the Social Studies Teacher, make bar and line graphs plotting natural resources against death rates and death rates by malnutrition, tuberculosis, and cancer.

Materials:

References

a. Calhoun, Donald. An Introduction to Social Science, Chicago, Illinois; J. B. Lippincott, Company, 1957.
b. "Natural Resources." The World Book Encyclopedia, 1972, 14, 50.
c. Thomas Malthus (The Malthusian Theory): Population tends to increase faster, at a geometrical ratio, than the means of subsistence, which increases at an arithmetical ratio.

SCIENCE

Purpose: To make pupils aware of the natural resources of the earth and the need for wise consumer use of these resources.

Objectives: Upon completion of this unit, the student should be able to:

1. Identify by picking out and naming six minerals from a rock collection.
2. Describe the refining of a metal from an ore.
3. Describe the process of oil formation.
4. Describe the process of coal formation.
5. Demonstrate the process of distillation of an organic material like wood.
6. Diagram the carbon-oxygen cycle

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Teacher introduction of this topic with the display of rocks and minerals from the Washington region displayed at stations around the room. Use limonite and hematite as iron ores, mica, quartz, granite, and feldspar, schist, sandstone, limestone, and conglomerate. Number each specimen. Place a piece of broken bathroom porcelain tile by each for a streak test. Distribute hand lenses. Instruct pupils to move from station to station observing the appearance and characteristics of the rocks.
2. From the observations which the pupils made develop the idea of rock and mineral classification and identification. Give the names of each kind of numbered rock. List its properties for the identifying feature. Develop the understanding that these are some of our local natural resources.

Activities -- Continued

3. Quest: Report on the public building of D. C. made of sandstone quarried locally (Seneca, Md. and Aquia Creek, Va.)

4. Develop the idea of metamorphic rocks from limestone, sandstone, and granite being turned into marble, quartzite, and schist through heat and pressure. Have pupils learn to use dilute HCl to test for limestone and marble.

5. Develop the concept of sedimentary rocks deposited by water. Explain the bacteriological action in forming bog iron.

6. Give pupils practice quizzes in rock and mineral identification. Have them make rock collections. Use discarded egg cartons as convenient specimen holders. Prepare labels and paste in the lid. Test on identification.

7. Show films describing clay brick making, cinderblock manufacturing, and iron ore refining. See references. Have a team of pupils visit the brick ovens on New York Avenue east of Bladensburg Road and report to the class. Have another team visit the cinder block manufacturing plant at Terra Cotta by the B & O overpass and Riggs Road, Northeast. Report back to the class.

8. Have pupils gather local clays from their neighborhood, work the air out of them, shape them into small bricks, and fire them in the kiln. Tie-in with Art department.

9. Quest: Report on early iron-making in Washington, D.C. by John Foxall.

10. Summarize these activities with the idea that man's technology has developed useful products from natural resources. Develop the further idea that recycling products will conserve natural resources and is becoming more and more necessary.

11. Bring in bottled samples of petroleum products: gasoline (high and low octane), kerosene,

Activities -- Continued

fuel oil, light motor oil, heavy motor oil, vasoline, and paraffin. Test each one for its specific gravity with a hydrometer. Ask the questions: Where did these come from originally? How were they separated?

12. Divide the class into teams; each team is to report on one topic:

    a. formation of oil
    b. oil well drilling
    c. refining oil
    d. fractional distillation
    e. oil pipe lines
    f. off-shore oil.

13. Prepare a team of pupils to demonstrate the principle of distillation using a less flammable organic product like wood. Use broken wood splints in a test tube fitted with a one-hole rubber stopper and glass condenser tube. Collect the tars that come off. Try to burn the gas that escapes. Use this illustration of distillation to help explain petroleum refining and coal tar production.

14. From pupils' study of rocks and minerals select coal for further study. Assign reports on the geological history of the formation of coal. Report on life and fossils of the Pennsylvania period. Report on fossils associated with coal formation. Make fossils by making imprints in modeling clay (a leaf, snail shell, etc.) and then cast it in plaster of Paris.

15. Research and summarize man's natural organic resource in a diagram of the carbon-oxygen cycle showing the uses of oxygen, carbon, and carbon dioxide.

Materials:

1. Rocks and mineral samples, pieces of procelain tile
2. Hydrometer
3. Plaster of Paris
4. Films (free)
    a. "Raw Materials of Steelmaking", American Iron

Materials -- Continued

and Steel Institute, 1000 - 16th Street, N. W., Washington, D. C. 20036.

from Twining School (D.C.)

b. #1587 Geological History of the Grand Canyon. C, 11 min. I-S.
c. #976 Treasures of the Earth, B. 11 min., I.
d. #719 Prehistoric Times - The World Before Man. B, 11 min., S.
e. #917 Minerals and Rocks - Stones of the Earth, Cm 16 min, I-S.
f. #398 Oil Today - Power Tomorrow C, 16 min., I-S.
g. #1741 Rocks that Originate Underground B, 23 min. S.
h. #1542 Rocks that Form on the Earth's Surface B, 16 min. I-S.

5. References

a. Berry, James. Exploring Crystals. London: Crowell-Collier Press, 1969.
b. Clarke, Mary Stetson. The Iron Peacock, New York: The Viking Press, 1966.
c. Comfort, Iris Tracy. Earth Treasures: Rocks and Minerals: Englewood Cliffs, New Jersey: Prentice-Hall, Inc. 1964.
d. Cosgrove, Margaret. Plants in Time, New York, Dodd, Mead and Company, 1967.
e. Fenton, Carroll Lane and Mildred A. Riches From the Earth, New York: The John Day Co., 1953.
f. Flaherty, John J. Flowing Gold: The Romance of Oil, Philadelphia: J. B. Lippincott Company, 1957.
g. Gallant, Roy A. Exploring Under the Earth, Garden City, New York: Garden City Books, 1960.
h. Grice, Frederick. Out of the Mines; the Story of a Pit Boy, New York: Franklin Watts, Inc. 1960.
i. Lewis, Alfred. The New World of Petroleum, New York: Dodd, Mead & Company, 1966.
j. Matthews, William H. III. Exploring the World of Fossils, Chicago; Childrens Press, 1964.
k. Newcomb, Ellsworth and Kenny, H. Miracle Metals, New York: G. P. Putnam's Sons, 1962.
l. Place, Marian T. Our Earth: Geology and Geologists, New York: G. P. Putnam's Sons, 1961.
m. Schackne, Stewart and Drake, N. D. Oil for the World, New York: Harper and Brothers Pub., 1960.

Materials -- Continued

n. Shepherd, Walter. Wealth from the Ground, New York, The John Day Company 1962.
o. Williams, Helen L. Stories in Rocks, New York: Henry Holt and Company, 1948.
p. Zim, Herbert S. & Shaffer, P. R. Rocks and Minerals, New York: Golden Press, 1957.

SOCIAL STUDIES

Purpose: To develop an awareness of the role played by natural resources in our daily lives.

Objectives: Upon completion of work in this unit, the student should be able to:

1. State the origin, meaning, and importance of natural resources.

2. Identify various categories of natural resources, especially in the Washington area, and describe the relationship of these resources to their daily lives.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Discuss the meanings of natural and resource and write a comprehensive definition of the term "Natural Resource." Tie-in with Language Arts.

2. Group Quests: Research the origin of the most important natural resources in the United States. Report on 1) soil (varieties, location and use); 2) minerals; 3) water; 4) forests; and, 5) wildlife.

3. Quest: List, define, and explain the uses of selected raw materials vital to the United States and make a chart showing the percentage of those which are domestic and those which have to be imported. Tie-in with Mathematics.

4. Quest: Research and discuss how the resources of the District of Columbia area are utilized in products for consumer use.

5. Quest: Keep a diary explaining how they use natural resources in their daily lives. Clippings from periodicals can further illustrate and dramatize their stories.

6. Resource person: Invite a representative of the various utilities serving Washington, D. C. to

Activities -- Continued

explain how resources are developed for consumer use.

7. Individual Quest: Research and report to the class on "What is Happening to Coal".

8. Individual Quest: Research and report on scarce resources of the United States and what is being done to find alternates or substitutes.

9. Research and discuss why natural resources are vital to human and wildlife survival Discuss resources under the following categories: 1. water, 2. land, 3. living resources, 4. energy resources, 5. marine resources.

10. Individual or Group Quest: Research and report on the previous categories in their use for recreational purposes. Make charts or drawings illustrating such uses. Tie-in with Art.

11. Arrange for class participation in the annual spring tour to observe nature along the C. and O. Canal.

12. Visit any of the following sites: The MacMillan Water Plant, Nature Center in Rock Creek Park, National Arboretum, Luray Caverns, Great Falls, etc. Take notes and discuss after each trip. Special attention should be paid to the types of jobs observed.

13. Resource person: Invite a representative from selected governmental agencies to discuss their role in controlling the wise use of selected natural resources. Example: Agriculture Department.

14. Group Quest: Make a bulletin board display of natural resources in the United States. Tie-in with Art.

15. Group Quest: Draw or make a papier maché map of the United States and designate the most economically important natural resources for each state.

Activities -- Continued

16. Research and report on the high correlation between levels of living and the use and sometimes abuse or ignorance of natural resources. An example would be contrast and comparison of a nation that has experienced technological growth with one that has not, and relationship between technology/industrialization and pollution.

17. Research, report, and discuss how wildlife depends on nature for survival. Display pictures or drawings of those that are becoming extinct and state why.

18. Quest: Send soil samples to the Department of Agriculture for analysis and suggestions for improving its quality. Research why and how soil quality is or has been diminished.

19. Visit the Smithsonian Institute to view the display of natural resources here and in other parts of the world. Take notes for discussion.

20. Resource person: Seek the aid of the science teacher in demonstrating how water is purified.

21. Prepare bulletin board display or exhibit showing the many by-products of natural resources. Example: coal tar, wood pulp, nylon, rayon.

22. Individual Quest: Make a scrapbook illustrating job opportunities related to the area of natural resources and indicate the ones which he or she would be interested in pursuing. Example: Forest Ranger, horticulturist.

23. Individual Quest: Research, report and discuss the dependency of one animal on adequate natural resources.

24. Have students collect pictures to indicate the uses of wood. Important categories for other resources could be designed for a similar study. Contrast this with a manufactured substance, e. g., plastic and its equivalent uses.

Activities -- Continued

25. Quest: Have students study relationships between countries as a function of the exchange of natural resources for manufactured goods.

Materials:

1. Map of the United States, charts, art paper
2. Handout on the uses of wood. Its value in the following areas might be explored:
   a. Housing
   b. Transportation
   c. Communication
   d. Clothing
   e. Energy

BUSINESS EDUCATION

Purpose:

To give students an opportunity to explore the relationships between technology and natural resources within our capitalistic society.

To give students an opportunity to explore in a simplified fashion the concept of wants versus scarcity within our American enterprise system.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. Define in writing or select from a multiple choice question format terms that relate to the economic concept of unlimited wants versus limited resources.

2. Select a natural resource of individual interest and submit a written report on it containing different sections as outlined by instructor. This report would emphasize a specific natural resource and its relationship to technology, the community, business and industry, etc.

3. List a minimum number of natural resources found in the Metropolitan area and relate in writing or outline form how technology assimilated one such resource.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Teacher-led discussion of wants versus scarcity. The teacher might use some of the following questions:

   a. What would you get if you could have everything in the world you wanted?
   b. Is it possible to satisfy all our wants?
   c. Can we classify wants into groups? Basic needs vs. luxuries.
   d. What are the different kinds of resources?

   Tie-in with reading assignment, short quiz.

Activities -- Continued

2. Teacher-led discussion of the different types of natural resources, marine resources, nonfuel minerals, etc., and make a bulletin board comprised of lists so that the student can select a specific resource to use in his student report.

3. Individual Quest: Have student select a natural resource and report on how technology has affected its supply.

4. Have students research and discuss the different natural resources found within Washington, D. C. Have panel groups discuss such topics as source of water supply, power, and fuel, building materials. Contrast these with resources that must be imported.

5. Discuss "land as a natural resource and as a factor of production important in urban economic development". Tie-in with Social Studies.

Materials:

1. Books
   a. Crabbe, Ernest, Enterline, Herman, and DeBrum. General Business. New Rochelle, N. Y. South-Western Publishing Company, 1962. (Unit 1 "You live in a Business World".)
   b. Daughtrey, A. S. Methods of Business and Economic Education. South-Western Publishing Co., 1965. (Chapter 8 "General Business" and chapter 13 "Economic Geography".) Teacher source.
2. Pamphlets
   a. Boylan, Myles. "Economics of the Community". Curriculum Resources Institute, Series Booklet #4. Minneapolis: 1961. pp. 28-83.
   b. "The Eight Precious Metals". The International Nikel Co. 67 Wall Street, N. Y., N. Y. 10005.
   c. "What Goes into a Ton of Paper?" Nekoosa-Edwards Paper Co. Port Edwards, Wisconsin 54469.
   d. "Oil Industry Teaching Aids". American Petroleum Institute 50 West 50th St., N. Y., N. Y. 10020.
   e. "Conservation and Use of Natural Resources".

Materials -- Continued

Chamber of Commerce of the U. S.

3. Films
   a. "Productivity: Key to America's Economic Growth". MP-S-16 mm. 28 min. Rent. Sutherland Educational Films, Inc. 201 N. Occidential Blvd. Los Angeles, Calif. 90026.
   b. "Raw Materials of Steelmaking". FS-Si-35 mm. 43 frames color. Free. American Iron and Steel Institute, Teaching Aids Distribution Center, 150 East 42nd St., N. Y., N. Y. 10017.

INDUSTRIAL ARTS

Purpose:

To show that nearly everything we need to live in comfort comes from a natural resource.

To show the modern technology required in processing natural resources and the inherent career opportunities.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. Identify the natural resources needed to provide food, clothing, and shelter.
2. Identify some of the tools used to improve living conditions, and the natural resource(s) for which each may be used.
3. Identify some careers related to natural resources.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Write a paper comparing early Americans, the Indians, with present-day Americans in methods used to provide food, shelter, and clothing. Tie-in with Language Arts.
2. Build a layout showing some of the natural resources needed to provide food, clothing, and shelter.
3. Make a plyboard replica of the United States. Then view films of natural resources in various states and place reproductions of these resources in their proper geographic location on the map.
4. View films and list some of the career opportunities observed.
5. Write a 200-word essay on "How Modern Technological Processing of Natural Resources Has Changed Our Standard of Living". Tie-in with Language Arts.

Materials:

1. Imitation grass, tools for carving, strips of metal for oil rigs, derricks, etc., modeling clay, small strips of wood for house and barn construction, imitation trees, animals, and plywood.
2. Films
   a. "Nevada and Its Natural Resources: (Rev. 1967(16mm. Sound 31 min. Color.
      This film gives a panoramic view of mining and processing of minerals, agriculture, irrigation, dairying, poultry and cattle raising, land reclamation, scenic attractions, educational institutions, historic sites and leading cities.
   b. "Oregon and Its Natural Resources" (Rev. 1970) 16 mm Sound 27 min. Color.
      This film shows the natural resources of the State. It includes scenes of gold dredging, mining of silver, copper, lead, zinc, manganese, magnesite, obsidian, alumina and basalt. It also includes glimpses of the lumbering and agriculture of the state as well as the commercial fisheries.

   Book the above films at least two weeks in advance; borrower pays return postage. Available from: United States Department of the Interior, Bureau of Mines, Motion Pictures, 4800 Forbes Arenue, Pittsburgh, Pennsylvania, 15213.

   c. "New York State Profile -- Farm and Forest" (1962) 16 mm Sound 30 min.
      This film discloses New York's agricultural might and the variety of its many "first" in food growing and processing, from cheese and onions to seafood.
   d. "New York State Profile -- The Face of Empire" (1962) 16 mm Sound 29 min.
      This film presents an overview of New York state's physical geography and resources, revealing the magnificence of its waters for both transportation and power, from Sandy Hook to Niagara and the St. Lawrence.

   Book the two films above four months in advance; pay return postage. Available from: New York State Department of Commerce, Film Library, West Mall Plaza, 845 Central Avenue, Albany, New York 12206.

GRADE 7

CAREER CLUSTER MODULE

V

AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

Unit/Topic - 2 - Ecology (Pollution and Recycling of Waste)

Topic: Ecology (Pollution and recyclying of waste)

Purpose: To broaden the students' knowledge of exactly what pollution is and its effect on people and the environment.

To learn about the disposal and re-use of some waste materials.

Main Ideas:
1. Technological progress has favorably and unfavorably affected the environment.
2. A natural ecological balance is vital to man's survival.

Individual and Small Group Quests:

1. Make posters on pollution prevention to be placed in the school and your neighborhood.
2. Research the effect of pollution on humans and wildlife.
3. Report how waste is chemically disposed on airplanes, buses, and trains.
4. Obtain information on "Operation Ecology" program from Canada Dry Corporation, Waltham, Massachusetts (recycling glass and metal containers).
5. Cite some of the statutes passed by state and federal legislatures concerning the protection of the environment.

Career Opportunities:

1. Unskilled

county waste disposal worker
greenskeeper
laborer
fish farms and game preserves worker
sewage-plant helper

2. Semiskilled

maintenance man
porter
recreation worker
sanitarian aide
sanitation truck driver
scout leaders

Career Opportunities -- Continued

3. Skilled

community planner
farm manager
forest ranger
gamekeeper
health officer
parks director
recreational director
sanitation technician
sewage-plant operator
waste water treatment technician
water filtration superintendent

4. Professional

botanist
chemical engineer
chemist
ecologist
farmer
forester
geologist
geophysicist
hydrologist
life scientist
microbiologist
pathologist
plant scientist
public health nurse
sanitary engineer

LANGUAGE ARTS

Purposes:

To deepen appreciation for the wealth of natural resources found in the U.S.A.

To understand "balance in nature" and how it is maintained.

To learn both the positive and negative ways man can effect ecological changes.

To develop improved verbal skills.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. Discuss America's wealth of natural resources.
2. Give a scientific explanation for "ecological balance."
3. List careers that can make a difference in preserving a healthful natural environment.
4. List activities for every citizen to help prevent pollution.
5. Perform the four verbal art skills at grade level or beyond.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Enter class slogan contest: write a clever "Pollution Prevento."
2. Help create a class booklet, "Films We Found Helpful." (Writeups on films seen in this unit can be typed and duplicated and preserved for use with other classes in other years).
3. Participate in producing class booklet containing reports of books on ecology read during this unit. A title might be "Our Library Libretto on Ecology." Appropriate illustrations (drawing or cut-and-paste work should be encouraged).

Activities -- Continued

4. Make individual cassette programs: "Careers that Make a Difference in Ecology" (Data are gathered from films and books listed for this unit).

5. Take listening tests on the day "Careers in Ecology" cassettes are presented to the group.

6. Work with the teacher in understanding elements of an effective slogan, brevity, pith, focus, literary language.

7. See films listed here to gather information and to achieve overall objectives designed for this unit:

   a. A Carnival of Ugly (Mass Media Associates, Inc., 28 min., presents today's major environmental problems: air pollution, water pollution, slums, erosion, litter.
   b. Environmental Health: Water, 15 min., calls attention to the crisis in the world's water supply created by increased demand and by pollution.
   c. Let's Keep America Beautiful (Keep American Beautiful, Inc. 14 min., dramatizes the damage done by litterbugs; contrasts the evil of littering against the background of America's loveliest landscapes.
   d. National Arboretum (U.S. Department of Agriculture, 14 min., shows how cultivating nature's greenery can offset confusion and dirt of city living.
   e. Nature's Birds of Prey (Norwood Films, 30 min., explains the ecological role of birds.
   f. Nature's Plan (Encyclopedia Britannica Films, 17 min., tells how nature's water cycle provides all living things with required moisture.
   g. Rainbow Valley (Focal Films, U.S. Department of Interior, 21 min., discusses conservation and trout fishing in Montana.
   h. The Redwoods (Sterling Educational Films, 20 min., presents the vanishing Sequoia; contrasts nature's power to create and man's power to destroy.
   i. River of Grass (A/V Explorations, 25 min., show man's encroachment on the Everglades and nature's effort to maintain balance there.
   j. The Third Pollution (Stuart-Findley, Inc., 23 min., explains principles of solid waste management; shows how refuse, garbage, and other solid wastes can be disposed of economically without producing air pollution.

Activities -- Continued

k. Waters of Yosemite (Pyramid Film Producers, 9 min.; gives a brief view of streams and pools in this National Park: shows how glorious unpolluted nature can be.
l. Who Killed Lake Erie? (NBC Educational Enterprises, 51 min.: shows how pollutants change the chemical composition of water and destroy the delicate balance of plant and animal life.
m. Wildlife of the Rocky Mountains (National Film Board of Canada, 9 min.; shows animals and birds living in the Rockies; affirms the positive value of preserving our natural resources.)
n. The Wood Duck's World (Mr. J.W. Wilkie, Continental Machines, 3).: Explores the balance of nature and shows how this balance must be preserved.

8. Take informal composition tests to rate grade level of performance.

9. Take standardized reading tests to determine G score of each student in the class.

10. Take teacher-made test on content specified for this unit. This should include matching the following words with their definitions:

acidic	life cycle
alkaline	literary diction
aphorism	motto
axiom	nature's pyramid
bird of prey	pollutant
cliché	proverb
dictum	slogan
ecological	spoilage
fertilizer	truism
fish hatchery	

11. Do individual quest reading and report on one of the books listed here:

a. Aglesworth, Thomas G. This Vital Air, This Vital Water: Man's Environmental Crisis. Rand McNally, 1968.
b. Bethel, Mary. How to Live in Our Polluted World. Pyramid Publishers Inc., 1969.

Activities -- Continued

c. Chandler, T.J. The Air Around Us: Man Looks at His Atmosphere. Doubleday, 1969.
d. Darling, Lois and Louis. A Place in the Sun: Ecology and the Living World. Morrow, 1968.
e. Dobrin, Arnold. Marshes and Marsh Life. Coward-McCann, 1969.
f. Halary, D.C. Now or Never: Today's Pollution - Tomorrow's Tragedy. Four Birds Press, 1970.
g. George J. Who Really Killed Cock Robin? Dutton, 1971.
h. Heady, E.B. High Meadow: The Ecology of a Mountain Meadow. Grosset & Dunlap, 1970.
i. Hilton, Suzanne, How Do They Get Rid Of It? Westminster Press, 1970.
j. Hirsch, S. Carl. Guardians Of Tomorrow: Pioneers in Ecology. Viking, 1966.
k. Hirsch, S. Carl. The Living Community: A Venture Into Ecology. Viking, 1966.
l. Hungerford, Harold. Ecology: The Circle of Life. Children's Press, 1971.
m. Jones, Claire. Pollution: The Land We Live On. Lerner Publications, 1971.
n. Jones, Claire. Pollution: The Air We Breathe. Lerner Publications, 1971.
o. Jones, Claire. Pollution: The Waters of the Earth. Lerner Publications, 1971.
p. McCoy, Joseph J. Shadows Over The Land. Seabury Press, 1970.
q. Nickelsburg, Janet. Ecology: Habitats, Niches, and Food Chains. J.P. Lippincott Co., 1969.
r. Pond, Alonzo. Survival In Sun and Sand. Norton, 1969.
s. Pringle, Laurence. The Only Earth We Have. Macmillan, 1969.
t. Raskin, Edith. The Pyramid of Living Things. McGraw-Hill, 1967.
u. Shuttlesworth, D.C. Clean Air, Sparkling Water: The Fight Against Pollution. Doubleday, 1968.
v. Stevens, Leonard A. How A Law is Made: The Story of a Bill Against Air Pollution. Crowell, 1970.
w. Stoutenberg, Adrien. Animals At Bay: Rare and Rescued American Wildlife. Doubleday, 1968.
x. Stoutenberg. Out There. Viking, 1971.

Activities -- Continued

12. Mount and display "Pollution Preventos." (Use wall space organized for this entire cluster).

13. Participate in book report forum: each student reviews his book for the class, showing how it relates to the theme of this unit.

Materials:

1. Colored paper for mounting "Pollution Prevento" slogans
2. Ditto masters for Films booklet and Library Libretto
3. Typewriters, production materials for booklets
4. Blank cassettes for "Careers That Made a Difference" day.
5. Teacher-made tests in language arts: listening, speaking, writing
6. Standardized tests to measure reading skill.
7. Handout for development lesson on writing effective slogans.
8. Films listed in Activity #7.
9. Prizes for Pollution Prevento contest
10. Books listed in Activity #11 above
11. Teacher-made unit test covering content and common experiences planned for this unit.

Notes:

Tie-Ins with Specific Career-Related Skills

Self-assurance through increased knowledge; verbal astuteness; social know-how (group activities); more positive general attitudes.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Ecology

MATHEMATICS

Purpose: To help students gain an understanding of the role of mathematics in determining "acceptable" and "destructive" aspects of pollution.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Solve simple equations.
2. Add, subtract, multiply and divide whole numbers, common and decimal fractions.
3. Convert decimal and common fractions with denominations of 10 or 100 to percent.
4. Convert a common fraction to a percent, and conversely.
5. Name the decimal and percent equivalent of frequently used common fractions, and conversely.
6. Find the missing element in a percentage problem using either the factor-product or the proportion method.
7. Interpret line, bar, and circle graphs.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Make a chart indicating the temperature ranges (in Fahrenheit) of some species of bacteria given as follows:

   Species of bacteria

   mesophiles - temperature range 20° C to 45° C will allow the bacteria to live
   psychophiles - temperature range 10° C to -8° C will allow the bacteria to live.
   thermophiles - temperature range 50° C to 75° C will allow the bacteria to live.

   The students must convert the temperature boundaries using the following formula: F - Fahrenheit temperature; C - Centrigrade temperature;

   $$F = \frac{9}{5} \cdot C + 32$$

   Tie-in with Science.

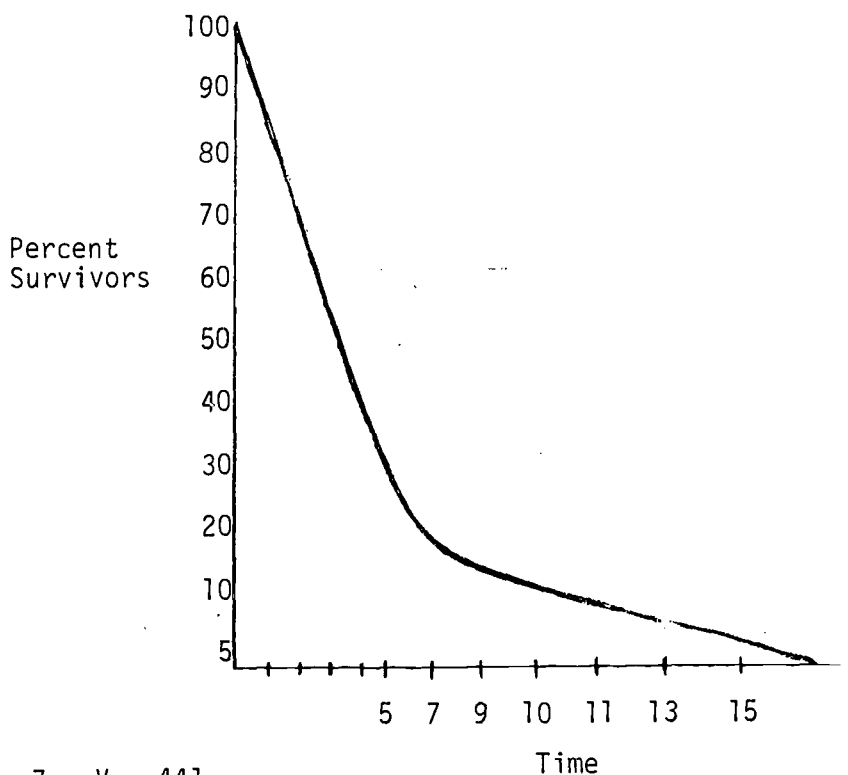
Activities -- Continued

2. Find the highest and lowest temperature of the Potomac River in order to determine what species of bacteria above can survive in the water. Tie-in with Science.

3. Assuming that each species of bacteria doubles in number per minute when in the temperature ranges and dies off at half per minute when out of the temperature range, the teacher is to make up several problems for the students based on calculating the amount of bacteria after a given number of minutes. Tie-in with Science.

4. Calculate the percent of air pollutants resulting from motor vehicles, factories, electric power plants, furnaces, and burning of wastes which contribute, respectively, 100 million tons, 28 million tons, 19 million tons, 11 million tons, and 4 1/2 million tons of pollutants to the air annually.

5. Use the graph below to determine what percent of bacteria remains after X minutes when treated with a lethal agent.



Activities -- Continued

6. The teacher should teach a unit on scientific notation to assist the students in understanding pollution count.

Materials:

1. "Pollution, Air." The World Book Encyclopedia, 1972, 1, 185-7.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Ecology

SCIENCE

Purpose: To gain an understanding of our water supply and rivers as important parts of the ecology of our area.

To help realize the essential natural resource that is water.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Describe flow chart components of the water cycle.
2. Demonstrate the presence of minerals in water.
3. List some of the pollutants man adds to natural rivers and lakes.
4. Describe ways of minimizing these additional pollutants that man adds.
5. List several important ways in which water can be conserved.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Introduce this unit by having three common forms of water on display on the lab table: ice, liquid, and a steaming boiling flask. Ask pupils what must be done to convert each form of the water into another form. Demonstrate evaporation from the boiling flask and condensation in the steam cloud by holding an ice tray in the clear hot vapor area to see drops of water form on it and drip to the table top. Explain that this is part of the cycle that water goes through between earth, river, and atmosphere.
2. Ask the questions: Can evaporation take place without boiling? Are living things involved in the water cycle? Have pupils suggest experiment to answer these two questions. They should come up with the idea of placing half petri dishes of water at different parts of the room, on the outside windowsill, in shade, and in the sun and timing and measuring the evaporation. For living things: have pupils place a small geranium plant under a bell jar in the sun. Cover the bottom of the pot with

Activities -- Continued

a plastic bag and tie the top around the plant's stem. A piece of cobalt chloride paper inside the bell jar is a good indicator of developing moisture (transpiration from the plant). Let the pupils hypothesize this before giving them the term. Have pupils breathe on a glass to see condensation from the water vapor of their breath. Remind them of seeing this condensed vapor on a frosty morning. Diagram and develop the full water cycle. Pupils copy and label it. Briefly teach the use of water in photosynthesis as a raw material.

3. Use the interrelationships of the water cycle to introduce the larger interrelationships of ecology; the interactions of organisms with each other and with their environment. Cite examples.

4. Develop the idea of an ecosystem as being a self-contained "Garden of Eden" where materials are recycled and life goes on for generations - changing yet flourishing. Point out that water is one of the essential physical factors of any ecosystem.

5. Diagram a lake ecosystem with its components to give pupils the idea. Develop the idea that water pollution is one of the main deterrents to the normal function of an ecosystem. List the additions to lake and river water that pollute. Have pupils take phosphate detergent, add it to water in test tubes; test for acid or base with litmus, then add alum to precipitate the phosphate. Have pupils take lime water and bubble carbon dioxide from their breath into it to precipitate the calcium oxide. Ask the question, How do such minerals get into water? How have we removed them? Do you see a proof of carbon dioxide coming from the animal kingdom in the carbon-oxygen cycle? List other minerals in water that it might be desirable to get rid of (nitrates and mercury salts).

6. Discuss with pupils what happens to our city water used in homes and businesses. Introduce the sewage treatment as an essential step to cleaning water before returning it to the river. Have pupils

Activities -- Continued

diagram the steps in sewage treatment. Tie-in with Social Studies.

7. Show the filmstrip "Phosphates and The Environment" free from Proctor & Gamble (see Materials, below). Analyze with the class the phosphate and sewage experiment shown in the film very carefully. Is it valid?

8. Introduce the term eutrophication. Develop this idea and the damage to aquatic life through the drain on the supply of oxygen in the water.

9. Quest: Visit the Potomac River at Great Falls, at Haines Point and below Blue Plains and take samples of water for each place. Compare them for turbidity and odor. Try precipitation tests with powdered alum and carbon dioxide. Test with litmus for alkalinity and acidity.

10. Discuss the need for larger sewage treatment facilities and constructive uses of sludge and nutrients in city waste water.

11. Demonstrate a slowly dripping faucet. How much water does it waste per hour? How much per 24 hours? How many slow water drips and leaks are there in our school? in our community? How much water does the entire District waste this way each day? What is its cost in man-hours and in dollars and cents? This is a good exercise in multiplying to find volumes and converting volumes to dollars and cents and man-hours of labor. Tie-in with Mathematics.

12. Quest: Research the questions: What is the D.C. Corps of Engineers projection on water use this summer? On water use for next year? How does this compare with the capacity of the Potomac River and of our reservoirs?

13. Quest: Research the question: What progress has been made to obtain fresh water from salt water (de-salinization)?

Activities -- Continued

14. Sum up this unit with re-emphasis of the vital role of the water cycle (hydrologic cycle) in ecology.

Materials:

1. Ice cubes and trays
2. Bell jar
3. Small potted plant
4. Alum
5. Phosphate detergent
6. Graduated cylinder
7. Films (free)
   a. "Phosphate and the Environment" w/Teachers Guide and pupil handout sheets, from Public Information Department, The Proctor & Gamble Company, P.O. Box 599, Cincinnati, Ohio 45201.

      from Twining AV Center (D.C.)

   b. #567 Water Cycle, The. B, 11 min., I-S
   c. #1867 Water for the City, B, 11 min., P-I
   d. #569 Water in the Air, B, 11 min., I
   e. #1055 Rivers B, 10 min., P-I

      from D.C. Public Library

   f. Teamwork on the Potomac. Stuart Findley, 1964, 29 min. C jh-a.
   g. Importance of Rivers, AV-ED, 1959, 11 min. C, jh-a.
8. References:
   a. Archer, Sellers G. Rain, Rivers, and Reservoirs, New York: Coward-McCann, Inc. 1963.
   b. Bronson, Wilfrid S. Children of the Sea, New York: Harcourt, Brace and Company, 1940.
   c. Buehr, Walter. Water: Our Vital Need, New York: William Morrow and Company, 1967.
   d. Darling, Lois and Louis. A Place in the Sun, New York: William Morrow and Company, 1968.
   e. Dobrin, Arnold. Marshes and Marsh Life, New York: Coward-McCann, 1969.
   f. Helfman, Elizabeth S. Rivers and Watersheds in America's Future, New York: David McKay Company, Inc. 1965.
   g. Raskin, Edith. The Pyramid of Living Things, New York: McGraw-Hill Company, 1967.

Materials -- Continued

h. Shuttlesworth, Dorothy E. Clean Air-Sparkling Water, Garden City: Doubleday and Company, Inc., 1968.
i. Woodbury, David O. Fresh Water from Salty Seas, New York: Dodd, Mead, & Company, 1967.

SOCIAL STUDIES

Purpose: To develop an awareness of man's relationship to his sociophysical environment.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Identify and classify the types of pollution which threaten animal and plant existence.
2. Explain some of the dangers of environmental pollution.
3. Determine and evaluate what is being done to combat the threats to man's existence and to discover how each individual can share this responsibility.
4. List some of the many job opportunities related to this problem.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Teacher-led discussion of man's dependence on nature for survival. Have students define the essentials for life on this planet (air, water, food, shelter, and warmth). Tie-in with Science.
2. Form a committee to research, report, and discuss with the class the characteristics and causes of the ecological crisis. The categories will include: air, water, noise, solid waste, radiation, and pesticides. Find or draw pictures illustrating these conditions. Tie-in with Science.
3. Determine how man's job, home, and community are affected by environmental conditions and make charts and posters to show this relationship.

   Example:
   1. job - occupational hazards which threaten health
   2. home - use of defective consumer products
   3. community - threat from air, water, land use, noise, traffic, and public health conditions brought about by overcrowding and urbanization.

Activities -- Continued

4. Quest: Study population trends and discuss the effects of expanding population growth on man's chance for survival. Tie-in with Mathematics.

5. Research and report on what happens when there is a temperature inversion.

   a. How did London solve the problem?
   b. What happened in Birmingham when the crisis arose?

   Tie-in with Science: smog, carbon monoxide, toxic fuels.

6. Quest: Discuss the question: "Is it really 'America the Beautiful'?" Key points: billboard signs, deteriorating inner city slums, abandoned cars, urban-suburban sprawl, traffic problems, trash, rats, noise. Find pictures to illustrate these conditions.

7. Quest: Research and report on the causes and effects of Black Lung Disease. Tie-in with Science.

8. Quest: Write a report on pesticides as an environmental hazard. Tie-in with Science.

9. Resource Persons: Invite the science teacher to discuss thermal pollution with the class; invite a physician to discuss the diseases caused by environmental pollution, e.g., bronchitis, emphysema, lung cancer, salmonellosis.

10. Quest: Research and report on what happens to marine and plant life whenever there is an "oil spill." Tie-in with Science.

11. Quests: Research and discuss what happens when man attempts to strike a balance between his desires and preserving a natural balance. Consider the following conflicting situations:

Activities -- Continued

a. lumber for homes vs. preserving forests for ecological balance.
b. rivers as dumping places for waste of commerce and trade vs. clean rivers for fishing and recreation and wildlife preservation.
c. modern technology for better living conditions vs. fresh air.
d. the desire for raw materials to create products vs. open spaces for beauty and recreation.

Is man willing to make the sacrifice? What has happened to the "beautiful Potomac?"

12. Quest: Write the Washington Star for copies of "The Murky Business of Cleaning the Waters" (editorial, Sunday, March 26, 1972) and report to class findings for discussion and analysis. Have there been changes since this editorial was written?

13. Quest: Make a scrapbook on cartoons, letters to the editor and other materials on pollution. Clip or draw the cartoons. Tie-in with Language Arts, Art.

14. Research and report on the role of the Department of Health, Education and Welfare in the prevention and control of air pollution. Send for the booklet: "The Federal Air Pollution Program." Division of Air Pollution, U.S. Department of Health Education and Welfare, Washington, D.C. 20201. Ask also for "Programs for Community Development" which explains how communities can prevent and control pollution.

15. Survey the areas in your neighborhood and around your school and list some of the signs of deterioration and decay and offer suggestions for improvement. Also indicate what can be done individually to aid in this effort. NOTE: A "Shutterbug" can photograph evidence for class inspection, comment, and action where possible. Tie-in with Language and Graphic Art.

16. Write a letter to "Action Line", The Washington Star for help in securing removal of debris and correcting other conditions which mar the neighborhoods.

Activities -- Continued

17. Discuss "Freeways and Parking Lots vs. Mass Transportation: Arguments for and Against." Note specifically the debate over the Three Sisters Bridge and the North Central Freeway. Which side should prevail? Why?

18. Research, report and discuss with the class "Disposal of Waste in the District of Columbia and Its Effect on the Environment." Why does control of this source of pollution require inter-urban, and in some cases, interstate cooperation? What new techniques are being considered for waste disposal?

19. Resource Person: Invite a representative of PEPCO to explain how the company disposes of its waste. Have class discuss adequacy of waste disposal.

20. Plan an anti-pollution campaign with speakers, parade, posters, etc. Culminate this activity with an assembly program for the entire school.

21. List some of the many career opportunities in the field of ecology.

Materials:

1. Film:
   a. "Air Pollution: Take a Deep Breath." McGraw-Hill Contemporary Films, 330 W. 42nd St. New York, New York 10036. 54 min., Color, Rental fee: $35.00
2. Articles and Pamphlets:
   a. "Air Pollution." (Life Reprint, February 7, 1969.) Life Ed. Reprint Program. Box 834 Radio City Post Office, New York, New York 10019.
   b. "Air Pollution Created by Aircraft Jet Engine Emissions." Joint Hearing of Commerce Committee and the Subcommittee on Air and Water Pollution of the Committee on Public Works, United States Senate. 91st Congress, 2nd Session, February 4, 1970, U.S. Government Printing Office, Washington, D.C. 20402, Serial No. 91-85.

Materials -- Continued

c. Ashbaugh, Bryon and Beuschlan, Mureil. Things to Do in Science and Conservation, Danville, Maryland: The Interstate Printers and Publishers, Incorporated, 1960. Library of Congress Catalog Card 60-14456.

d. Becker, Henry F. Resources for Tomorrow, New York, New York: Rinehart and Winston, Incorporated, 1964

e. "Congregation of Vapors" (facts and issues), League of Women Voters of the United States, 1730 M Street, NW, Washington D.C. 20036, Pub. #393, 35¢ per copy, 10 copies $2.80. This is an excellent resource.

f. "Environmental Quality", The First Annual Report of the Council on Environmental Quality, Transmitted to Congress August 1970. See also Chapter 4: "Air Pollution" reprinted by the U.S. Department of Health, Education and Welfare, Public Health Service, Environmental Health Service, National Air Pollution Control Administration. (Includes effects of air pollution on human health).

g. "Danger in the Air. Sulfur Oxides and Particulates." U.S. Department of Health, Education, and Welfare, Public Health Service, Environmental Health Service, 1970, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. 40¢

h. "Environmental News." Environmental Protection Agency, Washington.

i. "Man and His World: ABC's of HUMAN Ecology". Environmental Protection Agency, Channing L. Bete Company, 1971, Box 112, Greenfield, Massachusetts 01301.

j. "Needed: Clean Air: The Facts About Air Pollution." Channing L. Bete Company Publishers, Box 112, Greenfield, Massachusetts 01301 Cat. #1454 - 1616. Single copies 25¢. Bulk rates available.

k. "Services and Programs for Community Development." Air Pollution Program. U.S. Department of Health, Education, and Welfare, Wash. D.C. 20201

Materials -- Continued

l. Sweet, A.H., Steigerwald, T. and Ludwig, J.H. "The Need for a Pollution Free Vehicle." Journal of Air Pollution Control Association, February 1968, Vol. 18, No. 2, Department of Health, Education and Welfare, Washington, D.C. 20201

m. Technical Publications of the Office of Air Programs, U.S. Environmental Protection Agency, September, 1971. Air Pollution Technical Information Center, Office of Technical Information and Publications, Research Triangle Park, North Carolina 27711, Tel. 919 549-8411, Extension 2135.

BUSINESS EDUCATION

Purposes:

To give students an opportunity to look at some of the effects on people and the environment of pollution caused by industry and business.

To give students an opportunity to look at some of the costs imposed on business and the consumer due to the public's concern over different types of pollution.

Objectives:

Upon the completion of work in this unit, the student should be able to:

1. List some of the direct effects of pollution caused by specific businesses on people and animals.

2. Relate orally to the class one specific suggestion that an individual or a business could enact in order to combat some form of pollution.

3. Collect advertisements, cartoons, or other written evidence showing how a specific business has attempted to combat a form of pollution.

4. Indicate in writing the direct or hidden costs incurred by businesses in conducting a compaign against different forms of pollution.

5. List some of the promotional advantages arising for a specific business over its competitors due to the public's concern over the dangers of pollution.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Research and list the different businesses or industries that cause pollution of air, water, by noise, solid waste, radiation, and pesticides. Report to the class how such pollution affects people and/or animals.

2. Organize an advertising campaign to promote a school contest whereby contestants submit in writing their ideas for projects that individuals or businesses could use to combat some form of pollution. (See Activity 8 below, before beginning this activity).

Activities -- Continued

3. Research and discuss how concern over pollution has affected American businesses. For example, the automobile industry or a popular detergent could be used to show how the public's concern with pollution has affected its research department efforts, changed its focus on promotional policies, packaging processes, cost of production, effectiveness of products, cost to consumer, etc.

4. Collect advertisements and other written announcements used by various businesses to promote their role in curbing one type of pollution caused by the nature of their product.

5. Individual/Group Quests: Interview a local business to discover what, if any, steps it has taken to alleviate some form of pollution. Report findings to class.

6. Individual/Group Quest: Tour the neighborhood and write a report on the effects of pollution that they observed.

7. Classify businesses into groups such as service, entertainment, manufacturing, distributing, financing, etc., and under each of these headings indicate the types of pollution such businesses might cause.

8. Indicate their own personal reaction to one form of pollution, indicating whether they strongly oppose, oppose, neutral, unoppose or strongly unoppose. On the basis of their own individual reactions, this group might make a survey of the entire class to discover their personal reactions to different dangers resulting from various forms of pollution. Such a survey might be used in order to start Group Project #2.

Materials:

1. Nolan and Warmke. Marketing, Sales Promotion, and Advertising. 7th ed. South-Western Publishing Co. (Teacher source)
2. Newspapers and magazines (for advertisements)

BUSINESS EDUCATION

Purpose: To give students an opportunity to develop creative thinking techniques by suggesting ways to recycle waste products into worthwhile materials.

To introduce students to various selling techniques and to give them practice in delivering sales demonstrations of materials recycled into new useful products.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Role play a sales demonstration of a waste product that has been converted into something useful.

2. List a minimum of three waste products and indicate in writing several creative uses that would convert these waste materials into salable articles.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Have a creative thinking exercise by bringing to class different articles such as a typewriter cover, yardstick, letter opener, etc. and have a contest to see how many different uses different teams of students can devise for each article.

2. Conduct a class discussion on the advantages of recycling waste products, citing in particular measures taken by different industries in recycling their waste products.

3. Participate in a teacher-led demonstration of how to make a good and bad sales presentation, letting students criticize the demonstrations - using a discarded material.

4. Work in groups of five to practice selling techniques using a waste product for which they have devised a new use. Let each group select a representative from their group to role play to the entire class the sales demonstration that was most effectively presented and also showed the most creative use of a waste product.

Activities -- Continued

5. Individual or small group quest: Visit a local junkyard and list the different items present. Report to class and see how many different uses class members can think of to make such junk items re-usable-again stressing creative thinking ability.

6. Field Trip: Visit a food store and see how many different containers are present. Later indicate to the class those containers, which because of shape or material substance might be recycled (reprocessed) into another useful product.

7. Panel group might discuss the comparative costs factor, outlet for leisure time, and other advantages and disadvantages involved in buying used articles from Bargain Village, Goodwill, etc. and converting them into worthwhile items.

8. Clip newspaper and magazine advertisements pertaining to various products. Small group of students display to class, using a sales demonstration technique, how this same product could be used for a variety of other purposes not stressed by the original producer. Bulletin board display of this activity would be effective also.

Materials:

1. Books:
   a. Russon, Allien. Business Behavior. Chapter 10: "Business Psychology in Selling", South-Western Publishing Company, 3rd edition, 1964.
   b. Wingate, John W. and Carroll A. Nolan. Fundamentals of Selling, New Rochelle, New York: South-Western Publishing Company, 1955. Teacher reference.
2. Films:
   a. "It's the Little Things that Count" (Salesmanship know-how). MP-So-16mm (1 reel 30 min., rental price-$4.00) Business Education Films, 5113 - 16th Avenue, Brooklyn, New York 11204
   b. "Through the Mirror" (demonstrates the fundamentals of good selling techniques). MP-S 16 mm 1 reel 27 min. rental basis. Jan Handy organization, 2821 East Grand Blvd., Detroit MI 48211 - also - "The Things People Want" (highlights the six important interests of buyers.)

Notes:

Tie-Ins with Other Subject Areas

Social Studies - Activity 2. Legal and historical aspects of recycling waste materials.
Industrial Arts - Activity 4. Cooperation in restructuring a waste product for new use.

Tie-Ins with Specific Career-Related Skills

Skill in thinking creatively and utilizing basic selling techniques is important in occupations related to agri-business selling as well as other areas of selling.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Ecology

INDUSTRIAL ARTS

Purpose: To make the students aware of ecology and its effect on the environment.

To identify some of the many careers related to ecology.

Objectives: Upon completion of the work in this unit, the student should be able to:

1. State the meanings of ecology and identify the all-embracing areas.
2. Identify the industrial areas concerned with ecology.
3. Identify some of the careers related to ecology.
4. Explain how man is beginning to conserve and reclaim the earth's ecological balance.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Write a research paper on ecology, identifying all embracing areas. (recycling of all waste, pollution, animal, plants, etc.) Tie-in with Science.
2. Construct a bulletin board showing the industrial areas concerned with ecology.
3. Individual/Small Group Quests: Visit local environmental agencies, interview personnel and write job descriptions.
4. Write PEPCO Vice President Stanley Ragone requesting information on the role his company is playing in "Nuclear Power" and use of "Recycled Paper."
5. Write the Appalachian Regional Commission requesting information on the specific and controversial ecological issue of Strip Coal Mining. Tie-in with Social Studies.

Activities -- Continued

6. Field Trip-Quest: Visit the Library of Congress or other places where copies of recent legislation signed by the President to begin reclamation and conservation of the earth's ecological balance may be obtained.

7. Write a report on the June 1971 Environmental Meeting in Sweden attended by 130 nations.

8. Quest: Read Silent Spring by Rachel Carson and make a report to the class. Tie-in with Language Arts.

Materials:

1. Scissors, construction paper, thumb tacks or pins
2. Typing paper

GRADE 7

CAREER CLUSTER MODULE

V

AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

Unit/Topic - 3 - Landscaping

Topic: Landscaping

Purpose: To make students aware of the many career opportunities in landscaping.

To learn the importance of landscaping in enhancing property value.

To show the importance of landscaping in preventing soil erosion.

Main Ideas:

1. Landscaping has a long history throughout the world.
2. Landscaping has both economic and aesthetic value.
3. Many career opportunities exist for professional, skilled, and unskilled personnel.

Individual and Small Group Quests:

1. Make a papier maché replica of the National Arboretum.
2. Copy one of the landscape paintings by Jean Baptiste Corot.
3. Draw a design of a landscaping plan for your front yard.

Career Opportunities:

1. Unskilled

greenhouse attendant
greenskeeper
laborer

2. Semiskilled

arborist
construction machinery operator
florist
gardener
junior draftsman
nurseryman
real estate salesman
routeman
stonemason helper
tree surgeon

Career Opportunities -- Continued

3. Skilled

agricultural agent
Botanical gardens director
custom spray operator
draftsman
farm machinery dealer
highway draftsman
horticulturist
land appraiser
landscape contractor
seed and fertilizer dealer
stonemason
tile setter
turf manager

4. Professional

agricultural engineer
botanist
chief highway engineer
ecologist
landscape architect
soil scientist
urbanologist

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Landscaping

LANGUAGE ARTS

Purposes:

To explore careers in landscape architecture.

To deepen appreciation for values implicit in outdoor work in agri-business.

To refine skills in reading, writing, speaking, listening.

To understand that the process of composition underlies all creative effort.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. State 3-5 careers related to landscape architecture and minimum job requirements.
2. Speak positively about work that is performed outdoors.
3. Show improved scores on tests of total language arts competency.
4. Explain both orally and in writing how the process of composing underlies all creative work.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Write an abstract of the paper "Landscape Architects." (Reprint, Occupational Outlook Handbook, 1970-71.
2. Create a drawing and write-up called "Youth Recreates." Choose a site in community; redesign it in terms of what this cluster has taught about ecology and natural resources. On the back of the rough sketch write the rationale for redesign.
3. Choose one of the references listed below: compose a brief review "There's Something You Should Know" for oral presentation to the class. (Teacher should check on focus -- all compositions should be written in the second person; all should be in the expository mode. Review prior to writing, if necessary.)

Activities - Continued

a. Boy Scouts of America. Landscape Gardening. Boy Scouts of America, 1969. (Address below).
b. Boy Scouts of America. Landscape Architecture. Boy Scouts of America, National Council, New Brunswick, New Jersey 08906, 1969.
c. Frazier, John and Julian R. Your Future in Landscape Architecture. Supply Division, North Brunswick, N.J. 08902; 1967.
d. Zaidenberg, Arthur. How to Draw Landscapes. Abelard, 1963.

4. See the following films and write critiques. Compose a bulletin board of critiques.

   a. "Design and Man" (U. of Iowa, 12 min.)
   b. "The Draftsman - Surveyor" (Modern Talking Pictures, 29 min.)
   c. "Frank Lloyd Wright" (Encyclopedia Britannica Films, 30 min.)

5. Take teacher-made test to check whether student can explain relationship of composing process to all creative effort. Tie-in with Art.

6. Take objective tests measuring total verbal proficiency: Contrast with scores made in previous units. Tie-in with Mathematics.

7. Prepare "Youth Re-Creates" sketches for wall display.

8. Write an essay "Advantages and Disadvantages of Outdoor Work".

9. Work in groups to produce job descriptions (1 per group) of careers in landscape architecture: Share orally.

10. Produce an on-the-spot personal essay entitled: "My Thoughts on the Composing Process".

Materials:

1. Multiple reprints of "Landscape Architecture."
2. White drawing paper, 18" x 24".
3. Multiple copies of references listed in activity #3 above.
4. Films cited in Activity #4 above.

Materials -- Continued

5. Colored, corrugated paper for displaying "Youth Re-Creates" sketches.
6. Teacher-made tests on:

    a. unit content.
    b. reading.
    c. composition (Criteria For # 10).

Notes:

Tie-Ins with Other Subject Areas

Increased self-assurance, improved verbal proficiency, more positive work attitudes, awareness of inner resources, realistic about requirements for jobs explored in this unit; and, increased skills in social interaction.

MATHEMATICS

Purpose: To show the students the role that mathematics plays in planning communities.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Construct diagrams of a community using, as his needs dictate, the geometry and arithmetic to which he has been exposed.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Given an acre of land, design a city park in detail. The student must place all of the benches, trees, flowers, shrubbery, etc. with the amount of space between everything. The students are to calculate the cost of building the park.

2. Given some land and told to design a community with homes, apartment buildings, stores, recreation areas, schools, and churches with all things positioned on the land, the students are to calculate the cost of building the community. The teacher might make this a group project where designs and bids for the job are proposed to the teacher and a group of students must evaluate and accept the job.

3. Estimate the size (population) of the community that they have designed when the community matures and classify the community as a ghetto, middle-class or high-income neighborhood.

Materials:

1. "Landscape Architecture." The World Book Encyclopedia, 1972, 12,59-60.
2. List of cost for equipment and labor for building the park and the community.
3. Costs of landscaping materials.
4. Costs of building materials.

SCIENCE

Purpose: To help pupils make better use of the land through an understanding of its dynamic character and composition including microorganisms, minerals, and humus.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Plant seeds to raise a member of the legume, tomato, or lettuce family of plants.
2. Test soil for its degree of acidity or alkalinity.
3. Describe a soil as to its texture: sandy, clay, or loam.
4. Plan a garden for the yard.
5. Describe the making and use of compost for the garden and explain the advantage of compost over artificial fertilizers.
6. Diagram the nitrogen cycle.

Activities: To accomplish the objectives, the students may engage in activities such as:

1. Introduce this unit to the pupils by taking them on a walk around the school grounds noting the plants and their location, the shady and sunny sides of the building, any eroded places of the land, and any unused spots that might be suitable for planting.
2. Make a vegetation map of the whole school property. See if there is room for a vegetable garden and a compost pile. If so, select a student committee to obtain permission of the principal to start these. Tie-in with Mathematics, Art.
3. Introduce the idea of planting seeds by giving them soaked bean seeds to dissect. Identify

Activities - Continued

the parts and their function. Have students diagram and label parts.

4. Each pupil plants other soaked bean seeds in milk carton containers filled with soil. Have pupils also plant tomato, carrot, lettuce, and corn seeds in milk carton containers.

5. Make a vegetation map of their own yards or a nearby vacant lot, noting sun and shade locations, north, east, south, and west exposures. Use this map to select an area for transplanting their seeds. If this is an impossible dream because the ground is over-used by humans and animals, discuss mini-gardens in flower boxes on the window sill or in tubs of earth on the apartment balcony (see ref.) Herbs and tomatoes respectively can be raised this way. Tie-in with Mathematics, Art.

6. Design a plan using a committee of students for making a school vegetable garden that will last to fruition. See if pupils can put on an education campaign that will bring respect and cooperation of the rest of the school to let the garden grow. Tie-in with Language Arts.

7. Soil testing. Have pupils bring in soil samples from their prospective garden sites. Sample should be a core from surface to four inches deep. Mix it well. Place a piece of red litmus and a piece of blue litmus paper on a glass slide. Wet the papers with distilled water (if possible). Place a sample of the soil to be tested on one end of each litmus. Wet the sample. After several minutes, examine the papers. Blue litmus turned red with acid; red litmus turns blue with base (alkaline) soil. If a soil is too acid, have the pupil add a little lime and test again. Result? Has the acid been neutralized?

8. Take a bit of the remaining soil sample; place it in a narrow, tall bottle with a top, fill it with water, and shake well. Allow it to stand overnight. Notice the layers formed.

Activities - Continued

This is a measure of how much sand, clay, silt, and humus (organic material) are in the soil. Sand forms the bottom layer. Compare soil samples for mineral and humus content. The humus will usually float on top of the water. Discuss the make-up of a good loamy soil. Diagram the layers of a natural soil and of the soil tested.

9. Introduce composting as a natural means of supplying nitrates and humus to the soil without increasing nitrate run-off into the rivers through artificial fertilizers. Rake the yard and begin a compost pile at school and at home.

10. Explain the nitrogen cycle in simplified form as the way nitrates, essential to protein formation, are returned to the soil and reincorporated in plant and animal life. Pupils diagram and be able to reproduce it.

11. Carefully dig up a clover plant from a vacant lot keeping the roots and soil intact. Rinse the soil from the roots to reveal the nodules in which nitrogen-fixing bacteria live. This is a symbiotic relationship with the clover plant (a legume).

Materials:

1. litmus paper
2. gas collecting bottles
3. spades and trowels
4. soil samples
5. plant seeds
6. Twining A-V Center (D.C.)
   a) #1702 Soil and Life, The B, 14 min., P-I
   b) # 504 Soil Resources C, 11 min. I-S
   c) # 438 Plant Growth, b, 11 min. S.
   d) # 486 Seed Dispersal, B, 11 min. I-S
   e) #1917 Gardens for Everyone C, 11 min. P.
   f) #1668 Land Forms and Human Use B, 11 min., S.
7. References
   a) Beaumont, Arthur B. Garden Soils, New York: Orange Judd Publishing Company, Inc. 1952.

Materials - Continued

b) Browne, Roland A. For Better Gardens, Garden City, New York: Doubleday & Company, Inc. 1964.
c) Cooke, Emogene. Fun-Time Window Garden, New York: Children Press, 1957.
d) Cutler, Katherine N. The Beginning Gardener, New York: M. Barrow & Company, 1961.
e) Hutchins, Ross E. The Amazing Seeds, New York: Dodd, Mead & Company, 1960.
f) Selsam, Millicent E. How to Grow House Plants, New York: William Morrow and Company, 1960.
g) _____. The Tomato and Other Fruit Vegetables, New York: William Morrow and Company, 1970.
h) Pellegrini, Angelo M. The Food-Lover's Garden, New York: Alfred A. Knopf, 1970
i) Webster, Helen N. Herbs: How to Grow Them and How to Use Them, Newton, Massachusetts. Charles T. Branford Company Publishers, 1959.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Landscaping

SOCIAL STUDIES

Purpose: To make students aware of the many career opportunities in this field.

Objectives: Upon completion of work in this unit, the student should be able to:

1. State the importance of landscaping today and in earlier civilizations.

2. List various areas of landscaping service and the basic qualifications for each.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Group discussion. Find pictures of property without landscaping and compare them with pictures of property with landscaping. Does the presence or absence of landscaping affect the price of the property?

2. Group Quests: Reasearch the history of landscape gardening and find illustrations to present to the class. Use the opaque projector; have the class members comment on their contribution. Examples: The Hanging Gardens of Babylon, A Roman garden, plantations, palace gardens in England and France; the Vatican Gardens in Italy, the sculptured gardens of Japan.

3. Research and discuss the talents one should possess in order to be a landscape architect or gardener. Then, write a "profile" study of a successful landscape gardener. Tie-in with Language Arts.

4. Prepare a bulletin board display of appealing landscape settings and legends. Include a display of the works of the French paysagist, Jean Baptiste Camille Corot.

5. Field Trips:
   a) Plan a visit to a nursery to observe the

Activities - Continued

different types and varieties of ornamental plants. Which are most expensive? Why?
b) Tour the National Arboretum and write a brief report on its purpose.

6. Quest: Research and report on the differences between a landscape gardener and landscape architect.

7. Resource Persons: Invite a professional in each of the two categories in Activity 6 to discuss his work.

8. Quest: Research and report on Lady Bird Johnson's Beautification Program and show on a map of the District of Columbia where these beauty spots are located.

9. Make photographs for a bulletin board display which could include the Cherry trees on the Tidal Basin, the Arboretum, the Aquatic Gardens, etc.

10. Individual/Group Quests: Plan and execute a beautification project on the school premises and in your homes. The individual projects should include before and after pictures. Give prizes to the winners of the contest sponsored and judged by the class.

11. Field Trips:
a) Visit the Phelps Vocational High School Greenhouse.
b) Visit the International Center "Meridian House" and learn the history of the Linden Trees that are planted there.
c) Visit the Landon School Azalea Show.
Write a report on one of the field trips.

12. Make beautification posters with original captions for display in the classrooms or school corridors. Tie-in with Art.

13. Individual Quest: Research one aspect of the relationship between landscaping and environmental control.

Activities -- Continued

14. Quest: Report, after conferring with a horticulturist at a local nursery or the proprietor of a sod farm, on the various types of grasses that are most suitable for the Washington area and why. Ask also about the history and use of zoysia. Tie-in with Science.

15. Individual Quest: Research and report on the work of 4-H clubs in the plant-science area.

16. Make scrapbooks of job opportunities in the plant-science area and their qualifications.

Materials:

1. Opaque projector
2. Old newspapers and magazines
3. Scissors
4. Poster boards
5. Construction paper
6. Crayons and/or watercolors
7. Paste
8. References:
   a) "Careers as a Landscape Architect and Landscape Nurseryman." Institute for Research, 537 South Dearborn Street, Chicago, Illinois. $1.00.
   b) "Career Opportunities in the Nursery Industry." American Association of Nurserymen Incorporated, 835 Southern Building, Washington, D.C. 20005. (Send self-addressed stamped envelope.)
   c) Future in the Nursery Industry. Richards Rosen Press, Incorporated, 29 East 21st Street, New York, New York 10010.
   d) Griffin, J.M. Landscape Management. California Landscape Contractors Association, P.O. Box 621, La Mirada, California 90638
   e) "Landscape Architect Brief #164." Chronicle Guidance Publications, Incorporated, Moravia, New York 13188
   f) "Opportunities for You in Horticulture." Department of Horticulture and Forestry, Ohio State University, Columbus, Ohio.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Landscaping

BUSINESS EDUCATION

Purpose

To give students an opportunity to develop creative thinking techniques by suggesting and prompting different ways to landscape various grounds.

To give students an opportunity to expand their vocabulary relative to landscaping and simultaneously develop a working knowledge of clerical alphabetical filing techniques.

To give students an opportunity to become aware of the differences between real and personal property and the legal and costs factors connected with such classifications of properties.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. Index and file cards listing names of various shrubs, trees, flowers, etc. in alphabetical order and make a minimum number of cross reference cards for the subject classification; for example, a card listing zinnia would be cross referenced under the classification guide titled flowers.

2. Design a poster showing the layout or landscaping of a particular piece of real property, indicating costs estimates for shrubs, trees, etc.

3. On a multiple choice test format, distinguish or classify different types of properties and/or rights and responsibilities thereof of owners and tenants.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Listen to a teacher-led discussion on property including such concepts as the following: (a) nature of property, (b) possession, (c) real and personal, (d) landscaping, a cost of ownership, and (e) tangible and intangible property.

2. Discuss the specific career opportunities that could be connected with landscape gardening and landscape architecture. Classify these jobs into

Activities - Continued

major categories to be used as part of the subject guide file index project.

3. Learn the basic filing system and be responsible for collecting the names of different types of trees, shrubbery, flowers, etc. and print such names on index cards with a corresponding picture or illustration if possible. Team groups could be organized to represent different classifications making up landscape gardening. Special guides and folders would be made up as students continued to collect pictures and names of plants, flowers, etc. Cross references could be made on the basis of perennial or annual plants or their Latin names. Other student groups could be building the subject file index system including such categories as types of equipment operators use needed to work in landscaping, selling positions available in agri-business, etc. This would be an on-going, continuous project incorporating vocabulary skills and filing skills and job opportunities in landscaping. Tie-in with Science.

4. Construct a bulletin board display of various landscape settings clipped from magazines and newspapers. Tie-in with Art.

5. Discuss cost factors pertaining to landscaping as a decision-making factor in deciding whether to rent, lease, or buy a house and selecting location sites.

6. Field Trip: Visit the local greenhouse and landscaping concerns within the city to collect cost data on landscape-poster project. (See Activity 7).

7. Design individual posters outlining a landscape setting for a particular plot of ground. Posters could consist of templates cut from magazines and gardening catalogues or free-hand drawings. Would include an estimate of cost. Students would use their alphabetic and subject filing systems as sources of references. Tie-in with Art.

Activities - Continued

8. Individual/Group Quest. Visit various public and private properties to observe and report on the landscaping ideas represented.

Materials:

1. Books
   a) Gregg, Fries, Rowe and Travis. Applied Secretarial Practices. 6th ed. Gregg Division, McGraw-Hill Book Co., 1968. (Unit 16 -- "The Why and How of Filing")
   b) Wilhelms, Fred, Heimerl R. and Herbert Jelley. Consumer Economics. 3rd ed. Gregg Division, McGraw-Hill Book Co. 1966. (Unit 6 -- "Housing")
2. Pamphlet
   a) Your Farm Background and Agribusiness Selling (320.4). Sales and Marketing Executives International, 630 Ave. NY, NY, 10017
3. Teacher-constructed Test

Notes:

Tie-ins with Specific Career-Related Skills

Skill in designing layout plans and computing costs of materials is important in occupations relating to agri-business selling positions.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Landscaping

INDUSTRIAL ARTS

Purpose: To show students that landscaping is the art of enhancing man's surroundings so as to produce a more pleasing appearance.

To identify some related careers.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Identify the two distinct styles of landscaping.
2. Plan landscape gardening for an average house.
3. Write specifications for landscape contractors.
4. Identify some related careers in landscaping.
5. Identify tools and equipment used in landscape gardening.
6. Explain operation of a greenhouse.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Individual Quest: Research and report to the class on one type of landscape gardening. Have class define the two distinct styles.
2. Lay out, plan and build model for a small rambler located on one-half acre lot. Tie-in with Mathematics, Art.
3. Write, lay out plans for landscape contractors for a small park including playground with swimming pool. Tie-in with Mathematics.
4. Field Trip: Visit A. Gude and Sons Complete Landscaping Service and write some job descriptions. Address: Landscape Department, 1318 Eye Street, N.W., 628-6880; Nurseries, Rockville, Maryland, 762-6141.
5. Field Trip: Visit Phelps Vocational High School Landscaping Department. Request information on

GRADE 7

CAREER CLUSTER MODULE

V

AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

Unit/Topic - 4 - Conservation

Activities - Continued

tools and equipment used and a field trip through the greenhouse. Tie-in with Science.

6. Field Trip. Visit the National Arboretum to study proper layout of lawns, flowers, trees and shrubs.

7. Match each of the following terms with its definition:

erosion control	landscape gardener
flowering shrubs	liquid fertilizing
flowering trees	mechanical hydro feeding
garden maintenance	sodding
grading	top soil
hybrid	transplanting
lawn renovation	tree surgery

Tie-in with Language Arts.

8. View films listed under Materials and write impressionistic review. Tie-in with Language Arts.

Materials:

1. Artificial grass
2. Clay (modeling)
3. Mechanical drawing equipment
4. Wood
5. Woodworking tools
6. Cardboard
7. Plywood (teacher selection)
8. Films
   a. "Gardens of Japan" 16mm Sound 18 min. color. Shows the innate love of the Japanese for nature in all its aspects as revealed in their perfection of the art of the landscaped garden. Various types of Japanese gardens are shown in this film--from a moss garden to one devoid of trees and water, created solely of sand and rock. The famous garden of the Katsura Imperial Villa is shown as a classic example of the art of Japanese landscape. Book three months in advance; borrower pays return postage. Order

Materials - Continued

from: (Consulate General of Japan): Association Films, Incorporated, 600 Madison Avenue, New York, N.Y. 10022
b) "Green Thumb for Macauley, A" 16mm Sound 14 1/2 min. Color. Follows the adventures of a young married couple from the time they plant a garden to the day their task is completed. It shows the details of planning, soil preparation, planting and maintenance, to the time when they have achieved a beautifully landscaped garden. Book six weeks in advance; borrower pays return postage. Order from: The Union Fork and Hoe Company, Advertising Department, 500 Dublin Avenue, Columbus, Ohio 43216

Topic: Conservation

Purpose: To make the students more knowledgeable about the role that conservation should play in their daily lives and to develop a more positive attitude toward the preservation of our natural resources.

Main Ideas:

1. Water, soil, wildlife, forests, and minerals must be wisely used so as to conserve them for later use.
2. Man's continued existence depends on the wise use and replacement of natural resources.
3. Conservation is everybody's business.

Individual and Small Group Quests:

1. Report on "How to Prevent Soil Erosion."
2. Collect information on Tennessee Valley Authority.
3. Make a chart showing the animals and plants that are in danger of becoming extinct.
4. Research the effects that diminishing marshlands have on fish and fowl
5. Report on how national disasters have affected conservation.
6. Research the legal limits set for fishing and hunting in the area in order to preserve wildlife.

Career Opportunities:

1. Unskilled

   laborer

2. Semiskilled

   arborist
   range conservationist
   tree surgeon
   truck driver

Career Opportunities -- Continued

3. Skilled

- county agricultural agent
- farmer
- farm manager
- fish, game and wildlife manager
- game warden
- plant quarantine and plant pest control inspector
- range conservationist
- soil conservationist
- water analyst

4. Professional

- agricultural engineer
- agronomist
- ecologist
- entomologist
- forester
- geologist
- metallurgist
- microbiologist
- plant scientist
- rural sociologist
- urbanologist
- veterinarian
- vocational agricultural teacher

LANGUAGE ARTS

Purposes:

To reinforce positive attitudes about preserving nature's gifts.

To learn practical ways to effect conservation.

To extend knowledge about conservationists and what they do.

To develop new skill in language arts.

Objectives:

Upon completion of work in this unit the student should be able to:

1. List several positive ways to effect conservation.
2. List 5-10 things young citizens can do to preserve nature's gifts.
3. List 5-10 things adults should do to conserve our nation's resources.
4. Explain orally what conservationists do.
5. Write, read, and recite limericks on conservation.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Attend a three-day series of development lessons, organized by the teacher, called Limerick Lyceum. Students learn form, rhyme pattern, and meter of the limerick; punctuation is important, too. (During and following this activity, students create individual limericks with a conservation message).
2. Participate in a limerick contest. (Each student must perform twice for the class and a panel of judges: he takes one turn reciting his own limerick; then one turn selecting a limerick from the class box and reading it with appropriate pauses and expression).
3. Type up original limerick on colored file cards for the class limerick box on conservation.
4. See the following films to gather information and

Activities -- Continued

insights related to the objectives organized for this unit:

a. A Heritage We Guard. (U.S. Department of Agriculture, 30 mins.; shows positive ways to preserve natural resources).
b. Blessing on the Woods. (Canadian Film Travel Library, 11 mins.; interprets an inspirational poem by Arthur Guiterman).
c. Forest Conservation. (Encyclopedia Britannica Film, 11 mins.; the effects of exploitation; suggest what needs to be done).
d. Grass Roots in the Soil. (Iowa State University, 22 mins.; shows how soil can be saved by contour farming and enriched by plantings of grass).
e. The World at Your Feet. (International Film Bureau, 22 mins.; shows how man's mastery of nature entails certain responsibilities to guard and preserve nature's gifts).

5. Prepare limericks for display on wall space organized for this cluster and this unit. Tie-in with Art.

6. Take a teacher-made inventory of attitudes on conservation. Compare and discuss attitudes.

7. Do individual reading from the following references, chosen for their close relationship to the stated objectives of this unit:

a. Barker, Will. Wildlife in America's History. Luce, 1962.
b. Brindy, Ruth. The Sea, The Story of the Rich Underwater World. Harbrace, 1971.
c. Gates, Richard. The True Book of Conservation. Children's Press, 1959.
d. Harrison, C.W. Conservationists and What They Do. McGraw-Hill, 1970.
e. Mattison, C.W. Man and His Resources in Today's World. Creative Educational Society, 1967.
f. Pownall, Evelyn. The Thirsty Land: Harnessing Australia's Water Resources. Coward, McCann, 1968.
g. Pringle, Laurence. The Only Earth We Have. Macmillan, 1969.

Activities -- Continued

h. Stone, A.H. The Last Free Bird. Prentice-Hall, 1967.

8. Write a book or film review on one of the references listed above for this unit: focus the report to one of the following topics:

   a. How to Help with Conservation.
   b. Conservation: A Universal Concern.
   c. What I Know About Conservation.
   d. What I believe in Conservation.

9. When report has been evaluated, mount for wall display. Tie-in with Art.

10. Keep a notebook of new words and definitions for this unit. Some possibilities are:

alliteration	energy
aquatic plants	iambic meter
anapestic meter	iambus
anapest	irony
biological	limerick
botantist	punctuation marks
carbon dioxide cycle	reservoir
conservationist	rhyme patterns
dactylic meter	trochaic meter
dactyl	trochee

Materials:

1. Teacher hand-out on form, rhyme, meter, and punctuation in the limerick.
2. Prizes for limerick contest.
3. Box and colored file cards (5" x 7") for class limerick box on conservation.
4. Films listed in Activity #4 above.
5. Colored poster paper to mount limerick for wall display.
6. Teacher-made inventory of attitudes on conservation.
7. Individualized reading list: Activity #7 above.
8. Dittoed copy of topics appropriate for film/book review required in this unit.
9. Miscellaneous travel folders.
10. Magic markers.
11. Rubber Cement, scissors, etc. for students wishing

Materials -- Continued

to illustrate wall display copies of their limerick and book/film report.

Notes:

Tie-Ins with Specific Career-Related Skills

Increases verbal skills, greater self-awareness, more positive life attitudes, greater self-worth, openness to competition, poise in social situations.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Sciences
Conservation

MATHEMATICS

Purpose: To show the student that conservation is necessary for the survival of man and that this survival is directly related to mathematics.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Find the circumference and area of a circle.
2. Find the missing element in a percentage problem using either the factor-product or the proportion method.
3. Add, subtract, multiply, and divide whole numbers, common fractions and decimal fractions.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Calculate the approximate circumference and area of the earth given that the radius of the earth is 8000 miles. The students are to calculate the area of the earth that is covered by water given that water makes up seven-tenths of the earth's area. The social studies teacher is to tell the students how much land in the world is good for farming, and how much land is not inhabitable by man. The students are to then calculate the percent of land available for farming and the percent of land that is uninhabitable by man.
2. Resource Person: Listen to the science teacher explain the principles of crop rotation. Then, calculate what years they would plant what crops for the next 20 plus years. For example, maybe a three-year cycle is being used where corn is planted the first year, wheat, the next, and grass the third year; then the student would calculate the years to plant each starting from some fixed year. The teacher should relate this to arithmetic progressions.
3. After being furnished a standard of how much rainfall drains off how much topsoil by the science and social studies teachers, calculate how long it would take an unprotected farm land to become a desert. Tie-in with Social Studies.

Activities -- Continued

4. Analyze a wild game law such as the Deer Game Law and find out why the law was made and what mathematical knowledge influenced the development of the law.

Materials:

1. References:

   a. "Conservation." The World Book Encyclopedia, 1972, 4, 778-794.
   b. Moon, Truman J. Modern Biology, New York: Henry Holt and Company, 1958.

SCIENCE

Purpose: To increase the pupils' understanding of our diminishing natural resources and the need to plan ahead and restore materials used where possible or preserve viable numbers of living species to insure their future.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Describe the wise use of top soil.
2. Name ten endangered species of animals in America and suggest ways to preserve them.
3. Describe tree farming and tell how to transplant a tree for the yard.
4. Describe how to stop erosion of soil by water.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Teacher-introduction of this unit with the concept of soil erosion. Build on the knowledge of soils gained in landscaping to observe how foot traffic, water, and wind pack and carry away soil. Lead a walk around the school property to look for signs of water-erosion furrows and gullies. Put these places on the vegetation map of the school yard made in landscaping.
2. Test the difference in compacting of earth in the footpath shortcut vs. the grassy lawn by trying to drive a wooden stake into each place. Have pupils note the relative hardness of each type of soil.
3. Use a spade to remove a wedge of soil from the surface to one foot deep to reveal top soil and subsoil from the footpath and from the grassy lawn. Compare the relative moisture of each wedge. Rate each on a 4-point scale: wet, moist, dry, very dry. Help pupils derive the greater moisture-retaining ability of the grassy wedge. Test each soil sample for acidity and alkalinity. Correct the pH.
4. Discuss with pupils ways of preventing further soil erosion from bare earth and returning it to a growing

Activities -- Continued

crop of grass or other vegetation. Have pupils squirt water on bare soil and on grassy soil and note the relative amounts of spattering.

5. Quest: Research and discuss the ways to cover bare soil while it is planted with seeds to prevent spattering and erosion before the seeds grow. A mulch of hay and twigs is suitable.

6. Show a film with scenes of the Dust Bowl and develop the analogy of soil as the "placenta of life" for land organisms of the biosphere. Have student(s) write the Dept. of Agriculture for information on what has been done to prevent future "Dust Bowls." Tie-in with Language Arts.

   a. Introduce the endangered animals concept with the opaque projector and pictures from the book by George Laycock cited in the references or by other pictures color-lifted from National Geographic. These animals could include: black-footed ferret, California condor, sperm whale, Attwater's prairie chicken, green turtle, Eskimo curlew, key deer, Lake sturgeon, osprey, bald eagle, ivory-billed woodpecker, alligator, masked bobwhite, grizzly bear, Kirtland's warbler, sea otter, whooping crane, sandhill crane, antelope, trumpeter swan, brown pelican, roseate spoonbill, Everglade kite, desert bighorn sheep, Nene geese, timber wolf; and, from the Potomac River Valley: shad, herring, eagle, osprey, fox, bass, black snake, king snake, copperhead, wood turtle, bobwhite, bullfrog.

7. Participate in a discussion on what makes a species endangered. Develop the predator-prey relationship and the food chain idea. Have pupils make these two types of charts for animals of their own yards or neighborhoods. Help them discover that a break in the food chain cancels out the animals above the break; that it is not only over-predation by man but destruction of animals' natural habitats or environments. Develop and diagram a food pyramid as representing the numbers of individuals involved in a food chain.

Activities -- Continued

8. Individual Quest: Assign an endangered animal to each pupil to make a report on. In the report have him stress where the ecology of that species has been upset and what can be done to restore the balance if possible.

9. Introduce tree farming by having pupils list twenty items made of wood in the school and at home. Ask the questions: How long does it take to grow a tree? Were trees in this area before the buildings? How much does wood cost at the lumber yard? What kind of trees would benefit our school and neighborhood? How does a tree grow? From these answers develop the idea of trees as a valuable resource being used up faster than they are being replaced. Tie-in with Mathematics.

10. Diagram the parts of a tree from root to leaf and fruit and its method of growth. Count growth rings in log cross-sections. Have students estimate the age of trees in the school yard from their circumference (find the diameter) at breast height (dbh). Tie-in with Mathematics.

11. Quest: Which is the biggest tree in the school zone? What kind is it? What are good estimates of its age? Is its environment conducive to further growth? Tie-in with Mathematics.

12. Contact the D.C. Schools Buildings and Grounds Department to see if they will give trees for planting in the school yard. Have pupils look up directions for planting a tree properly. Report on this. Carry out the project, if feasible.

Materials:

1. cloth tape measure
2. hatchet or hammer
3. spade
4. log cross-sections
5. Films (from Twining A-V Center (D.C.)
   a. #1497 Erosion - Leveling the Land, B, 14 min. I-S
   b. #1554 Tree is a Living Thing, A. C, 11 min, P-I
   c. #1449 Tree, The. B, 10 min. P-I

Materials -- continued

d. #1978 Trees and Their Importance, B, 12 min, I
e. #1642 Conserving Our Soil Today, B 11 min. I-S.
f. #1912 Message from a Dinosaur C, 10 min, I.
g. #2216 What Are We Doing to Our World C, 52 min. S-a.

6. References:

a. Fenska, Richard R. The Complete Modern Tree Experts Manual, New York: Dodd, Mead and Company, 1959.
b. Harrison, C. William. Conservationists and What They Do, New York: Franklin Watts, Incorporated, 1963.
c. Harrison, C. William. Conservation: The Challenge of Reclaiming Our Plundered Planet, New York: Julian Messner, Incorporated, 1963.
d. Hogner, Dorothy C. Conservation in America, Philadelphia: J.B. Lippincott Company, 1958.
e. Lauber, Patricia. Dust Bowl, New York: Coward-McCann, Incorporated, 1958.
f. Laycock, George. America's Endangered Wildlife, New York: Grosset & Dunlap, Incorporated, 1969.
g. Udall, Stewart L. The Quiet Crisis, New York: Holt, Rinehart, and Winston, 1963.
h. Van Dersal, William R. The Land Renewed, New York: Henry Z. Walck, Incorporated, 1968.
i. Wood, Frances and Dorothy. Animals in Danger, New York: Dodd, Mead, and Company, 1968.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Conservation

SOCIAL STUDIES

Purpose: To make students aware that the survival of mankind depends on the conservation of our natural resources.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Define conservation and state its origin and several of its purposes.

2. Examine conditions which make conservation programs necessary.

3. Identify some of the conservation measures commonly used in the United States.

4. List some of the job opportunities related to the conservation effort.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Find synonyms for conservation and write a definition of the terms.

2. Individual/Group Quest: Research and report on when the need for the conservation of natural resources was given national recognition. Report the details to the class for discussion. (See President Theodore Roosevelt, 1907).

3. Individual/Group Quest: Discover how the Industrial Revolution and man's wastefulness of natural resources made conservation necessary and report to the class. Tie-in with Science.

4. Write an illustrated composition on what America was like before conservation was needed. Additional pictures should illustrate what has happened since that time. The Before and After pictures might include:

   a. Undisturbed land forms vs. strip mining.
   b. Trees and forest areas - before and after the loggers came.
   c. Wise land use (farming) vs. soil erosion.
   d. The Buffalo.
   e. Wildlife - example: "The American Eagle"

Activities -- Continued

5. Individual/Group Quest: Trace the history of Yellowstone National Park (the first National Park) in an effort to preserve natural beauty, and report to the class.

6. Individual/Group Quest: Write and discuss the history of Rock Creek Park and its importance to the citizens of the Washington area. Report to the class.

7. Individual Quest: Role-play Theodore Roosevelt explaining why a conservation program was necessary.

8. Individual/Group Quest: Research and explain to the class how Roosevelt by-passed a reluctant Congress in preserving vast areas of land for public use.

9. Individual/Group Quest: Research and describe to the class how the following programs operated:

   a. Civilian Conservation Corps, 1933, forerunner of Job Corps, 1960's.
   b. Tennessee Valley Authority (T.V.A.)
   c. Taylor Grazing Act,1934.
   d. Flood Control Act, 1936.
   e. Hoover Dam
   f. Fort Peck Dam
   g. Bonneville and Grand Coulee Dams on the Columbia River.

10. Individual/Group Quest: Study and report on the disastrous effects of strip mining. Tie-in with Science.

11. Resource person: Invite a representative from the Department of Interior to explain the Department's conservation program. Have all students write a critique.

12. Individual/Group Quest: Research and describe how Israel was transformed from a desert to a "green wonderland." Tie-in with Science.

13. Group Quest: Research the damage (economic and

Activities -- Continued

otherwise) of forest fires.

a. How long does it take to regain the natural resources lost in a forest fire?
b. Make a chart showing the yearly damage from forest fires since 1900. What caused the majority of them? What were other causes?
c. How old is Smokey the Bear?

Tie-in with Mathematics, Science.

14. Resource person: Invite the science teacher or a representative from the Department of Agriculture to explain the causes of soil erosion and what should and/or is being done to prevent it. Have students ask pre-prepared questions.

15. Group Quest: Locate the wildlife preserves in the United States on a map for the class and explain their history and purposes.

16. Group Quest: Research and report on what is happening to animal and wildlife in Africa. (Each student might be assigned one country.)

17. Discussion. Should the giant redwoods be cut to make way for modern technology? How is wildlife being threatened in the United States? What problems are caused by radiation? Does the Atomic Energy Commission help to promote conservation?

18. Group Quest: Trace the history of irrigation from ancient times to the present for the class.

19. Group Quest: Make a bulletin board display of the role of the Department of Agriculture in preserving our natural resources.

20. Make mini-job booklets containing written descriptions and pictures or clippings illustrating job opportunities related to conservation. Tie-in with Language Arts, Art.

21. Have students continue to add to their vocabulary notebooks for this unit. Some possibilities are:

agriculture	irrigation
agronomy	nutrition

Activities -- Continued

conservation	pasture
depleted soil	pest control
entomology	physiology
eroded soil	quarantine
erosion	range
genetics	strip mining
grazing land	watershed
horticulture	veterinary
husbandry	

Tie-in with Language Arts.

Materials:

1. Film

   a. "Problems of Conservation: Air". Encyclopedia Britannica Educational Corporation, 425 N. Michigan Avenue, Chicago, Illinois 60611. 15 minutes, B/W and color. Rental fee $8.00.

2. References

   a. "America's Department of Natural Resources." The United States Department of the Interior, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. 40¢. This is an excellent reference.
   b. McCoy, J. Conservation of Natural Resources, New York, New York: Seabury Press, Incorporated, 815 Second Avenue, 1970.
   c. Swatek, Paul. Conservation, New York, New York: Ballantine Books, 101 Fifth Avenue, 10003, 1970.
   d. Laycock, George. Conservation, New York, New York: Doubleday Publishing Company, 277 Park Avenue, New York, 10017. 1970.

BUSINESS EDUCATION

Purpose: To give students an opportunity to develop personal and positive attitudes toward the preservation of our natural resources.

To give students an opportunity to explore some of the economic conflicts that exist for our society in its dedication to growth and conservation policies.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Submit a paper indicating ways in which he might personally conserve one natural resource such as water, soil, wildlife, etc.

2. Answer in writing a minimum number of objective type questions pertaining to basic economic concepts and their relationship to conservation policies.

3. Write a personal-reaction paper to one aspect of conservation in relation to the goal of economic growth and progress.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Research, give examples of, and discuss the two different meanings of conservation: (1) enforced nonuse and (2) avoidance of waste in physical and economical terms.

2. Individual Quest: Select an area of choice to consider ways in which one can personally conserve its natural resources.

3. Elect different students to act as resource persons in their other classes so that they can relate means for conserving a specific natural resource. Students may use this data in their individual reports. (Activity 2)

4. Listen to teacher lecture/discuss on an elementary level some of the following concepts related to conservation and the market economy factor present in our society: consumer choice, price determination

Activities -- Continued

supply and demand, factors of production, competition and exploitation of natural resources, etc. Have student add these terms and their definitions to his vocabulary notebook for this topic. Tie-in with Language Arts.

5. Debate or react in panel format to the possibilities inherent in a "no-growth" society, citing fundamental shifts in behavioral patterns. Tie-in with Social Studies.

6. Research and discuss how local suburbs are attempting to control growth. Tie-in with Social Studies.

7. Research and discuss conservation problems resulting from population distribution. Tie-in with Mathematics, Social Studies.

8. Individual/Group Quest: Construct bulletin board of maps showing areas of dense, sparse and moderate population patterns on a city or state basis. Bulletin board might be used to launch different class discussions related to conservation and natural resources. Tie-in with Mathematics, Art, Social Studies.

9. Individual/Group Request: Prepare bibliography on current articles pertaining to conservation efforts in the areas of water, soil, wildlife, forests and minerals. Tie-in with Language Arts.

Materials:

1. Books

   a. Kennedy, Olsen, and Dodd. Applied Economics. 7th ed. South-Western Publishing Co. (Teacher reference.)
   b. Wilcox, Clair. Public Policies Toward Business. Revised edition, 1960. Richard D. Irwin, Inc. (Chapter 14, "Control of Natural Resources". Teacher reference.)

2. Magazines and Newspapers

   a. "The Worst Is Yet to Be". Environment Section. Time, January 24, 1972. p. 32, 36.

Materials -- continued

b. "Suburbs Struggle to Preserve Quality of Life in the 70's." by Kenneth Bredemeir. The Washington Post, January 19, 1972. C1 and C3.

3. Films

a. "Exploring Basic Economics." MP-So-16mm. A series of six color films. Rented by Modern Learning Aids, 1212 Avenue of the Americas, N.Y.,N.Y. 10036

b. "The Law of Demand and Supply." Mp-So-16mm. 11 min. Rental $2.50. Business Education Films, 5113 16th Ave., Brooklyn, N.Y. 11204.

4. Charts

a. "Coal Areas in the United States." A 9" by 16" chart in color. Available from the National Coal Assoc., Educational Division Coal Building, 1130 17 St., Washington, D.C. 20036.

b. "Forests and Trees of the United States." 25" by 36" wall chart available from American Forest Products Industries, Inc. 1835 K Street, Washington, D.C. 20006.

c. "What We Get from Trees." A 28" by 40" chart. Order from U.S. Government Printing Office, Division of Public Documents, Washington, D.C. 20402.

Notes:

Tie-ins With Specific Career-Related Skills

Skill in seeing the relationship between technology and the conservation of natural resources is important in occupations in both the social and biological sciences.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Conservation

INDUSTRIAL ARTS

Purpose: To create a general awareness of the importance of conservation and relate some of the many things found at home and school that come from soil, water, forests and minerals.

Objectives: Upon completion of work in this unit, the student should be able to:

1. List some of the objects found in the school shop that are made from natural substances.
2. Identify Industrial Arts activities related to natural gas, coal and oil industries.
3. Identify some of the careers related to conservation.
4. Identify industrial safety devices in use for conserving human resources.
5. Explain the role of education in conservation.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Investigate materials in the Graphic Arts Shop and write a paper on "The Necessity for the Future" (Ink, Paper, Water, Electricity.) Tie-in with Language Arts.
2. Compile a scrapbook showing the industrial activities related to natural gas, coal and oil operations; present it to the class. Tie-in with Art, Language Arts.
3. Write several job descriptions of conservation-related careers. Tie-in with Language Arts.
4. Write a paper on "If All Trees Were Used to Make Paper, What Would Happen to Our Environment?" Write a short report on the "Dam Disaster in West Virginia." Reproduce both papers in the school Graphic Arts Laboratory. Tie-in with Language Arts, Science.
5. Have students add new words and definitions to their vocabulary notebook for this unit. Possibilities are:

Activities -- Continued

drainage	sewage disposal
erosion	sheet erosion
flood control	soil bank
mineral water	soil conservation
plant exploration	watershed
plant quarantine	wildlife conservation

Materials:

1. Offset press
2. paper
3. offset plates and related supplies

GRADE 7

CAREER CLUSTER MODULE

V

AGRI-BUSINESS, NATURAL RESOURCES, MARINE SCIENCE

Unit/Topic - 5 - Oceanography

Topic: Oceanography

Purpose: To show how the study of plant and animal life of the ocean today may mean the survival of the human race tomorrow.

Main Ideas:

1. Oceanography provides a new frontier for man.
2. Many career opportunities exist in oceanography.
3. The ocean is a source of food, mineral wealth and recreation.
4. Oceanography and Astronomy are interrelated.

Individual and Small Group Quests:

1. Investigate the equipment used in oceanography.
2. Research the Undersea Lab.
3. Research the possibilities of man's survival beneath the ocean.
4. Investigate the findings of Jacques Cousteau relative to the sea.
5. Report on how glaciers are formed.
6. Report on the basic food supply of the ocean.
7. Research the animals of the sea that are treacherous to man.

Career Opportunities:

1. _____

2. Semiskilled

commercial fisherman
laboratory aide

3. Skilled

electronic technician
radio operator
research assistant
scuba diver

4. Professional

agronomist
astronomer
botanist
chemical oceanographer
geological oceanographer
geophysicist
hydrologist
marine biologist
mathematician
oceanographic engineer
tectonophysicist

LANGUAGE ARTS

Purposes:

To reinforce positive attitudes regarding man and his natural environment.

To appreciate the value of untapped ocean resources.

To learn about careers in environmental science, especially oceanography.

To develop new power in the language arts.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. List some of the advantages that will accrue to man should he safeguard nature's gifts.

2. List and/or describe some of the yet untapped resources in the world's oceans.

3. List and describe job opportunities in marine science.

Activities:

To accomplish the objectives, the student may engage in activities such as:

1. Participate in reading program called Submarine Maneuvers. (Wall display can show one sub for each student; sub descends one fathom for each book read. All subs reaching 5 fathoms receive awards. See Activity 2).

2. Read the books listed here for submarine maneuvers: also be prepared for and take a one-question writeup test on each title read.

   a. Arnold, Oren. Marvels Of The Sea & Shore. Abelard, 1963.
   b. Beaty, Janice J. Seeker of Seaways: A Life of Matthew Fontaine Maury, Pioneer Oceanographer. Pantheon, 1966.
   c. Boy Scouts of America. Oceanography. Boy Scouts of America, 1965.
   d. Boyd, Waldo T. Your Career in Oceanology. Messner, 1968.

Activities -- Continued

e. Briggs, Peter. Men In The Sea. S & S, 1968. (Simon & Shuster).
f. Carolisle, Norman. Riches of the Sea: The Science of Oceanology. Sterling, 1967.
g. Carson, Rachel L. Sea Around Us. Watts, 1966.
h. Chency, Cora & Partridge,Ben. Underseas: Challenge of The Deep Frontier. Coward, 1961.
i. Coggins, Jack. Hydrospace: Frontier Beneath Sea. Dodd, 1966.
j. Coombs, Charles. Deep-Sea World: The Story of Oceanography. Morrow, 1966.
k. Dean. Exploring and Understanding Oceanography. Benefic, 1970.
l. Dempsey, Michael. The Skies and The Seas, Foundations of Meteorology, Oceanography and Cartography. Messner, 1969.
m. Epstein, Samuel & Williams, Beryl. Pioneer Oceanographer: Alexander Agassiz. Messner, 1963.
n. Field, Adelaide. Auguste Piccard, Captain of Space, Admiral of the Abyss. Putnam, 1969.
o. Goldin, Augusta. The Bottom of the Sea. Crowell, 1966.
p. Kovalik, Vladimir and Nada. Under Sea World of Tomorrow. P-H, 1968.
q. Kovalik, Vladimir. The Ocean World. Holiday, 1966.
r. May, Julian. The Land Beneath the Sea. Holiday, 1971.
s. Olney, Ross. Inquiring Mind: Oceanography. Nelson, 1969.
t. Olsen, E.A. Mystery At Salvage Rock. Oddo, 1970.
u. Omer, Devorah. Path Beneath The Sea. Amis Publishing Co., 1969.
v. Shannon, Terry. Saucer in the Sea. Hale, 1965.
w. Shannon, Terry. The Sea Searchers: Men and Machines at the Bottom of the Sea. Golden Gate, 1968.
x. Scott, Frances and Walter. Exploring Ocean Frontiers, Parents, 1970.
y. Shannon, Terry and Payzant, Charles. Project Sea Lab: The Story of the United States Navy's Man-in-the-Sea Program. Golden Gate, 1966.

Activities -- Continued

z. Silverberg, Robert. World of the Ocean Depth, Hawthorn, 1968.
aa. Spilhaus, Arthelstan, Ocean Laboratory, Creative Ed., 1967.
bb. Stephens, William M. Science Beneath The Sea. Putnam, 1966.
cc. Telfer, Dorothy. Exploring the World of Oceanography. Childrens, 1968.

3. See the following films to catch the creative wonder implicit in a study of the sea.

   a. Full Fathom Five. (Pyramid Film Producers, 7 min.; a film ode to the mysterious underwater world)
   b. Ocean. (Holt, Rinehart, Winston, 9 mins.; an inspirational interpretation of the ocean, using poetry and creative camera techniques to show a variety of moods).

   Have each student then draw or find a picture for bulletin board display and construct a legend based on the film.

4. Create Bubble Brabbles, two-line rhyming couplets on the subject matter of this unit.

5. Create aqua-antics, quatrains reflecting knowledge and values organized in this unit.

6. Mount bubble brabbles and aqua-antics for wall display. Tie-in with Industrial Arts.

7. Cooperate in organizing a culminating activity for this unit which also encompasses the cluster just studied. Each student should participate: present one or more of the verbal art products made during the last six weeks. The audience can be school children or parents; the auditorium or speech arts room would be an appropriate site; the community library might also be used, with library personnel serving as guests. Tie-in with all other subject matters.

Activities -- Continued

8. Make a class list of career titles and descriptions for this whole cluster: magnify for wall display. Tie-in with Art/Industrial Arts.

9. Match the following terms with their definitions:

aquatic	maneuver
bathymetry	marine biologist
bathyscope	meteorologist
dimeter	metrical foot
fathom	pentameter
field of gravity	plankton net
geodesy	salt water fisheries
geologist	stressed syllable
geophysicist	tetrameter
heptameter	trimeter
hexameter	unstressed syllable

Materials:

1. Colored paper and bulletin board materials for Submarine Maneuvers reading list.
2. Teacher handout explaining couplet and quatrain; especially showing how to compose dimeter, trimeter, tetrameter, pentameter, and heptameter lines of verse.
3. Films for Activity 4 above.
4. Miscellaneous props for the Cluster Culmination described in Activity 5 above.
5. Colored poster paper, tag board, and crepe paper for imaginative mounting of Bubble Brabbles and Aqua-antics;
6. Books listed for Activity 7 above.
7. One-question test to accompany each book listed for Submarine Maneuvers.
8. White plaster-board or heavyweight paper to present magnified wall display of career titles and capsule descriptions for entire cluster, including this unit on oceanography.
9. Teacher-constructed test for Activity 8.

Note:

Tie-Ins with Specific Career-Related Skills

More positive work attitudes, self-affirmation (develops through creative activities), improved language skills, increased social skills, and new knowledge of jobs.

MATHEMATICS

Purpose: To show the role of mathematics in the study of the ocean and the survival of the human race.

Ojbectives: Upon completion of work in this unit, the student should be able to:

1. Find the area of a circle.
2. Convert simple common units of measure from one unit to another within the same system: linear, liquid, weight, dry.
3. Convert cubic miles to cubic feet, cubic feet to cubic inches, cubic inches to gallons and cubic feet to gallons.
4. Convert gallons to liters, liters to kilograms, kilograms to pounds, and pounds to ounces.
5. Find the volume of a rectangular solid.
6. Find the missing element in a percentage problem using either the factor-product or proportion method.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Calculate the area (in miles) of the earth covered by the Atlantic Ocean, by the Pacific Ocean, by the Lakes in North America, and by the Potomac River and the percent that each body of water occupies relative to the area of water that occupies the earth.
2. Calculate the number of gallons of water contained in the Potomac River, the Pacific Ocean and the Atlantic Ocean. Using the fact that 3.5 percent of the ocean water is salt, calculate the amount of salt in one gallon of ocean water in pounds. Tie-in with Science.
3. Find the average weight of a tuna fish. The students are to calculate how many cans of tuna fish can be produced from the average-size tuna fish.

Activities -- Continued

4. Using the fact that a cubic mile of sea water contains 6 million tons of magnesium, the student is to calculate the number of cubic miles of sea water contained in the Atlantic and Pacific Oceans and the amount of magnesium likely to be found there. Tie-in with Science.

5. Have students research specific meat and fish consumption and compare the percentages of each variety.

Materials:

1. "Ocean." The World Book Encyclopedia. 1972, 14, 492-499.
2. Pacific Ocean: area-63,800,000 square miles; average depth 14,000 feet.
3. Atlantic Ocean: area-31,530,000 square miles; average depth 14,000 feet.
4. One liter of water weighs one kilogram and occupies 1,000 cc. under a pressure of 76 cm. of mercury at 4 degrees centigrade.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Oceanography

SCIENCE

Purpose: To help pupils grow in knowledge and understanding of the vast resources of the marine environment and the many fields of science that are involved in its study.

Ojbectives: Upon completion of work in this unit, the student should be able to:

1. Diagram and name the areas and zones of the sea.
2. Explain what causes tides and diagram solar positions.
3. Name common organisms of the Chesapeake Bay and the Mid-Atlantic coast.
4. Explain the value of a salt marsh or wetland to marine life.
5. Describe underwater exploration by SCUBA diving, and research vessels.
6. Diagram how sonar works.
7. Describe the life of a porpoise.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. As an introduction to marine environment, view the film, "Scientist and the Sea:" U.S. Navy (See Reference), or a filmstrip, "Salt Water Pollution" (See Materials). Discuss with pupils their experiences with the bay or ocean. [List organisms observed, tidal phenomenon, boating experiences, etc.]
2. Use globes or moving models of the solar system to explain the tides. Have pupils clip the tidal times from the newspaper weather report. Have one pupil investigate and report on the height of tides at Haines Point.
3. Show a map or globe of the underwater seascape with its mountains and valleys and plains. Diagram the typical structure of the sea: Littoral,

Activities -- Continued

Photosynthetic, Pelagic, and Benthic Zones; Continental Shelf and Open Ocean. Have pupils diagram these areas and draw a portion of the true seascape. Ask the question: How were these underwater mountains discovered?

4. Introduce the term SONAR (Sound Navigation and Ranging) if the pupils do not respond to the previous question. Review with them the main ideas of sound conduction developed in Cluster III: Fine Arts and Humanities. Describe and diagram briefly how the echo sounder works.

5. Individual Quest: Have a pupil report on the discovery, development and many uses of SONAR.

6. Use the list of marine organisms the pupils developed in the first activity to group the animals and plants in several ways: by phyla, by habitat and niche, and by food chain or food web relationships. Pass around or display sea-shells and skeletons of marine animals.

7. Group Quests: Divide the class into groups to report on mollusks, echinoderms, porifera, coelenterates, worms, crustaceans and other arthropods, and vertebrates of the sea. The vertebrates might be divided into fishes, mammals, and birds. Have the groups make audio-visual aids to go with their reports.

8. Develop big food webs on the board and food chains to show the interrelationships between the groups.

9. With the aid of teacher, focus on the marine organisms found in the Chesapeake Bay and the Mid-Atlantic Coastal Region. Have pupils make up-to-date reports on the pollution problems man is causing for these economically important marine lives. Dissect a clam, a crab, and a perch. Compare the anatomy and physiology of each.

Activities -- Continued

10. Develop the idea of the salt water marsh or wetland as the breeding ground for the simple forms of life and the larvae of higher forms which make the essential lower steps of the food pyramid, the beginning of the food chain. Help pupils understand that these wetlands are more important as breeding grounds for marine life than they are as real estate for human beach communities. Tie-in with Social Studies.

11. Quest: What actions have the state legislatures of Maryland, Virginia, and Delaware taken to protect their wetlands from human encroachment? Three pupils should report on each state. Tie-in with Social Studies.

12. After being introduced to underwater exploration with the Cartesian diver demonstration, three pupils should prepare three of these "divers" in advance of this activity using 500 or 1,000 ml. graduated cylinders or equivalent, medicine dropper pipettes, and rubber diaphragm. Let pupils try these "divers" by pressing on the diaphragms. Make a hypothesis about why the diver sinks and rises again. Discuss hypotheses and develop the idea that the diver merely changes the volume of air inside itself through transmission of pressure by water. State the law of buoyancy.

13. Invite a SCUBA (Self-contained underwater breathing apparatus) diver from one of the local diving clubs to demonstrate the hardware of SCUBA and give a slide talk to an assembly or class. Telephone Ron Young, President, Atlantic Skin Diving Council at 629-7870 (See Materials reference). Follow this with a list of swimming opportunities for lessons at the local pools. Tie-in with Physical Education.

14. Develop the trainable aspects of the porpoise as a friend and aid to divers. Have pupils give special reports on this mammal and experiments in training it. Show the film: The Dolphin Joins the Navy (See reference for the source).

Materials:

1. Map, globe, or chart of underwater seascape (mountains, valleys, plains)
2. Assorted shells, skeletons, and preserved marine organisms.
3. Large glass cylinders like 500 ml. graduates.
4. Rubber dam for diaphragms.
5. Filmstrip with accompanying LP record: "Salt Water Pollution." Warren Schloat Productions, Incorporated, Pleasantville, New York 10570.
6. References:
   a. Briggs, Peter. The Great Global Rift, New York: Weybright and Talley, 1968.
   b. Bronson, Wilfred S. Children of the Sea, New York: Harcourt, Brace and Company, 1940.
   c. Buehr, Walter. World Beneath the Waves, New York: W.W. Norton and Company, Incorporated, 1964.
   d. Burton, Maurice. Under the Sea, New York: Franklin Watts, Inc., 1960.
   e. Carlisle, Norman. Riches of the Sea. New York: Sterling Publishing Company, Incorporated, 1967.
   f. Clemons, Elizabeth. Tide Pools and Beaches, New York: Alfred A. Knopf, Incorporated, 1964.
   g. Clemons, Elizabeth. Waves, Tides, and Currents, New York: Alfred A. Knopf, Incorporated, 1964.
   h. Coggins, Jack. Hydrospace: Frontier Beneath the Sea, New York: Dodd, Mead and Company, 1966.
   i. Huntington, Harriet E. Let's Go to the Seashore, New York: Doubleday and Company, Incorporated, 1941.
   j. Lindsay, Barbara. Monsters of the Sea, New York: The Four Winds Press (Scholastic Magazines), 1962.
   k. McCarthy, Agnes. Creatures of the Deep, Englewood Cliffs, New Jersey: Prentice-Hall, Incorporated, 1963.
7. Information source for SCUBA speaker: Mr. Ron Young, President, Atlantic Skin Diving Council, Telephone: 652-7326 (home) and 692-7870 (work). He is very helpful, has many diving club contacts speakers to fit the audience.

Materials -- Continued

Also has a helpful brochure. Film on SCUBA from Los Angeles County Recreation Department: "Let's Go Diving." No local source or outlet known.

8. Film resource on Oceanographic topics: Commandant, Naval District of Washington, Building 200, Second floor, Washington Navy Yard, Attention: Public Affairs Office, Telephone 433-3342. They have many films on Oceanography such as: The Dolphin Joins the Navy, Scientist and the Sea, Sounds in the Sea, Sixty Days Beneath the Sea, Nature of the Sea. Order from the Navy well in advance. Write a letter on school letterhead stating the titles desired and lengths of time desired for use. Allow one week's shipping time. They allow one week for return after your use.
9. Films from Twining AV Center, D.C.
   a. #1637 Challenge of the Oceans, B, 27 min., S
   b. #2287 Oceanography - Science of the Sea, C, 11 min., I-S.
   c. #1340 Tides of the Ocean - What They are and How Caused, C, 17 min., S
   d. #1295 Watermen of Chesapeake, C, 28 min. I.
   e. #918 Mollusks: Snails, Mussels, Oyster B, 14 min. S.

SOCIAL STUDIES

Purpose:

To make students aware of the national effort in water research which includes oil extraction, mining, commercial fisheries and aquatic recreation.

To inform the students of the various national agencies involved in oceanography.

To make students aware that oceanography is vital to our national security.

Objectives:

Upon completion of work in this unit, the student should be able to:

1. State the meaning and scope of underwater engineering today.
2. State how man will reap benefits from the exploration of this new frontier.
3. List several of the job opportunities made available by this exciting field of research.

Activities:

To accomplish these objectives, the student may engage in activities such as:

1. Discuss: "Why is man turning to the sea as a means of survival?" Here the class may review and discuss the current world problems including expanding population and scarce resources, and reasons for seeking new avenues for raw materials for survival.
2. Group Quest: Form a committee to research, identify, and explain the nature and character of the research in underwater engineering and report the findings to the class for discussion. NOTE: Each committee should report on one of the following areas of specialization and prepare an exhibit to illustrate their findings:
   a. Physical. the study of tides, currents, temperatures, conditions and sound transmissions.
   b. Geological. involves the study of the ocean bottom, its origin, shape, its sediments and rock formations.

Activities -- Continued

c. Chemical. involves study of the chemical content of the various water levels and currents.

3. Individual/Group Quests:
   a. Research and report for discussion modern man's uses of the seas as a source of food, recreation, and a means of survival. (e.g., fishing, transportation, defense)
   b. Research and report on past societies which relied on the products of the seas as a major means of survival. NOTE: One might include biblical references to the sea and the Vikings.
   c. Research and report on the life and works of Matthew F. Maury, the true father of American oceanography.
   d. Research and report on the role of Benjamin Franklin in developing interest in marine research.
   e. Research and report on the German U-Boat menace in World War II and the Allied efforts to combat it.
   f. Research the following: How long did it take man to map the earth? Approximately how long will it take him to map the sea? Report your findings to the class. Tie-in with Mathematics.
   g. Seek the aid of the science teacher in preparing a report on the Gulf Stream and ocean currents.
   h. Research and describe to the class the floor plan and sophisticated operational devices of the ill-fated submarine "Thresher" (1963) Tie-in with Science.
   i. Research and report on the use of electronic devices in underwater explorations. Draw sketches for display. Tie-in with Science.
   j. Research and report on Project Mohole (a federally sponsored project to trace the history of the earth from a mile core drilled out of suboceanic rock.) Tie-in with Science.

Activities -- Continued

k. Write for the booklet Ocean Frontiers; Report to the class on its contents.

4. Resource Person: Invite the science teacher to discuss and demonstrate the method by which ocean water is converted into drinking water.

5. Resource person: Invite a speaker from the Interagency Committee for Oceanography (I.C.O.) or from the Navy's School of Marine Science (Man-in-the-Sea Program) to discuss the importance and potential of underwater explorations. Write or call the Office of the Oceanographer of the Navy, 732 N. Washington Street, Alexandria, Virginia 22314.

6. Make a booklet "Careers in Ocean Technology". This should list and describe job opportunities available in this field.

7. Resource Person: Prepare an exhibit on Opportunities in Ocean Technology. (Seek the aid of science teacher.)

8. Field Trip: Visits to Oceanographic Centers: a. Aqualab, Navy Yard; b. Naval Academy; Annapolis, Maryland, and c. Smithsonian Institute.

Materials:

1. Catalog from I.C.O., Navy Yard Annex Building 159E, Washington,D.C. 20303.
2. Free materials from the National Oceanographic Data Center, Washington, D.C. (clearing house for data received from research by government and private organizations).
3. References:
   a. Abel, Robert B. and Lindquist, Clarence B. "Inner Space - Sea of Opportunity," Superintendent of Documents #FS 5256-56020, U.S. Government Printing Office, Washington, D.C. 20402. 15¢
   b. Chronicle Occupational Brief, Oceanographers #200, Chronicle Guidance Publications, Incorporated, Moravia, New York 13118.

Materials -- Continued

c. Cousteau, Jacques Y. The Silent World, New York: Harper and Brothers, 1953.
d. Dugan, James, Man Under the Sea (Adventures of Undersea explorers from Alexander the Great to Captain Cousteau), New York: Harper and Brothers, 49 East 33rd Street.
e. McKee, Alexander. Farming the Sea (with 32 photographs), New York: Thomas Y. Crowell and Company, 1969.
f. Loftas, Tony, The Last Resource (Man's Exploitation of the Oceans) Henry Regnery Company, 114 West Illinois Street, Chicago, Illinois 60610 (1970).
g. Russel, John L. "Underwater Engineering", Opportunities Illustrated, Vol. I. No. I, January 1968, Executive Review Publishers, 605 North Michigan Avenue, Chicago, Illinois 60611.
h. Sweeney, John. Skin Diving and Exploring Underwater, New York: McGraw-Hill Book Company, 1955.

4. Free Materials:
a. Oceanography, U.S. Naval Research Laboratory, Washington, D.C. 20390.
b. Woods Hole Oceanographics Institution, Woods Hole, Massachusetts 02543.
c. American Society of Limnology and Oceanography, Department of Oceanography, Oregon State University, Corvallis, Oregon 20390.
d. Interagency Committee on Oceanography, 159 E., Navy Yard Annex, Washington, D.C. 20390.
e. Students Ocean Science Study Kit, U.S. Naval Oceanographic Office, Washington, D.C. 20390.
f. Publications Price List, National Oceanography Association, 1900 L Street NW, Washington, D.C. 20036.
g. "Oceanography Achievements and Opportunities," National Academy of Sciences. 2101 Constitution Avenue, NW, Washington, D.C. 20418.
h. The American Geophysical Union, 2100 Pennsylvania Avenue, NW, Washington, D.C. 20037.

Career Development Curriculum Guide: Grade 7
Agri-Business, Natural Resources, Marine Science
Oceanography

INDUSTRIAL ARTS

Purpose: To show students how the building of a city beneath the ocean may be beneficial to man and to discuss the careers related to oceanography.

Objectives: Upon completion of work in this unit, the student should be able to:

1. Identify the part of the U.S. where a city beneath the sea is in progress.
2. Discuss several ways in which life beneath the ocean may benefit man.
3. List the technical knowledge necessary to build such a city.
4. Identify the old and new careers related to building a city beneath the ocean.

Activities: To accomplish the objectives, the student may engage in activities such as:

1. Present oral or written reports on the progress of the city beneath the ocean off the coast of California.
2. Individual Quest: Write the Department of the Navy for information concerning the concept of a city beneath the ocean. Report to the class. Use material as part of Activity 5.
3. Write a paper on how life beneath the ocean will benefit man. Include recycling waste, ecology and pollution. Tie-in with Language Arts, Science.
4. Construct a bulletin board showing the kinds of equipment and technology necessary to build a city beneath the ocean. Tie-in with Science, Art.
5. Write a report listing careers in oceanography. Have each student select one of the list and state why it is his preference. Tie-in with Language Arts.

Materials:

1. Graphics from the Navy Department