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Assessment of inservice needs in environmental education and implementation suggestions: K-8

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Assessment of the Inservice Needs in Environmental Education and Implementation Suggestions: Grades Kindergarten - Eight

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By

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Abstract

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Statement of the Problem

Environmental education inservices provided to teachers are sorely lacking. Therefore, the purpose of the project was to ascertain the perceived needs of teachers for inservices on the various aspects of environmental education. Based on the information, suggestions for several different types of inservice programs were assembled.

Procedure

The assessment was a twenty-five item survey which was given to ninety-two teachers in ten different districts. The rankings possible for the items on the survey were: (A) strong need, (B) need, (C) desired, but not available, (D) no need, and (E) not applicable.

The survey was analyzed by percent response for each

of the rankings. The results also were analyzed when two of the rankings, strong need and need, were summed together, and when three of the rankings, strong need, need, and desired, were summed together. (See Appendix B.)

Conclusion and Implications

Once the survey was computed, the top eight topics were addressed in a general environmental education inservice guide. Each inservice topic was addressed by listing possible activities, available resources, and related children's literature.

The following topics, listed in order of importance, received the highest ratings for inservice needs by teachers:

Recycling and Waste Management
Environmental Science Projects
Environmental Issues
Energy Education
Local History
Wildlife
Correlation with Subject Areas
Available Resources

Acknowledgements

I would like to give a very special word of thanks to Dr. Darleen Stoner for all her encouragement, direction and support.

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Introduction

The intent of this project is two-fold: (1) to assess the perceived needs of teachers for inservices on various aspects of environmental education; and (2) to create a general guide for inservices on environmental education. The survey provided an up-to-date assessment of teachers' needs for environmental education. Based on the results of these surveys, guides for several inservices were developed for future use.

Environmental education is the essential element to be taught in our curriculum if students are to become responsible "world conscientious" citizens. The need for environmental education inservices has been indicated by teachers (Simpson,1991). The same study also emphasizes educators acknowledge environmental education must be integrated into all subject areas. The state of California has indicated the necessity for interdisciplinary application of science in the new Science Framework for Public Schools (1991). In order to implement a program, teachers need to become acquainted with environmental education resources, techniques,and subject matter.

The survey found the environmental education needs of teachers to be significant at all grade levels. The need for integration and correlation of environmental education

into the subject areas was ranked highly. Knowledge of available resources was an identified need at all grade levels.

The guide includes topic ideas, activities, children's literature, and available resources for the six highest rated topics. It is intended that the guide will be used as a resource when preparing activities and locating the necessary resources required to plan and to implement inservices. The topics for inservice are:

Recycling and Waste Management
Environmental Science Projects
Energy Education
Local History
Wildlife
Environmental Issues and Action Projects

The topic ideas are included to provide educators with a list of appropriate areas to be covered. Topics can be expanded to fit specific inservice needs.

The environmental education guide lists various activities. They include descriptions of well known environmental lessons. Hands-on and experiential activities, which are essential to environmental education are included. Many environmental activities must be done outdoors. Therefore, the outdoor activities I have listed

can be done on school grounds or nearby parks since most schools do not have large field trip budgets.

Each topic area has a children's literature listing. Not only can these books be easily incorporated into the activities, but they also relate specifically to the topic areas. Thus, they can be integrated into all phases of the curriculum.

Review of Related Literature

The literature relating to surveys of environmental education needs addresses several topics. However, the needs can be combined into a few major areas of concern. When surveyed educators indicated a need for inservice training, curriculum guides, experiential learning and hands-on activities, integration of the subject areas and solutions to the lack of field trip experiences.

Pettus (1980) found that 58.5% of the teachers she surveyed felt that curriculum guides and other instructional materials were the most beneficial tools for implementing environmental education in their classes and schools. Other needs which were rated highly by teachers were available resources (49.2%), and inservice training (42.7%).

Childress (1978) found that 60.5% of the teachers surveyed did not use a published textbook as their primary source of instruction for environmental education. Moreover, the study found that 57.1% had not adopted a published environmental education curriculum program as a primary source of instruction. Finally, 51.5% claimed they used a combination of materials from state agencies and those developed by a school-wide or system-wide committee.

Research shows that teachers feel students need more

than the traditional science approach of lecture and lab to learn and to retain important academic concepts. The majority of teachers assessed felt that students need to be actively involved in outdoor education. Yet, 98% of the students' learning time is spent in goal related teaching in the classroom (Simpson,1991).

This figure may be due to a lack of experience in environmental education. In a study done by McCaw (1980) teachers felt the need for instruction in this area. Many felt they did not have the expertise to assist students in achieving the necessary skills to teach environmental concepts. Ninety-eight percent of the teachers sampled stated a need for inservice to enable them to implement an outdoor study program and were willing to attend an environmental education inservice.

Research has shown (Backman,1990) that teachers feel that science based education is not enough. Many feel that the science related social issues are also very important, especially where the "at risk" students are concerned. Thus, science courses are not giving students the knowledge and experience to become active and concerned citizens.

Studies have found that earth science and other outdoor related field trips are often not carried out due to expense, district restrictions, liability reasons, and class size. McCaw (1980) found that 88% of the teachers sampled said that transportation was a major factor which

limited outdoor teaching of environmental education. Time limitations in junior high and high school are major factors which affect outdoor education programs. Yet McCaw (1980) claims that educating administrators on the benefits of outdoor experiences is essential to any environmental education program.

Research has shown that teachers feel the need for educating parents and for involving the community when promoting environmental education. According to Pettus (1980), 32.8% of the teachers felt that adequate training was necessary to implement an exemplary environmental education program that involves teachers, parents and community.

Disinger (1990) reviewed the advantages of incorporating the language and math assignments into the outdoor or environmental settings. The findings demonstrated that those students which participated over a longer period of time in these programs had higher test scores in the subject areas.

Tanner (1980) stated that both teachers and parents have a major influence in the attitudes of youth. The research showed that individuals which had childhood interests and experiences in nature were more likely to have jobs related to nature or were active in environmental issues, urban environmental problems or alternative energy sources.

Currently urban and suburban children take field trips in large groups to natural settings only on rare occasions. Tanner (1980) believes this situation must improve. Vacant lots or other local areas should be visited. The school playground can also be used. These experiences can be promoted by classroom follow-up activities, checking out nature-oriented books, and utilizing the expertise of citizen groups, conservation agencies, and environmental groups. Local agencies and environmental groups can be incorporated into the environmental education program. Since seventy-five percent of our students are being raised in urban or suburban environments, this means that most of them are removed from nature.

Overall, educators acknowledge the need for environmental education inservice training. The general consensus shows a concern for the accessibility to hands-on and nature oriented activities. Therefore, environmental education must involve parents, the school, administrators, and the community. Student participation in environmental education activities increase test scores, influences attitudes, stimulates interest, and enhances learning skills.

Statement of Goals and Objectives

The intent of this project is two-fold: (1) to assess the perceived needs of teachers for inservices on various aspects of environmental education; and (2) to create a general guide for inservices on environmental education.

Design of the Proposed Project

The assessment was given to teachers at the Kindergarten through eighth grade levels in different districts. The intent of the assessment was to provide a basis for the development of the inservice guide for environmental education. The survey consisted of twenty-five items which were bubbled in on a Scantron sheet. The participants were also given the opportunity to write in any needs or suggestions. (See Appendix B.)

Participants were asked to rate the following categories according to their environmental education needs: Recycling and Waste Management, Energy Education, Air Pollution, Aquatic Environments and Pollution, Correlation with Children's Literature, Correlation with Language/ English, Correlation with Social Studies/History, Correlation with Math, Correlation with Fine Arts, Water and Soil Conservation, Plants, Oceanography, Meteorology, Wildlife, Available Resources, Land Use Planning,

Activities Doing Fieldwork, Impact Studies, Environmental Science Projects, Agriculture, Teaching Environmental Issues, Involving Students in Action Projects, The Local Environmental History, and Teaching the Thematic Approach. (See Appendix A.)

They ranked their specific environmental education inservice needs according to the following categories: (A) strong need, (B) need, (C) desired, but not available, (D) no need, and (E) not applicable.

Based on the assessment, the top eight topics were addressed in a general environmental education inservice guide. The guide for each topic includes: related topics, children's literature and available resources.

The guide is in a basic list format for easy use. Each entry has a short description. The resources section includes addresses and available sources.

Results and Discussion

The survey I conducted was designed to analyze the environmental education needs of teachers. Ninety-two people participated in the survey. They represented ten different school districts: Antelope Valley, Beaumont, Colton, Fontana, Hesperia, Moreno Valley, Rialto, Rim of the World, Riverside, and San Bernardino City.

The educators surveyed in the districts were teachers, administrators and support personnel such as school site facilitators. Ninety-six percent surveyed were teachers, Kindergarten through eighth grades. The composition of teachers which participated are as follows:

Kindergarten through third grade:.....33.6%
Fourth through sixth grade:.....7.1%
Seventh through Eighth grade:.....36.9%

Of those surveyed, 38.2% indicated that they were teaching one subject area. The majority indicated they taught at the middle school level. The results were as follows:

Science.....22%
Math.....6.5%
Language Arts.....6.5%
Social Studies.....3.2%

After reviewing the initial data (See Table I), the

writer felt that the survey was more valid by summing two or three rankings together to ascertain a valid sample of teacher perceived needs for environmental education inservices. When strong need and need rankings, were summed together, the results were as follows: (See Appendix B.)

Energy Education..... 81.5%
Environmental Issues..... 76%
Recycling and Waste Management.....75%
Wildlife.....70.5%
Environmental Action Projects..... 67%
Environmental Science Projects..... 66%
Available Resources..... 65.2%
Water and Soil Conservation..... 64%
Local History..... 61.9%

When strong need, need, and desired were combined, the following were found to be the major areas for inservice needs. (See Appendix B.)

Recycling and Waste Management..... 91%
Environmental Science Projects..... 85.8%
Correlation with English /Language.... 84.7%
Environmental Issues..... 83.6%
Energy Education..... 81.5%
Local History..... 79.3%
Wildlife..... 79%

Correlation with Social Studies..... 79%

The final list of topics for inservices became:

Recycling and waste Management

Environmental Science Projects

Energy Education

Local History

Wildlife

Environmental Issues and Action Projects

This list of topics for the inservice guide was based on the following factors:

1. Combining similar topics when possible.
2. Consideration of the topic appearing on both lists when summing of rankings was used.
3. Incorporating components of original topics into other topics.

Five of the six topic areas selected occurred on both lists. The environmental issues and action projects topic was derived by combining environmental issues and environmental action projects. Water and soil conservation was distributed into several topics for inservice. Available resources were given for each inservice topic. Correlation with the subject areas (language arts, science, social studies, history and math) was incorporated into each inservice topic.

The correlation of various subject areas (language arts, science, social studies, local history and math) with environmental education was high with all of the need areas.(See Appendix A.) The combining of cross-curricular approaches is supported by the new Science Framework for California Public Schools (1991). Integrated curriculum is a frequently mentioned need of teachers. In fact, the Science Framework for California Public Schools is requiring teachers to integrate all subject areas and to use the thematic approach when teaching science.

Environmental Education Inservice Guide

Recycling and Waste Management

Recycling and Waste Management: To collect used products (usually paper, metals and glass) and make them into new products, and to manage the amount and types of trash going to the landfill. This includes the "3R's: reduce, reuse and recycle.

Possible topics:

1. Recycling: Waste products which can be made into new products.

2. Resource Depletion: When products are produced, distributed, and consumed, solid waste is created. The natural resources represented in the products are buried in the sanitary landfill.

3. Pollution: Too much solid waste pollutes our environment, making it unhealthy, unsafe, and unsightly.

4. Landfill Sitting: To dispose of large amounts of solid waste we produce, large amounts of valuable land are needed. Sitting landfills is difficult because people do not want landfills near their homes.

5. Renewable Resources: They can be replaced. All plants, not only trees, are renewable.

6. Fossil Fuels: They can not be replaced once they are used up. We are using them up far faster than they can be replaced.

Activities for all grade levels:

* Logo contest (art) Have students design a logo about recycling for their class or school.

* Posters (art) Have a recycling poster contest. Solicit help from local recycling representatives, stores, or businesses. Place posters for display in your community.

* Trash Can Inventory (science, social studies, mathematics)
Have students go through trash cans or bags at home and make a list of what's in the trash.

- List what the resource base is for each item.
-What item is most commonly found?
-How could the amount of solid waste thrown in the trash be reduced?

* Current Events Activity (reading, writing, social studies,language)
Have students look through newspapers, and magazines for articles dealing with problems of solid waste. Have

students cut out articles and write a synopsis of them along with their own reaction or opinion. Have students read their reports to the class.

* Litter Photo or Picture Activity (Art)
  Sketch or photograph littered areas.
  Collect litter and create a litter art picture.

* Litter Poem Activity (writing, language)
  Pupils can write litter poems about their art or the litter they found. Poems can be displayed along with the art work.

* Graph Activity (math)
  Using the results of the liter walk, students can prepare a bar or line graph showing the types of litter found, how often they were found, where they were found.

* Recycled Paper Activity (science)
  See Project Learning Tree, "Make Your Own Paper"

* Recycling Unit (science, math, social studies, language arts.)

  Garbage Survey: Give each student four garbage bags. Their job will be to set up four containers at home:

  1 for metal
  1 for paper

1 for glass and ceramics

1 for other materials

At the end of the week the students will weigh each bag. The weight of the bag is divided by the number of people in the family. This will provide the average amount of garbage produced by each family member. This activity can be taken a step further. The students can figure out the amount of total city garbage per week. They can figure the average of the individual citizen by dividing the population of the city. As a follow-up students could write the editor of the local newspaper with their results.

Landfills: This activity is done over a period of several weeks. Have students make a landfill using accessible materials:

Glass pie plate

Layer of fertile soil

Scrap of bread

Slice of banana

Piece of cooked meat

Piece of paper

Chunk of styrofoam

Piece of clear plastic

Clear plastic to use as a cover

1. Spread the soil over the bottom of the pie plate.

2. Lay the pieces of food, styrofoam and plastic on the soil.
3. Sprinkle with water.
4. Cover with plastic wrap.
5. Punch a few holes in the plastic wrap.
6. Place the plate in a warm shaded place.
7. Check every day for growth or mold.

Discuss with students the size of an area needed for a landfill. (one acre pit seven feet deep for every 10 thousand people each year.)

Recycling Poll: Students can write and take a poll on recycling. Students can poll other classes. The results can be posted for the school. Students may opt to provide a collecting area. Awards can be provided for the class which collects the most. The community can become involved.

The Students should:

1. Prepare the poll.
2. Run off the poll.
3. Distribute the poll to each class/ grade level.
4. Collect and tabulate the polls.
5. Post the results.
6. Publish the results in the school paper.

Recycling Poll Sample:

1. Do you recycle at home?

   A. Cans yes no

B. Bottles/Plastic yes no

C. Paper yes no

D. Glass yes no

Available Resources (See Appendix C for addresses, phone numbers and prices)

1. The Trash Monster Environmental Education Program, The 4-R Solid Waste Reducing Plan
2. Project Learning Tree
3. Re: Thinking Recycling, An Oregon Waste Reduction Curriculum.
4. Nature Scope, "Pollution: Problems and Solutions"
5. Waste in Place,"Keep America Beautiful"
6. Waste: A Hidden Resource, "Keep America Beautiful"
7. Waste Away, Information and Activities for Investigating Trash Problems and Solutions
8. Kaleidoscope
9. Bottle Biology, for classroom terrarium and aquarium and other experiments and uses for recycling at low cost.
10. Project WILD

Books:

Wilcox,Charlotte (1988). Trash. Minneapolis,Carolrhod Books, K-5

Suess,Dr. (1986). The Cat in The House Comes Back. Random

House, K-5

Asimov, Isaac (1989). Space Garbage. Milwaukee, Stevens Publishing, K-Adult

Javana, John (1990). 50 Simple Things Kids Can Do To Save The Earth. The Earth Works Group, K-8

Van Allsburg,Chris (1990). Just A Dream. Boston, Houghton Mifflin, K-6

Environmental Education Inservice Guide

Environmental Science Projects

Science projects which test environmental problems and solutions have become very popular with students. Many students feel they may be helping the environment. Many county and state level science fairs encourage student participation in these areas by getting environmental agencies to donate prizes. Some fairs even have different environmental themes each year.

Science Project Procedure

Step 1. Problem: Word in the form of a question.
Sample: What is the quality of our drinking water when compared to other towns?

Step 2. Hypothesis: What you think will be the result based on some previous research.
Sample: The water quality in Beaumont will have less pollution and will be a better quality than water from near-by towns, since it comes from Artisan Wells.

Step 3. Materials: List the materials needed to conduct the experiment and record the results.

Step 4. Procedure: List step by step how you conducted the

experiment.

Step 5. Data: Keep a notebook or log of all the results which you collect. These will later be compiled into charts or graphs for your display.

Step 6. Results: The results should show the outcome of your project. It usually includes charts, graphs, tables or histograms.

Step 7. Conclusion: The conclusion should state if you proved your hypothesis. It should state any findings. The conclusion should sum up the project, including any further studies.

The project should include:

- A journal or log of your daily findings.
- A notebook which will include the research, data, bibliography and acknowledgments.
- Display

Suggested Environmental Science Project Topics

Pollution Topics

Acid Rain

Air Pollution: Amounts of Carbon Dioxide

Air Quality

Algal Blooms

Auto Emissions

Composting

Greenhouse Effect

Jet Stream Effects

Landfills

Phosphates in Detergents: Do They Pollute?

Oil Spill Clean Up

Ozone Layer

Sulfur Emissions from Coal

Things That are Biodegradable

Toxic Waste

<u>Water Topics</u>

Ground Water Contamination

Salt Water and Land Growing Plants

Obtaining Pure Water from Salt Water

What Microbes Live in Water?

Hydroponics: Growing Plants Without Soil

Erosion

PCBs and Other Chemical Contamination

Sewage Treatment

Fertilizer Contamination

Ocean Dumping

Sludge Disposal

Pesticide Use

Water and Soil Conservation

Energy Topics

Decomposition of Organisms

Energy Received from the Sun During the Winter and Summer

Energy Conservation: Electrical, Water, Waste

Hydro-energy

Insulation

Solid Waste Energy

Solar Energy

Salinity

Wind Energy

Available resources: (See Appendix C for Addresses Phone number and prices.)

Project WILD

Project Learning Tree

ClASS Project

AIMS: Water,Precious Water, Critters

Hands-On Nature: Information and Activities for Exploring The Environment with Children

Nature Scope (Science projects)

Bottle Biology

Reproducables and Ditto Books: (Available at most school supply stores)

Weather, Electricity, Environmental Investigations (1982).The Learning Works Inc. This book has several

environmental activities.

Creative investigations (1982). The Learning Works Inc. this book has a great format for elementary science projects to follow.

Science on a Shoestring (1985). Addison-Wesley Publishing Company.

Hooked on Science Sewall, Susan, Breyer (1990). The Center for Applied Research in Education.

Environmental Education Inservice Guide

Environmental Issues and Action Projects

Environmental Issues are a great way to stimulate student interest and integrate various subject areas. Students react very well to environmental issue discussions and activities, especially if they are topics to which they can relate.

Global Environmental Issue Topics

Global Warming

Climate Changes

Rising Seas

Changing Weather Patterns

Reforesting the Earth

Greenhouse Effect

Fossil Fuels

Nonrenewable Resources

World Hunger

Birth Rates in Underdeveloped and Developed Countries

Technology Advances in Underdeveloped Countries

Ocean Topics: Dolphin Killing, Oil Spills, Fishing Regulations, Pollution, and Sewage Dumping

Tropical Rain Forest Depletion

Local Environmental Issue Topics

Offshore Oil Drilling

Water Pollution

Air Pollution

Urbanization

Over Crowding of Schools

Energy Resources

Pest Control

Plant and Animal Resources

Roads and Highways

Noise pollution: Highway or Airport

Landfills

Industry Regulations

Wildlife Management

Public Smoking

Drugs and Alcohol

Becoming "Earth Citizens" - Action ideas for becoming responsible citizens: Be sensitive to the local environment. Know what is going on in the environment around you:

Where does your water come from?

Where does your garbage go?

Know local wild animals and plants.

What are the projected future land uses?

"Ecologize" your thinking: Be sensible citizens.

Think globally and act locally.

Be a leader for others.

Use positive rather than negative reinforcement.

Activities on Environmental Issues (science, language, social studies)

* Class discussions and debates: Have the students discuss the pros and cons of the issues.
* Role play situations with decision making solutions (See Project WILD, ClASS Project)
* Local Action projects:
    - School Wide Recycling
    - Adopt a Highway
    - Adopt a Tree
    - Buy a Parcel of the Rain Forest
    - Clean Up Projects
    - Local Impact Studies
    - Beautification of School Site
    - Adopt a Whale
    - Reforestation Programs
* Write to local agencies
* Contact local interest groups: Sierra Club, Audubon Society, Marine Mammal Center, Turtle and Tortoise Club, museums, or aquariums.
* Write to legislators about your concerns

Available Resources: (See Appendix C for addressees, phone numbers and prices)

Newspapers

News Magazines

National Geographic

National Wildlife

Natural History

Clearing

Discovery

Organizational Periodicals: Many environmental groups have their own publications (Audubon Society)

National Science Teachers Association: Science Teacher, and Science Scope

Discovery Channel

Project WILD

Nature Scope

CLASS Project

Science World by Scholastic

Project Learning Tree

Forsea

Toxics: Taking Charge

Books

Pringle,Laurence (1990). Global Warming. New York, Arcade Publishing. K-Adult

Cherry,Lynne (1990). The Great Kapok Tree. San Diego, Gulliver Books. K-8

Wilcox, Charlotte (1988).Trash. Minneapolis,Carolrhoda Books. K-5

Caduto, Michael, J. and Bruchac, Joseph (1989). Keepers of the Earth. Fulcrum Inc. K-8

Lauber, Patricia (1990). Seeing Earth From Space. New York, Orchard Books.K-8

Environmental Education Inservice Guide

Energy Education

Energy concepts have been recognized as vital links to the scientific disciplines. In the new Science Framework for California Public Schools energy is one of the six themes which is integrated into the various strands of the curriculum. Energy is a science concept which is easily incorporated in other subject areas.

Suggested Energy Topics

-Most Energy Comes from the Sun.
-All Human Activities Require Energy.
-Some Energy Sources are Renewable.
-Wise Energy Choices Will Conserve Energy.
-Getting Energy Requires an Expenditure of Energy.
-Energy Supply is a Major Source of Pollution.
-Energy Transitions in U.S. History.
-How a Bill Becomes a Law to Conserve Energy.
-Agriculture and Energy.
-Coal: Its History and Indian Legends.
-Energy Sources.
-Energy Can Be Converted from One Form to Another.
-Energy Developments and Use Can Create Impacts on the Environment.
-Past Energy Practices Versus Future Energy Practices.

Suggested Energy Activities (science, math , social studies,language)

* Energy audit at home or school using a basic check list Older students can monitor their gas or electric meters and compare the difference when conservation steps are taken.(ClASS Project, "Meter Monitors" activity is appropriate)

* Insulation Testing: Students can bring various materials from home. Use a box with a light bulb inside. Cover each box with insulation material. Measure the temperatures. (Bird houses work great)

* Make a local food web. Discuss the energy each organism uses in the process.

* Make food chains with your meals.

  Hamburgers = sun-> grass-> cows-> Me

  sun-> grain-> bread-> Me

  ** Put food chains on large "Christmas Tree chains" and hang around the room.

* Energy can cause pollution:

  Have students get samples of different types of pollution. Students can put Vaseline on white file cards or an open petri dish to collect samples of car exhaust, and air. For the older students the samples can be taken at various locations. (Math and social studies can easily

be incorporated with maps and graphs.)

* Energy Math :

-Price of gasoline /miles per gallon comparison

- Kilowatt conservation: figure the price of kilowatt per hour using different watt bulbs.

- Calculate The "Classroom Population".

Calculate the annual rate of global population grow which is 1.8% for the year 2000.

1. Multiply the number of students in the class by 1.018.
2. Class (40) X 1.018 = 40.72
   This is the increase for the class for 1992.
3. 40.72 X 1.018 = 41.45 for 1993.
4. 41.45 X 1.018 = 42.20 for 1994 and so on till you reach the year 2000.
5. Average the year's growth together.
6. Take the final number of students in the class in the year 2000 and multiply by the averages to get the final impact your class will have on the environment in the year 2000.

*** Consider the effect these figures will have on transportation, energy, water, solid waste, and hazardous materials.

Available Resources. (See Appendix C for addressees and prices.)

California ClASS Project - see section on energy use

Nature Scope, Pollution: Problems and Solutions

Project Aims, Correlation with energy activities

Project WILD

Energy Action in Schools, Animated Bibliography

A Sample of Energy Education Curriculum Materials

K-6, and 7-12.

Energy Math

Energy Activities for the Primary Classroom

4-H Home Conservation Guide, Hands-on projects

Practical Energy Projects, for industrial arts classes

Teacher Resources For Earth Day 1990

K-3,4-6, 7-8, and 9-12

Environmental Education Inservice Guide

Local History

Students can benefit from their own surroundings to study the local environment. The local history is something which they can relate to easily. They can visually see the various changes. By understanding the past, they can plan for the future. Students can become involved in local action projects or local planning sessions.

Possible Topics

Water - The topic "water" can lead to many other topics such as: Local watershed, available sources of water, and the local history. Students can study the future of their water resources and possible impacts and solutions.

Economics - such as the town development, farming, resorts, agricultural products.

Boundaries - Have the town / Local boundaries changed and what were the effects? What are the future plans and the possible impacts?

Transportation Routes - such as popular trails, train lines, stage lines, trapping areas, or local mining camps which may have had an important part on the history.

Natural Resources of the Area - Such as crops, mining,

trapping, lumber, and energy sources.

Resources

-Old newspapers

-Chamber of Commerce

-Local Library

-Local Historical Association

-Water Board

-Local Clubs: Audubon, Sierra, Garden Clubs, Woman's Club,

-Scouts, Grange or Service clubs.

-Church records

-Survey Records - Older students are able to research the town records.

Activities (language, social studies, math)

1. Role play issues from the view point of the past residents (fur trappers, miners, lumber industry, water rights, cattle grazing, sheep farmers, and bankers) Role play the same issues form a present day viewpoint. (Remember some may be pro and some may be con.) *** See Project WILD: To Zone or Not to Zone.

2. Trace old trails or train routes on a map. Compare these to present day highways or freeways. What land marks or local areas have been affected due to these changes?

3. Create an Ad - State why someone would want to come out here and live. What can they gain? What does the

location offer for them? Use old pictures or newspapers if possible.

4. Math: Compare water rates per month from early 1900's to present. The local water company can give you old rates as well as old newspapers.

   Older students can add for livestock, or businesses.

   Example: Water Rates for Beaumont in 1908

   Dwelling with 5 rooms or less with one family..$1.25

   Each additional room.....10

   Each head of stock.....25

   Each bath tub.....25

   Each water closet.....25

   Small stores or business.....$1.50

   Large store or business.....$2.50

   Any of the above with yard irrigation

   May 1 - Oct.1 Not to exceed 150 ft.... 1/2 cent per ft.

   Yard exceeding 150 ft depth

   May 1 - Oct.1.....25 per extra 1000 sq. ft.

* Language Arts: Write a letter to the editor of the paper in the early 1900's on a specific issue.

* Geography: Map the local area such as the original well sites (available form water district)

  Other possibilities are: streams, lakes, orchards, mines, local animal homes, or general topography.

* Newscast: Divide the students into groups. They will prepare and present a newscast pretending to be in the past and giving it from an "early" years viewpoint. They can debate on the weather,local fruit crops, local news, currency rate, stocks, and local issues. Tape and present at open house, history day, or present to local clubs.

Available Resources

Project WILD

WILD Aquatic

Project Learning Tree

Keepers of the Earth

Books

Bierhorst,John (1971). In The Trail Of The Wind. Sunburst Books. 4-8

Benet,Rosemary and Vicent, Stephen (1961). A Book of Americans. New York, Henry Holt and Company Co. 4-8

Janeczko, Paul,B. (1984). Strings: A Gathering of Family Poems. New York, Bradbury Press.

Environmental Education Inservice Guide

Wildlife

The future of our wildlife depends on the present attitudes of our students. Wildlife which was once abundant is now endangered or in danger of losing its home. Our students must find solutions for people to survive without destroying the habitats of our wildlife.

Possible Topics

-Habitats
-Food Chains
-Predator-Prey Relationships
-Camouflage
-Adaptations
-Hibernation
-Estivation
-Migration Patterns
-Classification of Animals
-Characteristics of Animal Groups
-Myths about Wildlife
-Indian Legends
-Past uses of wildlife: Trapping, Quills for Miners, Weather Forecasting, Danger Signals, Animal Dung
-Endangered Animals
-Wildlife Legislation

-Animal Rights

-Pesticides

_Rodenticides

-Fire: Advantages and Disadvantages

-Clothing Industry: Leather, Fur, Ornaments such as Feathers, Bone, Tusks, Ivory

-Poaching

-Animal Senses: Sight, Sound, Smell

-Current Issues: Domestic Pet Food Consumption in Relation to World Hunger Situation.

-Relates Poems and Literature

Possible Activities

Design a habitat: (10 animals) Science, Social Studies, Language and Math

-Diagram food webs for several organisms.

-State basic animal needs.

-Discuss: The habitat, carrying capacity, and the limiting factors.

-Make energy pyramids.

-Make food web or food chain mobiles.

Class Discussion:

-Predator/ prey relationships

-Effects of animal populations when increased or

decreased

-Role of the decomposers

-Carrying capacity if more trees were planted

which populations might increase?

Analysis of an Ecosystem: (Science, Language)

Which animals are omnivores, carnivores, herbivores, and scavengers?

Which organisms are producers, and consumers?

Which animals live near water, in the forest, and in the meadow?

Which animals are nocturnal?

What are the limiting factors of your habitat?

Population Study: (Science, Math)

-Measure out plot areas of square meter.

-Count the plants and their types.

-Count the animals and their types.

-Discuss the different plots. Why are more organisms on one plot than another?

-Discuss "edge", where two different habitats meet.

Predator/Prey Relationship: (Science)

-Dissect owl pellets.

-Identify and classify bones.

- Read Owl Moon by Jane Yolan to the class about "Owling".

Mapping Movements: (science, social studies, behaviors, observation)

Observe a hamster and a cricket in an empty container. Add both food and shelter and observe any changes. Compare the animals movements before and after the environment has been changed. Explain this is how biologists study animal behavior.

Guided Imagery: (Language, Art, Social Studies)

Tape record or buy a recording of an ecosystem. Have the students close their eyes. They are to visualize while you take them on a journey. (Water Wings in Project WILD is excellent.)
They can draw what they saw, then write a poem. This makes a great open house "class book"!

Animal Tracks: (Science)

Show students different samples of animal tracks. Discuss the different uses and how each animal is adapted to their environment. With birds compare the foot and beck adaptions to their environment. (Project WILD, and Nature Scope: Birds)
Have the students find track signs outside: insects, snails, worms, dogs, and cats can easily be found. Make track casts using Plaster of Paris

when appropriate. You can buy track molds or if you want you can find prints in nature and make your own molds. They make great Father's Day gifts! (Project WILD, or Nature Scope)

Oil Clean Up: (language, social studies, science)

Have students collect bird feathers. Place the feathers in water. Observe the water being repelled after placing oil on the feather to demonstrate an oil spill. Wash the feathers with detergent and water. Try the water repelling again. Ask students how oil spills affect birds in their natural habitat. Also try putting an egg in oil. Observe any differences. Students can simulate an oil spill clean up in a pan with water. Some materials to try are: Soap, a sponge, fire (probably teacher demonstrated), sand, liquid fertilizer, cotton balls, and a vacuum (turkey baster). See Project WILD and Forsea for some good activities and background.

Available Resources: (See Appendix C for addresses and prices)

Project WILD

Aquatic WILD

Forsea

Nature Scope: Amazing Animals Part I & II

Incredible Insects

Birds,Birds, Birds

Wading into Wetlands

Lets Hear it for the Herps

Amphibians and Reptiles

Endangered Species

Trees are Terrific

Digging into Dinosaurs

Discovering Deserts

Project Aims: Critters

Mapping Animal Movements

Mapping Fish Habitats

CLASS Project

Books

Benyus, Janine, M. (1989). The Field Guide to Wildlife Habitats of the Western United States. New York, Simon and Schuster Inc.

Siebert, Diane (1990). Sierra. Harper-Collins Publisher.

Burnie,David (1988). Eyewitness Books Bird. New York, Alfred A. Knopf Inc.

Cherry,Lynne (1982). Chipmunk Song. New York, Lodestar Books.

Jarrell, Randall (1963). The Bat-Poet. New York, Macmillan Publishing Company.

Sandburg, Carl (1982). Rainbows are Made. Hartcourt Brace Jovanovich.

Cherry,Lynne (1982). The Snail's Spell. Penguin Group.

Yashi (1987). Who's Hiding There?. Picture Book Studio.

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Holling,Clancy, Holling (1957). Pagoo. New York, Houghton Mufflin.

References

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Disinger, John (1990). Needs and mechanisms for environmental learning in schools. Environmental Horizons, 6 (1), 28-36.

Bybee, Rodger,W. (1991). Planet earth in crisis: How should science educators respond?. The American Biology Teacher, 73 (3), 146-54.

Backman, Shelia,and Crompton, John (1990). Education experiences contribute to cognitive development. Journal of Environmental Education, 68 (2), 4 -12.

Pettus,Alvin, M., and Teates, Thomas, G.(1989). Environmental education in Virginia schools. Journal of Environmental Education, 67 (3), 16-21.

Tanner,Thomas (1990).Significant life experiences: A new research area in environmental education. Journal of Environmental Education, 11 (4).

McCaw, Steven (1979). Teacher attitudes toward environmental education. Journal of Environmental Education,11 (2), 18-23.

National Wildlife Federation (1982). California CLASS Project, California Department of Education.

Western Regional Environmental Education Council (1987). WILD Aquatic, Boulder, Colorado.

Western Regional Environmental Education Council (1983). Project WILD, Boulder, Colorado.

Lingelbach,Jenepher (1986). Hands-On Nature. Vermont Institute of Natural Science, Woodstock, Vermont.

Miller,G. Tyler, Jr. (1991). Environmental Science Sustaining The Earth. Belmont,California, Wadsworth Publishing Company.

California State Board of Education (1991). Science Framework for California Public Schools Kindergarten Through Grade Twelve. Sacramento, California.

Alameda County Office of Education (1987). California State Environmental Education Guide - A Curriculum Guide for Kindergarten Through Sixth Grade. Hayward, California

Appendix A

Environmental Education Needs Inservice Survey

ENVIRONMENTAL EDUCATION NEEDS SURVEY

PLEASE FILL OUT THIS SURVEY ACCORDING TO WHAT AREAS YOU FEEL YOU WOULD LIKE TO HAVE MORE TRAINING, MORE INFORMATION OR MORE CLASSROOM ACTIVITIES AVAILABLE.

1. GRADE LEVEL YOU TEACH - PICK THE ONE WHICH IS MOST APPLICABLE FOR YOU.

K-3	4-6	7-8	9-12	OTHER
A	B	C	D	E

2. IF YOU ARE TEACHING ONE SUBJECT AREA PLEASE INDICATE THE AREA TO WHICH THIS APPLIES.

SCIENCE	A
MATH	B
LANG. ARTS	C
SOCIAL STUDIES	D
OTHER	E

PLEASE ANSWER THIS SURVEY BY SELECTING THE LETTER CHOICES BELOW WHICH ARE MOST APPLICABLE TO YOUR NEEDS.

A) STRONG NEED

B) NEED

C) DESIRED, BUT NOT AVAILABLE

D) NOT NEEDED

E) NOT APPLICABLE

3. RECYCLING AND WASTE MANAGEMENT

4. ENERGY EDUCATION
5. AIR POLLUTION
6. AQUATIC ENVIRONMENTS AND POLLUTION
7. CORRELATION WITH CHILDREN'S LITERATURE
8. CORRELATION WITH LANGUAGE/ ENGLISH
9. CORRELATION WITH SOCIAL STUDIES/HISTORY
10. CORRELATION WITH MATH
11. CORRELATION WITH FINE ARTS
12. WATER AND SOIL CONSERVATION
13. PLANTS
14. OCEANOGRAPHY
15. METEOROLOGY
16. WILDLIFE
17. AVAILABLE RESOURCES
18. LAND USE PLANNING
19. ACTIVITIES DOING FIELDWORK AND IMPACT STUDIES
20. ENVIRONMENTAL SCIENCE PROJECTS
21. AGRICULTURE
22. TEACHING ENVIRONMENTAL ISSUES
23. INVOLVING STUDENTS IN ACTION PROJECTS
24. THE ENVIRONMENT AND LOCAL HISTORY
25. THEMATIC APPROACH TO TEACHING ENVIRONMENTAL EDUCATION (AS IN NEW SCIENCE FRAMEWORK)
26. OTHER NEEDS ....PLEASE WRITE BELOW AND GIVE TO PRESENTER.

Appendix B

Environmental Education Inservice Needs Survey Results

TABLE I. ENVIRONMENTAL EDUCATION NEEDS SURVEY RESULTS							
TOPIC	PERCENT RESPONSE (n = 92)						
	1 Strong Need	2 Need	3 Desired	4 No Need	5 N/A	Sum of 1-2	Sum of 1-3
Recycling and Waste Management	33	36	15	8	1	75	91
Energy Education	22	38	15	12	1	82	82
Air Pollution	24	33	8	16	3	62	71
Aquatic Environments and Pollution	20	34	17	13	3	59	77
Correlation Children's Literature	20	23	26	14	7	48	75
Correlation English	21	24	26	14	4	48	85
Correlation History	21	21	17	13	4	61	79
Correlation Math	14	30	26	16	4	48	76
Correlation Fine Arts	13	27	26	16	6	43	72
Water and Soil Conservation	28	31	31	12	2	64	78
Plants	12	45	9	20	2	61	72

CONTINUED TABLE 1. ENVIRONMENTAL EDUCATIONAL NEEDS SURVEY RESULTS							
TOPIC	PERCENT RESPONSE (n=92)						
	1 Strong Need	2 Need	3 Desired	4 No Need	5 N/A	Sum of 1-2	Sum of 1-3
Oceanography	13	44	15	17	3	55	72
Meteorology	16	25	18	22	5	45	64
Wildlife	30	35	8	11	3	71	79
Available Resources	35	25	12	8	3	65	78
Land Use Planning	27	19	12	19	9	61	63
Fieldwork and Impact Studies	16	23	12	19	9	61	63
Environmental Science Projects	30	31	8	8	5	66	86
Agriculture	19	30	17	8	8	53	68
Environmental Issues	36	34	7	8	4	76	84
Action Projects	31	31	7	10	7	67	75
Local History	13	44	16	7	4	62	79
Thematic Approach	23	14	16	8	17	51	58

Written-In Comments: Inservice Needs Survey

1. At risk students need more involvement into outdoor programs and action projects.
2. Resource students need more opportunity for hands on activities.
3. Districts need to be more supportive of teacher and student needs by supporting field trips and special projects.
4. More time needs to be allowed for upper grades for outdoor education. One class period is not enough!
5. Environmental current affairs need to be addressed. These are areas of concern: Fire, earthquakes, drought, and oil spills.
6. Chemical pollution such as pesticides in natural foods.
7. Water pollution due to toxic waste should be addressed.
8. Gifted and talented action projects are needed.
9. More community involvement is needed.
10. Educating parents and students in school workshops would be beneficial to all.

Appendix C

Available Environmental Education Resources

Available Resources

Kits and Curriculum Guides

1. The Trash Monster Environmental Education Program,
   "The 4-R Solid Waste Reducing Plan"
   SWRL Educational Research and Development
   4665 Lampson Ave.
   Los Alamitos, CA. 90720
   No Cost to Schools

2. Project Learning Tree
   Department of Forestry
   P.O. Box 944246
   Sacramento, CA. 95814
   (916)323-2498
   Inservice requirement

3. Re: Thinking Recycling, An Oregon Waste Reduction Curriculum.
   Oregon Department of Environmental Quality
   Hazardous and Solid Waste Division
   Waste Reduction Section
   811 SW 6th
   Portland, Oregon 977204
   phone 229-6046 or 1-800-452-4011

4. Nature Scope," Pollution: Problems and Solutions"
   National Wildlife Federation
   1400 Sixteenth St. NW
   Washington, D.C. 20036-2266
   $7.95

5. Waste in Place,"Keep America Beautiful"
   Cost $40.00, plus $5.00 shipping (K-6)
   (203)323-8987
   Keep America Beautiful
   9 West Broad St.
   Stamford, CT. 06902

6. Waste: A Hidden Resource, "Keep America Beautiful"
   $50.00, plus $5.00 for shipping
   $20.00 for resource software,plus $2.00 shipping
   (203)232-8987
   Keep America Beautiful
   9 West Broad St.
   Stamford, CT. 06902

7. Waste Away, Information and Activities for
   Investigating Trash Problems and Solutions for Upper
   Elementary and Junior High School Students,
   $18.95
   Vermont Institute of Natural Science
   P.O.Box 86

Woodstock, VT. 05091

(802)457-2779

8. Kaleidoscope published by the Wisconsin Academy of Sciences, Arts and Letters

Center for the Advancement of Science, Mathematics, and Technology Education

Eight issues yearly. Each issue addresses the interdisciplinary use of a children's literature book.

Subscriptions $12.00

1992 University Ave.

Madison, WI. 53705

(608) 263-1692

9. Bottle Biology

Bottle Biology Office

1630 Linden Drive

Madison, WI. 53705

(608)263-5645

10. Project WILD

Public Affairs/ Conservation Education

California Department of Fish and Game

1416 Ninth Street

Sacramento, CA. 95814

(916)445-7613

Inservice Requirement

11. California ClASS Project
    Environmental Education
    California Department Of Education
    P.O.Box 944272
    Sacramento, CA. 95814

12. Acid Rain, Corroding National Treasures -Lists sources of acid rain and it's effects on the environment, National Wildlife Federation
    1400 Sixteenth St. NW
    Washington,D.C. 20036-2266

13. Bill Oliver's Audio Tapes - Songs about environmental issues
    515 E.40th Street
    Austin, TX. 78751
    Approx. $10.00 per tape

14. Project AIMS is a "hands on" integrated math and science activity program
    AIMS Education Foundation,
    P.O. Box 8120
    Frenso, CA. 93747
    Office: (209)255-4094

15. FORSEA: Investigating Marine Science
    Marine Science Center
    Educational Service District 114

Poulsbo, Washington 98370

Guides 3-4, 5-6, 7-8, 9-12 Approx. $30.00 each

16. OSCARS OPTIONS (Ocean State Cleanup and Recycling)
Department of Environmental Management
Providence, RI. 02908

17. Energy Source Education Program
5505 East Carson Street, Suite 250
Lakewood, CA. 90713
Offalot..... Kindergarten
Brightland..... First/Second Grade
Fossil Fuel..... Third/ Fourth Grade
Power Switch..... Fifth/ Sixth Grade
Energy Crunch..... Junior High Science
Energy in American History..... Junior High History
Energy Choices and Challenges..... High School Social Studies or Science

18. Exploring The Coastal Environment And Its Resources
(1985) School of Education Office
School of Natural Sciences
California State University
1250 Bellflower Blvd.
Long Beach, CA. 90840

19. Hands on Nature- Information and Activities for Exploring the Environment with Children.

Vermont Institute of Natural Science
Woodstock, Vermont 05091
(802)457-2779 Price: $16.95

20. Practical Energy Projects, for Industrial Arts Students,
California Energy Extension Service
El Dorado County Office of Education
6767 Green Valley Road
Placerville, CA. 95667

21. Energy Math, California Energy Extension Service
El Dorado County Office of Education
6767 Green Valley Road
Placerville, CA. 95667

22. 4-H Home Conservation Guide
California Energy Extension Service
6767 Green Valley Road
Placerville, CA. 95667

23. Energy Activities for the Primary Classroom
California Energy Extension Service
(916) 323-4388

24. Energy Action in Schools, Animated Bibliography
K-6, and 7-12
California Energy Extension Service

(916) 323- 4388

25. Educator's Guide To The Three E's, on: Energy/Ecology/Economics. Single copy available to teachers.
Sears, Roebuck and Co.
Consumer Information Services
Sears Tower
Chicago, IL. 60684

26. Playing with Energy: Games and Simulations
Grades 8-12
National Science Teachers Association
stock # 471-14778 under $10
1742 Connecticut Ave., NW
Washington, D.C. 20009
(202) 328-5800

27. California State Environmental Education Guide (K-6)
Alameda County Office of Education
313 West Winton Ave.
Hayward, CA. 94544-1198
$17.95 plus tax
Supplements
Toxics: Taking Charge
$6.50 and 7% sales tax
Water Wisdom
$14.50 and 7% sales tax

Reproducables and Ditto Books: (Available at most school supply stores)

Weather,Electricity,Environmental Investigations (1982).The Learning Works Inc.

Creative Investigations (1982). The Learning Works Inc. this book has a great format for elementary science projects to follow.

Science on a Shoestring (1985). Addison-Wesley Publishing Co. This book has scientific investigations for all grades: K-8. Kits are available to supplement activities.

Hooked on Science Sewall, Susan, Breyer,(1990). The Center for Applied Research in Education

Mapping Fish Habitats (1987). GEMS, Lawrence Hall of Science,University of Berkeley. Under $10

Mapping Animal Movements (1987). GEMS, Lawrence Hall of Science, University of Berkeley. Under $10

Books:

Wilcox,Charlotte (1988). Trash. Minneapolis,Carolrhoda Books, K-5

Sues,Dr. (1986). The Cat in the Hat Comes Back. Random House, K-5

Asimov, Isaac (1989). Space Garbage. Milwaukee,Stevens Publishing, K-Adult

Javana, John (1990). 50 Simple Things Kids Can Do To Save

The Earth. The Earth Works Group, K-8

Van Allsburg (1990). Just A Dream. Boston, Houghton Mifflin

Pringle,Laurence (1990). Global Warming. New York, Arcade Publishing. K-Adult

Cherry,Lynne (1990). The Great Kapok Tree. San Diego, Gulliver Books. K-8

Caduto, Michael, J. and Bruchac, Joseph (1989). Keepers of the Earth. Fulcrum Inc. K-8

Lauber, Patricia (1990). Seeing Earth From Space. New York, Orchard Books. K-8

Bierhorst, John (1971). In The Trail Of The Wind. Sunburst Books. 4-8

Benet, Rosemary and Vicent, Stephen (1961). A Book of Americans. New York, Henry Holt and Company. 4-8

Janeczko, Paul,B.(1984). Strings: A Gathering of Family Poems. New York, Bradbury Press. 4-8

Benyus, Janine, M.(1989). The field Guide to Wildlife Habitats of the Western United States. New York, Simon and Schuster Inc. 4-Adult

Siebert, Diane (1990). Sierra. Harper-Collins Publisher. K-8

Burnie,David (1988). Eyewitness Books Bird. New York, Alfred A. Knopf Inc. 4-8

Cherry,Lynne (1982). Chipmunk Song. New York, Lodestar Books.K-3

Jarrell, Randall (1963). The Bat-Poet. New York, Macmillan

Publishing Company. 4-8

Sandburg, Carl (1982). Rainbows are Made. Hartcourt Brace Jovanovich. 4-8

Cherry,Lynne (1982). The Snail's Spell. Penguin Group. K-3

Yashi,(1987). Who's Hiding There?. Picture Book Studio. K-3

Parker, Steve (1989). Eyewitness Books Mammal. New York, Alfred A. Knopf. K-8

Holling,Clancy, Holling (1957). Pagoo. New York, Houghton Mufflin. K-8 $13.95

Parker,Nancy, Winslow and Wright, Joan, Richards (1990). Frogs, Toads, Lizards, and Salamanders. Greenwillow Books, New York. 4-8

Willow, Diane and Jacques, Laura (1991). At Home in the Rain Forest. Charlesbridge Publishing,Watertown,MA K-8 $13.95

Burningham,John (1989). Hey! Get Off Our Train. Crown Publishers, INC.,New York K-8 $15.00

Glimmerveen, Ulco (1990). A Tale of Antarctica. Scholastic INC., New York, K-3 $12.95

Siebert, Diane (1988). Mojave. Thomas Y. Crowell,New York K-8 $13.95

Dehr, Roma and Bazar, Ronald, M. (1990). Good Planets are Hard to Find! Earth Beat Press, Vancouver, B.C. 4-8 $6.95 (604) 736-6931

Free or Inexpensive Materials:

The U.S. Government Printing Office continuously publishes new materials on environmental topics. You can write for free bibliographies which include descriptions of the materials and prices. For topics listed below write to:

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

Air Pollution -SB No. 46
Atomic Energy and Nuclear Power -SB No. 200
Energy Management for Consumers and Business-SB No. 303
Energy Policy,Issues and Programs-SB No. 305
Energy Supplies, Prices and Consumption-SB No. 304
Environmental Education and Protection -SB. No. 88
Solar Energy SB.No. 9
Waste Management-SB No. 95
Water Pollution and Water Resources -SB.No. 50
Wildlife Management -SB No. 116

Trade or Private Organizations

1. American Gas Association, Education Services
   1515 Wilson Blvd.
   Arlington, VA. 22209

2. American Petroleum Institute, Educational Department
   2101 L Street, NW
   Washington, D.C. 20037
3. Southern California Edison, Educational Department
   P.O. Box 800
   Rosemead, CA. 91770
4. Mobil Oil Corporation, Educational Services
   612 S. Flower
   Los Angeles, CA. 90017

Environmental Organizations

1. The California Nature Conservancy
   785 Market Street
   San Francisco, CA. 941032.

2. Center for International Environmental Information
   300 E. 42nd Street
   New York, NY. 10017

3. Center for Renewable Resources
   1001 Connecticut Avenue, NW
   Suite 510
   Washington, D.C.20036

4. Defenders of Wildlife
   1244 19th Street, NW
   Washington, D.C. 20036

5. Environmental Action Foundation
   724 DuPont Circle building
   Washington, D.C. 20036

6. National Audubon Society
   950 Third Avenue
   New York, NY. 1022

7. National Wildlife Federation
   1412 16th Street, NW
   Washington, D.C. 20036

8. Sierra Club
   730 Polk Street
   Suite 725
   San Francisco, CA. 94109

9. North American Association for Environmental Education
   P.O. Box 400
   Troy, OH. 45373

10. Northwest Association Of Marine Education
    (206)779-5549

<u>Periodicals and Newsletters</u>

1. Audubon Activist. 950 Third Ave. New York,NY 10022
   Bi-monthly journal on environmental issues. $10.00 a year.

2. Audubon Educator. National Audubon Society, 376
   Greenwood Beach road, Tiburon, CA. 94922.
   Newsletter for Audubon Educators

3. National Science teachers' Association
   Science and Children 8 times a year/$40.00 Elementary
   Science teacher 9 times a year/$40.00 High School
   Science Scope 8 times a year/$40.00 Middle/Junior
   High
   Membership and two journals is $75.00 a year
   Membership and three journals is $95.00 a year
   Membership and one journal is $50.00 a year
   1742 Connecticut Ave, NW
   Washington,D.C. 20009-1171

4. National Wildlife Federation Publications:
   Ranger Rick Ages 6-12 / 12 issues/$15.00
   Your Big Backyard Ages 3-5 / 12 issues/12.00
   National Wildlife 6 bi-monthly issues/$16.00
   International Wildlife 6 bi-monthly issues/ $16.00
   1-800-432-6564
   1400 Sixteenth Street, NW
   Washington,D.C. 20036-2266