1995

Extending the science curriculum through children's literature

Barbara L. Kranz
University of Northern Iowa

Extending the science curriculum through children's literature

Abstract

Adolescents have an inherent curiosity about science. Therefore, the role of the teacher is to capitalize on this intellectual trait through developmentally appropriate activities and projects and then relate that learning to the real world. Some students, though, are being turned away from science topics when they are placed in content area textbooks and their scientific aptitude is judged by their ability to comprehend the text. The reading level of these texts may be too difficult for many of the students (Kantor, Anderson, & Armbruster, 1983). Content textbooks break concepts into formal clusters of information that do not encourage reader interest, content acquisition, or meaningful retention (Smith & Johnson, 1993). Then, the study of science becomes no more than memorization of vocabulary and isolated facts (Goodlad, 1983). The students 2 become frustrated and no longer choose to pursue the answers to questions.

Extending the Science Curriculum Through Children's Literature

A Graduate Project
Submitted to the
Department of Curriculum and Instruction
In Partial Fulfillment
of the Requirements for the Degree
Master of Arts in Education
UNIVERSITY OF NORTHERN IOWA

by
Barbara L. Kranz

May 1995

This Project by: Barbara L. Kranz

Entitled: Extending the Science Curriculum Through Children's Literature

has been approved as meeting a project requirement for the Degree of Master of Arts in Education.

Jeanne McLain Harms

6/7/95
Date Approved

Director of Research Paper

Jeanne McLain Harms

6/7/95
Date Approved

Graduate Faculty Adviser

Constance J. Ulmer

6/7/95
Date Approved

Graduate Faculty Reader

Peggy Ishler

6/7/95
Date Approved

Head, Department of Curriculum and Instruction

Introduction

The trend in middle school education is to provide an instructional program that promotes genuine learning as students incorporate understandings gained from their school experiences into their own scheme of meanings. Subject matter becomes more meaningful to adolescent students when it is related to important personal or social themes. Such a program can be enriched by quality literature experiences (Beane, 1992).

Rationale of the Project

Adolescents have an inherent curiosity about science. Therefore, the role of the teacher is to capitalize on this intellectual trait through developmentally appropriate activities and projects and then relate that learning to the real world. Some students, though, are being turned away from science topics when they are placed in content area textbooks and their scientific aptitude is judged by their ability to comprehend the text. The reading level of these texts may be too difficult for many of the students (Kantor, Anderson, & Armbruster, 1983). Content textbooks break concepts into formal clusters of information that do not encourage reader interest, content acquisition, or meaningful retention (Smith & Johnson, 1993). Then, the study of science becomes no more than memorization of vocabulary and isolated facts (Goodlad, 1983). The students

become frustrated and no longer choose to pursue the answers to questions.

A trend in science education that addresses the problem of meeting the various needs of middle school students is the activity-based discovery approach. Although beneficial in helping students develop critical thinking abilities, these programs often lack opportunities for students to apply their learning to real world experiences. With both the content-driven textbook approach and the activity-based discovery approach to science instruction, literature experiences that include different genres (fiction, poetry, and folk literature as well as nonfiction) can provide a more individualized program, thus promoting more student interest (Smith & Johnson, 1993). Literature experiences can offer students new insights into their familiar world, thus extending their knowledge of science concepts and relating them to their lives (Smith, 1983). An extended literature base can enhance the integration of the curriculum. Integrating, or linking, instruction in several areas of the curriculum through a common theme incorporates personal-social and knowledge strands, thus providing a broader instructional base.

Purpose of the Project

The purpose of this project is to engage in the process of extending a science unit for grade six through many literature

genres. The literature experiences will be provided primarily through learning centers and peer discussion. Attempting to provide more than just the facts as dictated by a content-driven textbook approach and more direction than a total activity-based science curriculum, this unit will provide students opportunities to connect the content and activities with the world around them.

Procedures of the Project

Taking into account the existing science curriculum and the interests of sixth grade students, the topic of conserving the earth's environment will be extended. Related concepts will be noted to guide the search for quality literature from the different genres. Resources such as Booklinks and Science and Children, professional books, and the collections of the public and school libraries will be used to develop a list of literature works. From these works, reading experiences and related activities will be developed. Such a unit can provide genuine experiences within the functions of language, such as researching a topic and presenting a report.

Extending the assessment of student learning in this unit will be explored. Because of the implementation of the whole language instructional concept in the classroom that offers students opportunities to become responsible for all aspects of the writing process from topic selection to assessment, many of the writing pieces developed in the unit can be the focus of

student-teacher conferences and can become part of the students' portfolio assessment. Other evaluation methods used will be teacher observation including anecdotal records, student journal reflections, and teacher/student checklists.

Pertinent Terms to Project

Learning centers are the areas of a classroom devoted to providing independent activities for children to develop an understanding of science concepts through experiences with meaningful reading and expressive tasks.

Literature circles are groups of four to six students all reading the same trade book or a book on the same theme who meet together to discuss their reading and then cooperatively complete a project that reflects the concepts in the books.

Trade books are works, such as anthologies, novels, picture books, and magazines, from the different genres published for children or adolescents and easily accessible through libraries, book stores, and book clubs. Trade books will also be referred to as children's literature or adolescent literature.

Whole language is an instructional development concept that focuses on learners creating meaning through the language processes within the functions of language, thereby extending their thinking-language abilities.

Review of Professional Literature

The increased support for incorporating literature, or trade books, into the content areas of the elementary school program is made obvious by the number of articles in science and social studies publications as well as in reading and language arts journals. In fact, each March, Science and Children, a publication of the National Science Teachers Association, provides a list of outstanding trade books centered on science themes. Most of the publications on instruction, though, only provide strategies for presenting literature experiences and discuss the expected student outcomes. A few studies have been conducted of instructional development projects in which science programs have been extended through literature experiences representing the different genres. In this section, these studies will be followed by a summary of discussions on instruction.

Offering literature experiences to extend school science programs is not new. In fact, in 1967, Barrilleaux reported the results of a two-year study in which multiple library sources, mostly nonfiction, replaced the textbook in a junior high program. From the assessment, he found significant growth in student achievement, attitudes, critical thinking, and writing abilities. He concluded that students developed independence and individual responsibility from this instructional approach and

became more aware of the additional materials available to them rather than being dependent on the limited information in a textbook. In other words, they were more able to find the answers to personal questions and to fulfill other areas of interest related to science.

In 1980, Fisher patterned a study after Barrilleaux's (1967) to ascertain the effect of literature experiences in a junior high school science program on students' attitudes and achievement. Her study included two experimental groups and one control group. While the control group developed the concepts through the textbook approach only, both experimental groups were introduced to trade books relating to the topic studied. The first group was encouraged to read from the selections offered as a way of broadening textbook information. The second group was given specific assignments requiring the reading of trade books as a supplement to the textbook. Results for each group varied according to ability level. In the group encouraged to read trade books, the higher ability students scored highest on the cognitive abilities section of the assessment while in the group given required reading, the higher ability students rated highest on the affective section. For the lower ability students, assessment indicated better results when the reading was encouraged but not required. However, both experimental groups, regardless of the method, attained higher scores on both

cognitive and affective measures than the control group. Fisher generalized from the results that improved attitude and achievement can be obtained through expanding an existing science curriculum with quality literature experiences.

Lyttle (1982) also studied the effectiveness of extending a science program through literature experiences in grade four. An experimental group read trade books selected to meet the same objectives of the unit taught through the textbook to the control group. Assessment of cognitive and affective abilities at the end of the unit found no differences in achievement or attitude between the groups. However, the researcher related that there were several threats to the internal validity of her study. Most notably mentioned was the fact that the attitude of the group was generally high as shown by the pretest, and regression was seen in the post test. Because the number and quality of trade books available during her study was limited, the availability of materials was inadequate. Lyttle believed that this problem may have influenced her study so she interviewed the students and found that most of the students had been frustrated by this problem; thus, they preferred having a textbook. Notably though, as with the studies of Barrilleaux (1967) and Fisher (1980), a change in students' approach to science study was seen later when they sought out trade books to find more in-depth information on a science topic than was found in their textbook.

More recently, Levitan (1991) studied the effects of extending a hands-on approach to science into the language arts curriculum by linking literature pieces read during class to the science unit. The experimental group included a class of 17 sixth graders previously identified as below average readers. Although the researcher found a slight decrease in attitude of these students, the achievement scores for members of this group increased significantly, indicating increased comprehension of the reading material. Levitan concluded from these findings that further study of larger, more diverse groups should be conducted.

Piburn and Baker (1993) completed a qualitative study of attitudes toward a science program focused on a textbook using a stratified random sample of 149 students chosen from kindergarten through grade 12. Instead of a typical paper and pencil test traditionally used to measure student attitudes, these researchers conducted interviews with subjects. Significant data was found in the students' answers to questions about attitudes toward science and the instructional techniques, materials, and activities presented. Upper elementary and junior high students reported that science had little relevance to them. Many believed they were being taught things they would never need to know. Comments about too many worksheets and over dependency on the textbook were heard along with a concern that students were seldom able to provide input about how and what is taught.

Researchers concluded that students were becoming alienated from science for two reasons--ambiguity and complexity. They recommended that instruction involve methods to alleviate these problems.

The conclusions from these studies, though not all directly citing the relationship of trade books as a link to the real world, imply that children's literature experiences can assist in making science instruction more relevant, thus improving students' attitudes and achievement. While few current studies of this instructional approach have been completed, the abundance of books and professional articles citing the benefits of integrating literature and content areas encourages educators to extend the literature base of the school program, connecting the study of science with the real world. Such is the premise suggested in these articles. Hickman and Cullinan (1989) suggest that one function of literature experiences in the content areas is to provide insights into the human condition and to help the student rethink their experiences. Literature can allow students to put their ideas into a larger context. Spiegel (1987) agrees stating that students need to "develop a conscious awareness that literature can broaden their knowledge of the world" (p. 162).

Moss (1991) relates that trade book experiences provide a rich context for understanding real events and broadening a child's schemata. According to Nordstrom (1992), a fine trade

book can support children's inquiry into science and can encourage a child to think and relate ideas until they eventually develop understandings on that topic.

In addition, trade books with lively narratives can offer an aesthetic dimension that most textbooks do not contain, allowing children to make connections between facts and real-life concepts more easily (Crook & Lehman, 1990). Also, real-life uses and abuses of scientific knowledge and the dramatic elements of scientific discovery can be explored (Spiegel, 1987).

Overall, the science community understands that the science curriculum in the elementary school needs to offer more than memorization of facts and activities with no focus. Science education must have wide curriculum goals. Among them should be an emphasis on everyday coping in which science provides a means for understanding and controlling one's environment. Experiences with trade books can be a valuable aid to help reach this goal (Roberts, 1982).

Literature-Based Science Unit:
Protecting Our Environment

Goals of the Unit

This instructional development project extended the literature base of an existing unit Protecting Our Environment in the science curriculum for grade six. The literature base was

designed to meet the range of interests and abilities of sixth grade students in a middle class, rural community.

Literature Base

The unit was initiated by the introduction of full length books (realistic and historical fiction) dealing with various ways people interact with the earth to survive. After a brief introduction of each book and author, students chose the book that appealed most to them.

The books selected were:

George, J. C. (1959). My Side of the Mountain. New York: Trumpet. Young Sam Gribley, a city boy, chooses to spend the winter in the Catskills where he uses knowledge gained through reading to survive on the land. He keeps a journal of the adventures he has as he makes a home, sews clothing, and finds food while trying to stay hidden.

George, J. C. (1991). Who Really Killed Cock Robin?. New York: Harper Trophy. The town of Saddleborro searches for a famous robin's cause of death. The townspeople track down several environmental concerns that will contribute to an even bigger problem for Saddleborro than the death of the bird if not corrected.

O'Dell, S. (1988). Black Star, Bright Dawn. New York: Fawcett Juniper. Bright Dawn and her lead dog, Bright Star, face the challenge of the Iditarod race. They must use their instincts and knowledge of the area to survive the dangers posed by the rugged terrain and harsh weather.

O'Dell, S. (1960). Island of the Blue Dolphin. New York: Dell. Karana, an American Indian girl, is accidentally left behind on an island when the rest of her people leave after an attack by the Aleuts. For eighteen years, she is forced to provide food, shelter, and clothing for herself. Yet, when rescued by Spanish priests, she feels sadness about leaving.

Paulsen, G. (1987). Hatchet. New York: Trumpet. When the pilot of Brian's plane suffers a heart attack and dies while flying him to be with his father, the boy finds himself left to survive the Canadian wilderness with only a hatchet.

Paulsen, G. (1991). The River. New York: Dell. Asked to return to the Canadian wilderness as part of a government study on survival, Brian returns with a psychiatrist to relive an earlier experience of survival. However, when Derek, the psychiatrist,

is hit by lightning, Brian is faced with an even greater problem--getting Derek to safety.

Students were given the opportunity to read these works as the basis for discussions in small peer groups, or literature circles.

Organization of the Classroom

Offering literature experiences as an extension of the science unit involved the use of two instructional methods, literature circles and learning centers. A 75-minute block of time was devoted each day to reading theme-related works of literature and working on related expressive activities. Students could work independently or in small groups.

Literature circles. These small groups were introduced along with the literature base of the full-length books. Those students choosing the same title became a circle of students working together to further their understanding of science and language arts concepts through discussion, journaling, and project work. The literature circle worked through these processes: First, students read and discussed within their group the story and shared ideas and questions. Secondly, students journaled their thoughts, feelings, and questions about the work and then received a response from the teacher. Finally, each group prepared and presented an expressive activity that incorporated the knowledge about the environment gained from

reading and discussing the work to the whole class. A list of possible expressive activities that had potential for extending the science concepts was provided as a basis for the group projects. However, groups were free to expand these ideas or design their own projects if it provided insight into the story and its science concepts.

Each circle was provided a folder for organization purposes. Ideas from Neamen and Strong's Literature Circles: Cooperative Learning for Grades 3-8 (1992) were adapted for the folder development. Work done by the group during a class period was also stored in the folder for easy access during the next class period. In addition, a list of group behavior expectations devised by the class was copied and included. Samples of assessment forms that would be used by the group to conduct a self-evaluation of their work, as well as an evaluation form listing the criteria to be used by the teacher when evaluating the group project, were included for reference.

Meeting daily the groups first decided how the period would be spent. The first two or three class periods were basically spent reading the chosen book with time allotted for discussions of favorite passages, characters, and unknown vocabulary. However, since this unit was introduced early in the school year and these students had not previously worked in this type of instructional setting, the teacher needed to provide some

structure for the students' responses. For example, as the teacher held daily meetings with each group, a student was asked to share a journal entry and appropriate, extending responses from group members were encouraged. The teacher sometimes asked a "what if" question to encourage discussion. As students progressed through the books, they began to divide their time between reading and planning the projects. Again, some guidance was provided by the teacher to help set realistic goals for the group.

At the end of each period, students were expected to react in their journals to their reading and related expressive activity experiences. The teacher responded in writing to the students' entries each day and used these responses to guide the unit study.

The final stage of the literature circle was to cooperatively develop a group project that could be used to present the chosen novel and related science concepts to the class. Even though several suggestions for expressive activities were provided for each group, the groups often developed their own ideas. The teacher offered these specific suggestions for the discussion pieces through a handout that was kept in the group folder for reference.

Suggested projects for Hatchet, by Gary Paulsen

1. Brian learned much about the plants and animals in the

wilderness. Select plants and animals mentioned in the story to research and prepare a guide describing each. Include how each was helpful or harmful to Brian during his adventure.

2. Brian lived in two types of shelters during his stay in the wilderness. Reread the descriptions of each; then using as many natural materials as possible, make scale models of each.
3. Brian's hatchet was very important to his survival. Skim the story to find out all the ways he used it in his search for food and shelter. Put all of the ideas together in a book or mural, illustrating and describing the uses.

Suggested projects for Black Star, Bright Dawn, by Scott O'Dell

1. The Iditarod race covers 1000 miles through Alaska. On a map pinpoint the checkpoints of the route and other exciting events that happened in the story. Describe each point's significance.
2. Bright Dawn needed to be aware of the environment around her and the skills needed to survive. Using information learned through reading about Bright Dawn's experiences, write your own manual of survival tips to help other racers in the future. Refer to the book for

assistance, and if necessary, consult other books about the Iditarod. You may wish to publish this manual in booklet form with a cover, title page, author, publisher, and copyright date.

3. Your group has been placed in charge of advertising for the Iditarod race. Your goal is to encourage more people to enter. Using a variety of media, such as television and radio commercials, newspaper and magazine ads, and billboards, develop an effective campaign. What kind of people should you try to interest? What can you say about the environment? What can someone gain from running the race?

Suggested projects for Island of the Blue Dolphins, by Scott O'Dell

1. Imagine that you are members of a team of scientists exploring the island several years after Karana left it. You are uncovering many of the items she and the people of her village left behind. Prepare a journal of your notes, describing and illustrating the items you find. Since you are seeing these items for the first time, you might speculate on the possible uses for them.
2. Karana depended greatly on the wildlife found on the island. Write and illustrate a guide for others to

use when visiting the island. Use the information in the book to help, but also other reference books to find further information. Your guide could be developed into a book with a cover and title page that will include the name of the author, publisher, and copyright date.

3. Make a 3-D map of the island using such materials as clay, paper-mache or salt dough to illustrate its shape and important features. Develop a key to identify the location of the events in the story.

Suggested projects for My Side of the Mountain, by Jean Craighead George

1. Sam became very skilled at inventing the things he needed for survival, such as fish hooks and whistles. Working together write a how-to book. You may wish to give illustrated step-by-step directions for others living in the wilderness.
2. Imagine that Sam has decided to open a restaurant serving only the foods he ate while living alone. Prepare a menu, describing the appetizers, main dish items, desserts, and beverages in a way that others may want to try them.
3. Sam did not have many tools to work with on the mountain. You, however, will be allowed to take 12

items with you when you leave on your ten-day wilderness survival vacation. Organize a chart that lists those items and the uses each will have. You may not include food or anything battery operated, and all items must fit into a small backpack.

Suggested projects for Who Really Killed Cock Robin?, by Jean Craighead George

1. Many people are unaware of the potential harm of certain materials to the environment. Using the events from the book as a starting point, find potentially harmful products. Research other items that may be misused unknowingly. You may want to limit your research of products found around the home or branch out further. Present your findings to the class, listing the products: proper use, storage, and disposal; and the result of improper use. Visual aids, such as copies of warning labels, pictures from magazine articles, and informational charts, can be helpful.
2. Residue from chemical dyes can pollute water. Research ways Indians and other groups have made dyes. Make a color chart showing what plants can be used to make specific colors. Write out the directions for making

dyes and if possible prepare some to be used in dyeing coffee filters or old cloth for a display.

3. Publish an environmental newspaper. Include a feature story about the events that happened in Saddleborro. Other suggestions for articles are: information about true environmental tragedies (e.g., Lake Erie, Kuwaiti oil fields, or Valdez oil spill), helpful hints for keeping the earth safe, a question and answer section, and advertisements for environmentally friendly products you would like to invent and place on the market.

Suggested projects for The River, by Gary Paulsen

1. Make a map or scale model of the Necktie River. Pinpoint the important locations for Brian and Derek. Using the book as a reference, describe each point in terms of the obstacle they faced and the survival methods used that allowed them to live through this adventure.
2. Imagine that Brian is now teaching classes in wilderness survival. Write a textbook for his class using the information he has learned from his experiences, such as building shelters, finding food, surviving weather and animal problems, etc. You may want to develop the information into a book with a

cover, title page presenting the name of the author and publisher, copyright page, and table of contents.

3. Write the script for a talk show featuring Brian and Derek as guests as they retell their story. Be sure that the interviewer is asking questions in a logical order and that the guests are explaining in enough detail so the audience can follow the events in the order they occurred. You may want to include visual aids such as maps, models, and props as you present your show to the class.

Learning centers. During this unit of study, two types of learning centers presented literature experiences and related expressive activities. Following a format similar to that provided by Harms and Lettow in Literature and Expressive Activity (1992), students were given the opportunity to become involved with a wide range of genres of children's literature through individual and small group work in sustaining centers and centers specific to the unit. Sustaining centers, those that remain a constant part of the classroom all year such as listening/reading, poetry, author, and bookmaking, were stocked with materials that connected them to the environmental unit. In addition, centers specifically designed to be used with the unit offered students opportunities to expand their understanding of

science concepts through their involvement with quality works of literature and to engage in many types of expressive activities.

During this unit, these sustaining centers were presented to extend the environmental theme.

Poetry Center

Science Goal: The student will recognize the importance of protecting the earth for the enjoyment and survival of its inhabitants.

Literature Experiences:

Brenner, B. (1994). The Earth is Painted Green. New York: Scholastic.

Livingston, M. C. (1986). Earth Songs. New York: Scholastic.

Haiku--Examples collected from several sources

Cinquain--Examples collected from several sources

Expressive Activity:

1. Haiku and cinquain are Japanese forms of poetry that reflect single moments of time in nature. The haiku is a three-line, seventeen syllable, unrhymed poem which uses nature as its primary focus. The syllables are divided among the three lines in a five syllable, seven syllable, five syllable pattern. The cinquain is an unrhymed poem consisting of five lines arranged in a two, four, six, eight, and two-syllable pattern.

The first line announces the topic, the second describes the topic, the third expresses action, the fourth expresses a feeling, and the last line is a synonym for the topic. Read some of the examples. Then you may wish to try expressing your experiences with nature by following the form for a haiku or cinquain poem.

2. After reading several of the poems found in The Earth is Painted Green, you may wish to write your own poem about nature. One easy way to begin is with a couplet, a two-line rhyming poem. For example, you can write a garbage can couplet, by first thinking of as many words that rhyme with litter as possible. Then complete this couplet "What will we do with all this litter?" Add your completed couplet to the drawing of the garbage can on the wall. You may want to further the experience of composing couplets by writing an original couplet or by writing several related couplets that might form a longer poem.

Author Center

Science Goal: The student will recognize the major theme of the environment in the writings and lives of Jean Craighead George, Scott O'Dell, and Gary Paulsen.

Literature Experiences:

George, J. C. (1972). Julie of the Wolves. New York: Trumpet.

_____. (1959). My Side of the Mountain. New York: Trumpet.

_____. (1990). On the Far Side of the Mountain. New York: Trumpet.

_____. (1989). Shark Beneath the Reef. New York: Harper Trophy.

_____. (1983). The Talking Earth. New York: Harper.

_____. (1987). Watersky. New York: Harper Trophy.

_____. (1991). Who Really Killed Cock Robin? New York: Harper.

O'Dell, S. (1967). The Black Pearl. Boston: Houghton.

_____. (1988). Black Star, Bright Dawn. New York: Fawcett Juniper.

_____. (1960). Island of the Blue Dolphin. New York: Dell.

_____. (1989). My Name is Not Angelica. New York: Dell.

_____. (1980). Sarah Bishop. New York: Scholastic.

_____. (1970). Sing Down the Moon. New York: Dell.

_____. (1986). Streams to the River, River to the Sea. New York: Fawcett Juniper.

_____. (1976). Zia. New York: Dell.

Paulsen, G. (1990). Canyons. New York: Dell.

_____. (1991). The Cookcamp. New York: Dell.

_____. (1987). The Crossing. New York: Dell.

_____. (1983). Dancing Carl. New York: Scholastic.

_____. (1985). Dogsong. New York: Scholastic.

_____. (1990). The Foxman. New York: Puffin.

_____. (1987). Hatchet. New York: Trumpet.

_____. (1992). The Haymeadow. New York: Dell.

_____. (1991). The River. New York: Dell.

_____. (1984). Tracker. New York: Puffin.

_____. (1989). The Voyage of the Frog. New York: Dell.

_____. (1990). Woodsong. New York: Scholastic.

Expressive Activity:

1. Select an author and his/her works to study. Each student in your literature circle can select one or more works to read and then discuss with the entire group.
2. Using the materials found in the author center and in the library, write a short profile about one of the featured authors. Be especially aware of his or her relationship with the environment.

Bookmaking Center

Science Goal: The student will become aware of the abundance of natural and recycled articles that can be used in creative ways.

1. Contribute items no longer needed at home for use in the bookmaking center, such as cereal boxes to be cut and covered for book covers with left-over wrapping paper.
2. Students will be offered an assortment of natural items to use when designing covers or pages. Waxed leaves, pressed flowers, and feathers can be used for rubbings, stencils, ink prints, or laminated onto a cover. Small twigs might be used as a frame for a poem or drawing.

These centers were specifically designed to enhance the science concepts in the environmental unit through literature experiences and related expressive activity.

Center--The Future is in Our Hands

Science Goal: The student will recognize the role of the individual in maintaining the earth and the quality of life on it.

Literature Experiences:

Read one or more of these books.

Cooney, Barbara. (1985). Miss Rumphius. New York: Puffin.

Peet, Bill. (1970). The Wump World. Boston: Houghton.

Seuss, Dr. (1971). The Lorax. New York: Random House.

Van Allsburg, Chris. (1990). Just a Dream. Boston: Houghton.

Expressive Activities:

1. Make a chart showing different kinds of pollution, what are its causes, and how it affects others.
2. Write a newspaper editorial from the point of view of one of the characters in the books.
3. In The Lorax, when the Once-ler got angry, he told the Lorax, "All you do is yap yap yap and say Bad! Bad! Bad! Well, I have my right sir, and I'm telling you I intend to go on doing just what I do!" (unpaged). Discuss whether you think people do have the right to do just what they want to do without considering the welfare of others and the environment. Give examples to support your idea from the book or from your own personal experience.
4. Form a small group to prepare a radio interview that can be presented to the class. The roles that can be played are the interviewer and the characters from a book presented in the center (Miss Rumphius, the Lorax, the Once-ler, a Wump, or a Pollution). To prepare for the interview, the group can work together to form a list of questions on the topic of conservation.

5. Draw a picture showing the kind of world you would like to live in if you had to leave the Earth.
6. Miss Rumphius's goal was to make the world a better place which she fulfilled by planting lupines. Tell or write about how you could make the world better.
7. Barbara Cooney dedicated Miss Rumphius to Saint Nicholas. Research who he was and why it was appropriate to dedicate this book to him.
8. In Just a Dream, Walter had a vision of what the future would be like. What is your vision of the future? What do you think your life will be like in the year 2050? Tell or write about your vision. You might illustrate your ideas.
9. Walter changed his mind about receiving a tree for a birthday present in Just a Dream. Starting with a tree, make a chart listing some environmentally appropriate gifts and how they would benefit the receiver as well as the environment.
10. Write your own short story warning people of potential harm to the planet or encouraging them to take responsibility for maintaining the earth.

Center--A Fascination with Water

Science Goal: The student will recognize the value of our water resources for survival and pleasure and will

become aware of the need to keep the water supply free of pollution.

Literature Experiences:

Read one or more of the following books.

Locker, Thomas. (1984). Where the River Begins. New York: Puffin.

Say, Allen. (1989). The Lost Lake. Boston: Houghton.

_____. (1988). A River Dream. Boston: Houghton.

Zolotow, Charlotte. (1992). The Seashore Book. New York: Harper.

Expressive Activities:

1. In The Lost Lake, what changes do you think Dad saw in the lake, now called the Found Lake, that he remembered from his childhood? Draw a picture of what you think Lost Lake was like before it became "found." Include any plants or animals that might have been destroyed or pushed out by civilization.
2. Make a list of rules to be given to the users of Lost Lake. How must they behave if the lake area is not to become unsafe for humans and the wildlife of the area?
3. In A River Dream, Mark and his uncle spent time fishing but never kept the fish they caught. Interview men and women who fish to find other benefits people get from fishing besides having fish to eat or to have as

trophies. You might want to make a list of your findings.

4. Have you ever had a dream (even a daydream) about an adventure in nature? Tell or write about the dream using all of the senses to describe the experience. You may want to include an illustration.
5. Josh and Aaron liked to make up stories about the river that flowed by their home in Where the River Begins. If you live near a river or stream or have visited one, make up your own story about the river and its inhabitants or the effects of the weather on it. Perhaps you would like to tell it from the point of view of the river bank. What kinds of experiences occur on it each day?
6. Locate information about the Mississippi River or another major river of your choice. Find out its source, length, width at various places, major tributaries, and other interesting information. Place this information on a chart or map, and then display it for others to see.
7. The mother in The Seashore Book describes the seashore for her son so vividly that he can actually see it. Describe a special place in nature (e.g., a pasture, a grove of trees, or a corn field) so that someone

unfamiliar with the area would be able to identify it. Be sure to use sensory images as you write or tell about it.

Center--Call to Action

Science Goal: The student will recognize the causes and solutions of pollution and that young people can be a part of both.

Literature Experiences:

Read one or more of the following books.

Baker, Lucy. (1990). Life in the Rainforest. New York: Scholastic.

Butterfield, Moira. (1992). 1000 Facts About the Earth. New York: Scholastic.

EarthWorks Group. (1990). The Recycler's Handbook. Berkeley, CA: Earthworks Press.

_____. (1990). 50 Simple Things Kids Can Do to Save the Earth. New York: Macmillan/McGraw.

Goodman, Billy. (1990). How to Save the Planet. New York: Avon.

Lord, Suzanne. (1993). Garbage. New York: Scholastic.

Mattson, Mark. (1993). Environmental Atlas of the United States. New York: Scholastic.

Expressive Activities:

1. Many of the books in this center contain names and

addresses of environmental groups offering free materials on ways that the earth can be saved. Survey these books looking for information that might be of interest to you and others. Form a group of interested people, and with your teacher's assistance, plan and send a letter requesting information on the topic.

2. Many of the activities in these books are easy enough for small children to do. Choose some of these basic activities, such as turning off the lights when leaving a room or turning off the water when brushing your teeth that you think a kindergarten-age child could do. Then write and illustrate a book designed for them that will teach them about how they can help save the earth. Keep your audience in mind and the vocabulary and tasks simple. Contribute this book to the kindergarten program in the school.
3. Look for energy wasters in your home. Make a chart to remind your family members of the tasks they should do to help conserve the earth's resources.
4. Choose a topic from one of the books (e.g., rainforests, Florida Everglades, sanitary landfills, or recycled products) and research it further. Present your information to the class using maps, charts,

graphs, or other visual aids to assist them in understanding the problems and solutions.

5. Using a melody that you already know, write lyrics for an environmental awareness song. Try to make it fun to sing with at least two verses and a chorus that is repeated. You may want others to help you with this project. Teach the song to the rest of the class. You might want to ask the music teacher for assistance.

Center--Under Our Feet

Science Concepts: The student will recognize various types of rocks, minerals, and fossil fuels and their impact on our lives.

Literature Experiences:

Read one or more of the following books:

Baylor, Byrd. (1974). Everybody Needs a Rock. New York: Aladdin.

Cole, Joanna. (1987). The Magic School Bus Inside the Earth. New York: Scholastic.

Marcus, Elizabeth. (1983). Rocks and Minerals. Mahwah, NJ: Troll.

Expressive Activities:

1. Byrd Baylor states ten rules for finding your own personal rock and then challenges the audience to think

of more rules. Tell or write about any additional rules you think are important.

2. Using the rules for finding a personal rock in the book Everybody Needs a Rock, find a rock of your own. Then, you may wish to describe the process you went through to find it and to explain why it is the perfect rock for you.
3. The format for the Magic School Bus books is always the same: There is a story about the trip taking place aboard the Magic School Bus by Mrs. Frizzle's class complete with dialogue between the students and Mrs. Frizzle. However, short factual reports are also provided on many pages. Important definitions and other interesting information can be found on the side of the pages on a small notebook sheet. Using this format as a guide, write your own short lesson about a concept you have been studying in science.
4. Imagine being in Mrs. Frizzle's classroom. It would be a real adventure. However, you are assigned to show the new student around. How will you describe Mrs. Frizzle and her teaching methods? Discuss appearance, personality, and the magical trips she takes using the trip inside the earth as the basis for your description.

5. After reading Rocks and Minerals, you might start your own rock collection. Collect at least ten different rocks. Then using some of the tests shown in Rocks and Minerals and other rock and mineral guides on the reference table, try to identify and label each one. Display your collection for others to enjoy.

Conclusions

This unit that extended science study through literature experiences presented to a classroom of sixth graders was a success. The goal of developing an appreciation and respect for the environment through involvement in trade books was reached in varying degrees by all students. Some became very involved in the research of environmental topics while others extended their awareness of the environment and its importance which they once took for granted.

The assessment, carried by several qualitative methods, revealed growth in awareness and understanding of students. The writing pieces and other expressive activities completed throughout the unit became less generalized as students formed specific opinions about environmental issues. Discussions about local parks and nature trails revealed a more informed attitude about each individual's responsibility to maintain them for the enjoyment of all citizens. In some instances, the journals completed by students became a personal pledge to do more to

protect the earth and offered ways they could change their behavior to be more environmentally friendly. Some wished to start an environmental group to meet after school; others wanted to develop a classroom project that would beautify our community in some way. Much of this growth came about through the integration of literature experiences and science concepts and discussions of readings with the teacher and small groups.

Of the two instructional methods implemented in the project, the literature circle groups were more successful than the learning centers. Perhaps the accountability of being part of a cooperative group helped to center the students' attention on the tasks assigned them. Because of that focus, students became involved in the discussions, extending trade book reading with related expressive activities. Such was the case with the group reading George's Who Really Killed Cock Robin? that was filled with many examples of the environmental issues that are also discussed in the science text. All groups enjoyed considering "what if . . ." questions that encouraged them to think about the importance of the setting of each story and how the story might have changed if the water had been polluted or the forests had been clear-cut.

The students became actively involved in carrying out their selected group projects. (Older students still enjoy learning through activity.) One group worked together to whittle and make

several of the tools used by Sam Gribley in George's My Side of the Mountain. The group even used a rabbit hide to make a pair of underwear like Sam's. The group reading O'Dell's Island of the Blue Dolphins completed a table-top model of the island, noting important landmarks, building a replica of the ship, and extending their knowledge of the animals on the island by adding pictures and short paragraphs about each one at an appropriate spot on their display. The students working with Paulsen's Hatchet created a board game based on the book where luck as well as knowledge of survival was important. Other projects included researching and making natural dyes, a topic discussed in Who Really Killed Cock Robin?, and a manual of cold-weather survival techniques initiated through the reading of Black Star, Bright Dawn. In every case, students found connections with the novel they were reading, the concepts of the science unit, and the real world around them.

Through their work in the learning centers, students were provided opportunities to extend the concepts of the unit. They could develop a broader, more aesthetic view of the environment through their reading of quality children's literature. In addition, they had opportunities to research the topics that interested them. By being offered a choice, the students became more personally involved as well as aware of the environment and began making connections between the concepts and the real world.

The students had more difficulty with the learning center activities. Because the unit was presented early in the school year and this particular group had little experience in choosing individual projects, they had trouble developing projects. Often they would choose to do an activity because it looked easy or a friend had chosen it, not being aware of how to start or even which books they should be reading before attempting the expressive activity. It became apparent that much more guidance and modeling of what was expected of them in learning center activities was needed. The learning centers were not without success stories: Some thoughtful pieces were written on issues such as the life of a river, environmental protection, and the beauty of unspoiled nature.

Continued reading of professional journals, such as Booklinks, has offered many new titles to supplement and replace some of the titles originally used in this project. Constant revisions and additions will be made as the unit is presented in the future as many titles are being published each year that can offer students more opportunities to study the environment.

Finally, further integration of the environmental topic into other areas of the curriculum is a real possibility. The premise of this project was to extend the science curriculum through literature experiences. However, extensions into math, social studies, and other areas of the elementary school program

naturally formed. Graphing projects linked the math curriculum; discussions about various social issues and their impact on the world tied into social studies; and art and music were incorporated into the expressive activities. Therefore, the project provided opportunities for students to make connections between their world in and out of school in many ways. Since the original goal of the project was to link student learning to the real world, the project can be considered a success.

Professional References

Anderson, R. C., Hiebert, E. H., Scott, J. A., & Wilkerson, I. A. G. (1985). Becoming a nation of readers: The report on the commission on reading. Washington, DC: National Institute of Education.

Barrilleaux, E. (1967). An experiment on the effects of multiple library sources as compared to the use of a basic textbook in junior high school science. Journal of Experimental Education, 35, 27-35.

Beane, J. A. (1992). Turning the floor over: Reflections on a middle school curriculum. Middle School Journal, 23(3), 34-40.

Crook, P. R., & Lehman, B. (1990). On track with trade books, Science and Children, 27(6), 22-23.

Fisher, B. (1980). Using literature to teach science. Journal of Research in Science Teaching, 17, 173-177.

Goodlad, J. I. (1983). A study of schooling: Some implications for school development. Phi Delta Kappan, 64(18), 522-558.

Harms, J. M., & Lettow, L. J. (1992). Literature and Expressive Activity. Minneapolis, MN: Burgess.

Hickman, J., & Cullinan, B. E. (1989). Children's Literature in the Classroom: Weaving Charlotte's Web. Needham Heights, MA: Christopher-Gordon.

Kantor, R. N., Anderson, T. H., & Armbruster, B. B. (1983). How inconsiderate are children's textbooks? Journal of Curriculum Studies, 15(1), 61-72.

Levitan, C. (1991). The effects of enriching science by changing language arts from literature base to science literature base on below average 6th grade readers. Journal of High School Science Research, 2(2), 20-25.

Lyttle, C. C. (1982). The effect of the use of trade books in the content area science. (Report No. 006 684). New Jersey: Rutgers, The State University of New Jersey. (ERIC Document Reproduction Service No. ED 217 380)

Moss, B. (1991). Children's nonfiction trade books: A complement to content area texts. Reading Teacher, 45(1), 26-32.

Neamen, M., & Strong, M. (1992). Literature circles: Cooperative learning for grades 3-8. Englewood, CO: Teacher Ideas Press.

Nordstrom, V. (1992). Reducing the text burden: Using children's literature and trade books in elementary school science education. References Services Review, 20(1), 57-70.

Piburn, M. D., & Baker, D. R. (1993). If I were the teacher . . . qualitative study of attitude toward science. Science Education, 77, 393-406.

Roberts, D. A. (1982). Developing the concept of "curriculum emphases" in science education. Science Education, 66(2), 243-260.

Shymansky, J. A., Kyle, W. C., Jr., & Alport, J. (1982). How effective were the hands-on science programs of yesterday? Science and Children, 19(3), 14-15.

Smith, F. (1983). Essays into Literacy. Portsmouth, NH: Heinemann.

Smith, J. L., & Johnson, H. (1993). Bringing it together: Literature in an integrative curriculum. Middle School Journal, 25(1), 3-7.

Spiegel, D. L. (1987). Using adolescent literature in social studies and science. Educational Horizons, 65(4), 162-164.