1991

Science and literature: An integrated model

Lisbeth S. Prows

California State University
San Bernardino

SCIENCE AND LITERATURE: AN INTEGRATED MODEL

A Project Submitted to
The Faculty of the School of Education
In Partial Fulfillment of the Requirements of the
Degree of

Master of Arts
in
Education: Reading Option

By

Lisbeth S. Prows
San Bernardino, California
1991

APPROVED BY;

[redacted]

Advisor: Dr. Adria Klein

[redacted]

Second Reader: Dr. Kathy O'Brien

SUMMARY

Prior to ten years ago no interest in integration of curriculum for science and literature existed. Each discipline existed and was treated as a separate entity.

Several years ago the State Superintendent of Education for the State of California facilitated an evaluation of the curriculum used by districts in the state. Out of the numerous committee actions and mandated modification of curriculum came requirements to base curriculum on literature and integrate literature into the base of curricula being taught.

The 1990 California State Framework in Science has been modified to include thematic units and mandates the integration of curriculum, science and language arts.

In order to develop an integrated curriculum in science and language arts, literature should be used in development of thematic units. Schema designed to develop background knowledge then must include literature and incorporate the use of science tradebooks.

A research of existing professional literature in the areas of science, thematic units, and integration of science and literature has shown that there is a void of such material. No development of thematic approaches to teaching science that is literature based for the fifth grade level exists.

This project consists of three fully developed model thematic

units, one in Life Science, animals, and provides two subsequent units in the content areas of Earth and Physical science using children's literature and trade books for science at the fifth grade level. Students will participate in lessons developed as part of this project. They will be speaking, listening, reading, and writing in all of the activities.

It is hoped that through this project, students will become more intrinsically motivated to read and learn about nature, their environment, and develop a positive attitude towards science and reading sources other than traditional textbooks.

ACKNOWLEDGEMENTS

I would like to acknowledge the love and support I have received from my family and friends in completing this project. Especially, I would like to thank my husband, Lee, for his tireless support, and my children, Tex and Julie, John and Chris, Linda, Carol, Michael, Jennifer, David, and Anne.

TABLE OF CONTENTS

INTRODUCTION/STATEMENT OF THE PROBLEM

For fifth grade teachers there is an absence of clear cut ways to teach science to facilitate thorough comprehension. The state and district approved textbooks are supposedly designed to meet the frameworks and scope and sequence of mandated skills to be taught at a grade level. However, the textbooks cannot address topics in depth; most topics are addressed in a paragraph to a page in a text, at best.

To adequately cover a topic, it is necessary to go beyond the textbook and use science tradebooks. Woodward, Elliot, and Nagel (1986) state that some of the scope and sequence and content presentations of textbooks are not consistent and not well-coordinated throughout the grade levels. While Anderson, Armbruster, and Kantor (1980) note the poor writing quality and the confusing formats found in some textbooks, they found the majority of tradebooks provide in depth coverage of topics, tend to be more interesting, appear to be well-written, and offer greater appeal to student readers. Others, such as Crook and Lehman (1990), state trade books are diverse in subject matter and are appropriate for a wide range of reading abilities. Where texts have narrower reading level application, trade books address a wider reading level diversity.

The California State Framework for Science (1990) lists a number of objectives for science instruction in elementary schools. These include: providing a balanced curriculum in physical, earth, and life sciences; integrating science with other subjects; reinforcing conceptual learning rather than rote learning; and at least 40% of the lessons are to be activity based (p. 160).

Further, the Science Framework lists ways themes can be used to enhance science curriculum including: assessment should be thematically based, themes can be used to direct the design of classroom science activities, and themes should be used to integrate concepts and facts at all levels of the curriculum (pp. 33-36).

It is the goal and objective of this project to provide models for teachers for instruction of fifth grade students in science using three model curriculum thematic units. These units will be in the areas of curriculum study designated by the California State Framework on Science (1990). It will provide a balanced curriculum in the areas of: Earth Science-Geology, Life Science-Animals, and Physical Science-Energy.

Integrating science with other subjects is an important concept, but sometimes what actually happens is another thing. The Commission on Reading in Becoming A Nation of Readers, (1985) stated that the logical place for instruction in most reading and thinking strategies is in social studies and science rather than in separate lessons about reading. In introducing the California

Reading Initiative in 1986, Superintendent Honig stated, "Good reading skills are critical to success in *all* academic areas" (p. 146). Additionally, Alexander (1986) related that content area teachers must also share with English teachers the responsibility for language arts instruction. Goodman (1986) said integration is a key principle for language development; otherwise language development and content instruction become dual curriculum for the teacher. As a fifth grade teacher, the last thing needed is more curriculum added to our ever increasing workload. Many teachers do not teach science in elementary classrooms because of time constraints and lack of training. It is visualized that use of the models within this project will save time and ease the workload for teachers.

Is it possible for science and reading to become integrated? At first glance one might say, no, science is concrete with hands-on experiences while reading is abstract and the two do not mix. However, when these two disciplines are examined, one can see similarities and by helping children to become better scientists you can help them become better readers (Brunworth, 1988). She takes the position that integration can be accomplished through science experiments in which children can see through order and logic the steps to problem solving. Then the students could see the direct results of reading the clues or directions carefully. As many of the lessons were multisensory, the students became more aware of

their own senses and generally improved in reading. All of these strategies will help students to become better readers.

One way of providing effective integration of content areas, language arts, and other areas of the curriculum is through thematic units. Thematic units are several multidisciplinary lessons that pertain to a central topic. The unit should be multisensory and address multicultural issues also. There are generally five or six concepts in the unit and the unit instruction usually lasts about four weeks. All areas of language arts are involved (listening, speaking, reading, and writing) as well as other areas of the curriculum.

An integrative interdisciplinary curriculum can provide students with a global view of learning. Teachers need to teach and present content in organized thematic units (Nielsen, 1989). Additionally, Goodman (1986) states that parts of the curriculum should be organized around thematic units. This provides a focal point for inquiry, language, and cognitive development. It can involve students in planning and often gives choices of authentic, relevant, meaningful activities to reach academic goals.

Categorization of literature books used in the classroom is an important component of the California Reading Initiative committee's work. They produced a list of over one thousand books that they divided into three divisions: Core, those books intended to be studied closely in a classroom setting; Extended, books assigned to individuals in small groups to supplement the regular classroom

texts; Recreational, books intended for leisure and motivational reading. These concepts were incorporated in the curricula development of a model school. It is also the goal of this project to utilize some of the books on the lists in organizing thematic units for fifth grade students.

One such school set out to become different. An elementary school in Carson, California, decided to get rid of textbooks and planned their curriculum around six pieces of literature built into thematic units at each grade level. The results were an increase of student attendance and a decrease by 50% of disciplinary actions (Johnson, 1989). The school also noted an increase in fifty points in CAP test scores. One reason for this success is the teachers took two years to develop the curriculum and carefully chose the sets of literature used for the basis of their thematic units. They incorporated integration of all areas of the curriculum in these units. Some categories for their choices of literature selection were: core with values that address important questions and help students learn to get along with people, possibilities for extended learning that would challenge students to explore, and recreational value that would stimulate students to become better readers.

According to Bond and Dykstra, as quoted in Harste and Burke (1980), "to improve reading instruction, it is necessary to train better teachers of reading rather than to expect a panacea in the form of materials" (p. 112). Additionally, Harste and Burke (1976)

continue and say that both the teacher and the learner hold particular and identifiable theoretical orientations about reading which in turn significantly effect expectancies, goals, behavior and outcomes at all levels. "A theoretical orientation is a particular knowledge and belief system held toward reading that influences many of the decisions made by teachers and pupils relative to reading" (Harste & Burke, 1980, p. 112). Current theoretical views of reading can be organized into three clusters and be perceived as falling along a continuum (Harste & Burke, 1980).

The first is a sound/symbol system of reading conceptualized as a pyramid cluster, the base of which is a sound symbol system of relationships. Learners develop through learning sounds associated with symbols, developed into words, and meaning is given the words. The greatest emphasis is given to development of sound/symbol relationships, the least is given to meaning. The placement of this model would fall to the left on a continuum of reading.

The second model presented by Harste and Burke can be defined as a skills oriented model cluster of reading. Here one learns through a sequential process of skills learning. Equal emphasis is given to letter sound relations, vocabulary, and meaning components. In actual practice, experience shows that most content area reading and science instruction is taught this way. On the continuum such a model falls mid-point.

The third of these clusters, called whole language, views reading as one of the ways in which the abstract concept of language can be achieved. The beginnings of this movement can be traced to John Dewey and his philosophies of integrating language (Dewey, 1943).

If a model of whole language could be drawn it would be constructed as a sphere with meaning at the center of the sphere, a layer of syntax structure surrounding the meaning, and the entire model surrounded with a letter-sound system. When language is the focus for instructional purposes, all three components are utilized simultaneously. In this model reading comprehension is always the main focus. To the teacher, the child's existing language system should become the basis for instruction. Reading differs only from speaking by the addition of the grapheme (letters) component to the outer layer of the model. "Reading is the active process of reconstructing meaning from language represented by graphic symbols (letters), just as listening is the active process of reconstructing meaning from the sound symbols (phonemes) or oral language" (Smith, Goodman, & Meredith, 1976, p. 115). Viewed on a comparative reading continuum, this whole language cluster model falls to the right in relation to the other two models presented.

Were I to place my own beliefs and philosophies concerning reading along the continuum, I would place it on the right towards the the whole language model.

This model was chosen as the basis for this project because it best outlines learning as a sequential process of building upon prior existing knowledge through the active process of a learner exploring different methods and written styles to build upon his or her prior background. Clewell, and Clifton (1983) stressed that prior knowledge is an important determinant to reading comprehension. Further, recent researchers look further than sentence structure and difficulty in vocabulary in evaluating textbooks for comprehensibility. They have considered students' prior knowledge a leading issue for reading comprehension and not necessarily the way material is presented. Goodman (1986) extends this philosophy and suggests the incorporation of the concept of whole language learning because it has a language-centered orientation to the curriculum. Additionally, Goodman encourages the use of integrated thematic units based on language, that are child centered, and allow students reading choice perogatives that lead to pride of ownership in their learning.

Dorothy Watson spoke of the advantages to using a whole language oriented designed curricula as opposed to a skills methodology. In the 13th Annual Reading Conference Proceedings, 1989, at California State University at San Bernardino she said, quoting a young university undergraduate student from her journal entry, "I'm beginning to see some important differences between a skills classroom and a whole language one. It is not just that

worksheets and basals are used in a skills program and that trade books and children's writing are used in a whole language program. It's more than that - in a whole language program kids are at the center of everything" (p. 3).

GOALS AND LIMITATIONS

It is the goal and objective of this project to provide instruction for fifth grade students in science thematic units using three model curriculum units. These units will be in the areas of curriculum study designated by the California State Framework on Science (1990). It will provide a balanced curriculum in the areas of: Earth Science-Geology, Life Science-Animals, and Physical Science-Energy.

This project will provide a use of literature as a model, instruct in the types of reading, use multicultural considerations, and employ all areas of language arts: listening, speaking, reading, and writing.

It provides a rationale for using literature that is not content text oriented to enhance interest and intensify content learning. It includes books classified as core, extended, recreational; students are presented with the concept that reading is one of the most effective ways to learn.

This project is a uniquely documented use of literature based strategy for conceptual learning and teaching science as there is a lack of support for this approach in the existing literature. The rationale for using thematic units is cited, and this project uses concepts from research and the California State Framework requirements for Language Arts and Science

(see Appendix E). Thematic units organize and articulate a scope and sequence at the school level that provides a platform for integrating science with other subjects.

Teachers are provided with a model and framework that will assist with an in depth study of a topic not available in a short portion of a textbook. The students then use literature to build upon past experiences so new learning will be faster and more meaningful for them. The project will require students to read widely, write more often, and use language frequently.

Lastly, teachers and the students are provided with an annotated bibliography whose texts provide them with different writing styles so they can evaluate the differences between sources.

Some of the limitations seen surrounding this program involve students, resources, and personnel.

There is no way of standardizing or insuring existing knowledge of students prior to the beginning of the project.

This project as a model does not propose to accelerate the learning of gifted students. It can, however, provide a springboard, background, and stimulus for their individual desired branching leading to greater in-depth study and achievements.

The availability of the books used in the program is limited to the supply in the school library and existing finances at the school site. The teacher can purchase some of the books, but the cost might be prohibitive to some. Sometimes extra funds are available at a site such as School Improvement Plan monies or California Teaching Improvement Program grants or lottery monies.

The reading level of the books might not be appropriate for all students. The teacher has to gather enough resources to meet the divergent reading needs of students. Teachers have little control over the science reading materials other than what they can gather. Large percentages of their allotted funds currently go for purchase of state adopted grade level science textbooks. Later, with much administrative support, a diversion of this money could be allocated for purchase of trade books and materials needed to facilitate purchase of alternative informational sources. The teacher has to coordinate with the librarian on ordering books as discarded non-current books are removed from circulation so they are not lost as a resource and can be retained by the teacher for appropriate class use.

The availability of some desired and needed curriculum supply items from the Instructional Media Center might not be timely to coincide with the unit and will require advanced

planning on the part of the teacher to order well in advance those materials needed for lessons.

The extrinsic environment surrounding the starting the new model can be very stressful and frustrating. There are no ready made teaching materials or teachers guides available to the teacher. This could be a problem for a new teacher or one unfamiliar with fifth grade curriculum.

It will be necessary to explain and develop communication with administrators regarding scope and content of the program and evaluation procedures used that are inconsistent with District philosophies and adoption of science mandated curriculum and frameworks. Parents will have to be kept well informed on the project, expectations, requirements, and grading criteria. The project explores areas within the three domains of learning, tactile, visual, and auditory but has little control over the district's dependency on tests for evaluation and success measures.

Further development and expansion of the model would be left up to another teacher. It is hoped that each professional teacher will continue to create units consistent with the philosophy and model of this project.

This program is specifically planned for a fifth grade classroom. The themes selected for the units are consistent

with those found within the fifth grade curriculum scope and sequence.

This program can be easily adapted to other grade levels due to the general topics of the thematic units and the alignment with the goals of the elementary science program and the goals of the California State Science Framework, kindergarten through grade twelve, and the use of thematic units.

In considering the adaptability to the primary grades, grades one through three, the responsibility of selecting the texts appropriate to the grade level and the supporting activities rests with the classroom teacher. Since several of the texts in the model unit are picture books, this should not be a problem. The teacher then would have to adapt the supporting activities to the level of the students.

Teachers of fourth and sixth grades would probably have the least difficulty adapting the program to their grade levels. The majority of the components of the program would blend nicely into their curriculum.

Teachers of middle schools, grades seven and eight, could use some portions of the program and the activities would be welcomed by the students. The range of reading levels seems to increase as students progress through the grades; some students would welcome the opportunity to be able to gain

significant information from such pleasing formats and non-threatening texts. This is important as these students who perhaps have difficulty reading a grade level text in science need the background and in depth learning science trade books can provide to build schema in content area learning.

This program is also adaptable to special education, both communicatively handicapped and learning handicapped, at all ages, as long as the teachers selectively use the portions of the program suitable for their particular class.

Science teachers of high school students could utilize parts of the program again to build schema for their thematic unit.

EVALUATION

If to evaluate something is to judge it with respect to its worth, then the evaluation process of any unit is basically the measure of success of the interaction between the teacher and the student. The purpose of this interaction is for the student to demonstrate knowledge gained and for the teacher to receive feedback that the objectives have been met.

All teachers know children need to be taught to use the tools of communication (listening, speaking, reading, and writing) in a purposeful, meaningful, integrated manner (Linek, 1991). One of the basic tenets of the Whole Language philosophy is that students learn reading and writing by actually being readers and writers and therefore have learned to view themselves in that state and to value their own literacy as well as the literacy of others.

Before undertaking teaching and evaluating with thematic units the wise teacher will do some public relations to ward off any negative situations. It will be necessary to examine the state frameworks and district guidelines to see that the goals and objectives of the district are met. It would be a good idea to inform the site principal of the plans for the project. Then if parents had concerns, the principal would be already aware of the teacher's plans for the project. Sending a

letter home to parents describing in detail the proposed project and types of evaluation would be a good suggestion. Some teachers might even wish to conduct a parent meeting to discuss this face to face with parents.

Generally teachers rely on paper and pencil responses given to worksheets and commercially produced tests to make their evaluation. The use of commercially prepared tests has risen dramatically in the last few years (O' Neal, 1991). While more districts are using testing, others are concerned as there is a bias in many items on these tests and some tests discriminate against minorities (O'Neal, 1991).

This project deals with literature based thematic units and allows for no paper and pencil tests. The evaluation process can and should take other forms. Because thematic units encourage students to interrelate ideas from different genres and disciplines, "evaluation procedures for thematic units must be varied and based on different data than is traditionally used for assessment" (O'Brien, 1988, p. 22). It would be counterproductive to administer paper and pencil tests at the conclusion of a unit. The evaluation must be thought of as an ongoing process of the teacher receiving feedback from students, and the students receiving feedback from the teacher. The types of evaluation essential to this approach are: individual conferences between the teacher and

the student, portfolios of student work, written reaction journals, reader response notebooks or journals, and performances of art, music, or drama for a selected audience. Often there are times for student self evaluation and group evaluations, depending on the project task being evaluated.

Some of the evaluation procedures used will relate directly to the particular type of activity in the project. Individual items such as an art project or a written piece can be evaluated on its own merit considering the student and his or her abilities, the amount of effort directed toward the result, and the overall attitude exhibited by the student during the project to achieve the desired results. Other portions of the project are group related and two kinds of evaluation can result from their activities. One is a self-evaluation that the individual student can use to evaluate herself in meeting the needs of the group in achieving the desired result of the group and the overall effectiveness of the group. Another is the group collectively or by consensus measures their progress.

Student involvement in goal setting, planning, and progress evaluation is important to success of students of the project. It is important that students know and understand completely the assignment, and what types of evaluation will be performed. Will the assignment be individually compared to prior assignments or compared to others in group? Will it be

random or group selected? If compared to a group the student should be given the choice of which completed piece she would like to submit for grading?

It is important to have individual conferences with each child to review dated, written assignments, suggest ways for improvement, note any skills that a mini-lesson might correct, observe any missing assignments, give the student opportunity to complete the work, and provide positive ongoing feedback to the student.

To facilitate the evaluation process, students can keep their dated work in a file or portfolio. The student could call her folder 'My Pride' or something else positive. That way whenever the folder is handled or dealt with, there is a positive thought conveyed. In this folder several samples of a student's written assignments are kept in several stages of development. Teacher comments are included as well as anyone else selected to read the materials. These might include self comments made by the student at the time the assignment was completed or peer readers. Input from parents can be included as well, especially if the teacher sends the work home and supplies peel and stick labels for comments. The work should be dated so progress and learning can be evaluated by students and readers.

Journal writing is a tool in evaluation process consideration. The importance of the written journal has been addressed in educational literature. Whether it is the written journal of the students feelings and emotions (Browning, 1986) or the oral reading and reading response journal (Simpson, 1986) both are important for allowing the student to evaluate her own ideas and feelings about reading events or reacting to other elements in her environment. The teacher can assist the student to become more focused in her reading and writing by providing leading statements for her to consider. When students react to reading rather than just write a summary of what they have read they must view their reading at the critical and interpretive levels of comprehension (Browning, 1986).

Some evaluation procedures should be more open ended than typical paper and pencil tests and worksheets allow. Students in either case will process information at higher level thinking skills. This processing may take a non-verbal form. The ability to construct meaning from a printed text to an art, music, or drama project demands a high degree of interpretation and comprehension. At the conclusion of such a project the student should be able to verbalize what the particular story was about.

Sometimes evaluation might mean some particular piece of writing being shared by students within a small group. Other projects may include performances before the class or a group of parents. The students need to know in advance what their audience will be and what form of evaluation will be used at the completion of the assigned project.

There are several existing forms for self and group evaluation. The student may evaluate her part of the cooperative or collaborative group or may evaluate her own performance on an individual form. Whichever process the teacher chooses, it has to be planned for in scheme of the thematic unit. The evaluation process should be evaluated itself, as well.

This project can be evaluated using any or all of the above processes.

REVIEW OF THE LITERATURE

This literature review will include materials available on the topic of Integrating Literature and Science in the Fifth Grade Classroom. For the purposes of this discussion, the issues of content area reading, integration of children's literature in science and reading, teachers' actions, and thematic units will be examined.

The California Reading Initiative is a state mandated framework requiring students to read widely, write, and use language frequently (Alexander, 1986).

In introducing the California Reading Initiative on May 9, 1986, Mr. Bill Honig, State Superintendent of Public Instruction in California stated: "Reading is one of the most effective ways of learning. I want to encourage students to read, and I want them to enjoy reading. Good reading skills are critical to success in all academic areas. A love of reading and of good books is one of the most important gifts that teachers and parents can give our young people" (Alexander, 1986, p. 149).

The California Reading Initiative committee produced a list of 1,010 books divided into three sections: core, or those books intended to be studied closely in a classroom setting as a stimulus for writing and discussion; extended, books

assigned to individuals and small groups to supplement the regular classroom work; and recreational, books intended for leisure and motivational reading.

Subsequently, the California English Language Arts Framework and the California Literature Project were written to be consistent with the Reading Initiative (Alexander, 1986). Teachers were trained in writing integrated curriculum units utilizing these lists of books. Since that time other frameworks have followed.

The Elementary School Science Curriculum Objectives from the California State Science Framework (1990) call for a balanced curriculum in earth, physical, and life sciences, integrating science with other subjects, showing that science is enjoyable, and developing positive attitudes towards science with activity based lessons utilizing conceptual rather than rote learning with an articulated scope and sequence at the school level, and further community resources use is recommended.

CONTENT AREA READING

The California Reading Initiative specifically levies subject area teachers with a requirement to make sure that students read widely, write frequently, and use language effectively. These content area teachers must also share with

English teachers, the responsibility of language arts instruction for their students (Alexander, 1986).

"The idea that reading instruction and subject matter instruction should be integrated," reports the Commission on Reading, "is an old one in education. But there is little indication that such integration occurs often in practice . . . The most logical place for instruction in most reading and thinking strategies is in social studies and science rather than in separate lessons about reading" (Anderson, 1985, p. 73).

Brozo and Tomlinson (1986) state that many students receive their first serious look at cultures, historical eras, politics, and scientific advances through the content area textbook. Unfortunately the narrative element, the stories that lie within all human interactions, is usually omitted from the textbook. The result is that the text and many of the classroom lessons may be dry and lifeless. For example, consider the impact of reading only one paragraph on pirates from a textbook compared to reading a novel about the exciting, swashbuckling life of Long John Silver from Treasure Island. The use of literature in this project will add to the narrative element lacking in expository style textbooks in their abbreviated form.

Alfonso (1987) states that when coupled with literature, a paragraph in a history book becomes a significant event

resulting from decisions and personalities of real people. Informational books and biographies can be used to expand reading choices in all areas of curriculum including the arts, natural and social sciences, and mathematics.

Teachers should provide alternative sources of narrative elements in reading and in lessons because it is usually absent in textbooks and the lessons based solely on textbooks as the primary source of information will not convey the intensity and meaning to the students. Topics in content areas can often be treated thoroughly and effectively through narrative text (Hiebert & Fisher, 1990).

Sanacore (1990) states that content area teachers must share the blame for negative attitudes towards content area books because they don't allow class time for reading for pleasure, that this is not their responsibility. He suggests including literature as a part of the instructional program in content area classes, reading aloud to students, and supplying a wide variety of print materials for the students to read.

Sanacore (1983) states that the principal is one who can promote free or recreational reading in the content areas. Recreational reading is reading that is student selected rather than teacher assigned. The ultimate goal of free or recreational reading is that the student will enjoy reading and select reading as a leisure time activity.

Sometimes teachers and students in content area classes think they are working together on similar instructional goals. However, Smith and Feathers (1983) interviewed students and teachers from content area classes regarding the teachers' instructional goals and the students' perceptions of the teachers' goals. While the teachers were concerned about developing citizenship and higher level thinking skills, the students felt that the teachers were concerned about learning facts more than ideas and in general they felt that the information was not useful or important for a job.

Realizing this information, it would become necessary for effective content area teachers to change the students' perceptions of their desired goals and to teach students to become more focused on setting goals and realizing the importance that higher level thinking skills can play in their lives. In developing thematic units the goals will have to be more obvious to students so they can use literature to relate the facts and concepts in improving their lives.

Within this project this will be accomplished by having students read daily, gaining knowledge, and having a practical use for the information received. Practice in setting and attaining short and long term goals is also important so students can feel the fulfillment of accomplishment.

In a recent study, (Feathers & Smith, 1987) the authors found that focusing solely on the textbook and not using any other sources as found in the real world gave the students no real purpose for reading and acquiring information and thereby isolating the students from the real world. There was little similarity between the classes in the study and the real world use of print and non-print materials to gain information. Ideally, classroom instruction should resemble the real world and examine the use of informational material. Also sources of material used for instruction should model that found outside the classroom. There is great importance in students reading relevant materials from real world sources so the students may realize the importance of credible informational origins. Some examples of real world sources used in this project are in a variety of print: narratives, biographies, poetry, informational texts; and nonprint materials: videos, films, television, tapes, advertisements, and individualized meetings will be available for classroom instruction. The study brought out that teachers must teach students the types of reading that must be done to gain information, how to evaluate sources, and to determine how material gained will be used. Students should be provided instruction in locating, comparing, analyzing, evaluating, and synthesizing the information. This study has an impact upon content area

classes as the teachers in these classes need to make classes become real and alive to hold the students' interest. The use of literature's narrative and thematic schema can add interest and meaningful elements to learning.

Student comprehension is a major problem in content area classes. This problem has been addressed by Nist, Kirby, and Ritter in 1983. They define two types of comprehension. There is product comprehension in which a student is typically given a passage to read and multiple choice questions to answer. This may identify one isolated skill area of difficulty and remediation can be given, but it doesn't tell why the student has a problem in that particular area. Process comprehension helps the student become aware of both the positive and negative aspects of her reading. This is done by the student keeping a reading journal to note feelings and ideas while reading magazines. Teaching a student skills that are relevant and meaningful teaches her to process comprehension and to retain information that may be useful in life. Teaching of isolated skills gives students nothing to apply to their reading when reading on their own. Students must learn to be active readers to become aware of what they are feeling as they read to understand. An isolated skills approach to reading cannot accomplish these things. This project meets this challenge by integrating credible sources

with direct application in activity based information processing.

Ausubel cited in Thelen (1979) stated the most important single factor influencing reading comprehension and therefore learning is finding out what the learner already knows. After this base is assessed, teach her accordingly to build upon this foundation. New information is retained most efficiently when related ideas are already in the reader's memory. This prior knowledge serves to provide an anchorage or schemata to which successive pieces of information are attached (Thelen, 1982). She felt that if nothing in the student's past experience was related to the new material, the student was less likely to assimilate and retain the information.

Therefore, it is a goal of this project for teachers to design schema to allow students to build upon the pyramid of prior knowledge. This will prevent her memorizing key words or phrases to pass a test which may hide a lack of understanding of the content material. According to Moore, Readence and Richelman (1982), students and teachers need to be aware that memorization of key words and phrases to pass a test can hide a lack of understanding of content material. It is not a measure of concept comprehension.

One way concept comprehension schema can be activated is by using a brainstorming technique with dialogue between

students to determine pre-reading knowledge to ascertain not only what the students know prior to reading, but teaching the students how they know what they do know (Langer, 1980). This type of comprehension, content area mapping, using existing prior knowledge, and prediction are significant areas of thematic units as found in this project.

Content area mapping is a practical, visual way to apply schema theory in the classroom while teaching students about the text structure. When teachers construct an informal network on the chalkboard or overhead for the students to see prior to their reading the text they will be able to see that the ideas to be read will connect with previous knowledge on the topic (Peresich, Meadows, & Sinatra, 1990).

The use of prior knowledge and prediction is a very good tool in assisting students in setting purposes for reading and in using their own experiences as a basis to facilitate comprehending the text and realizing the purposes for reading. In the past, researchers examining textbooks for comprehensibility looked primarily for vocabulary difficulty and sentence length. Now researchers are looking beyond readability formulas to other features such as the extent to which the text takes into account the reader's prior knowledge (Clewell & Clifton, 1983). This is important as prior knowledge is an important determinant to reading

comprehension. Other factors affecting comprehensibility are the coherency or unity of meaning within the text, the degree to which the author adheres to the topic, and the structure of the text. The selection of many science tradebooks to make up thematic units, such as this project's, can take into account readability, and topics are usually limited to one per text. The lack of prior knowledge can act as a limitation, but it can be improved through aesthetic or recreational reading.

Regardless of prior knowledge, and despite attempts at understanding the organization and key elements of a text, a student is likely to encounter unfamiliar vocabulary words (Barrett & Graves, 1981, Kossack, Campbell, & Reichbach, 1980). Teachers should teach context clues and other reading skills so even students with little prior knowledge that encounter unfamiliar vocabulary can read and comprehend concepts successfully. In planning content area reading a major thrust of this project is directed at consideration and evaluation of texts as to scope and sequence and content presentations, then the gaps are filled with appropriate tradebooks or experiences for student's comprehension.

Television can be optimally used in content area classes. There is a wealth of media available, yet more children are growing up in an urban environment and most information about the environment is gained from vicarious experiences:

reading, television, parents, teachers, and peers (Kirk & Karbon, 1986). This model thematic unit includes the use of additional resources other than the printed page.

Content area teachers should teach writing as part of a reading program and develop comprehension abilities of students. Gebhard (1982) states the teaching of writing is becoming a responsibility for all teachers. Few other components of a school's reading program are more important than an effective writing program in developing comprehension ability. This project utilizes a strong writing program to facilitate comprehension.

In examining the body of research regarding effective schools and reading research, some findings need to be put into practice in the classroom. More school time should be devoted to reading literature that captures and feeds the imagination and more than basal materials are necessary for effective instruction (Lehman & Crook, 1988). Children will learn better if they understand what they are to learn and why (Baumann, 1984), and children will learn what they are taught (Berlinger, 1984, Duffy, 1982).

The integrated curriculum (White, 1986) is organized around the characteristic sets of decisions that teachers make in three domains: the organization of knowledge, the teaching/learning process, and the relationship of ownership

and control. The model thematic unit builds on the positive aspects of ownership and control by sharing in small groups the pride of ownership, sharing of work enhances responsibility.

SCIENCE AND READING

In this section we will examine the coordination of science with reading in relation specifically to time management, science tradebooks, reading science tradebooks, reading skills, children's literature and picture books, and see how these these subskills fit within a thematic unit on science.

We need to be sure the things we are spending time and money on in teaching are the things we want children to learn. If a child is completing workbook pages and skill sheets instead of reading relevant literature that can be tied to many senses and or content areas, that is a waste of effective learning time and effort. This project of model thematic units will enhance an expeditious use of time and expenditures for schools and teachers.

Schools need to consider an efficient use of money and time. Schools generally have limited funds, and teachers have limited time. Relevancy of literature is the issue and integration of the materials into the content areas is the tool. An integrated program would mean that students read relevant

literature tied to many different senses and meaningful development of content areas rather than completing workbook pages and skill sheets. The integrated content area program's focus on effective teaching and learning using library books to supplement, augment and even replace the textbooks is a great benefit to students.

Lehman and Crook (1989) point out that there are many sound reasons for using more informational tradebooks and fewer textbooks in content classes. Textbooks are limited to the selected grade level while the reading levels in any classroom may span several grade levels. Because of the adoption sequence in textbooks, sometimes the materials can be out of date. It is the design of this project to build upon this concept of using science tradebooks in content area classes.

Teachers can teach that there are many positive aspects to using science tradebooks in the classroom regardless of students level of reading skills and grade level.

Teachers who have discovered the great wealth stored in informational books on library shelves can help fill their students time with meaningful literature rather than worksheets (Alfonso, 1987). Then the textbook becomes what it should be: a reference book, one source of information on a subject rather than the source for all information. Previous

funds can be saved in the school budget by utilizing existing resources and or having to purchase supplemental textbooks.

Reading science materials can be a challenge to even a good reader. There is usually a greater concentration of facts and technical vocabulary than is found in other types of reading. Janke and Norton (1983) point out the key to successful reading of science materials is recognizing and getting students to recognize that reading science nonfiction books involves several different kinds of reading skills. Some of the reading skills which can be taught from these books are: teaching students to vary their reading rate according to the difficulty of the material presented and the purpose for which it is read. Other skills are meeting unfamiliar words, being able to learn from graphics, learning about main ideas, supporting details and organization, following directions, and making judgements. They point out nonfiction science trade books are often successful in teaching these skills as these books are usually interesting and attractively presented and deal with only one subject. Reading tradebooks seems more like fun than reading a textbook.

Children's literature, especially fiction, is sometimes not taken as seriously as nonfiction expository texts in elementary school (Butzow & Butzow, 1988). Consequently, what is generally used in the classroom are the textbooks.

Teachers need to be careful not to use texts as the primary source of material consistently. This concept is a major underlying facet of this model project.

Traditionally, science in classrooms has been taught in an expository style rather than a narrative mode. The exposition mode tends to convey information in an authoritative, dictatorial, and powerful manner; those who know telling or relating detailed information to those who don't know. In comparison, narration is considered to be a detailed account of an event as the story logically unfolds.

In contrast to texts, Alfonso (1987) feels that picture books are interesting books that are specifically designed to meet the needs of young readers. The texts are simple, the plots and characters are appealing, there is a definite theme, and the language matches children's oral language. They can often instill specific values and provide springboards for conversations leading to positive attitudes. Upper elementary and even junior high school age students can benefit from analyzing picture storybooks. Besides providing students with an enriching experience and excellent literature, the study of such books raises their awareness of the power of print.

Teachers need to select interesting books that meet the needs of students and match their oral language, including books that allow students to analyze concepts, and increase

enriching experiences using literature. The activity features of this project's thematic units allow such experiences, analyzations, and enrichment using literature selected for high, interesting content. Books have been pre-selected to allow for efferent and aesthetic appeal reading.

Woolsey and Burton (1986) discuss the two types of reading: efferent and aesthetic. Efferent reading is the type usually found in nonfiction books where one is looking for specific information; aesthetic reading is where the reader's attention is directed toward what he is living through, his relationship with a particular book or story. It is important that children learn to read both kinds of books and to read for different meanings and purposes. This is done by providing divergent texts in style, tone, and function. For example, with respect to selection for different reasons for reading, select ones to scan quickly, to read more deeply, or to read a selection for its aesthetic appeal.

Society is becoming increasingly dependent on science, and it is important for teachers to help students develop positive attitudes about science (Koballa & Rice, 1985). Teachers must project credibility and be topically informed on subjects yet consider students' needs and desires to become involved in the curriculum; while the students' past attitudes can also be a factor, involving students in science instead of

just talking about it. This project with activity based thematic units is ideal for involving science in the curriculum, while applying schema and increasing student interest and concept development through the use of science tradebooks and interesting lessons.

It is without a doubt that books are important in science (Rutherford, 1987). Classrooms should be stocked with many reference texts at appropriate reading levels. These books should deal with any type of science that could be of interest to the child. Such a library of books within the classroom will help the teacher and the student to explore their natural surroundings together.

How does a teacher choose wisely from the vast number of science tradebooks available? Janke and Norton (1983) have compiled guidelines available from the American Association for the Advancement of Science, the National Science Teachers Association, and the Children's Book Council to assist teachers in their selection. These guidelines suggest all facts should be accurate, pertinent, timely, and the author qualified to write the book; stereotypes avoided; illustrations an accurate enhancement of the text; texts that encourage analytical thinking; the organization clarifying the content; and the writing style should be lively and clear.

Crook and Lehman (1990) state tradebooks are diverse in subject matter and depth of coverage and are appropriate for a wide range of reading abilities, which supports the concept of relating science tradebooks to the model thematic unit.

Woodward, Elliott, and Nagel (1986) state some of the scope and sequence and content presentations of textbooks are not consistent and well-coordinated throughout the grade levels. In planning, consider and evaluate texts as to scope and sequence and content presentations, then fill in the gaps with appropriate tradebooks or experiences for comprehension.

Anderson, Armbruster, and Kantor (1980) note the poor writing quality and confusing formats found in some textbooks. In contrast, the majority of tradebooks provide in depth coverage of topics, tend to be more interesting, appear to be well-written, and offering greater appeal to student readers. This project uses tradebooks, rather than textbooks and allows reading levels adjustable to an individuals ability levels to decrease anxiety that inhibits the students' success.

While there is some data (Spiegel, 1987) to show that we are doing a better job of teaching reading we still do not have adolescents who select reading as a leisure time activity. In order to encourage leisure time reading, teachers need to build positive attitude by expanding vocabularies and promoting non-threatening environments. Literature provides broad concept

experiences that can be built upon and fill in the impoverished schema about some subjects while promoting non-threatening environments.

How about the students who can read but choose not to? There is general concern for this aliterate population in our society. This project addresses this problem directly by incorporating techniques such as reading aloud to students.

In this way it enhances students' reservoirs of literature. This strengthens several areas: first the teacher is able to model good reading; second, most teachers enjoy reading to children and children enjoy listening to others read, and adds additional variety and diversification. As stated in Becoming a Nation of Readers (Anderson, 1985, p. 23), "The single most important activity for building the knowledge required for eventual success in reading is reading aloud to children." Dwyer and Isbell (1989) take the position that reading aloud to students is the third part of the reading program. The other parts are direct instruction and sustained silent reading.

Is it a detriment to ones study of science in the elementary grades if the tradebooks seem illusionary? Smardo (1982) felt that using children's tradebooks can help young children clarify science concepts between what is real and what is imaginary. As students reach a desired degree of fluency, the use of expository text should increase (Levstik,

1986). The tremendous value of having a wealth of science tradebooks at all levels enhances the conceptual development for young children and provides credible answers in science as children become better readers.

How can science and reading become integrated? At first glance one might say, no, science is concrete with hands-on experiences while reading is abstract. However, when these two disciplines are examined, one can see similarities and by helping children to become better scientists you can help them to become better readers (Brunworth, 1988). This can be done through science experiments in which children can see problem solving through order and logic. All of these skills will help students to become better readers. The students can see the direct results of reading the clues or directions carefully to obtain the desired results.

For the purposes of this study it is assumed that the study of science with the use of literature will facilitate learning, but will there be learning that will beneficially transfer and certain amounts of learning extended to other disciplines as well? All books teach some social value, and the transfer of new ideas is sometimes obvious, sometimes subtle (More, 1977). Because the more one reads the better reader she becomes, teaching reading of science has the ability

of transfer to improve learning and grades in other areas, for example social science and other content areas.

TEACHER ACTIONS

When one discusses the merits of any reading program one central component is the role of the teacher in the effectiveness of the program. It is the teacher that makes the difference in any reading program, and all teachers are theoretical in their approach to reading (Harste & Burke, 1980). This project offers an integrated approach to reading and includes strategies of teaching science through the use of literature for teachers. Some of the strategies included here are: storytelling, recreational reading, reading aloud to students, and choosing science tradebooks and picture books to cover wide ranges of reading levels.

What is the value of storytelling as a strategy and how does it relate to studying science? The etymology of the word story reminds us that it is related to the Greek word eidos which means the idea, form or shape of things. Stories help us give form and shape to experiences. Stories can act as a "container" helping the listener to see how different events are related and connected to other strings of events. Storytelling is one of the oldest modes of teaching, but it may be the best way to teach some of the newest ideas in science (Martin, Miller, 1988). Few techniques or strategies hold a

child's attention more than storytelling, and it is the smart teacher who learns to practice this skill and include it in her bag of tricks to teach science and other areas of content reading.

Linda Clary (1986, p. 38) a school board member states, "Recreational reading increases students' desire to read and gives them the opportunity to exercise their reading skills." Teachers need to use and integrate recreational reading into their reading programs because it gives students the chance to practice their reading skills. Wise teachers also need to advertise their program so that school board members can help finance additional funds for books for recreational reading and building positive attitudes toward reading.

Sanacore (1990) suggests including literature as a part of the instructional program in content area classes, reading aloud to students, and supplying a wide variety of print materials for the students to read. Teachers should allow recreational reading for pleasure during content instruction and include literature as part of the content instructional program, plus reading aloud to students, providing a wide variety of printed materials for reading.

Teachers need to select science tradebooks diverse in subject matter and depth of coverage which are appropriate for a wide range of reading abilities (Crook & Lehman, 1990).

All teachers need to allow class time for recreational reading in order to build and encourage positive attitudes toward reading, and one that would be consistent with elementary school philosophy toward reading (Sanacore, 1990). The principal has a great deal of control about the amount of time spent in recreational reading. Teachers who believe in this philosophy would be wise to encourage visits by the principal, give reports orally to her regarding positive gains in reading interest among students, and present written work relating to reading to her.

Teachers should read aloud to model reading and build knowledge (Anderson, 1985, Dwyer & Isbell, 1989). By encouraging leisure time reading, teachers can build positive attitudes, expansion of vocabularies and promote reading in a non-threatening environment.

Sharp (1984) says that picture books can and should be used to teach all ages of elementary students, to show students that reading is a part of all learning regardless or the subject and to encourage students to become lifelong readers. The use of picture books can encourage students to be lifelong readers.

Teachers can help students learn that books are still the best medium for pursuing their own interests and explore a subject in depth, and should encourage use of tradebooks

because they are appropriate for a wide range of reading abilities and are diverse in subject matter.

Guidelines for teachers are available from the American Association. for the Advancement of Science, National Science Teachers Association, and the Children's Book Council that stress accurate, pertinent, and timely analytical thinking and organization to clarify the content of the vast number of science tradebooks available for classroom use (Janke & Norton, 1983).

However, teachers must select trade and children's books carefully. Bard (1970) examined twelve Newberry books from 1960-1970 for natural conservation, communications, and interdependence. Award winning children's literature tends to teach socially prescribed behaviors more than environmental content. Some environmental content may be included in stories of minorities living in isolated areas with a need for self-sufficiency like The Island of the Blue Dolphins or Call It Courage, for example, but it did not occur as a theme or even a sub-theme in most cases. More children in urban settings are gaining natural world experiences through vicarious experiences. Kirk and Karbon (1986) state that more children are growing up in an urban environment and most information about the environment is gained from vicarious experiences such as reading, television, parents, teachers, and peers. The

transmission of new ideas and thoughts often occurs during these experiences.

Thematic unit development takes one into, through, and beyond literature. Judicious teacher planning can introduce positive vicarious experiences that can be augmented by such media as television and video/laser disc programs.

This project and resultant teacher actions can early on serve to build a foundation of background knowledge, vocabulary, and reading desire and ability in students.

Some students have difficulty with introductory science classes, and since science texts follow the standard pattern students have difficulty learning from a text. Kurland (1983) feels that the problem may not be the students' reading difficulty, but their inability to understand scientific discussion. Since science teachers are primarily oriented towards content, the student can best be helped by a reading specialist who can assist the student in developing critical reading skills. Employment of a reading specialist is commendable, but is it practical? Short of adding a new faculty member, the reading specialist, fifth grade teachers can use the model thematic units presented in this project as a skeleton and apply the concepts to develop curricula further.

There may be other things teacher can do and consider to intensify teaching while saving time and money. Grano and

Asby-Davis (1983) state the need for teachers of language arts and content area classes in junior and senior high schools to be paired to share students and preparation times. In their study, the language arts teachers taught the English skills from the social science textbooks, and the content teachers became directly involved in teaching reading and writing in relation to their course content. Teachers can gain support of similar programs by the administration allowing teachers to share students, texts, and preparation times, team teach areas, or combining classes as a model. Teachers reporting positive gains in student interest and time on task will help such programs to become more accepted in schools.

Shenkman (1982) details a program with the teacher asking questions relating to the reading, or to use provocative statements relating to the major concepts in the reading matter to evoke written or discussion responses, and a third activity the teacher provides a stimulus word or phrase and the students list as many associations as they can which can be grouped into major categories. To increase student involvement, plan for a program that includes phases where the teacher asks thought provoking questions on concepts in reading matter, provides stimulus word or phrases, and evokes answers in discussions or written dialogue.

Regardless of prior knowledge, and despite attempts at understanding the organization and key elements of a text a student is likely to encounter unfamiliar vocabulary words (Barrett & Graves, 1981). Kossack, Campbell, and Reichbach (1980) state teachers can help students list areas of association for stimulus words or phrases relating to concepts, then group these areas into categories. The students can then study, gain understanding, and recognize the use of their background knowledge to recognize unfamiliar words encountered in text.

The teaching of writing is becoming a responsibility for all teachers. Few other components of a school's reading program are more important than an effective writing program in developing comprehension ability (Gebhard, 1982). Teachers need to incorporate teaching of writing as an integral component of a reading program; it helps develop comprehension ability. This project provides such a model for teacher actions.

Teachers need to include the two types of reading in their reading programs. One is the type usually found in nonfiction books where one is looking for specific information; another type of reading is where the reader's attention is directed toward what he is personally identifying with a particular narrative text. It is important that children learn to read both

kinds of books and to read for different meanings and purposes. This is done by teachers providing divergent texts in style, tone, and function and different reasons for reading, to scan quickly, to read more deeply, or to read a selection for its esthetic appeal. Teachers need to teach and demonstrate differences between efferent and aesthetic reading, and the importance of reading both types of books (Woolsey & Burton, 1986). Teachers can teach students to predict using their own knowledge and content experiences, so they can identify with purposes for reading and comprehension of text.

Language experience is an effective way to build an understanding of science concepts, where children's experiences provide science observations that are recorded for reading and extension activities (Barrow, Kristo, & Andrew, 1984). An effective way to an understanding of science concepts is through students making science observations that are recorded for reading and extension activities.

Teachers should teach use of prior knowledge to read and comprehend better (Clewell & Clifton, 1983). They should also teach critical reading skills in order to facilitate prediction. The use of prediction can improve content area reading. Nichols (1983) discussed the use of prediction in relationship to content area reading and how prediction can improve content area reading. A prediction technique is used before the

student begins reading the text. It arouses student interest by asking her to predict what will be learned in the lesson. What is anticipated is that the student having made a prediction will read or listen more carefully to find out if her prediction is correct.

Children's literature books that deal with science and scientific concepts can become the basis of an integrated language arts and science program. Many of these books with a strong story line enable children to understand and remember more scientific concepts than they would by using a science textbook. Such literature can easily be integrated into thematic units geared for development into all curricular areas.

THEMATIC UNITS

The California State Science Framework (1990) specifically states that science should be taught in themes and in thematic units whenever possible (p. 8). Thematic units were chosen as the tool for the integration of science, literature, and reading for this model project. Considerable research has demonstrated the effectiveness of integrating literature in a language arts program, keeping language "whole", and incorporating the concept of whole language learning because it has language-centered orientation to curriculum.

Whole language is a conceptual theory of learning and of language development. It is a view of teaching and the role of teachers and learners, plus a language-centered orientation of curriculum (Goodman, 1986). It is a philosophy of teachers designing an integrated curriculum centering on thematic units, keeping language whole, with a child-centered emphasis, allowing the child to have choice or ownership of his learning. Integrated thematic units based on language are child centered, allowing choices and pride of ownership.

If language is learned best when it is whole, then integration is a key principle for language development. Language development and content instruction each become curriculum for the teacher. The areas of the language arts: listening, speaking, reading, and writing are constantly being explored and evaluated within the context of the content area. Individual growth of each child is the goal.

Thematic units are adaptable for any age or group of students. Davis (1990) reports the success of using carefully chosen, well planned thematic units to teach returning high school former dropouts. These were students who had not experienced success in school and most were considered aliterate (able to read but choosing not to).

Thematic units utilize planning and other activities to activate schemata. In this project a strategy to question or

Whole language is a conceptual theory of learning and of language development. It is a view of teaching and the role of teachers and learners, plus a language-centered orientation of curriculum (Goodman, 1986). It is a philosophy of teachers designing an integrated curriculum centering on thematic units, keeping language whole, with a child-centered emphasis, allowing the child to have choice or ownership of his learning. Integrated thematic units based on language are child centered, allowing choices and pride of ownership.

If language is learned best when it is whole, then integration is a key principle for language development. Language development and content instruction each become curriculum for the teacher. The areas of the language arts: listening, speaking, reading, and writing are constantly being explored and evaluated within the context of the content area. Individual growth of each child is the goal.

Thematic units are adaptable for any age or group of students. Davis (1990) reports the success of using carefully chosen, well planned thematic units to teach returning high school former dropouts. These were students who had not experienced success in school and most were considered aliterate (able to read but choosing not to).

Thematic units utilize planning and other activities to activate schemata. In this project a strategy to question or

discuss key areas of a unit is used prior to content reading so as to enable the teacher to determine the level of prior existing content schemata before reading the text or beginning the activity. The teacher can then fill in any gaps with a variety of materials.

The use of thematic units and activities allows vicarious experiences for children growing up in urban settings. The transmission of new ideas and thoughts often occur during reading (Kirk & Karbon, 1986). This project has added additional experiences through diversified reading, audio-visual media, and discussion not previously available to students. Children are expected to learn through these divergent vicarious experiences and gain awareness of the natural world and their environment. Large amounts of information available can be organized to create a systematic schema.

Picture books are used for all reading levels and informational books and biographies and are consistent with the philosophy of this project. Universal use of picture books is designed throughout the thematic units as springboards for discussions leading to positive attitudes and providing enriching experiences. Literature has the capability of making facts 'real' to children of all ages. The model thematic unit demonstrates that the use of picture and informational books

as well as science tradebooks have high interest level for students. These materials and subsequent activities are used within the curriculum of thematic units (Alfonso, 1987). Literature is used to expand reading choices in all areas of curriculum including the arts, natural and social sciences, and mathematics. It was a major objective of this project to ensure, build, and use model thematic units incorporating literature as bases of planned teaching rather than stressing a use of fifth grade texts as primary source of facts and information.

The project is consistent with the philosophy that increasing amounts of factual information available to the learner requires that students will create systematic organized schema rather than memorizing individual pieces of information. An integrative interdisciplinary curriculum can provide students with a global view of learning (Nielsen, 1989). Teaching present content in organized thematic units is to develop and teach integrative interdisciplinary curriculum systematically organized to meet the needs of students.

The results (Johnson, 1989) demonstrated in Carson, California may not be the same because only one class will be expected to complete the units, however if an entire school were to undertake the work, this project will assist planners.

It would be hoped that the results of an increase in student attendance and a decrease by 50% of disciplinary actions, an increase in 50 points in CAP test scores could be realized. One reason for their success was that teachers took two years to develop the curriculum and carefully chose the sets of literature. Some criteria for their choices were: core values that address important questions and help students learn to get along with people, possibilities for extended learning that would challenge students to explore, recreational value that would stimulate students to become better readers. The objectives and criteria for this project that integrates literature and science incorporating literature as basis of planned teaching rather than stressing a use of fifth grade texts as primary source of facts and information were consistent. It is a design of this project to use a creative approach to presentations and lessons, and give thought to substituting selected science literature for the text book.

Zemer (1987) states that because all things are related in one way or another, that as we lead children in a discovery process we can help them to learn about science. Thematic units may be considered one topic, however because of the diversified nature of the lessons, there can be a great deal of variety in the presentations. For example, with the topic of mammals, sub topics could be sea mammals, land mammals,

and within those areas, sub topics could be size, location, habitat and other similar qualities or characteristics that are common among them.

Individual sub topics as parts of the curriculum can be organized within thematic units. A unit provides a focal point for inquiry, language, and cognitive development. With coordination, it can involve students in planning and often gives choices of authentic, relevant, meaningful activities to reach academic goals (Goodman, 1986).

There is an old adage that many educators follow: 'Keep it simple, Simon.' Don't we build tall buildings one floor at a time? Isn't there a necessary relationship between the buildings foundation and each successive floor? Can one equate the flight on an airplane and the movement of a whale through the water? Through a series of 'zig zag' reading and reporting lessons, children may help each other in the coordinating of science and reading. Building thematic units coordinating science and reading involving background reading experiences, demonstrates to children problem solving through order and logic. Students can then realize the direct results of reading the clues or directions carefully.

Schools need an infusion of authentic tasks that will make a difference in students lives (Brown, 1989). Teachers need to make students more focused on setting goals and realizing the

importance of higher thinking skills that will be useful in their lives. Thematic units, multisensory, and multidisciplinary lessons lead to more efficient use of all educational materials and concept comprehension is the ultimate goal. Teach students to set goals and achieve objectives.

CONCLUSION

The conclusion of this writer is that the body of research clearly demonstrates the need for science and other content areas to be taught by teachers who genuinely care about their students and their comprehension of the materials presented. Teachers need to get away from using textbooks and develop libraries of science tradebooks to explore topics in depth and scope. The use of tradebooks and picture books can increase the motivation and add interest to subjects being studied by students.

Teachers should read aloud to all students for modeling, information, and enjoyment. All teachers have a theoretical view of reading regardless of where their philosophy falls on the reading continuum.

Science is best taught in organized thematic units with a variety of student involvement that takes the student into, through, and beyond the literature. Students are able to build new concepts and ideas on existing prior knowledge. Teachers

involved in these processes and ascribed methods of teaching reading and science are successful, and what is more important, their students are successful. These successful students have a positive experience relating literature and science and continue to choose reading as a leisure time activity, and by learning to explore books they have learned about life.

Therefore, this project has been written to address these needs. The project consists of three model thematic units consistent with the guidelines of the California State Framework on Science for the fifth grade.

REFERENCES

Alfonso, Sister R. (1987). Modules for teaching about young people's literature-module 3: Values children can learn from picture books. Journal of Reading, 30(4), 299-301.

Alfonso, Sister R. (1987). Modules for teaching about young people's literature-module 5: Picture storybooks vs. basal readers. Journal of Reading, 30(6), 497-499.

Alfonso, Sister R. (1987). Modules for teaching about young people's literature-module 6: Informational books. Journal of Reading, 30(8), 682-686.

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

Ansbacher, T. H., & Richter, B. (1983). Heigh-ho, come to the fair! Science and Children, 23(6), 53-55.

Barrow, L. H., Kristo, J. V., & Andrew, B. (1984). Building bridges between science and reading. Reading Teacher, 38 (2),188-193.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42.

Browning, N. F. (1982). Journal writing: One assignment does more than improve reading, writing, and thinking. Journal of Reading, 30(1), 39-44.

Brozo, W. G., & Tomlinson, C. M. (1986). Literature: The key to lively content courses. Reading Teacher, 40(2), 288-293.

Brunsworth, J. (1988). Science and reading-a perfect match. Teaching K-8, 18(4), 60-61.

Butzow, C., & Butzow, J. (1988). Facts from fiction. Science and Children, 25(6), 27-29.

Butzow, C., & Butzow, J. (1989). Science through Children's Literature. Englewood, CO: Teacher Ideas Press, Libraries Unlimited.

California State Department of Education. (1987). English-Language Arts Framework. Sacramento, CA: 49.

California State Department of Education. (1984). Science framework addendum. Sacramento: CA.

California State Department of Education. (1990). Science framework for California public schools kindergarten through grade twelve. Sacramento: CA.

California State Department of Education. (1987). Science model curriculum guide kindergarten through grade eight. Sacramento: CA.

Clary, L. M. (1986). Here's what your board should understand about reading instruction. The American School Board Journal, 173(9), 38-39.

Clewell, S. F. , & Clifton, A. M. (1983). Examining your textbook for comprehensibility. Journal of Reading, 27(3), 219-224.

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

Cullinan, B. E. (Ed.) (1987). Children's literature in the reading program. Newark, DE: International Reading Association. 141-173.

Davis, S. J. (1990). Breaking the cycle of failure through the thematic experience approach. Journal of Reading, 33(6), 420-423.

Dewey, J. (1943). The child in curriculum in school and society. Chicago: University of Chicago Press.

Dwyer, E. J., & Isbell, R. (1989). The lively art of reading aloud to students. The Clearing House, 63(3), 111-113.

Feathers, K. M., & Smith, F. R. (1987). Meeting the reading demands of the real world: Literacy based content instruction. Journal of Reading, 30(8), 506-511.

Flint-Ferguson, J., & Youga, J. (1987). Making evaluation a part of the learning process. Journal of Reading, 31(2), 140-145.

Gebhard, A. O. (1983). Teaching writing in reading and the content areas. Journal of Reading, 27(3), 207-211.

Goodman, K. (1986). What's whole in whole language? Portsmouth, NH: Heinemann.

Goodman, K. (1990). Whole language research: Foundation and development. The Elementary School Journal, 90(2), 214.

Goodman, Y. (1990). Roots of the whole language movement. The Elementary School Journal, 90(2), 116.

Grano, V., & Ashby-Davis, C. (1983). Reading teachers and content teachers: A collaborative program. Journal of Reading, 27(3), 245-251.

Hague, G. R., Jr. (1987). Sing and cheer for science. The Science Teacher, 54(6), 56.

Harste, J. , & Burke, C. (1980). Understanding the hypothesis: It's the teacher that makes the difference. (T.V. Series). Bloomington, IN: Indiana University Reading Program. Reading Comprehension: Instruction Video Tape Research Guide.

Hennings, Dorothy G. (1982). Teaching communication and reading skills in the content areas. Bloomington, IN: Phi Delta Kappa.

Herber, H. L. (1978). Teaching reading in content areas. Englewood Cliffs, NJ: Prentice-Hall.

Hiebert, E. H., & Fisher, C. W. (1990). Whole language: Three themes for the future. Educational Leadership, 47(6), 62-64.

Janke, D., & Norton, D. (1983). Science Trades in the Classroom: Good tools for good teachers. Science and Children, 23(6), 46-52.

Johnson, J. (1989). Literature-based curriculum replaces textbooks. Curriculum Review, 28(8), 8-10.

Kirk. K. A., & Karbon, J. (1986). Environmental content in award winning children's literature: 1960-1982. Journal of Environmental Education,17(3), 1-7.

Kirman, J. M. (1988). Integrating geography with other school subjects: A view from an education faculty member. Journal of Geography, 87(3), 104-106.

Koballa, T. R. Jr., &. Rice, D. R. (1985). What Research Says: Six strategies for improving attitudes toward science. Science and Children, 23(6), 32-35.

Kurland, D. J. (1983). The nature of scientific discussion: critical reading and the introductory science course. Journal of Reading, 27(3), 107-111.

Lehman, B. A., & Crook, P. R. (1989). Content reading, tradebooks and students: Learning about the Constitution through nonfiction. Reading Improvement, 26(1), 50-57.

Levstik, L. S. (1986). The relationship between historical response and narrative in a sixth-grade classroom. Theory and Research in Social Education, 14(1), 1-19.

Linek, W. M. (1991). Grading and evaluation techniques for whole language teachers. Language Arts, 68(2), 125-132.

Martin, K., & Miller, E. (1988). Storytelling and science. Language Arts, 65(3), 255-259.

Mc Garry, T. P. (1986). Integrating learning for young children. Educational Leadership, 44(3), 64-67.

Mitchell, R., Haycock, K., & Navarro, M. S. (1988). Off the tracks: English-Language Arts framework implementation. Sacramento: California State Department of Education. 1-14.

Nichols, J. N. (1983). Using prediction to increase content area interest and understanding. Journal of Reading, 27(3), 225-228.

Nielsen, M. E. (1989). Integrative learning for young children: A thematic approach. Educational Horizons, 68(1), 18-24.

Nist, S. L., Kirby, K., & Ritter, A. (1983). Teaching comprehension processes using magazines, paperback novels, and content area texts. Journal of Reading, 27.(3), 252-261.

Norton, D., & Janke, D. (1983). Science trades in the classroom: Good tools for teachers. Science and Children, 20(6), 46-52.

Norton, D., & Janke, D. (1983). Improving science reading ability. Science and Children, 20(4), 5-8.

O'Brien, K. (1988). Using children's literature in the history-social studies curriculum. Social Studies Review, 28, 53-63.

O'Neal, S. (1991). Leadership in California: Student assessment present and future. From gatekeeper to gateway, transforming teaching in America. Language Arts, 68(1), 67-73.

Pearce, D. L. (1983). Guidelines for the use and evaluation of writing in content classrooms. Journal of Reading, 27(3), 212-218.

Peresich, M. L., Meadows, J. D., & Sinatra, R. (1990). Content area cognitive mapping for reading and writing proficiency. Journal of Reading, 33(6), 424-432.

Pearson, P. D. (1985). Changing the face of reading comprehension instruction. The Reading Teacher, 38(8), 724-738.

Rutherford, F. J. (1987). The character of elementary school science. Science and Children, 24(3), 8-11.

Sanacore, J. (1990). Creating the lifetime reading habit in social studies. Journal of Reading, 33(6), 414-423.

Sanacore, J. (1983). How the principal can promote free reading in the content areas. Journal of Reading, 27(3), 229-233.

Sharp, P. A. (1984). Teaching with picture books throughout the curriculum. Reading Teacher, 38(2), 132-137.

Silvern, S., Lehman, B. A., & Crook, P. A. (1988). Effective schools research and excellence in reading: A rationale for

children's literature in the curriculum. Childhood Education, 68(4), 235-239.

Simpson, M. (1986). A teacher's gift: Oral reading and the reading response journal. Journal of Reading, 30(1), 45-50.

Smardo, F. A. (1982). Using children's literature to clarify science concepts in early childhood programs. Reading Teacher, 26(2), 267-273.

Smith, F. R., & Feathers, K. (1983). The role of reading in content classrooms: Assumption vs. reality. Journal of Reading, 27(3), 262-268.

Smith, F. R., & Feathers, K. (1983). Teacher and student perceptions of content area reading. Journal of Reading, 27 (3), 262-270.

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

Thelen, J. N. Role of pre-reading in content learning. Paper presented at the West Virginia University reading center annual meeting, Morgantown, WV, June, 1979.

Trelease, J. (1985). The read aloud handbook. New York: Penguin Books.

Wagner, B. J. (1985). Integrating the language arts. Language Arts, 62(5), 557-560.

Watson, D. (1989). Whole language celebrating the student within the learning community through literature. 13th

Annual Reading Conference San Bernardino: CSUSB Reading Conference, 3.

White, J. J. (1986). Decision-making with an integrative curriculum. Childhood Education, 62(5), 337-343.

Woolsey, D. P., & Burton, F. R. (1986). Blending literary and informational ways of knowing. Language Arts, 63(3), 273-280.

Ziemer, M. (1987). Science and early childhood curriculum: One thing leads to another. Young Children, 42(6), 44-51.

APPENDIXES

APPENDIX A

Thematic Unit 1: Life Science: Animals

Concepts:

This unit is built upon the following concepts:

1. It is important to have an appreciation for animals.
2. Animals have different needs.
3. Animals can communicate with people with some even learning sign language.
4. Awareness of some animals' fragile existence makes us aware of our own.
5. Studying animals can help us 'unlearn' past stereotypes and prejudices one might have had.

Literary Materials:

Poetry:

Out of the ark: An anthology of animal verse compiled by Gwendolyn Reed. Poems about animals from all kinds of poets from ancient (Sparta) to modern. It also has notes concerning famous pets or animals in history.

Poems to solve by May Swenson. Children are encouraged to solve poems by inference.

Rabbits, rabbits by Aileen Fisher. Poems about rabbits.

Wordless Picture Books:

What whiskers did by Ruth Carroll. Uses pictures to tell the story of a runaway dog who lives with a family of rabbits.

One frog too many by Mercer and Marianna Mayer. A boy has a dog, turtle, and a frog as pets. When a new frog comes, the other frog tries to get rid of 'his rival.'

Children's Books:

A cat's nine lives by L. Hess. The story of Misty a cat who goes through nine 'lives' with different owners until finding happiness.

A peaceable kingdom: The shaker abecedarius illustrated by Alice and Martin Provensen. From the Shaker Manifesto, 1882.

APPENDIX A

Thematic Unit 1: Life Science: Animals

Concepts:

This unit is built upon the following concepts:

1. It is important to have an appreciation for animals.
2. Animals have different needs.
3. Animals can communicate with people with some even learning sign language.
4. Awareness of some animals' fragile existence makes us aware of our own.
5. Studying animals can help us 'unlearn' past stereotypes and prejudices one might have had.

Literary Materials:

Poetry:

Out of the ark: An anthology of animal verse compiled by Gwendolyn Reed. Poems about animals from all kinds of poets from ancient (Sparta) to modern. It also has notes concerning famous pets or animals in history.

Poems to solve by May Swenson. Children are encouraged to solve poems by inference.

Rabbits, rabbits by Aileen Fisher. Poems about rabbits.

Wordless Picture Books:

What whiskers did by Ruth Carroll. Uses pictures to tell the story of a runaway dog who lives with a family of rabbits.

One frog too many by Mercer and Marianna Mayer. A boy has a dog, turtle, and a frog as pets. When a new frog comes, the other frog tries to get rid of 'his rival.'

Children's Books:

A cat's nine lives by L. Hess. The story of Misty a cat who goes through nine 'lives' with different owners until finding happiness.

A peaceable kingdom: The shaker abecedarius illustrated by Alice and Martin Provensen. From the Shaker Manifesto, 1882.

Gorilla by Anthony Brown: A child fantasizes about her toy gorilla coming to life and taking her to the zoo when her father is 'too busy.'

Gorilla, gorilla by C. Fenner. A story of a young gorilla captured and placed in a zoo. He decides to survive after a female is brought to the compound and they remember habits from the wilds.

Koko's kitten by Dr. Francine Patterson photographs by Ronald H. Cohn. Story of Koko, a gorilla in a research project who has been taught to sign, and her pet cat. The cat is killed and is replaced after some time.

Listen, rabbit by Aileen Fisher. A story told in a narrative poem about a boy who finds a rabbit in the wild and tries to make friends with her. The rabbit eludes the boy until spring when he sees her warren and her babies.

Opossum by K. Mizumura. Story of a boy and his father finding an opossum and learning about them.

Seven little rabbits by J. Becker. Rabbits on their way to Toad's house one by one stop off to sleep at Mole's house

The bat by N. Leen. A photographic essay about bats, the different types of bats and their lifestyles.

The story of Nim the chimp who learned language by A. Michael. Nim is a chimpanzee who was taught sign language then was released back to where he was born, also in captivity.

Wonders of elephants by S. Lavine and V. Scuro. A very factual account of the history of elephants and the development of the uses for elephants. Includes photographs some very old and various art forms depicting elephants used in art.

Periodicals:

Zoo babies. (1988, March). 3-2-1-Contact.

Koko's kitten. (1978, October). National Geographic.

Koko's kitten. (1985, January). National Geographic.

Turtles. (1987, January). National Geographic World.

Zoos. (1979, May). National Geographic World.

Elephant extravaganza. (1984, Spring). New Yorker.

Treatment of animals. (1986, December). New York Times.

Scandal of Atlanta's zoo. (1984, June). Newsweek.

Bats. (1975, October). Ranger Rick.

Amazing mammals, parts I and II. (1987, Fall). (Ranger Rick's

Nature Scope.

Media Static Display:

Bat.
Cat.
Coyote.
Box turtle
La Brea Tar Prints, Picture.
Opossum.

Media Study Prints:

Prehistoric animals and plants.
Wild animals.
Zoo animals.
Reptiles and amphibians.
Zoo.
Inside look at animals.
Animals of the zoo.
Life cycle of a cottontail rabbit.

Media Records:

"Baby Elephant Walk," Henry Mancini, RCA record company.

Media Filmstrips:

Cats.
How Animals Grow and Change.

Media Cassettes and Books:

Bats: I Can Read About Bats.
Cat is a cat, I can read about cats and kittens.
Gorilla.
Elephants.

Activities

The activities listed represent various disciplines. Not all students will participate in all activities.

Language Arts (listening, speaking, reading, writing)

1. Students will read a variety of books.
2. Students will listen to the teacher read some stories about animals.
3. Students will discuss with partners or small groups the concepts regarding animals presented in the unit.

4. Students will have an opportunity to write about animals.

Social Science

1. Students will learn how animals cooperate to survive.
2. Students will learn that their own survival depends on animals' survival.
3. Students will work in cooperative groups and share materials appropriately.

Science

1. Care and growth of the turtle can be hypothesized and observed.
2. Trackings of mice in mazes and effects of rewards on behavior.

Math

1. Food can be cooked in class.
2. Animal populations can be charted.
3. Turtle's consumption of food can be measured.

Art

1. Students will draw cats, rabbits and other animals.
2. Students will use colored chalks as a new medium of expression.

Music

1. Students will explore moving to the music to imitate the walking of elephants.
2. Students will explore and record the effects on different animals behavior during periods of excitement.
3. Students will visit a zoo or visualize elephants moving and walking.

This is a thematic unit consisting of ten lessons. The lessons have been placed in subgroups:

Types of Books

1. Animal Alphabet
2. Wordless Picture Books
3. Poetry

Mammals

4. Bats
5. Cats

6. Rabbits
7. Elephants

Primates

8. Sign Language
9. Gorillas

Class Pet

10. Turtles

Types of Books

Lesson# 1 - Animal Alphabet

Before

Teacher will share A peaceful kingdom: The shaker abecedarius (Shaker Manifesto, 1882) and An ape in a cape (Eichenberg, 1952) with the class. These are alphabet picture books. An ape in a cape has full page colored illustrations of very simple rhymes. Each short line has an internal rhyme also,i.e. "Carp with a harp" and "Kitten with a mitten." The book is designed to be very humorous.

During

Children will work in pairs to create a new alphabet book of their own. I will put the letters of the alphabet in a container and the pairs of students will draw which two letters each group will work on. We have previously used a thesaurus in class and students are familiar with its usage.

After

Individual pages of the book will be stapled together, and the book will be shared by the students.

Lesson# 2 - Wordless Picture Books

Before

Teacher will read What whiskers did (Carroll, 1932) and One frog too many (Mayer, 1975) with a small group of students (they can see the pictures better).

During

Teacher will share some prepared wordless books cut apart into individual pictures. Students will organize pictures into story board sequences and be able to tell a story from them.

After

Students will make simple flip books to tell a story about an animal using pictures.

Lesson# 3 - Poetry

Before

Teacher will read selected poems from Out of the ark (Reed, 1968), Poems to solve (Swenson, 1966), and Rabbits, rabbits (Fisher 1983).

During

Students will write short (2-4) lines of poetry describing an animal.

After

Students will trace a simple outline picture of an animal. (I have some shapes die-cut from the media center.) Students will copy their poems on the outline of their animal. These can then be displayed on a bulletin board.

Mammals

Lesson# 4 - Bats

Before

An interested, small group of students will observe a static media display of a bat, listen to a media cassette of Bats. Teacher will share and read The bat (Leen, 1976).

During

Students will discuss the characteristics of bats. Each will write a short story about a bat.

After

Students will draw a bat to accompany the story. Stories and pictures could be mounted for all to share.

Lesson# 5 - Lives of An Animal: A Cat

Before

Students will listen to a media cassette and read some books titled A cat Is a cat and I can read about cats and kittens, and see a

filmstrip Cats. They will also share the story A cat's nine lives (Hess, 1984). This story tell about the nine 'lives' a cat had.

During

Students will make little booklets showing each of the cat's nine lives.

After

Students may exchange booklets and read and share each others.

Lesson# 6 - Rabbits

Before

Read seven little rabbits. (Becker, 1973) In a predictable style book, some rabbits are out for a walk to Toad's house. They all end up at Mole's house for a nap. Details in the pictures add interest to the text. Students will view media study prints Life cycle of a cottontail rabbit. Teacher will read Listen rabbit (Fisher 1964). This is a story of a boy who finds a rabbit in the wild and tries to befriend her. The rabbit eludes the boy until spring when he finds a nest of babies in her warren.

During

Students will write their own story about seeing or finding a rabbit.

After

Students will be provided with art paper and colored chalks to make rabbit pictures to accompany their stories.

Lesson# 7 - Elephants

Before

Play the music "Baby Elephant Walk" and have students imagine the gait of the elephants walking. Students are to bring and wear their impressions of elephant memorabilia. Students may bring any pictures or related symbolistic artifacts to share experiences with the rest of the class. Observe the media study prints Prehistoric animals. Students will listen to media cassettes and books: Elephants. Teacher will read Wonders of elephants (Lavine, Scuro, 1982).

During

Share the article Elephant extravaganza (New Yorker, 1984) using the predictable book strategy.

After

Students and teacher will make "Elephant Ears." Students will cut flour tortillas into fourths. Teacher will fry in hot oil. Students will shake cooked tortillas in cinnamon-sugar mixture, eat and enjoy.

Primates

Lesson# 8 - Sign Language

Before

Teacher will read The story of nim the chimp who learned language (Michel, 1980) and Koko's kitten (Patterson, 1985) Share related articles from the National Geographic magazine.

During

Learn to practice some simple signs from the book. Students could make a simple dictionary of the signs.

After

Write a letter to the Gorilla Foundation to find out more about their research with primates.

Lesson# 9 - Gorillas and Zoo Reform

Before

Teacher will read Gorilla (Brown, 1983). Students will look at prints of Zoo animals, Zoo, and Animals of the zoo, and listen to media cassettes of Gorillas. Articles in 3-2-1-Contact, World, and the New York Times regarding zoos will be discussed Teacher will also read Gorilla, gorilla (Fenner, 1973).

During

Students will discuss needs of animals and how these need are being met by zoos. Lists can be made on the chalkboard.

After

The class will draft a letter to the Los Angeles Zoo to inquire how the zoo is meeting the needs of the animals.

Classroom Pet

Lesson# 10 - To Care for an Animal: A Turtle

Before

Read the story of Opossum (Mizumura, 1974). The boy and his father find a opossum. They read and find out how to care for the animal. Introduce the turtle, Schultz. Schultz is going to be a permanent member of the classroom. Share media items: World (1987), static display Box turtle, study prints Reptiles and amphibians, and Inside look at animals.

During

Students will discuss the needs (diet, rest, exercise) that the turtle will need. Further research may need to be done in an encyclopedia.

After

A chart may be made and recorded on daily to track the caring and growth of the turtle. Daily maintenance in the classroom will be monitored.

Evaluation

I feel that each lesson should be evaluated individually. Completion of the desired goal is one indicator of success. A brief conference with each student at the end of a project would be another way of measuring success. Publishing or posting the booklets and artwork the students have produced for others to see is another way of determining evaluation.

Lesson 1: Animal Alphabet, the student made books could be put on display in the school library.

Lesson 2: Wordless Picture Books, the flip books the students have made could be shared in small groups of students.

Lesson 3: Poetry, the poems produced can be displayed on the class bulletin board for Open House.

Lesson 4: Bats, the stories and pictures generated could be saved in the student's portfolio.

Lesson 5: Lives of an Animal: A Cat, the small booklets produced by students could be shared with a kindergarten class.

Lesson 6: Rabbits, the pictures the students will make can be displayed on a bulletin board either in the classroom or in the office.

Lesson 7: Elephants, the 'Elephant Ears' will be eaten and enjoyed by the students.

Lesson 8: Sign Language, the student generated letter to the Gorilla Foundation will hopefully bring a response. The results of which can be written and published in the school newspaper.

Lesson 9: Gorillas and Zoo Reform, again hopefully the letter written will bring a response from the Los Angeles Zoo and can be put on the bulletin board.

Lesson 10: Turtle, the charting and observance of Schultz's daily care can be observed and monitored.

BIBLIOGRAPHY

Bats. (1975, October). Ranger Rick, pp. 20-25.

Becker, J. (1973). Seven little rabbits. New York: Scholastic.

Browne, A. (1983). Gorilla. New York: Knopf.

Carroll, R. (1932). What whiskers did. New York: Walczak.

Doherty, S. (June 18, 1984). Scandal of Atlanta's Zoo. Newsweek. 103:41.

Eichenberg, F. (1952). Ape in a cape. San Diego: Harcourt, Brace, Jovanovich.

Elephant extravaganza at the Bronx Zoo. (l984, September 24). New Yorker. 60:40.

Fenner, C. (1973). Gorilla, gorilla. New York: Random House.

Fisher, A. (1964). Listen, rabbit. New York: Crowell.

Fisher, A. (1983). Rabbits, rabbits. New York: Crowell.

Hess, L. (1984). A cat's nine lives. New York: Charles Scribner & Sons.

Koko's kitten. National Geographic. (1978, October), pp. 412-414.

Koko's kitten. National Geographic. (1985, January), pp. 362-364.

Leen, N. (1976). The bat. New York: Holt, Rinehart and Winston.

Mayer, M., M. (1975). One frog too many. New York: Dial Press.

Michel, A. (1980). The story of Nim the chimp who learned language. New York: Knopf.

Mizumura, K. (1974). Opossum. New York: Crowell.

Nature scope: Amazing mammals, parts 1 & 2. (1987, Fall). Ranger Rick.

Patterson, F. (1986). Koko's kitten. Scholastic: Toronto.

People for ethical treatment of animals. (1987, December 25). New York Times, I 14: p. 2.

Reed, G. (compiler). (1968). Out of the ark. New York: Atheneum.

Shaker Manifesto. (1882). A peaceable kingdom. New York: Viking.

Swenson, M. (1966). Poems to solve. New York: Scribners.

Turtles. (1987, January). National Geographic World, pp. 24-27.

Zoo babies. (1988, March). 3-2-1 Contact, pp. 4-8.

Zoos. (1979, May). National Geographic World.

APPENDIX B

Thematic Unit 2: Physical Science: Energy

Concepts:

This unit is built upon the following concepts:

1. Energy is necessary and vital to our way of life.
2. We are all consumers and users of energy.
3. It is important to examine different sources of energy and their relative costs and effects on society.

Literary Materials:

Poetry:

Piping down the valleys wild: Poetry for the young of all ages by Nancy Larrick. Poetry for children.

Space Songs by Myra Cohn Livingstone. Poem about the sun.

Children's Books:

Sun power: Facts about solar energy by Steve J. Gadler and Wendy Wriston Adamson. Discusses the past, present, and future of solar energy and compares this energy source to the more widely used fossil fuels and water power.

Future sources of energy by Mark Lambert. Documents modern energy sources with excellent photographs interspersed with text on every page.

Fuel and energy by Herta S. Breiter. An introduction to the location and uses of various types of fuel and sources of energy.

Energy from the sun by Melvin Berger. This book briefly describes how, either directly or indirectly, the sun is the primary source for most of the energy used by man.

Nuclear power by Nigle Hawks. Discusses the power of the atom, nuclear reactors, and the dangers of nuclear power and weapons.

More Power to You by Vicki Cobb. This book explains electric power and other forms of power. It includes simple experiments.

Periodicals:

Bright new ideas for sun power. (1990, January 19). Current Science, p. 8.

Huge sun powered plant being built in U.S. (1988, October 7). Current Science. p. 13.

Media Study Prints:

Energy: Doorway to the future.

Media Computer Software:

Energy House.

Media Filmstrips:

Energy: The key to man's goals, I & II.
Energy and everyday life (National Geographic).
Energy and environment.
Energy: The story of fossil fuels.

Media Cassettes:

Energy from the sun.

Activities

The activities listed represent various disciplines. Not all students will participate in all activities.

Language Arts (listening, speaking, reading, writing)

1. Students will read a variety of books.
2. Students will listen to the teacher read some stories about inventors and discoverers of sources of energy, natural and synthetic.
3. Students will discuss with partners or small groups the concepts regarding energy, sources, and uses presented in the unit.
4. Students will have an opportunity to write about natural and alternative sources of energy.

Social Science

1. Students will learn how man and cultures cooperate in the use of energy to survive.
2. Students will learn that their own survival depends on man's use of energy sources and discovery of alternative sources of power.
3. Students will work in cooperative groups and share materials appropriately.

Science

1. Children will study the care and growth of the use of sources of power on earth and solar power sources so as to protect earth's environment.
2. Students will trace depletion and adverse effects of fossil fuel and synthetic materials use on earth's environment.
3. Study and learn the sources of nuclear, solar, and electrical energy.

Math

1. Calculations of loss of energy and matter in class.
2. Students will learn to read a typical household electric meter and bill.
3. Consumption of energy resources can be measured.

Art

1. Students will draw models of solar energy collectors.
2. Students will use colored chalks as a new medium of expression.

Music

1. Students will explore listening to the music and reflecting to the energy expended in the music.

This is a thematic unit consisting of three lessons relevant to the different types of energy. The lessons are:

Nuclear Energy
Solar Energy
Electrical Energy

Lesson# 1 - Nuclear Energy

Before

Teacher will share media study prints Energy doorway to the future. Students will view filmstrip program Energy: The key to man's goals I and II. The teacher will read Future Sources of Energy and Nuclear Power to the class.

During

Children will work in small groups to create lists of the positive and negative aspects of using nuclear power. The groups' ideas will be presented to the class and listed on the chalkboard.

After

Students will write letters to the San Onofre Nuclear Power Plant to share their ideas and concerns for safety.

Lesson# 2 - Solar Energy

Before

All students will view media filmstrips Energy and the environment and Energy: The story of fossil fuels. Small groups of students will do the remainder of the activities: listen to the media cassette Energy from the sun., read duplicated copies of periodicals Bright new ideas for sun power and Huge sun powered plant being built in the U.S., and read the books Sun Power: Facts about solar energy and Energy from the sun.

During

Students will discuss what they have learned about solar energy. Students will work in small groups to generate questions for an invited guest speaker from the university, an 'expert' in solar energy.

After

Students will make a simple solar cooker and will cook hotdogs to eat on the day the solar energy expert visits the classroom.

Lesson# 3 - Electrical Energy

Before

Teacher will show the sound filmstrip Energy and everyday life; and read Fuel and energy and More power to you.

During

Students will individually work on the computer using the software program Energy House. The teacher will demonstrate a typical electric bill and an electric meter.

After

Working in small groups, students will construct a sample household electric meter, and using charts from the electric company demonstrate to the other groups in the class what their meter should read for the amount of energy used.

Evaluation

I feel that each lesson should be evaluated individually. Completion of the desired goal is one indicator of success. A brief conference with each student at the end of a project would be another way of measuring success. Publishing or posting the booklets and artwork the students have produced for others to see is another way of determining evaluation.

Lesson 1: Nuclear Energy, when the letters are answered and the the students have received feedback and increased their awareness of nuclear energy, the letters will be placed on a bulletin board.

Lesson 2: Solar Energy, the results of the solar cooker will be enjoyed by the class as well as the discussions with the solar energy expert.

Lesson 3: Electrical Energy, we will display the completed electric meters and the charts of the electricity used on a bulletin board in the office.

An Annotated Bibliography of Children's Literature Relevant to the Study of Energy

Adler, Irving and Ruth Heat and its uses.

An introduction to heat covering its measurement, creation, conduction, uses, and molecules. From "The Reason Why" series. A revised edition of Heat.

Ardley, Neil Exploring magnetism.

An easy to read format of both background and experiments. The book teaches concepts as the reader progresses through the book. It uses real world items in experiments that children would be familiar with. The book has a broad scope of magnetism from small easily done experiments to the earth's magnetic fields. Even adults can learn from the concepts presented and experiments shown. This is from the Action Science series.

Ardley, Neil Exploring electricity.

Another book in the Action Science series. It has good illustrations with simple, easy to follow presentation of concepts and experiments. Appropriate for multi-ages in interest and vocabulary.

Ardley, Neil Future wars and weapons.

From The World of Tomorrow series. Topics include using an army of robots, poison warfare, future aircraft and ships, spies and surveillance from space, war from space, shields and their uses, and avenues for achieving peace.

Ardley, Neil Our future needs.

From the World of Tomorrow series. Topics include using robots and what foods we will have in the future, robot farms, harvesting the ocean, treasures of the deep, untapped waters, the biological revolution, energy from below, homegrown energy, wind and wave power, power from space, space factories, and taming the sun.

Barrett, N. S. Lasers and holograms.
Topics include: how to make a hologram, the uses of lasers and holograms, how to measure with lasers, how to send and receive signals, lasers at war, what a hologram does, stories of lasers, and the facts and records of holograms and lasers.

Bendick, Jeanne Putting the sun to work.
Discusses the principles, practicality, and possibilities of using solar energy to do some of our everyday work.

Berger, Melvin. Energy from the sun.
This book briefly describes how, either directly or indirectly, the sun is the primary source for most of the energy used by man.

Berger, Melvin Lights, lenses, and lasers.
Examines the sources of natural, artificial, biological, and reflected light and the properties and uses of lenses and lasers.

Berry, Joy Wilt Turn off the water and lights!
Explains to children the whys and hows of energy conservation in the home. Demonstrating exactly what children can do to help save energy. Topics very from: saving resources indoors, lights, heat and cold, appliances, using the washing machine, using the dryer, using the refrigerator and freezer, using the stove and oven, using the dishwasher, what to do when leaving home for several days, saving resources outdoors, water, recycling, and disposables.

Branley, Franklyn M. Energy for the 21st century.
Explains the uses of energy and describes its various sources with emphasis on future methods of energy production. Illustrations are simply black and white easily copied graphics, many graphs and charts.

Breiter, Herta S. Fuel and energy.
An introduction to the location and uses of various types of fuel and sources of energy.

Challand, Helen J. Experiments with electricity.
A discussion of the properties of electricity, with several related experiments, and an introduction to different kinds of batteries.

Charlie Brown's encyclopedia of energy.
Alphabetically arranged entries dealing with aspects of energy including fuels, famous people, and types of energy.

Cobb, Vicki. More power to you.
This book explains electric power and other forms of power. It includes simple experiments.

Gadler, Steve J. and Wendy W. Adamson, Sun power: Facts about solar energy.
Discusses the past, present, and future of solar energy and compares this energy source to the more widely used fossil fuels and water power.

Hawks, Nigle. Nuclear power.
Discusses the power of the atom, nuclear reactors, and the dangers of nuclear power and weapons.

Kettelkamp, L. The magic of sound.
Presents simple experiments which demonstrate the principles of hearing and acoustics and discusses related topics such as sound in industry, communications and sound effects. The reader learns how to tape his own library of home-made sound effects.

Kiefer, Irene. Energy for America.
Discusses the use of energy derived from finite quantities of fossil fuels and the need to develop alternate energy sources.

Lambert, Mark. Future sources of energy.
Documents modern energy sources with excellent photographs interspersed with text on every page.

Metos, Thomas H. and Gary G. Bitter. Exploring with solar energy.
Discuses the historical present, and the future uses of solar energy and includes instructions for experiments and model building.

Watson, Jane Werner. Conservations of energy.
Explains the pros and cons of various fuels and energy sources and discuses why we must and how we can conserve energy.

White, Jack R. The invisible world of infrared.
Discusses what infrared is; how it is used in science, in space, in the military, and in lasers today; and its incredible possibilities in the future.

BIBLIOGRAPHY

Adler, I. and R. (1973). Heat. New York: John Day Company.

Ardley, N. (1984). Discovering electricity. New York: Franklin Watts.

Ardley, N. (1983). Exploring magnetism. New York: Franklin Watts.

Ardley, N. (1982). Future war and weapons. New York: Franklin Watts.

Ardley, N. (1982). Our future needs. New York: Franklin Watts..

Barrett, N.S. (1985). Lasers and holograms. New York: Franklin Watts.

Bendick, J. (1979). Putting the sun to work. Champaign, IL.: Garrard Publishing Company.

Berger, M. (1987). Lights, lenses, and lasers. New York: G.P, Putnam's Sons.

Berger, M. (1976). Energy from the sun. New York: Crowell.

Berry, J. (1984). What to do when your mom or dad says... turn off the water and lights!. Chicago: Children's Press.

Branley, F. M. (1975). Energy for the 21st century. New York: Crowell.

Breitner, H. S. (1988). Fuel and energy. Milwaukee: Raintree.

Butzow, C. & J. (1989). Science through children's literature. Englewood, CO: Teacher Ideas Press.

Challand, H.J. (1986). Experiments with electricity. Chicago: Children's Press.

Cobb, V. (1986). More power to you! Boston: Little, Brown & Co.

Gadler, S. & W.W. Adamson. (1980). Sun power. Minneapolis, Lerner Publication.

Hawkes, N. (1984). Nuclear power. New York: Glouchester Press.

Kettelkamp, L. (1982). The magic of sound. New York: William Morrow.

Kiefer, I. (1979). Energy for america. New York: Atheneum. The Boatwright Press.

Livingstone, M.C. (1988). Space songs. New York: Holiday House

Metos, T.H. (1979) Exploring with solar energy. New York: Julian Messner.

Schultz, C. (1982) Charlie Brown's encyclopedia of energy. New York: Random House.

Swenson, M. (1966). Poems to solve. New York: Scribners.

Watson, J. (1978). Conservation of energy. New York: Franklin Watts.

White, J.R. (1984). The invisible world of the infrared. New York: Dodd, Mead and Company.

APPENDIX C

Thematic Unit 3: Earth Science: Geology

Concepts:

This unit is built upon the following concepts:

1. Earth, our planet, is necessary to our way of life.
2. We are all users of Earth's resources.
3. It is important to examine different aspects of geology, and their relationships and effects on mankind.

Literary Materials:

Poetry:

Earth songs by Myra Cohn Livingstone.

Sea songs by Myra Cohn Livingstone.

Children's Books:

Danger from below by Seymour Simon. Discusses how and why earthquakes occur, where they are most likely to happen, what to do when a quake hits, and how scientists predict earthquakes.

Disastrous Volcanoes by Melvin Berger. Discusses the formation, types, and locations of volcanoes and describes the eruptions of Paricutin, Vesuvius, Krakatoa, Mont Pelee, and Mount St. Helens.

The magic school bus inside the earth by Joanna Cole. A clever geology lesson, accompanying Mrs. Frizzelle on one of her "field trips." Well-illustrated with great appeal for children.

Ring of Fire by Alice Galbreath. Explains how volcanoes erupt, the work of scientists who study volcanoes, and describes some well-known eruptions.

Volcano by Patricia Lauber. An account of how and why Mount St. Helens erupted in May 1980, the destruction it caused, and a discussion of the return of life to the area. A Newberry Honor book. Outstanding photographs and text.

Volcanoes and Earthquakes by Martyn Bramwell. Covers the insides of volcanoes, different types of volcanoes, and earthquakes.

From the Earth Science library. Excellent color pictures and illustrations.

Volcanoes, the fiery mountains by Margaret Poyner. Discuses the formation of volcanoes, the eruption of such famous ones as Paricutin and Krakatoa, the ring of fire, the usefulness of volcanoes, and volcanic areas of the United States.

Periodicals:

After the big quake. (1989, November 3). Current Events. pp. 1-2.

The big quake of 1906. (1989, November 3). Current Events. p. 20.

Deadly quake shakes the world. (1990, October 5). Current Science. p. 9.

Earth the living planet. (1990, September 21). Current Events. supplement

Huge lava flow covers ocean bottom. (1989, October 20). Current Science. p. 14.

Ice erupts from volcanoes. (1988, December 16). Current Science. p. 10.

Kabourek, J. (1989, May). Surtsey is born. Highlights. pp. 12-13.

Kendrick, K. & B. Cheyat. (1990, October). Shaky predictions. Super Science-Blue. pp. 10-15.

New volcanoes form off Oregon coast. (1990, December 14). Current Science. p. 14.

October 17, 1989, 5:04 P.M. (1989, December 15). Science World. pp. 2-3.

Pope, G. (1990, September 7). River of fire. Science World. p. 3.

Pope, G. (1989, April 21). Volcano guts. Science World. p. 5.

Quake shakes up earthquake class. (1989, December 1). Current Science.

Quake quiz. (1990, Jan. 5). Current Science. p. 6.

Volcanoes: In a haze. Contact. (1990, November). p. 2.

Walters, B. (1990, February 16). Volcano deadly force. Junior Scholastic. 1990. pp. 10-11.

Westrup, H. (1990, January 5). Giant quake: When will it strike? Current Science. pp. 4-5.

Westrup, H. (1990, September 7) Volcanic eruption buries entire town. Current Science. pp. 4-5.

Media Records:

Music for the royal fireworks by George Frederick Handel

Firebird suite by Igor Stravinsky

Media Static Display:

Rocks kit (includes rock types and hardness chart).

Geological process: The rock cycle.

Media Filmstrips:

Adventures in science, unit II (contains mountain building, earthquakes, volcanoes, tsunamis.

Changes in the earth.

All about rivers.

Geologic measurement and maps.

Media Cassettes:

Earthquakes and volcanoes.

Media Video Tapes:

Born of fire (1983) National Geographic: Follows scientists around the world as they follow the boundaries between plates of the earth's crust--areas that may be the site for an earthquake, a volcano, and a geothermal power plant.

Media Laser Discs:

Volcanoes: Exploring the restless earth/heartbeat of a volcano.

Activities

The activities listed represent various disciplines. Not all students will participate in all activities.

Language Arts (listening, speaking, reading, writing)

1. Students will read a variety of books.
2. Students will listen to the teacher read some stories about geology and geological phenomena.
3. Students will discuss with partners or small groups the concepts regarding geology, mountain building, earthquakes, volcanoes, and earth's formations presented in the unit.
4. Students will have an opportunity to write about geology.

Social Science

1. Students will learn how animals cooperate to survive using formations as a result of mountain building, earthquakes, volcanoes, and how man copes with geological phenomena.

2. Students will learn that their own survival depends on geological factors.
3. Students will work in cooperative groups and share materials appropriately.

Science

1. Students will build and demonstrate volcanic action, growth of volcanic islands, growth or loss in height can be observed.
2. Study and trackings of island and new mountains formations, volcanic eruption effects in energy release.
3. Study and learn about oceanic effects and nautical charts.
4. Study and learn about geology mapping, above and sub-terrainial formations.

Math

1. Mountain growth especially growth and loss in volcanic eruption can be simulated and measured in class.
2. Island formation can be charted and plotted on maps.
3. Man's consumption of earth's resources, food sources can be measured.
4. Study and learn about oceanic effects and nautical charts formation and uses.
5. Study and learn about geologic measurements, mapping, above and below subterranean formations.

Art

1. Students will draw mountain building, earthquake results, shock waves, faults, volcanoes, caves, tectonic plate movement, and maps.
2. Students will use colored chalks as a new medium of expression.
3. Students will draw geologic changes to coast lines due to oceanic effects.
4. Students will study undersea formations draw creative figures and shapes using imagery.

Music

1. Students will explore moving to music to imitate the surf, the swaying of tall buildings, or mountain movements.
2. Students will explore and record the sounds of different animals during geological disturbances.

3. Students will visit a museum and examine factors relating to the fact that certain crystals emit sounds, stellar sound origins.
4. Students will study and duplicate different roaring sounds, such as volcanoes, streams and rivers, oceanic effects, and differences in surf.

This is a thematic unit consisting of three lessons relating to geology. The lessons are as follows:

Volcanoes
Earthquakes
Rocks

Lesson#1 - Volcanoes

Before

Teacher will share the music from the Firebird suite and The music for the royal fireworks, and show the videotape, Born of fire. The class will also see the media laser disc of Volcanoes : Exploring the restless earth/heartbeat of a volcano, and the filmstrip of Geologic measurement and maps Teacher will read the book Volcano,

During

Teacher will duplicate and students will read and share these articles from periodicals:

Huge lava flow covers ocean bottom.
Ice erupts from volcanoes.
Surtsey is born.
New volcanoes form off oregon coast.
River of fire.
Volcano deadly force.
Volcano guts.
Volcanoes: In a haze.
Volcanic eruption buries entire town.

After reading the periodicals, the students will brainstorm ideas that they have learned about volcanoes. They will write reports about the volcanoes, complete with drawings of the cross section of them, and on world maps the students will also be able to draw the ring of fire.

After

In small groups, students will construct volcanoes using plaster of Paris, vinegar and baking soda.

Lesson# 2 - Earthquakes

Before

Teacher show Adventures in science, unit II and Changes in the earth. The teacher will read Danger from below, and Earth songs, Students will listen to the media cassette of Earthquakes and volcanoes. Teacher will duplicate and students will read the following periodicals:

After the big quake. The big quake of 1906. (1989, November 3). Current Events. p. 20.

Deadly quake shakes the world.

Shaky predictions.

October 17, 1989, 5:04 P.M. Pope, G. (1990, September 7). River of fire. Science World. p. 3.

Quake shakes up earthquake class.

Quake quiz.

During

Students will list safety precautions to be taken in an earthquake; lists of items to be stored at home and at school and in the family car will be made.

After

After students have learned about plate tectonics, they will cut apart a teacher provided map of the continents of the world, and reassemble the map to show the world as scientists believe it once was and where the continents are expected to be in the future. These can be mounted on a bulletin board and displayed for others to see.

Lesson# 3 - Rocks

Before

Teacher will display media static displays Rock kit (includes rock types and hardness scale) and Geological process: The rock cycle.

Teacher will read The magic school bus inside the earth.

During

The students will bring in rocks they have found locally, experimenting with rocks, using their five senses to note differences or changes in the rocks. Some of these experiments could be using water to note changes in the rocks, their sight or smell; using heat, freezing the rocks then breaking them apart with a hammer, measuring the rock's mass by water displacement. Students will write down observations and compare rocks with the media rocks, creating charts of rocks and their properties.

After

Students will grow crystal garden. To make these use a glass or ceramic dish, several lumps of soft coal, 1/4 cup each of salt, water, laundry blueing and 1/2 cup of ammonia. Pour ingredients over coal and soak. Place a few drops of food coloring on each piece. Crystals will form and last for several days. These can then be displayed.

Evaluation

I feel that each lesson should be evaluated individually. Completion of the desired goal is one indicator of success. A brief conference with each student at the end of a project would be another way of measuring success. Publishing or posting the booklets and artwork the students have produced for others to see is another way of determining evaluation.

Lesson 1: Volcanoes, the students' work, their reports and drawings as well as their models of volcanoes, can be displayed in the library.

Lesson 2: Earthquakes, the pictures of the configurations of the continents from the past and their projection for the future can be posted on a bulletin board.

Lesson 3: Rocks, the students crystal gardens and displays of rocks can be displayed.

An Annotated Bibliography of Children's Literature Relevant to the Study of Geology

Baines, Rae Wonders of rivers.

Briefly discusses the characteristics, origins, formations, and uses of rivers. Well-illustrated with good vocabulary and meanings given within the context of the book.

Berger, Melvin Disastrous Volcanoes

Discusses the formation, types, and locations of volcanoes and describes the eruptions of Paricutin, Vesuvius, Krakatoa, Mont Pelee, and Mount St. Helens.

Blair, Carvel Hall Exploring the sea: Oceanography today.

Examines the world's major oceans and how they were formed. Also discusses the continual changes taking place on the ocean floor and along the coastlines and their implication for the future.

Bramwell, Martyn Mountains .

One topic on each page with many illustrations. Covers erosion, formation, weather, and uses of mountains. Contains glossary.

Bramwell, Martyn The oceans.

Discusses the sea floor, tides, waves, sea beds, what life is like in the ocean, and what foods we obtain from the sea. A part of the Earth Science Library.

Bramwell, Martyn Volcanoes and Earthquakes.

Covers the insides of volcanoes, different types of volcanoes, and earthquakes. From the Earth Science library. Excellent color pictures and illustrations.

Galbreath, Alice Ring of Fire.

Explains how volcanoes erupt, the work of scientists who study volcanoes, and describes some well-known eruptions.

Gans, Roma Caves.
A simple introduction to caves, their formation, past uses, and interesting features

Gans, Roma Danger-Icebergs.
Explains how icebergs are formed from glaciers, move into the ocean, create hazards to ships, and melt away.

Gates, Richard Conservation.
Explains how people have disrupted ecological chains, and what should be done now to protect our natural resources. Revised edition of the true book of conservation. A New true book.

Hargreaves, Pat, editor, The arctic: Seas and oceans.
An introduction to the Arctic Ocean: its formation and exploration, the movements of currents, winds, and icebergs, marine animals, and the life of the Eskimos who live on its shore. Has many pictures, at least one to each page and a glossary of terms.

Lauber, Patricia Volcano.
An account of how and why Mount St. Helens erupted in May 1980, the destruction it caused and the healing that has taken place with the return of life to the area. A Newberry Honor Book.

Peters, Lisa W. The sun, the wind , and the rain.
Presents a side-by-side narration of the earth's making a mountain, shaping it with sun, wind, and rain, and a child's efforts at the beach to make a tall sand mountain which is also affected by the elements.

Pettigrew, Mark Planet earth.
A study of the Earth, its formation, and how it is changing producing mountains, earthquakes, and volcanoes, also seasons and tides. It has a glossary of terms and a combination of drawings and photographs.

Polking, Kirk Oceans of the world: Our essential resource.
Discusses the formation, geologic feature, life forms, uses, and future of the world's oceans. Excellent photographs and illustrations has very scholarly background and resources.

Poyner, Margaret Volcanoes, the fiery mountains
Discuses the formation of volcanoes, the eruption of such famous ones as Paricutin and Krakatoa, the ring of fire, the usefulness of volcanoes, and volcanic areas of the United States.

Pringle, Laurence Restoring our earth.
Discusses ecological restoration of prairies, marshes, forests, and other damaged environments of North America. For a very good reader, or good background reading for an adult.

Radlauer, Ed and Ruth Earthquakes.
Explores what causes earthquakes, where the tremendous power of an earthquake comes from, why they occur without warning, and whether it is possible to predict future earthquakes. Good use of pictures one or every other page, some common sense ways to prepare for earthquakes.

Simon, Noel Vanishing habitats.
Examines the main types of large scale habitats found in the world and some smaller ones, and shows what is happening to them. It also points out that although the problems are usually man-made the degradation of habitat poses a threat to the quality of life and ultimately to human survival. More photographs than text.

Simon, Seymour Icebergs and glaciers.
Discusses the formation, movement, and different types of glaciers and icebergs and describes their effect on the world around them. Many excellent photographs, very easy to read format.

Updegraff, Imelda &Robert Mountains and valleys.
Has half pages included in the text to stimulate children's reading. Shows formation of mountains and valleys, their erosion, and the effects of rivers and glaciation.

Zim, Herbert S. Rocks and minerals.

A reference book for learning about geology. An encyclopedia of geologic terms richly illustrated. Contains scientific make-up of rocks and elements.

BIBLIOGRAPHY

Baines, R. (1982) Wonders of rivers. Mahwah, N.J. Troll Associates.

Berger, M. (198). Disastrous volcanoes. New York: Franklin Watts

Blair, C.H. (1986). Exploring the sea. New York: Random House.

Bramwell, M. (1987). The oceans. New York: Franklin Watts.

Bramwell, M. (1986). Mountains. New York: Franklin Watts.

Bramwell, M. (1986). Volcanoes and earthquakes. New York: Franklin Watts.

Butzow, C. & J. (1989). Science through children's literature. Englewood, CO: Teacher Ideas Press.

Cole, J. (1987). The magic school bus inside the earth. New York: Scholastic.

Gans, R. (1976). Caves. New York: Crowell.

Gans, R. (1984). Danger-icebergs. New York: Crowell.

Gates, (1959). Conservation. Chicago: Children's Press.

Gilbreath, A. (1986). Ring of fire. Minneapolis: Dillon Press, Inc.

Hargreaves, P. (1981). The arctic. Morristown, N.J.: Wayland Publishers Ltd. Silver Burdett.

Lauber, P. (1986). Volcano. New York: Bradbury Press.

Livingstone, M.C. (1986). Earth songs. New York: Holiday House.

Livingstone, M.C. (1986). Sea songs. New York: Holiday House.

Peters, L. (1988). The sun, the wind, and the rain. New York: Henry Holt.

Pettigrew, M. (1987). Planet earth. New York: Gloucester Press.

Polking, K. (1983). Oceans of the world. New York: Philomel Books.

Poynter, M. (1980). Volcanoes: the fiery mountains. New York: Julian Messener.

Pringle, L. (1987). Restoring our earth. Hillside, N.J.: Enslow Publishers.

Radlauer, E. and P. (1987) Earthquakes. Chicago: Children's Press.

Simon, N. (1987). Vanishing habitats. New York: Gloucester Press .

Simon, S. (1979). Danger from below. New York: Four Winds Press.

Simon, S. (1987). Icebergs and glaciers. New York: William Morrow.

Updegraffe, I. & R. (1980). Mountains and valleys. Mankato, MN: Children's Book Co.

Zim, H. (1957). Rocks and minerals. New York: Golden Press.

APPENDIX D

Physical Arrangements of Classroom

In order to insure the success of the program there are some considerations and decisions that must be made in regards to the physical arrangements of the classroom. These will relate to both the students' and the teacher's needs for space and convenience. We have little control over the furniture in our classrooms, the focus then must be on how to facilitate the existing design to meet the needs of the group and achieve the desired outcome.

First of all will be consideration of the students' needs. There needs to be movable desks so students can work together in small groups to accomplish their various projects. The desks must also be moved to allow space for a reading corner for the teacher to read books to the students. In this space there must be room for the students to sit on the floor without being crowded to be able to sit comfortably for short periods of time to listen to the teacher read to them.

There should be adequate wall space for suitable bulletin boards to be constructed to assist in motivating and stimulating student interest in the science unit studied at that time. There also must be substantial bulletin board space given to the students to display their work. This will assist in the motivation as the students will

feel a part of the program and feel ownership or power over their decisions and actions in regards to the science units.

There must also be adequate space for the teacher to store materials. There must be bookshelves to store books and closets or shelves to store projects or materials for projects. These items should be able to be placed out of the way yet be accessible for use quickly as needed. Sometimes covered boxes similar to the ones paper supplies are packaged are good for storing materials for easy labeling and retrieval. An extra space in a file cabinet is good also for storing flat items and thematic unit materials.

When items are requested and donated from parents or the community, it is important to have adequate means to store the needed items until their use.

A few minutes spent in carefully planning the classroom will assist the teacher in utilizing and maximizing existing storage and classroom facilities facilitating the ease of development of this project in the classroom.

APPENDIX E

Elementary School Science Curriculum Objectives from the California State Framework on Science, 1990 p. 160.

1. Provides a balanced curriculum in physical, earth, and life sciences.
2. Shows that science is enjoyable.
3. Reinforces conceptual learning rather than rote learning.
4. Organizes an articulated scope and sequence at the school level. At least 40% of the lessons are activity based.
5. Arranges classroom setting and student groupings to optimize positive attitudes for learning science.
6. Integrates science with other subjects.
7. Makes full use of community resources.

Ways In Which Themes Can Be Used to Enhance the Science Curriculum,

Science Framework, California Department of Education, 1990, p. 33-36.

1. Themes should be used to integrate concepts and facts at all levels of the curriculum.
2. Themes should be used to integrate the main subfields of scientific disciplines.
3. Themes in science should direct the design of classroom activities.
4. The emphasis on themes in science requires a reconsideration of how much detailed material should be included in science curricula.
5. Using themes in curricula can improve the quality of prose.
6. Assessment should be thematically based.
7. Themes can be used to lay out basic principles of science that will operate in many subfields and other disciplines of science.

Weighing Criteria for Adoption of Instructional Materials from the Science Framework, California Department of Education, 1990, p. 199.

Content (50%)

1. Material discussed in Content sections is present (5%).
2. Material is treated accurately and correctly (15%).
3. Material is treated thematically (15%).
4. Depth of treatment is adequate (10%).
5. Emphasis is placed on how scientific knowledge is gained (5%).

Presentation (25%)

6. Language is made accessible to students (5%).
7. Prose is considerate and engaging; scientific language is respected (10%).
8. Science is open to inquiry and controversy is presented non-dogmatically (5%).
9. Science is shown as an enterprise connected to society (5%).

Pedagogy (25%)

10. Hands-on experience is emphasized; there is an explicit connection with real experience and problem-solving; textbook and other materials are not the sole source of information. (15%).
11. Instructional materials recognize cultural diversity. (5%).

12. Assessment reflects experience, integration, and creativity. (5%).

APPENDIX F

Role of the Teacher and Other Support Services

The teacher's attitude and enthusiasm for this program is the single most important factor to guarantee its success. This is a great motivator to the students. The teacher also has the opportunity and the creativity to make science more enjoyable for the students.

Teacher has the opportunity to elevate science to a more important discipline in the classroom by integrating science with other subjects and by allowing the students to feel power or an element of control over their parts of the program.

This program will work for both a teacher in a self-contained classroom or one in a team teaching situation.

Other support services are available from the County Office of Education. Names can be supplied to the teacher so he can become aware of resources in other schools and the community. Many times parents in their employment can become resources to share their expertise with students in the classroom. Other parents may choose to become involved by making materials to be used and shared in the classroom. Librarians both at the school and at the local public library can become a valuable asset to the teacher. Librarians are generally very knowledgeable about books and can usually make some good suggestions and references to specific texts on a given topic or

to a related book that might enhance another. Other possible support services can be from the science department of a local college or a teacher in that department. Sometimes March Air Force Base will provide speakers to come to the classroom to discuss a particular topic. High school teachers are often willing to share their expertise. These is usually a science resource person at the district level in a school district who can assist an elementary teacher in meeting a high school science teacher to obtain background and information if necessary to feel secure in teaching a scientific concept. Some teachers may feel less than secure about teaching science. This is especially true if they are not using the teacher's edition of a textbook. Such pairings with an expert can assist the teacher in building confidence and insuring success in the program. The principal at the local school site can become a resource for building success in implanting this science program. He often is more familiar with the strengths of parents and other teachers and can make suggestions for others for the teacher to contact for possible involvement.

It is helpful for the teacher to understand and make some decisions regarding cooperative learning to assist the students in working well with each other. Will the groups be teacher selected or self-selected by the students? Will they utilize cooperative or collaborative grouping? In cooperative grouping there are small groups with interdependency upon each other within the group. Each

receives a group grade, and each member of the group has a well-defined role. Individuals work independently and share results with their group, then the group can make a presentation to the rest of the class from what they have learned. In collaborative learning students work for individual grades and do individual work, sharing some knowledge or facts with other students. Classroom presentations would be up to the individual students to prepare and complete.

The teacher will need to inform the parents at the beginning of the program that there will be changes in the classroom and about the evaluation of student work and reporting grades.

These are all choices available to teachers and decisions and concerns that need to be addressed prior to the beginning of this program.