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Extending the literature base of a science program

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Abstract

The purpose of this paper is to engage in the process of extending the literature base of the science program in grade one. This activity will be supported by ideas gained from a review of professional literature. The review will discuss the value of offering literature experiences representative of the different genres and accompanying expressive activities across the curriculum, thereby, integrating the language arts and the sciences. Then the outcome of the instructional development activity will be presented in a unit on underwater life.

Extending the Literature Base of a Science Program

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A literature-based instructional program can greatly support the implementation of the science curriculum. Such a program incorporates the many literature genres into instruction, therefore, providing children with opportunities to extend their knowledge base of science topics. In turn, the science program can support children's emerging literacy by providing opportunities for them to engage naturally in the functions of language. Many thinking tasks are common to the language and science processes. These overlaps reinforce children's development.

Purpose of the Paper

The purpose of this paper is to engage in the process of extending the literature base of the science program in grade one. This activity will be supported by ideas gained from a review of professional literature. The review will discuss the value of offering literature experiences representative of the different genres and accompanying expressive activities across the curriculum, thereby, integrating the language arts and the sciences. Then the outcome of the instructional development activity will be presented in a unit on underwater life.

The author of this paper was made aware of this type of integrated teaching, referred to as "whole science" after visiting Betty Strub's second-grade classroom at the Price Laboratory School in Cedar Falls, Iowa. In her classroom, the

children were engaged in the study of mice. Centers based on literature experiences from the different genres with many types of related expressive activities captivated children's interest, such as making mice bookmarks and following directions to make a mouse snack. She had poetry charts, collections of poems, and stories for the children to read. The children seemed truly interested in the topic and were involved in higher-level thinking. The writer questioned herself: Could I do this in my first-grade classroom? Would my students be as interested as Betty's? Science was not one of the writer's strong areas of teaching, but her students were always interested in exploring concepts in this area of the curriculum.

Review of Professional Literature

The problems of many science programs for young children will be discussed. Then the value of providing a literature base as a means of instructional improvement will be presented.

Problems of Science Programs for Young Children

Typically science is taught using traditional textbooks and worksheets. Subject matter is broken into isolated pieces bearing little meaning and relevance to children's lives. Concepts in textbooks are often too difficult for children to comprehend because the vocabulary is in general or technical terms. General words are those with common meanings that are not associated with any one content area, such as "change" or

"surface." Technical words are those that apply to the particular subject, such as "photosynthesis." By reading quality literature, children can relate that new vocabulary to their background knowledge (Vacca & Vacca, 1986).

Many questions need to be addressed concerning the status of science in education. Elementary teachers need to realize that the methodology for the elementary school program must be different than that of the secondary, for the developmental needs of children differ. Before the age of eight, children are in the preoperational stage of development, according to the studies of Piaget. This means that young children are not intellectually ready to engage in logical and abstract thinking as the study of science often requires.

Value of Providing a Literature Base for Science Programs

Butzow and Butzow (1989) have cited several reasons for extending science programs through literature experiences. First, science is abstract for children, and they must be able to see it as part of their own personal world if they are to develop understandings. Fictional literature supports the idea that science is a part of ordinary people's lives. The concepts from a story about characters and places enables children to understand and remember scientific concepts more easily than from a compact, information-type reading of a textbook.

Secondly, fictional stories are appealing to primary-age children because their story structure helps children to comprehend relationships.

The other genres of literature also have their place in the science curriculum. For example, experiences with quality poetry, by contemporary poets, offer children many opportunities to gain insight into the world that is new, sharp and intense. Today's poets present subjects with insight and imagination (Harms & Lettow, 1983).

Another genre that can support understandings in the sciences is folklore. In these stories, the world is viewed with wonderment and curiosity. Children respond to the world around them in much the same way (Yolen, 1981).

In many primary programs, little attention is given to integrating the language arts and the sciences through the different literature genres. By bringing the language functions into the science curriculum, common thinking abilities in both areas can be nurtured: asking questions, recording observations, and sharing ideas from experiments (Holdaway, 1979).

In providing literature experiences as a means of integrating the language arts and sciences in grade one, reading aloud experiences provide an effective base. Reading aloud experiences can be done while introducing a topic, summarizing

a particular unit, or integrating an appropriate bit of current events (Cornelius, 1989).

Implementing the First-Grade Whole Science Program

The process of extending the literature base of the science program was begun with a unit on underwater life that was found in the school-adopted science text.

Preparing the Literature Base

The librarian assisted in gathering books representative of the various genres--fiction, nonfiction, poetry, and folklore. The booklist Outstanding Science Trade Books for Children was used to find sources for the unit. Articles pertaining to the unit were also found in children's magazines. Pieces related to the unit were found in science and nature magazines for young children; National Geographic World, Owl, My Big Backyard and Ranger Rick were helpful in locating articles and photographs.

As books and articles were chosen, careful consideration was made to assure that the works were relevant to the unit and to the interests and abilities of the students. Many of the literature works gathered by the librarian and the teacher provided springboards for expressive activities.

Fiction and nonfiction books were selected for silent reading, reading aloud, classroom reference, and at-home reading. These sources facilitated children's research on a

topic and answered specific questions that evolved from classroom discussion.

Poetry and folklore works were also chosen for the unit. The poetry volume Sea Songs (1986), by Myra Cohn Livingston, presents a vivid, lyrical description of the images of sea life, for example, the taste of salt water and the sounds associated with the ocean. The poets Mary Ann Hoberman and Arthur S. Bourinot in A New Treasury of Children's Poetry have written poetry with fish images. Several of these poems were printed on poetry charts and others were compiled into a small collection and duplicated for the children to read and illustrate. Young children find great success in reading poetry because of the strong rhythm and rhyme.

The humorous folk tale The Three Wishes (Zemach, 1986) with a sea setting demonstrated the value of making good choices. In this story a poor woodsman is sent into the forest to cut down some timber. As he swings his ax, a little troll begs the man to spare his home. For this kindness, the man is granted three wishes. The wishes the man and his wife make are foolish, all involving one small fish for their supper. After reading the folk tale, the children can illustrate what their three wishes would be if the tiny troll granted them such.

While carefully reading books and articles, the goals that the literature-based activities would fulfill were noted. This

activity planner was used as a guideline for the review. An example is given from the underwater life unit.

Science Activities Planner

Title of book: Fish is Fish

Author: Leo Lionni

Genre: Fiction/modern fable

Science concepts:

Tadpoles develop into frogs.

Minnows develop into fish.

Fish must live in water.

Frogs can survive on land and in water.

Relevant vocabulary: pond, minnow, tadpole, water, floated, tail, gills

Possible science activities:

1. Put cards of frog and fish life cycles in correct sequence.
2. Tell how a frog can live in water and on land.

Possible language activities:

1. Write a dialogue between frog and fish.
2. The frog saved the fish's life. Tell of a hero you know.
3. Read and sing "There's a Hole in the Bottom of the Sea."
4. Do an author study of Leo Lionni, perhaps in the form of a rebus story.

Activities related to other curriculum areas:

1. Social Studies - On page 12, the frog mentions he has been

around the world. Show the students the globe. Do you think he was truly around the world? How could one get around the world?

2. Art - Design a new animal the frog could have seen.

3. Art - Experiment with collage similar to the illustrations in this book.

Additional Comments:

Surveying Prior Knowledge

The students' prior knowledge was surveyed. The intent of the survey was to find out if the students had previous experiences with the various topics, to involve the children in their own learning, and to create interest in the units. This survey was developed for parents and children to work on together, asking if they had books or pamphlets on the science units to be studied and if their children had visited areas related to these topics. The survey is presented in Appendix A.

The survey was also a source of information to parents, concerning the year's study. As each unit was begun, the parents sent different books to school. Several children got library cards so they could check out books from both the public and college libraries. Many children found pictures in magazines and newspapers to coincide with the units. These children were also becoming familiar with informational skills

as they used encyclopedias to find out more about a specific science topic.

Presenting the Unit

As the unit emerged, it was integrated throughout the entire day. Each school day began with some form of writing and sharing of events. The ideas related to the unit study were written on large chart paper. Vocabulary specific to the unit was also listed on a chart. This vocabulary was used in various ways. Besides helping with spelling during writing experiences, the words were put on fish-shaped cards and alphabetized.

Throughout the unit, song lyrics and poems on charts were hung around the room. They reinforced concepts as well as knowledge of literary elements--rhythm and repetition.

The learning environment was enriched by centers, both sustaining and specific to the unit. These centers offered children many alternatives for learning and also gave them opportunities to take responsibility for their learning through free choice activity and independence in carrying out goals.

Sustaining Centers

These centers are maintained in the room throughout the school year. Their contents support the specific units of study.

Listening and reading center. The center holds books and teacher-made tapes. Children of all reading abilities have the

opportunity to hear stories read to them on cassette tapes while they follow the text in the book. By listening to taped works, children are able to comprehend a text more difficult than they can read. Nonfiction and fiction works related to the study of underwater life, presented in Appendix B, were placed in the center.

Author/illustrator center. Leo Lionni was the featured author/illustrator during this unit. The first-grade children examined his illustrations and experimented with his multi-media and collage, as in the book Swimmy (1963) and Alexander and the Wind-Up Mouse (1969). A rebus story of Mr. Lionni's life (see Appendix C) was written. Many of Lionni's stories were also made into magnetic stories for story retelling and sequencing. For example, in Fish is Fish (1970), Lionni depicts some unusual characters. The children put these characters and events into a proper sequence by using the magnetic story pieces.

Interesting objects center. This center housed different objects from the sea--shells, seahorses, sand dollars, fishing nets, fishing poles, and a tank of live fish. The children examined these objects.

Bookmaking center. This center provided materials for children to record their responses to the unit.

Centers Specific to the Unit

Water and Water Pollution. Water and water pollution were discussed in great detail. Enid Bloome's The Water We Drink (1971) provided illustrations on the hazards of water pollution. The children then worked in cooperative groups to make posters describing reasons people need water. Some of the reasons were to drink, to play, to clean, and to work.

Floating and Sinking. The book Floating and Sinking, by Franklin Bradley (1967), was recorded for listening. The children brought small objects from home to see if they would float or sink. During center time, the children kept their own record of which objects would float. They also made predictions of why different items would float or sink.

Unusual Sea Creatures. A nonfiction selection, Amazing Fish, by Mary Ling (1991), provided the children with photographs of creatures, such as eels, sharks, rays, and blowfish. This book was used as a reference throughout the underwater life unit and many children chose to read it during free reading time.

In this center, the children read about many unusual sea animals, such as the hermit crab and seahorse. Finger puppets were made after reading Eric Carle's A House For Hermit Crab (1987) and Robert Morris' Seahorses (1972). Discussion included what a seahorse or hermit crab might say about their

habitat and eating habits. Further discussion was easily incorporated into mathematics. Because seahorses are approximately five inches long, students looked for other objects in the classroom of similar length.

Another unusual sea creature, the octopus, was explored in this center. It was introduced through the work Herman the Helper (1974), by Robert Kraus, with its accompanying cassette tape. The children experimented with straws and toothpicks to create the sucking sensation of the octopus' tentacles and the prickly appearance of the blowfish.

Cooking. After reading The Bold Fisherman, by Mark Taylor (1967), the children made edible sea creatures from bread dough. In making these creatures, the children had to work together reading and following directions to make a product.

Fancy Fish. This center included the making of "fancy fish" to identify and to label the body parts of an actual fish. Fancy fish are constructed from paper bags. The children designed their own fish and then labeled the kinds of fins--pectoral, anal, caudal or tail.

Whales Are Not Fish. The children discovered that whales are not members of the fish family. The National Geographic series, The Wonderful World of Seals and Whales (1984) and the fairy tale Pinnochio (1982) provided similar and differing views of the whale. In this center, the children cut out pictures of

items that a whale can swallow, thus exploring the actual size of the animal. They also manipulated magnetic animal characters in identifying which ones were or were not in the fish family.

Assessing Children's Responses in a Whole Science Classroom

The children in the first-grade classroom participated in various forms of writing to assess their understanding of difficult science concepts--class books, individual student books, newspaper articles, puppet play writing, book jacket construction, and radio and television advertising. For those children in the prephonetic stage, the teacher recorded their ideas. Many children used invented spelling.

As the children became more secure in their writing, the assessment became more self-initiated. By mid-December, the time this science unit was presented, the children were making their own books. During the underwater life unit, the children wrote books about such topics as fish, underwater habitats, water pollution, water fun, and unusual sea animals. In Figure 1, an example of a dictated story is presented. This child was reluctant to write. In Figures 2 and 3, these more able children revealed much knowledge about fish in their compositions. Also they know a great deal about the mechanics of writing. Their compositions became part of an ongoing

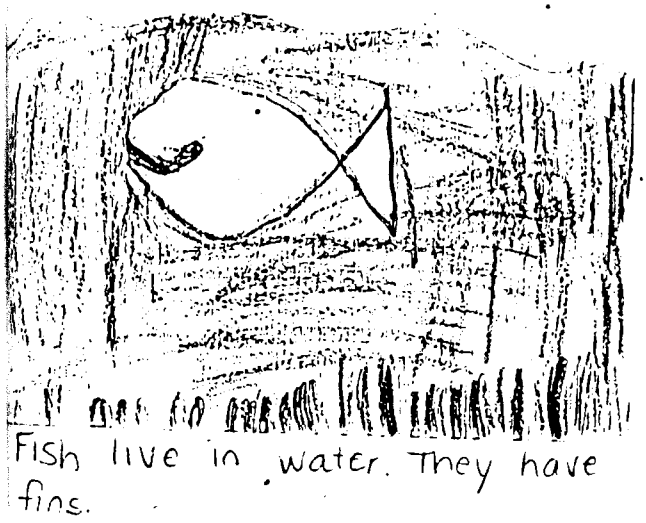

Figure 1. Tara's underwater life story dictated to teacher.

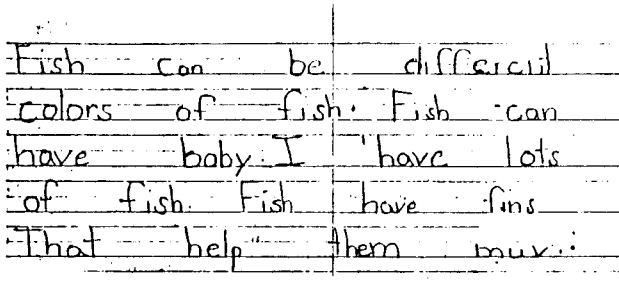

Figure 2. Erin's story with inventive spelling.

Figure 1. Tara's underwater life story dictated to teacher.

Figure 2. Erin's story with inventive spelling.

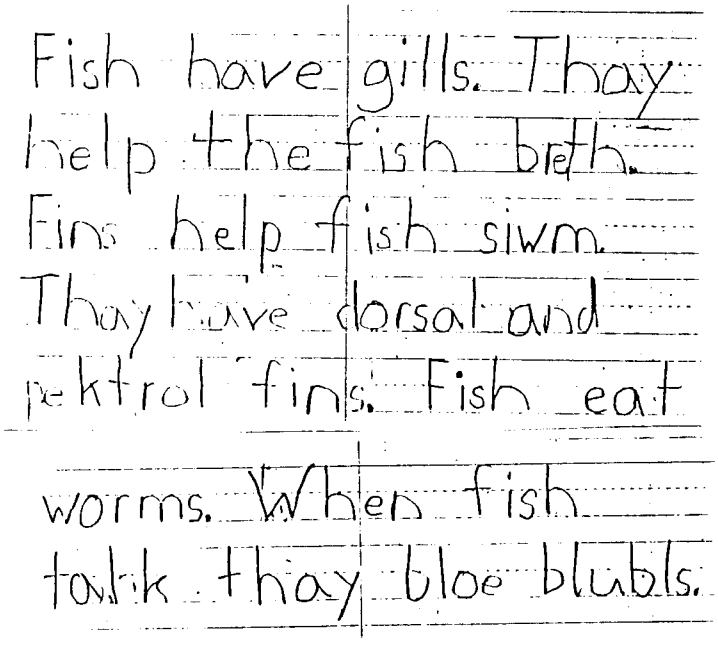

Figure 3. Adam's story using inventive spelling and many details.

collection of responses that were used to interpret the child's growth in the content areas and in language abilities.

Frequently the student-authored books were shared during "Author's Chair", a special time in a designated area of the classroom. The children learned a great deal from hearing each other's stories, discovering different concepts and points of view.

Conclusion

Various genres of literature aided in integrating the language arts and science areas for this unit of study. The literature selections presented science concepts in a more concrete way than the textbook.

The centers gave the children opportunities to own their learning, for they were able to choose their activity.

The insights gained from this instructional development project were presented at the Iowa Reading Association State Conference in Des Moines in April of 1991.

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Appendix A

Letter of Parents Regarding Science Program

Dear Parents,

We are planning an exciting year in first grade! Our science program is designed to give children hands-on activities integrated with literature experiences. Listed below are the units we study in science. Please answer the following questions about your child, _____.

1. Circle any topics you have books or pamphlets about.

butterflies	spiders
bears	five senses
weather	frogs
fire safety	birds/ducks
the farm	the Earth
fish/underwater life	

2. Do you have any children's magazines, such as Ranger Rick or "Owl"? yes no

Would you be willing to share these? yes no

3. Has your child ever been on a farm? yes no

to the ocean? yes no

to the mountains? yes no

to the fire station? yes no

Has your child ever planted a garden? yes no

waded in a lake? yes no

4. Are you in an area where you could find

caterpillars? yes no

spiders? yes no

frogs? yes no

tadpoles? yes no

seashells? yes no

We will be ending each science unit by making a book. I hope you will read these with your child and ask questions.

Please return this survey by _____.

Thank you for your cooperation.

Miss Newton

Appendix B

Children's Literature That Extended the Unit on Underwater Life

A. Literature

Bloome, Enid. (1971). The Water We Drink. New York: Doubleday & Co.

Bradley, Franklin. (1967). Floating and Sinking. New York: Thomas Crowell.

Carle, Eric. (1987). A House For Hermit Crab. Saxonville, Ma.: Picture Book Studio.

Cole, Joanna. (1984). A New Treasury of Children's Poetry. New York: Doubleday and Company.

Crow, Sandra L. (1974). The Wonderful World of Seals and Whales. Washington, D.C.: National Geographic.

Kraus, Robert (1974). Herman the Helper. New York: Windmill Books.

Ling, Mary. (1991). Amazing Fish. New York: Alfred A. Knopf.

Lionni, Leo. (1969). Alexander and the Wind-Up Mouse. New York: Dragonfly Books.

_____. (1970). Fish is Fish. New York: Dragonfly Books.

_____. (1963). Swimmy. New York: Random House.

Livingston, Myra C. (1986). Sea Songs. New York: Holliday.

Morris, Robert. (1972). Seahorses. New York: Harper & Row.

Taylor, Mark. (1967). The Bold Fisherman. San Carlos, CA.: Golden Gate Jr. Books.

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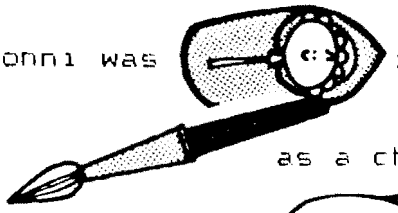
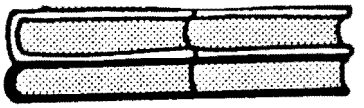
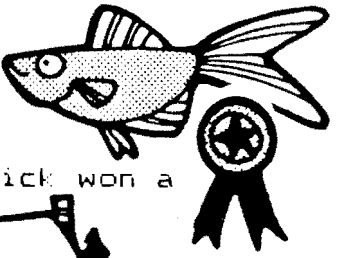
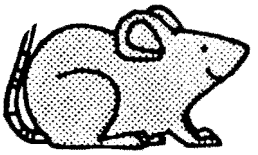
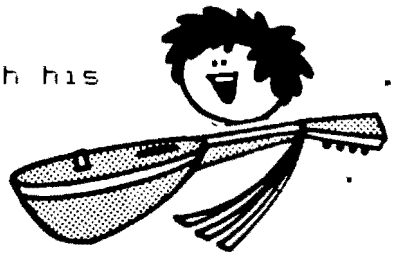
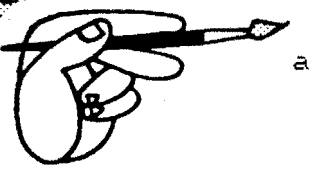
B. Songs

"I'm a Fish," by Lynn Beaird, from Piggyback Songs. Warren Publishing House, Everett, WA. (1983). Jean Warren, editor.

"Crawl, Crawl, Little Snake, Swim, Swim, Little Fish", from Piggyback Songs. Warren Publishing House. Everett, WA. (1984). Jean Warren, editor.

Appendix C

Rebus Story of Leo Lionni

Leo Lionni was  in Amsterdam on May 5, 1910. He liked to as a child. When he went to college, he worked in a  store. Lionni came to the United States in 1939. His first children's book was <u>Little Blue and Little Yellow</u>. He wrote and illustrated it in 1959. Other  he wrote are <u>Inch by Inch</u>, <u>Fish is Fish</u>, <u>Swimmy</u>  and <u>Frederick</u>  . Frederick won a Medal. Mr. Lionni designed the  he now lives in with his  . He still  and plays .