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ABSTRACT

Because of the limitations of traditional text-based instruction, it has been recommended that teachers use additional resources to enliven their instruction and make it relevant to students' lives. Literature can serve as a segue into the sometimes difficult and scary world of science. Reasons for integration are explained and supported by research in the areas of science and literacy. The strategies used in reading and writing successfully--which include organizing ideas, using prior knowledge, predicting, and making connections--should also be applied in the science content area. Thus literature becomes a natural tool for teaching scientific concepts to all students, regardless of age or academic level. This paper also describes how children's literature was incorporated into a middle-level summer science program. The activity described used the alphabet book "Animalia" by G. Base, an oversized book with extremely detailed illustrations and few words. Hundreds of objects identify each alphabet letter, and an observant person can spend hours locating and classifying these objects. The activity objectives were to give participants practice in observing, organizing, and recording data, and to create awareness of ways in which literature can be used in teaching science concepts. Contains 16 references and a 21-item bibliography of suggested literature for science integration. (PVD)

Students' Entry into Science through Literature

by

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Students' Entry into Science Through Literature

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The following is a written version of a workshop presented at the:
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Introduction and Rationale

Traditional text-based instruction has failed to excite students to learn, especially at the middle and secondary levels. Textbooks have been criticized by many experts as being impersonal, boring and difficult to read (Armbruster, 1984; Beck, McKeown, & Gromoll, 1989; Schallert & Roser ,1996). Recent research has focused on the use of children's books as a way of teaching students, regardless of grade and/or reading levels (Cooter, & Flynt, 1996; Neal & Moore, 1991; Schallert & Roser, 1996; Vacca & Vacca, 1996). Much attention is being given to the integration of content across the curriculum. With this information in mind, we looked toward literature as a way of "hooking" students into science concepts.

Why Integrate?

It is recommended by Schallert & Roser (1996), that teachers use additional resources to "enliven and enrich their instruction". In the science area, Program Standard B (NRC, 1996) states that, "science content must be embedded in a variety of curriculum patterns that are developmentally appropriate, interesting, and relevant to students' lives" (p.212). Using this as a basis for our beliefs, we integrated children's literature into a middle level summer science program. We have supported our integrated approach with research in the areas of science and literacy.

Science Needs

According to the National Science Education Standards (NRC, 1996), "Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry, including asking

questions, planning and conducting investigation, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments" (p. 105). With this as a backdrop, we believe science should: (1) be for all learners, (2) encourage creativity and, (3) follow inquiry patterns.

Science should be for all learners. All students can learn science regardless of gender, cultural or ethnic backgrounds, physical or learning disabilities, or their lack of interest in the subject. The opportunity for equal learning should be available to all students and the expectations for success should apply equally to all students.

Science should encourage creativity. For students to learn they need to be motivated. Often this motivation comes through peeking the student's interest for a particular science concept. Students will participate in activities that motivate and allow them the freedom to be creative in their approach to learning.

Science should follow inquiry patterns. Science must be more than a process. According to the National Science Standards, "When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others" (p. 2). In other words, students become active learners using the inquiry approach. For learning to be meaningful to a student, he/she must be able to apply it to their "real" world experiences. Using the method of inquiry students construct their own meanings of events and situations, thus permitting them the ability to transfer the knowledge learned to their personal lives.

Literacy, as used here, is defined as the ability to function productively and effectively in this society through four modes of communication - reading, writing, speaking, and listening. In literacy, the belief is that successful students posses specific strategies and skills which enable them to succeed. Following is a discussion of these strategies.

Strategies of Successful Readers and Writers

According to researchers (i.e. Lewis, 1992; Schmitt, 1990; Tompkins, 1997), successful readers and writers use strategies to assist them in gaining meaning from print. In other words, students who are successful in reading and writing are actively engaged in their literacy development. Among the strategies used are: organizing ideas, predicting, using prior knowledge, generalizing, making connections, visualizing, and monitoring their understanding of text. Understanding and teaching these strategies will assist students' entry into science concepts and knowledge.

Organizing ideas. Students cluster ideas and thoughts about what they are reading. This enables them to remember the information and connect it to prior knowledge and experiences.

Using prior knowledge. Students use what they already know about a topic to understand what they are currently learning. Without this prior knowledge it is difficult to connect the newly acquired information into a meaningful and lasting context.

Predicting. Successful students will "guess" or predict what they are about to read based on their prior knowledge and experiences.

Generalizing. Students who are successful readers and writers can synthesize the information being learned and draw conclusions. These conclusions help students develop and apply meaning to the knowledge they have obtained.

Making connections. It is extremely important for students to connect what they are currently learning to their personal lives. This "connection" becomes part of their schema, therefore becoming part of their knowledge base.

Visualizing. Successful students create visual images of what they are reading. This sensory connection provides the students a way of "seeing" the information in more detail than merely words on a page.

Monitoring their understanding of text. Students who are successful in reading and writing ask questions, when necessary, as they read and reread to ensure comprehension of the material.

The above strategies should be applied in the science content areas. If students are lacking in these areas, actives using literature can be developed to teach the strategies, as well as the science content required. For this reason, we see integration of literature as a natural tool in teaching science concepts to all students, regardless of age or academic level.

Key Terms

The integration of literature into the science curriculum requires an awareness of some basic classification of books and definitions. Classifications can vary somewhat but for this presentation we refer to trade books as "real" books such as stories, poems, fictional, and non fictional information. An example of a trade book is *Island of the Blue Dolphins* (O'Dell, 1990). Alphabet books vary in content and levels of difficulty but usually contain pages of objects of a specific letter of the alphabet. *The Yucky Reptile Alphabet Book* (Pallotta, 1989), and *The Butterfly Alphabet* (Sandved, 1996) are examples of this genre of literature. Wordless books contain few, if any, words but tells a story through illustrations. Students can create their own story using the illustrations. *Time Flies* (Rohmann, 1994) is an excellent example of a wordless book. Books relying on illustrations as well as words to tell a story are considered picture books. Picture books range in difficulty and can be appropriate for adults as well as young children. *The Orphan Boy* (Mollen, 1990), and *Wombat Stew* (Fox, 1986) are considered picture books. We developed an activity that demonstrates how students can learn science content through the use of literature.

Workshop Activity

For the workshop activity, we selected the alphabet book *Animalia* (1989), by Grame Base. With this book the science concepts of observing, organizing and recording data can be effectively taught. Using his imagination and artistic abilities, Base has develop a highly sophisticated book with extremely detailed illustrations and few words. The pages in this oversized book are completely filled with illustrations depicting the letters of the alphabet. Literally hundreds of objects identify each specific letter and an observant person can spend hours locating and classifying these objects. The objectives of the activity were to give participants practice in

observing, organizing and recording data and to create awareness of ways literature can be used in teaching science concepts.

Participants were arranged in groups, using one alphabet letter from *Animalia*, per group. All participants took an active role. These roles, one observer, one book handler, and two recorders, rotated, using a counter clockwise order. The book handler's role was to position the selected letter page so the other students could see the illustrations clearly. The observer's role was to name, in one minute, the objects he/she saw on a given page. The two recorders were numbered one and two, respectively, and were responsible for writing what the observer said. The purpose of the numbering of the recorders was to facilitate the writing process, each taking turns writing down what the observer said. Only the observer could talk. A one minute rotation occurred, allowing all participants equal participation in the activity.

After the participants rotated roles, they were given the opportunity to discuss within their groups the strategies they used in naming the objects. These ideas were then shared in a large group discussion. Using a second page from *Animalia*, the participants began the process again, implementing strategies they had learned from the group discussions.

At the end of the second complete rotation of roles, the participants discussed strategies they used in naming the objects, comparing their lists of objects to the first set they completed. A large group discussion concluded the activity focusing on ways these strategies can be useful in real life situations.

Conclusion

We believe students, regardless of reading levels, can learn and enjoy science (Baird & Dixey, accepted). An excellent way to introduce students to science concepts is through literature. Literature can serve as a segue into the sometimes difficult and scary world of science. There is an estimated 73,000 books for children currently in print, and more than 6,000 new titles yearly (Schallert & Roser, 1996). With resources such as these, teachers should take the time and effort to learn about quality literature and how its integration can stimulate and aid students in mastering

science concepts.

Frank May (1994) expresses the sentiments of many educators when he says, "The success of any program depends upon the knowledge, skill and enthusiasm of the teacher (p. 298)." The possibilities of children's books in the classroom are limited only by the teacher's lack of vision.

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