SCIENCE LEARNING ENHANCEMENT THROUGH THE USE OF CHILDREN'S LITERATURE AND HANDS-ON INSTRUCTION

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ABSTRACT

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It was postulated that through the use of children's literature, in conjunction with hands-on science instruction would enhance science learning. Children are used to story format and are able to read content in a format to which they are already accustomed. The purpose of the study was to see if the use of literature would assist or enhance the learning of rainforest content.

Through a six week's unit on the tropical rainforest, one group of students was selected to also receive literature relating to the study. Another group was taught the same content, but did not receive literature. At the onset of the study, both groups were given a pretest, and at the end of the entire unit, were given the same test as a posttest.

The results indicated that the use of literature did not make a difference in the retention of the content taught. Although the children appeared to enjoy the stories and colorful pictures, both groups were able to retain information equally about the rainforest through the use of hands-on activities and cooperative learning groups.

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CHAPTER I

INTRODUCTION

As we near the end of the twentieth century, we are able to see the need for evaluating science instruction within the classroom setting. How has science been taught? By many teachers, the use of textbooks has been the primary source of instruction. Textbooks provide facts, but fail to motivate the learner (Ross, 1994).

The use of children's literature is a powerful way to extend readers' experiences. It can provide motivation for learning, as well as enhance instruction. Since it follows a story line, children are able to attain factual information easier than comprehending facts from a textbook. The connections made among books can extend and deepen the understandings in curricular areas. Through literature instruction, a student's interest in science content can be bolstered, and their scientific knowledge can be extended through the integration of science and literacy process skills (Casteel, & Isom, 1994).

Through literature, children can satisfy their curiosity and find relevance to their world. It is able to bring a deeper understanding of science concepts, answer puzzling questions, and spark further interest in research and experimentation. Whether the combination of literature and hands-on science will enhance students' learning is the focus of this study.

Rationale

The use of children's literature in science instruction may make a difference. Literature, especially trade books, can provide more extensive information than the text. Trade books may add information about and enhance the concept being taught. An entire trade book can be written on one particular topic. Information in trade books is more up to date, as compared to textbooks, because trade books are published every year. Textbooks, on the other hand, are revised every 5 to 10 years (Hughes, 1994).

Some science trade books are in story form. Complex subject matter is much simpler for the child to understand when it follows the format of a story (Nordstrom, 1992). Good literature books engross the child's interest and information is absorbed (Butzow & Butzow, 1991). Teachers often feel more at ease with trade books and are able to integrate these books with science instruction.

Why are some children "taught" to hate science? Many times science instruction relies heavily on textbooks. Students are exposed to dry facts and lists of terms. "It is no wonder that most students get bored or confused and learn to avoid science." (Lang, 1990, p. 20). One solution to this problem is a hands-on approach to science instruction. Students need to have a "concrete" experience in science. "Trying to teach science without hands-on experiences is like trying to teach someone to swim without going near the water. If potential swimmers never have a chance to enter the water, their interest in swimming is bound to wane. The sooner the nonswimmer gets into the water and

overcomes doubt, the better." (Shair, 1990, p. i). Hands-on science allows the learner to assimilate the concept being taught. He/she becomes excited about discovering new things, and becomes motivated to make observations, as well as analyze what he/she sees and experiences.

Purpose of the Study

The purpose of this study was to examine the use of children's literature in promoting the student's comprehension of scientific information and reinforcement of concept skills in the hands-on study of the tropical rainforest.

Research Question

Do trade books (literature) when integrated into science instruction enhance fourth grade students' learning about the tropical rainforest?

CHAPTER II

REVIEW OF LITERATURE

The use of children's literature in the elementary classroom, especially trade books, presents science content, meets the needs of a variety of reading levels, and sets the stage for further exploration into the topics being taught. Once students are able to sense the relevancy from the "story," they become motivated to proceed to experiments and hands-on activities (Pond & Hoch, 1992). The topics of this review are how children's literature may be incorporated into the science curriculum, how hands-on science enables students to have concrete learning experiences, and why the use of cooperative learning groups aid students' understanding of science content.

Children's Literature

Children's literature includes the genres of fiction and nonfiction. It includes trade books, picture books, chapter books, and other reading material appropriate for the grade level being taught. Through the use of appropriate children's literature, curricular connections can be established with science topics. These connections can extend and deepen understandings of science content. Examination of the familiar gives way to viewing it in new ways, while gaining literary insight, and learning content (Freeman, Lehman, & Scharer, 1995).

Casteel and Isom (1994) contend that one way to assure the improvement of science learning is to start with what students already know about reading and writing, and capitalize on this knowledge by focusing on the basic literacy aspects of science as they teach the content. This may diminish some of the factors that cause students to have a strong dislike for science. Implementing experimentation, thematic units, and the use of technology will also encourage success in science.

Since the primary goal of every educator is for every student to attain knowledge, and learn how to "think," it makes sense that implementing science process skills and literacy process skills together will allow science concepts to become more familiar and less out of reach for the learner (Casteel & Isom, 1994). This integration of science and literacy process helps to make science content more meaningful and interesting for the student. Through the use of literacy-based instruction, students are able to relate science concepts to events within the story or to specific characters (Casteel & Isom, 1994). Some trade books put facts and concepts into a form that encourages students to form a hypothesis, make predictions, and test to determine if the ideas are correct (Butzow & Butzow, 1989).

Many authors of science trade books support the inquiry approach to science. Children become active readers through the use of activities of science investigation. These activities help children learn the meaning of "doing" science (Nordstrom, 1992). Students generally become excited about science, thus wanting to find out more. Their

curiosity is peaked through the use of literature, and they desire to find out more about the world around them.

The wide array of books on a given topic not only allows the learner to actively participate in learning experiences, but also invites critical thinking through comparison, contrast, analysis, and evaluation. With the use of trade books, children operate as scientists while moving closer to the construction of new concepts, or restructuring existing concepts (Freeman & Person, 1992).

According to Janke and Norton (1983):

> Well chosen and intelligently used, these books can assist in (1) giving children knowledge about the world; (2) helping them experience the excitement of discovery; (3) introducing them to the scientific method and helping them to appreciate the attitudes of people who employ this method; (4) stimulating them to explore on their own; (5) encouraging them to develop critical reading and thinking abilities; and (6) stretching their minds, enlarging their vocabularies, and stimulating their imaginations (p.47).

Hands-on Science

Hands-on learning is not a new phenomenon to children. Children naturally observe, experiment, and collect data. Collecting rocks, chasing leaves, and

experimenting to see what will float in the bathtub are common occurrences for most children (Stoodt, 1995).

"In general, hands-on science is defined as any science lab activity that allows the student to handle, manipulate, or observe a scientific process" (Lumpe & Oliver, 1991, p. 346).

The educator helps the children to develop an understanding of the scientific principles behind the activities. A hands-on approach makes learning a concrete experience instead of just another abstract, textbook- based approach. The teacher becomes a facilitator. Students are taught the scientific method by actually working through the scientific process time and again when completing experiments.

In elementary school, a student's interest in science may be either heightened or dulled. If students do not have a positive attitude in the elementary years, then generally their interest may be lost. Through the use of a hands-on approach to science, students are often less intimidated (Elder, 1986). Not only will they have an increased control over their environment, but they also have the opportunity to figure out the solutions to some problems, whether it be what is wrong with their in-line skates, or why all of the Christmas lights do not work. They will see that they are encouraged to reason and argue, instead of simply obeying and responding (Elder, 1986).

Teachers may not feel comfortable or feel they have the knowledge base to implement hands-on science. These teachers may have used the textbook primarily for instruction and may not be familiar with hands-on activities. It is hard for them to realize

that science is so much more than memorizing vocabulary, or being able to correctly answer the questions at the end of a chapter. Once a teacher successfully uses hands-on science, and is successful, it becomes easier to pull away from the textbook.

The benefits for both the student and teacher are such that science becomes fun for both parties. Learning becomes an exciting experience, and the student becomes a willing, active participant.

Cooperative Learning

In real life situations, whether in a farming community or on an urban construction site, working and learning are basically a cooperative effort (Manning & Manning, 1992). Yet students have been expected to work and learn independently. Educators are now encouraged to allow students to work in small groups to share ideas and exchange points of view. Thus, the term "cooperative learning" has been coined.

Cooperative learning is a powerful teaching tool (Kagan, 1996). Students feel less isolated by working in groups, and achievement improvement has been documented by research. This improvement effects all groups of students, whether they be main-streamed handicapped, gifted, average, or slow learners (The Education Digest, 1995).

Before a teacher uses cooperative groups in the classroom, the students must first be taught how to work together as a group. During this teaching phase, a teacher must lay the ground work. Emphasis is placed on the importance of each group member, and the use of peer support along with peer pressure. A sense of community will be

established if the educator first outlines the five basic steps given by Alan Colburn (Schafer, 1994, p.119):

1. Do whatever you must to ensure that students see the *need* for cooperative skills.
2. Do whatever you must to ensure that students *understand* just what the skill is, and when it should be used.
3. Set up *practice* situations and encourage mastery of the skill.
4. Ensure that students have the time and procedures for *discussing* (and receiving feedback on) how well they are using the skill.
5. Finally, ensure that students *persevere* in practicing the skill until it seems a natural action.

Kagan (1996) suggests the following small group activities for cooperative groups that involve each group in five major elements of cooperative learning (positive interdependence, individual accountability, social skills, students working face-to-face, and at the same time simultaneity):

1. Numbered Heads. Students number off one to four. The teacher asks a question, or gives directions. Teams

put their "heads together" to make sure everyone knows the answer. Students still work individually, but their teacher encourages them to help and teach each other.

2. Blackboard Share. One member of each team goes to the blackboard. Teams simultaneously post their best response to a question, problem, or data from a lab exercise. This lets students immediately compare their results with others, and allows the teacher to conduct a lesson that does the same thing.

3. Three Step Interview. Students interview each other within their groups to find others opinions or ideas on a topic given by the teacher. They interview each other within pairs. Each of the members then tells their team of four what they learned from their partners.

4. Think-Pair-Share. The teacher poses a problem or question to the class. Students take a moment to think about a response and then talk their ideas over with a partner. Comments are then shared with the class.

5. Jigsaw. Each student in a team is assigned something different upon which they become an expert. Students

> meet with members from other teams ("expert teams") who are assigned the same topic. These expert teams help each other understand and consider how to teach about their topic to classmates. Students return to their original teams ("home teams"), and each teach the others their topic. Students are responsible for learning all parts.

If a student should fail a task, the teacher intercedes and the responsibility shifts to the group. Encouragement needs to be given to the group to take the responsibility for making sure everyone within the group learns the material.

Cooperative learning is an effective approach, and lends itself nicely to the science classroom. Students become "active" learners, and each group member is held accountable. The support system of a group setting allows even reluctant students to become involved.

CHAPTER III

METHODOLOGY

The purpose of this study was to examine the use of children's literature to assist the student's comprehension of scientific information and the reinforcement of concept skills in the hands-on study of the tropical rainforest.

Subjects

The subjects were students enrolled in two, heterogeneous fourth-grade classes in one rural school district in North Central Texas. Class A had 20 students, and class B had 20 students. The campus was located in a socioeconomically depressed community. The population from Class A was represented by 80% Anglo-Americans, 5% African Americans, and 15% Hispanics. This group contained 60% boys, and 40% girls. Class A received hands-on science instruction augmented with readings from appropriate literature. The population from Class B was represented by 65% Anglo Americans, and 35% Hispanics. The group contained 60% boys and 40% girls. Class B received hands-on science instruction without readings literature in the science lesson.

Procedures

Both fourth-grade classes were taught a 6-week unit on the tropical rainforest. Prior to any instruction, a pre-test was given. A posttest was also given at the end of the

unit. The pre-test, and posttest were the same test and a copy is presented in the Appendix.

During the study of the tropical rainforest, students were given a wide range of instruction. On the first day of instruction, the students worked in groups to make a chart of what they knew about the rainforest, and formulated questions they had pertaining to the rainforest. These charts were displayed around the room, and during the course of our study, we referred to the charts to answer questions, and to add to our knowledge of the rainforest, as we learned. Both groups of students were given the same instruction, except Group A had literature either read to them during the lesson, or excerpts from literature which each group "jigsawed," so that every student would learn all of the material from the articles. A list of book titles is included in Appendix A. An outline of the 6-weeks instruction is presented in Appendix C.

Evaluation

The tests consisted of a total of 10 short answer/essay questions. All of the correct answers to the test were worth 4 points each. For example, questions 1, 2, 3, 4, 8, 9, and 10, each asked for more than one answer, and each correct answer was worth a total of 4 points. Questions 5, 6, and 7 each counted as 4 points, even though they were short answer questions. The students were allowed all of the 45 minutes to complete the test.

Upon completion, a comparison was made between the pre-test, and the posttest in both classes. A comparison was made of the mean scores for each classroom. The results are given in Table I.

Table 1

Mean Percentages and Standard Deviations for Rainforest Test

Group	Test			
	Pretest		Posttest	
	M	SD	M	SD
NLG	43.4	13.44	79.55	15.42
LG	47.2	17.00	82.10	19.70

CHAPTER IV

RESULTS, DISCUSSION, AND CONCLUSION

A hands-on instructional approach enables students to become actively involved in science learning. Whether the use of children's literature would enhance students' science learning, was the focus of this study.

Results

The question asked was whether children's literature, along with a hands-on instructional approach would enable students to acquire and retain knowledge about the tropical rainforest, better than students who were involved in the instructional approach without children's literature. Students from two groups, the Literature Group (LG), and the Nonliterature Group (NLG), were given a pretest prior to studying the rainforest and the same test was given as a posttest upon completion of the rainforest study. The ten item test was scored by percentage with 100% as the highest score.

The mean percentages and the corresponding standard deviations for the rainforest test for the LG, and the NLG, are shown in Table 1.

The posttest means are higher for both groups reflecting students' learning about the rainforest. An analysis of covariance was conducted to determine if there were

differences between groups. The results were not significant, $\underline{F}$ (1,1,37) = .002. Both groups learned the science content, but the use of children's literature apparently did not influence students' learning. Both groups were taught science using a hands-on instructional approach, and all students worked in cooperative learning groups.

Discussion

The results from this study differ from other studies that propose integrating reading and writing into science to enhance learning (Butzow & Butzow, 1989; Casteel & Isom, 1994), or that reading about science helps students to get excited about science (Nordstrom, 1992). Trade books about science topics can assist students to learn more about science topics (Janke & Norton, 1983). In this study, the reading of trade books about the rainforest to the students did not enhance their learning of this content. Students may need to be actively involved in the reading or they may need more time for literature integration across disciplines.

A hands-on instructional approach continues to help students enhance their science learning. Students who engage in hands-on activities weekly, score significantly higher in science (Stohr-Hunt, 1996). Hands-on instruction apparently helped the students in this study to enhance their knowledge about the rainforest. Hands-on science activities make learning a concrete experience (Lumpe & Oliver, 1991) and foster interest in science (Elder, 1986).

Working in cooperative groups as they complete instructional tasks enhances learning (Slavin & Stevens, 1995). Cooperative learning is a powerful instructional tool (Kagan, 1996) and helps students of various ethnicity's and abilities. Students in this study, as they completed their hands-on science activities, worked in cooperative groups. Neither cooperative group work, nor hands-on instruction were the focus of this study, but both probably aided students' learning about the rainforest.

The use of literature through the reading of trade books to the students did not appear to influence their success in the learning of rainforest topics. Students in both groups enhanced their knowledge of the rainforest, and this learning was probably , positively influenced by the instructional approach of hands-on learning and cooperative group work.

Conclusion

Although this study did not show a dramatic difference in the scores of children taught science with literature integration, versus those taught science without literature, it only stands to reason that good, up-to-date literature enhances the science program. Gender, nor ethnicity were a factor of how well the students scored on either the pretest or the posttest.

Through a combination of hands-on learning, cooperative learning groups, and literature, students will have a well-rounded science experience that is more concrete.

Through such concrete experiences children will begin to have a better understanding of their world, and will have the desire to know more.

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APPENDIX A

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APPENDIX B

NAME:_____

DATE:_____

RAINFOREST SCIENCE TEST

1. Name 3 continents on which you would find a tropical rainforest.

2. Name 3 rainforest animals.

3. Name the four layers of the rainforest.

4. Name 2 products that come from the rainforest.

5. Why are most rainforests located close to the equator?

6. Why is the rainforest important?

7. What can you do to stop the destruction of the rainforest?

8. Name the parts of the tree by drawing and labeling a cross section.
   Words to use: pith, heartwood, cambium, sapwood, outer bark.

9. Name two things that man is doing to destroy the rainforest.

10. Trees take in _____ _____,

and give off _____.

APPENDIX C

Six Weeks Lesson Outline

I. Day One-Both Classes

A. Rainforest Pretest

B. Charts made by groups-Know-Want to know-what they Learned

II. Day Two-Both Classes

A. Class discussion of world's tropical rainforests

B. Students will shade in rainforests of the world on map

III. Day Three

A. Teacher reads *The Lorax* (LG)

B. Groups will complete the activity-"Going, Going, Gone"

IV. Day Four

A. Whole class discussion of the layers of the rainforest

B. Students will cut and color the layers of the rainforest model

V. Day Five

A. Students will "jigsaw" excerpts about rainforest facts-*Exploring Earth's Biomes-*

Tropical Rainforest (LG)

B. Students will make 3-D trees & have a class discussion of trees in the rainforest

VI. Day Six

A. Teacher reads *The First Forest* (LG)

B. Go outside and measure off an acre with a trundle wheel

C. Class discussion-epiphytes

D. Students will make bromeliads from paper cups and construction paper

VII. Day Seven

A. Students will complete the experiment about plants in the rainforest

B. Discuss the scientific method

VIII. Day Eight

A. Students will view video-*National Geographic Rainforest*

B. Class discussion of video

IX. Day Nine

A. Teacher reads-*A Jungle Journey* (LG)

B . Students will design a postcard depicting something they might see in the rainforest

X. Day Ten

A. Review facts learned about the rainforest-refer to wall charts

B. Teacher reads *The Giving Tree* (LG)

C. In groups students will complete-"Extinction Is Forever"

D. Class discussion

XI. Day Eleven

A. Teacher reads *The Great Kapok Tree* (LG)

B. Discuss parts of a tree

C. Students will make observations about "Tree Cookies"

XII. Day Twelve

A. Review parts of a tree

B. Finish "Tree Cookie" activity

XIII. Day Thirteen

A. Students will view *3-2-1 Contact-You Can't Grow Home Again"*

B. Class discussion of video

XIV. Day Fourteen

A. Discuss making a rainforest in a bottle

B. Students will make plans for their rainforest in a bottle

XV. Day Fifteen

A. Discuss the greenhouse effect and the water cycle

B. Students will begin making their rainforests in a bottle

XVI. Day Sixteen

A. Teacher reads *Nature Hide and Seek Jungles* (LG)

B. Discuss the wide diversity of animals and insects in the rainforest

XVII. Day Seventeen

A. Refer to wall charts

B. Review rainforest facts

XVIII. Day Eighteen

A. Rainforest quiz

B. Students will receive a rainforest animal to research

XIX. Day Nineteen

A. Rainforest review

B. Students will research rainforest animal

XX. Day Twenty

A. Rainforest posttest

B. Animal research

XXI. Day Twenty-one

A. Go over rainforest test

B. Animal research

XXII. Day Twenty-two

A. Complete rainforest animal research

B. Begin making a 3-D animal to go with their research

XXIII. Day Twenty-three

A. Work on 3-D animals

B. Proofread research with a classmate

XXIV. Day Twenty-four

A. Begin giving research reports orally

B. Show 3-D animal

XXV. Day Twenty-five

A. Oral research reports

B. 3-D animals