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An Integrated Solar System Unit for Third and Fourth Grade Students Using Nonfiction Children's Literature

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ABSTRACT

AN INTEGRATED SOLAR SYSTEM UNIT

FOR THIRD AND FOURTH GRADE STUDENTS

USING NONFICTION CHILDREN'S LITERATURE

by

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This project was based on a review of literature in the areas of vocabulary development, curriculum integration, and using children's literature in the content areas. The purpose of this project was to provide third and fourth grade teachers with a handbook designed to increase the use of nonfiction, informational children's literature in the content area of science. The solar system-themed handbook consists of 10 comprehensive lessons containing vocabulary building activities, stories to be read aloud by the teacher, and hands-on science experiments. The handbook is intended for individual use, either as a compliment to the current curriculum or to be used in isolation.

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CHAPTER ONE

Introduction

Overview

Science instruction has traditionally been taught by the use of textbooks. However, this instructional technique has produced mixed results. "In textbook dominated science curricula, students gain neither an adequate understanding of the nature and methods of science nor the sufficient opportunity to apply scientific thinking to important relevant issues" (Armbruster, 1993, p. 346).

Increasingly, teachers have begun to integrate science, arts, reading, and other subjects together. This integration of subject matter involves a shift in philosophy from tradition subject by subject instruction with textbooks to a more connected curriculum.

Blending science instruction with children's literature is one way to achieve this connected curriculum integration. Children's literature has much to offer an existing science curriculum. Children's literature adds meaning, offers familiar text structure, and adds interest in subject matter for students. Science instruction can greatly benefit from including children's literature as part of the curriculum. Butzow and Butzow (1994) stated that using integrated science lessons creates more relevance for the students, as well as, makes conceptual connections to the student's abilities.

Rationale

Increasingly, states are demanding more and more from students and teachers by creating educational standards. Pajak (2001) stated that reform in education currently stresses a need for systemic change. Teachers need new and more inventive ways to meet these heightened expectations.

At the same time these standards are being put into action, there is a need to increase student involvement in school. Steinberg (1996) concluded that teachers need to find ways to increase student interest and activity levels in school. This need stems from the growing lack of interest in school on the part of the students. One way to increase student interest and meet state guidelines is through integrating children's literature into science curriculum.

Purpose

The purpose of this project is to create a handbook, which connects science with expository children's literature. Additionally, it is also intended to increase the use of nonfiction children's literature in the content area of science.

Significance of the Project

The significance of this project is to offer one possible solution to some current problems that exist in the K-6 grade science curricula.

Scope of Project

This project focuses on integrating expository, nonfiction children's literature with third and fourth grade science curriculum. The project is a handbook for teaching the solar system. It consists of ten lessons. Each lesson will include three main components. These components are a vocabulary building activity, a story to be read aloud by the teacher, and a hands-on science experiment or project.

There are five main sections of this project. Chapter One includes an introduction and statement of the problem. Chapter Two includes review of literature related to science and children's literature integration, as well as, research on vocabulary building techniques. Chapter Three describes the methods and procedures that were used to create this project. Chapter Four is a handbook designed for third and fourth grade teachers which integrates nonfiction children's literature, science, and vocabulary building activities. Chapter Five is a summary of the project, conclusions, and recommendations.

Definition of Terms

The following definitions are cited from Harris & Hodges (1995):

Children's Literature. Children's literature is writings specifically intended for children, or that children have made their own.

Comprehension. Comprehension is the construction of meaning of a written or spoken communication through the reciprocal, holistic interchange of ideas between the interpreter and the message in a particular communicative text.

Expository Text. Expository text is one of the four traditional forms of composition in speech and writing, intended to set forth or explain.

Informational Book. A nonfiction book of facts and concepts about a subject or subjects.

Integrated Curriculum. Integrated curriculum is a curricular organization intended to bring in to close relationship the concepts, skills, and values of separately taught subjects to make them mutually reinforcing.

Thematic Teaching. The organization of instruction around themes or topics instead of around subject areas such as mathematics or history.

Trade Book. Trade books are books published for sale to the general public, commercial books, other than basal readers, that are used for reading instruction.

Vocabulary. Vocabulary is all of the words of a language, a list of words, as in the dictionary or those words known by a person or group.

CHAPTER TWO

Review of Literature

Introduction

The goal of this chapter is to review professional literature in order to examine current problems teachers face when teaching science and to provide a possible solutions for these problems . The review of literature is divided into five sections: the first section contains research on problems with science instruction, the second contains strategies for improving science instruction through children's literature integration, the third will explain the cautions for children's literature and science integration, the fourth shows the benefits of combining informational children's literature and science instruction, the fifth will contain information on the benefits and reasons for vocabulary instruction in the content areas.

Problems with Science Instruction

"Throughout the history of science education, the sciences have been disconnected from the student's life" (Hurd, 2000, p. 284). Traditionally, science instruction has meant instruction solely with textbooks. Freeman & Person (1998) stated, "Textbooks do not create a sense of the time they are depicting, but seem to teach facts in isolation. Science and mathematic texts do not portray the excitement of great discoveries and the impetus such discoveries give other scientists, encouraging them to continue their labors" (p. 29). Most elementary teachers use textbooks as a major component of their science instruction (Shaymansky, Yore, and Good, as cited in Armbruster, 1993). As a result, science has left many students disengaged from the learning process because textbooks are often too difficult for students. The problem is not with the subject of science, but with science instructional techniques and the materials used to teach science.

Experts have noted that students are expected to read, comprehend, and critically evaluate scientific information in textbooks (Casteel & Isom, 1994). However, as Casteel and Isom pointed out, students who lack basic literacy skills are not capable of comprehending such technical materials. This can lead students to dislike the subject matter. Textbooks have been shown in many studies to be a common reason for difficulties in the content areas such as science and social studies (Mckinney & Jones, 1993).

Another problem with textbooks is that they cover many topics, but not in a thorough way (Mckinney & Jones, 1993). Each of these topics can only be briefly discussed due to the size constraints of the textbooks. This problem limits teachers and students without additional planning and searching for materials to use to offer extension opportunities.

In addition, Newport (1990) stated, " Curriculum materials tend to dictate teaching methods. Since textbooks are designed to be read by children, that is what many teachers have their students do with them-- read about science" (p. 68). This can contribute to a problem with students' attitudes toward science. Newport (1990) also asserted,"Many elementary teachers are willing to admit that most students are bored by reading about science in textbooks" (p. 69). This problem of boredom can be remedied through better instructional techniques. For these reasons, teachers have sought to find better ways to teach science.

Teaching Science Through Children's Literature

In recent years, educational professionals have increased their efforts to identify new strategies for teaching science. One such strategy that is gaining momentum is science integration with children's literature. Johnson (2001) encouraged integrated curriculum because of the possible increase in understanding by drawing upon a student's background knowledge. Johnson stated, "Several decades of schema theory research have shown us that we learn best when we

can relate new words and understanding to things we already know" (p. 96). He continued, "Interdisciplinary teaching and learning with an integrated curriculum is sound because of the many connections that exist among human knowledge" (p. 96). This is one of the stronger arguments for implementing an integrated unit of study. Any time a teacher can draw upon a student's background knowledge or schema, the student's learning is strongly benefited.

A further reason for integrating science and children's literature came from Butzow and Butzow (1994, 2000). They stated that children find it easier to assimilate new science concepts when they are presented in stories. They continued to explain that stories conform to the thought processes by which students interpret information. Further children do need to learn abstract information, but that must be developed from a foundation of knowledge. Before dealing with abstract information, they also contended that students must first assimilate ideas to information they already know. They also explained that trade books not only offer a contrast in style to elementary science textbooks, but also offer colorful illustrations and more relevance to children.

Butzow and Butzow were just one of many authorities who examine the use of trade book as part of science curriculum. Madrazo (1997) stated, "As tools to improve reading skills, develop knowledge of scientific principles and enhance general understanding of the world, science trade books can be valuable complements to curriculum and teaching" (p. 20). He continued by adding that trade books not only help with content learning, but also help students develop an appreciation for science based literature. He concluded by saying, "Science trade books are a valuable complement for these skills by enhancing and broadening the student's scope of topical understanding, and by serving as resources for further scientific inquiry" (p. 21).

Freeman and Person (1998) agreed with the previous assertions. They said, "In contrast to textbooks, trade books explore a single topic in depth and give the readers an exhilarating point of view, a personal voice of the author, who wants to communicate and share information with

readers" (p.36). This personal communication with the reader is not available in textbooks. This offers another reason for using more trade books to teach science.

A similar discovery was made by Kaser (2000) who said that the use of literature extended the study of science in her classroom and enhanced her students ability to deal with scientific concepts. She believed that her students gained more insight and understanding when she instructed using children's trade books rather than textbooks.

Using trade books can increase student interest and increase understanding by meeting more of their individual educational needs. Casteel and Isom (1994) said, "Processes and concepts that are complex may cause many children to approach science with disinterest unless motivating, relevant instructional strategies are used. Literature based instruction can support students' interest in science content and extend their scientific knowledge through integrating science process skills with literature and literacy process skills" (p. 538).

Using children's literature increases interest and as Madrazo (1997) noted, using children's literature, specifically trade books, can be an additional connection to the multiple intelligences. This connection occurred because scientific concepts are given to them in a format to match each individual's learning styles and areas of interest.

This change in philosophy from traditional science instruction to units based on integration, known as thematic units, has also had an impact on science instruction. Stiles (1995) said that a thematic approach to science instruction will allow the teacher a visual model on which to structure a science based curriculum. Using trade books is one way to move to integration.

Mayer (1995) added that because of the ease in which trade books can be integrated into thematic units, the varied topics available to educators and growing movement toward integration,

trade books are becoming readily accepted by educators. As a result, the use of textbook use is tapering off in the content area of science.

Tolman, Hardy and Sudweeks (1998) found that one third of the 427 teachers surveyed never used textbooks. The lowest use of textbooks was in the primary grades, kindergarten through second grade. This study supported a need for a replacement for traditional textbooks. Trade books offer an option to fill in the gaps left behind by declining textbook use.

Informational Trade Books

One subset of children's literature is informational trade books. Informational trade books are often referred to as expository texts or simply as nonfiction. Narrative books, which are the most widely recognizable type of children's literature, typically consist of characters, a plot, and settings. Informational text, however, makes use of compare and contrast, problem and solution, and various text structures. These text structures include timeless verb construction, general statements of opening and closing, and use of technical vocabulary. (Yopp & Yopp, 2000).

Informational writing includes many genres. Freeman & Person (1998) stated that informational text includes autobiographies, directions, experiment reports, and journals. Informational text is not limited to a fixed prose. This type of text often contains aids such as graphs, pictures, reference lists, and charts. All of these aids can be used in instruction to assist the reader.

Some disagreements existed in the definition of informational books. For clarification, "Textbooks are informational books, but not all informational books are textbooks" (Fisher, 1972, p. 11). Informational books come in a variety of forms and topics. The main purpose of informational books is to teach. However, Fisher continued to explain that there is more to an informational book than its technical aspect. Informational books "should contain fact, concept,

and attitude" (p. 12). "In addition to gaining exposure to a variety of text structures and features, children learn about there world from these text" (Yopp & Yopp, 2000, p. 411).

Person and Freeman (1998) stated that the primary purpose of informational books is to inform. The authors of informational text use an expository writing style, which has different features than narrative writing, however, informational text are currently beginning to have the same vivid language and lyrical qualities that children regularly hear in their favorite story books.

Another view of informational books came from Kobrin (1988). In her book, Eyeopeners, she says that nonfiction books about real people, places and things, begin to satisfy the natural curiosity that individuals have. Kobrin continued," The best nonfiction [books] answers questions and inspires even more" (1988, p. 4).

Even with these expert opinions, trade books are not being widely utilized in most curriculums. Moss, Leone, & Dipillo (1997) found that most teachers fail to capitalize on the fascination that nonfiction can provide. In a recent study, Yopp & Yopp (2000) found that of the 126 primary grade teachers they surveyed, only a small number used nonfiction books as read alouds. In their sample, only 14% of the books being read aloud on a given day were nonfiction. This study is very rare as most of the research on the use of children's literature in the classroom have focused on the use of fiction rather than nonfiction.

There are two reasons are commonly cited for the lack of nonfiction use by teachers. The first is that many teachers subscribe to the belief that it will not be interesting for their students (Pappas, 1991). The second is that narrative text is often seen to be easier that informational text (Yopp & Yopp, 2000). Both reasons have led to problems that are often not fully understood by teachers, however reading experts and researchers have begun to explore these issues.

Yopp & Yopp (2000) also pointed to a problem that commonly arises with nonfiction texts as students move into the higher grades. They explained a phenomenon, which occurs with

students in the fourth grade when they are suddenly expected to read, comprehend, and apply knowledge from informational text. In response to the heightened difficulty and expectations, many students appear to regress in abilities. However, if the students have had significant exposure to these types of texts throughout their education thus, they will not experience as much difficulty reading to learn with these materials. Yopp & Yopp (2000) asserted that the best way to remedy this problem is through continued exposure to informational text.

Problems With Using Children's Literature as an Instructional Method For Science

Problems exist for including children's literature as part of science curriculum. In her study, Mayer (1995), found that choice in literature is important because often science related books contain inaccuracies. This study showed that students will take the information in books as truth, whether is it or not. The results also showed that the students gained an insignificant amount of new knowledge and in many cases the literature's illustrations and the child's own biases interfered with their ability to gain information. The researcher went so far as to say that the literature may have actually interfered with the science learning. The underlying meaning of the article stated that teacher discretion is the key to choosing and using quality trade books to teach science concepts.

Another source, that agreed with the suggestions made by Mayer, is Eggerton (1996), "My experience in reading recent children's books made me aware of the importance of the teacher's judgment when it comes to choosing children's books for use in the classroom" (p. 22). She added that an increasing number of books are available with criteria to assist teachers with their children's literature selections. It is evident through reading Mayer and Eggerton that a criteria is needed to select children's literature to be used for science instruction. In the following section, many possible solutions will be offered.

Solutions for the Problems When Using Children's Literature to Teach Science

There are many solutions for the problems that exist when using children's literature to teach science. In fact, every March, a panel assembled by the National Science Teacher Association (N.S.T.A), in coordination with the Children's Book Council, selects the top books in science. Their purpose is to provide teachers with a yearly list of quality science related children's literature. They have been doing this annually for the past 19 years. The N.S.T.A. panel looks at several criteria, including whether the information is accurate, the illustrations are a clear representation and that the facts are not oversimplified. Teachers interested in finding quality books need only look up the lists compiled over the years by this panel. There are also rubrics available to test for the quality of a piece of literature for use in a science lesson. In several sources, the authors included a chart or checklist with many points for a teacher to look over as a guide to check for quality. For example, Rice, Dudely, and Williams (2000) included an example of a "Checklist for choosing children's literature to teach science". The questions included: (1) is the science concept recognizable, (2) is the story factual, and (3) is fact discernible from fiction?

A list of ten criteria for nonfiction books were created by Kobrin (1988). The ten criteria are: 1) attractiveness, 2) accuracy, 3) authority, 4) appropriateness, 5) rhetoric, 6) stereotypes, 7) tone, 8) cautions, 9) format, and 10) book design (p. 59). Wolff (1982), points to the Association for the Advancement of Science and their seven criteria for quality informational science books. If books fit within most of the criteria, they are given their recommendation. The Association for the Advancement of Science's criteria are: 1) authorship, 2) subject and content, 3) illustrations, 4) vocabulary, 5) biographies, 6) nature study versus science, 7) physical science and technology, 8) experiment books, and 9) reaching upward and outward.

Teachers can be selective when choosing books to use in their classroom and should take care when selecting materials. However, because options such as the yearly list of quality books and books with criteria are available, teachers should easily find appropriate books to compliment his or her curriculum and resolve the problem of children learning inaccuracies, Mayer (1995).

A Rationale for Integrating Informational Books With Science

Several reasons for integrating informational books exist. As explained by Yopp & Yopp (2000), teaching science with these types of books can offer more in depth study of a particular topic in a realistic way. By using nonfiction, for example, students can not only further their study, but also gain a base of information based on facts and factual illustrations. Informational books can also be paired with a textbook to clarify ideas or add details. It has also been suggested that small groups who read selections and become experts on their topic, are then better equipped to share their knowledge with the class. This can lead to a firmer, more concrete grasp of the material. For example, in a study of weather, one group could read a book on clouds, another could read a book about wind, and another could read about rain. Each group can become an expert on that aspect of weather and can then report their new found knowledge to the class (Yopp & Yopp, 2000).

Another benefit of using not just children's literature, but specifically nonfiction to teach science, is that it offers more opportunities for students to experience nonfiction's unique text forms and features such as heading, subheadings and technical language. As cited earlier, many reading experts are alarmed by the heightened expectations for students as the reach the fourth grade. Teachers who increase their use of this form of children's literature, will assist students in gaining the necessary exposure to these types of materials. Yopp and Yopp (2000) also found

that students are very capable of thinking about the information in these books. Pappas (1991) warned, however, that without constant exposure, students' capacity to deal with these materials begins to decrease.

Moss (1991) concluded that using children's literature provides the advantage of helping students learn in the content areas. Moss also found that nonfiction trade books compensate for many of the weaknesses of the content area textbooks such as difficult language and unfamiliar text structures.

Moss (1995) furthered her assertions when she discussed using nonfiction children's literature as read alouds. She suggested, " Nonfiction read alouds allow children to experience the magic of the real world--of predators and their prey; of planets and oceans; of other lands, times and places. . .nonfiction read alouds sensitize children to the patterns of exposition" (p. 122). This allows students to become familiar with expository patterns such as cause and effect, sequence, and enumeration. Lastly, Moss believed that most importantly, nonfiction read alouds lead to students self-selecting from the same genre.

Finally, informational science books can be very interesting and popular with children. Book publishers are aware of students' fascination with informational books. The sale of these books is second only to fiction. (Kobrin, 1988). Informational books offer variety and great substance.

There are an abundance of books on various topics available for students and teachers to gain knowledge from. With all of these choices available, students and teachers can experience a variety of quality children's nonfiction literature.

Vocabulary Development in the Content Areas

A final area to be discussed is the need for additional vocabulary instruction in the content areas including science, social studies, mathematics. Much of the research and expert

opinions (Johnson, 2001; Nelson-Huber, 1990; Elley, 1989) agreed that vocabulary instruction leads to better comprehension of materials and as a result deeper study can occur. Johnson (2001) said, "Learning vocabulary is essential for learning any subject" (p.97).

In a 1989 study, using 186 seven year old students, Elley found, " Children will learn more and retain more from an activity like hearing entertaining stories read aloud than from working on contrived exercises" (p.176). Elley further stated, "The findings from both experiments support the assumption that young children can learn new vocabulary incidentally from having illustrated storybooks read to them" (p. 184).

In a review of literature, Nelson-Huber (1990) found a differing conclusion for vocabulary instruction in the content areas. She stated, "To put it simply, extensive reading can increase vocabulary knowledge, but direct instruction that engages students in construction of word meaning, using context and prior knowledge, is effective for learning specific vocabulary and for improving comprehension of related materials" (p. 627). She also found that using cooperative learning and using varying contexts and activities are the best ways to keep students engaged in vocabulary learning, but she adds that intensive direct instruction is the key to solving the problems of vocabulary in the content areas.

Content area reading textbooks also offered opinions on vocabulary instruction. One such textbook (Standal & Betza, 1990) stated, "Vocabulary instruction is a tool that you can use for teaching the content of your discipline. By selecting vocabulary according to your purpose, you reduce the number of words that you need to teach, and make the instruction more meaningful because the word is unified in purpose" (p. 45).

Graves, Slater and White (1989) stated that no single in encounter with a word will put that word into the student's everyday speaking vocabulary. They contended that any instruction of that word will be one in a series of encounters that will lead to the mastery of that word.

Through these various opinions, one thing is clear. Most experts agree (Johnson, 2001; Standal & Betza, 1990; Nelson-Huber, 1990; Elley, 1989; and Graves, Slater & White, 1989) that vocabulary must be taught and that students will benefit from that instruction. This instruction can occur through many different strategies including direction instruction, read alouds, and cooperative learning activities. Vocabulary will not be learned incidentally, but as a process over time. Student learning is strongly improved with vocabulary instruction.

Summary

In the first section of this review of literature, problems with science instruction were discussed. These problems included students being disconnected from their learning, declining textbook use due to their difficulty and lack of in-depth study of any one topic, and the level of difficult of most content area materials.

The second section discussed teaching science through children's literature. In this section, the strategy of integration of reading and content areas was submitted. Many experts including Butzow & Butzow (2000) and Madrazo (1997) believed that there are many benefits to an integrated curriculum including enhancing and broadening a students background knowledge and providing relevance in writing and visual representations.

The next section was devoted to a discussion of informational trade books. Freeman & Person (1998) stated that this subset of children's literature includes autobiographies, directions, and journals. They also asserted that this type of text also provides students with exposure to different structural patterns than are available in narrative prose. A discussion of the lack of nonfiction usage in classroom also occurred. Yopp & Yopp, 2000, found that only a small number of teachers were using nonfiction as read aloud books.

The fourth section of the review of literature discussed the problems which exist when using nonfiction children's literature as an instructional method for science. One study discussed

in this section was Mayer (1995). In her study, she found that choice in literature was important because choosing the wrong texts can actually interfere with student's ability to gain knowledge. the conclusions of this study lead to a need for criteria in choosing quality texts.

The fifth section of the review of literature, discussed solutions to the problems when using nonfiction children's literature to teach science. In this section, several different experts (N. S. T. A. , annually; Rice, Dudely, & Williams, 2000; Kobrin, 1988; and Mayer, 1995) offer suggestions, solutions, and criteria for selecting quality children's literature.

The final section suggested the many benefits of integrating information books with the content area science. One benefit (Yopp & Yopp, 2000) offered was that teaching with these materials can extend instruction by offering more in-depth instruction in a realistic manner. Moss (1991) found another benefit from this type of integration. Moss found that trade books compensate for many of the problems that arise when using textbooks.

In conclusion, the review of literature was divided into five sections. Each section offered expert opinion and research based studies to express the need for improvement science instruction, benefits of integrating children's literature and science instruction, problems that hinder integration, and the use of nonfiction children's literature in the content areas. Through research it was shown that a program, which emphasizes the specific use of nonfiction to teach science concepts must be created.

CHAPTER THREE

Design of Project

Introduction

The purpose of this project was to present a handbook to supplement the science curriculum in the topic area of the Solar System by integrating it with expository children's literature. This project was designed to be a handbook available for third and fourth grade teacher to expose children to more informational, nonfiction children's literature while at the same time providing engaging science projects and experiments, and vocabulary building opportunities.

Procedures

Selection for children's literature were completed through a combination of using Kobrin's list of criteria for choosing nonfiction books and the list of quality books compiled by Science and Children magazine each March. Kobrin's (1988) criteria for choosing quality nonfiction books are:

1) Attractiveness
2) Accuracy
3) Authority
4) Appropriateness
5) Rhetoric
6) Stereotypes
7) Tone
8) Cautions
9) Format
10) Book Design (p. 59)

The topic selected for the curriculum was the solar system. This topic was chosen because it is universally taught in the primary grades, many exceptional trade books are available on this topic, and it is currently a suggested area of study in the Mount Vernon School District. Lessons in the unit were created matching a nonfiction, informational book with a concept based on the solar system along with the development of vocabulary activities to increase the understanding of the difficult subject matter and sometimes complicated words that will be encountered. Other sources used in compiling this project will be the New York City Public Library web site, books such as Eye Openers by Beverly Kobrin, and magazines including *Science and Children*, *Language Arts*, and *The Reading Teacher*.

CHAPTER FOUR

Project

This chapter contains a curriculum designed to be used by third and fourth grade teachers to integrate nonfiction children's literature and the content area of science, specifically the Solar System. The project is designed as a unit to compliment existing curriculum or to stand alone. The curriculum in this unit offers students and teachers a chance to explore the Solar System by expanding vocabulary and providing innovative science learning experiences.

The unit is comprised of ten lessons. The lessons are each divided into three main parts. The first part is a vocabulary building activity, the second part is a story read aloud by the teacher, and the third part is a science experiment or activity. Activities may be teacher-directed, done in cooperative learning groups, or independently by each child.

The vocabulary lessons are designed to help students understand and fully experience the stories. Science language can be difficult so these lessons will draw upon prior knowledge and encourage new learning. The lessons are a combination of teacher-led instruction and student independent work.

The story portion of the lesson is designed to be teacher-directed. The students may have copies to follow along if desired or it could be used as a story time. The stories were selected using a criteria found in Kobrin (1988). The criteria used to judge the books were: 1) attractiveness, 2) accuracy, 3) authority, 4) appropriateness, 5) rhetoric, 6) stereotypes, 7) tone, 8) cautions, 9) format, and 10) book design. Through these criteria ten nonfiction children's books were chosen matching topics of the Solar System that were intended for study.

The science experiment or activity time includes a variety of hands-on science experiments. They are designed to bring realism to the subject matter. These lessons were selected and adapted from various sources including *Mailbox* magazine. The lessons were selected because of their subject matter and the ease at which connections could be made between them and the other parts of the lesson.

Assessment for the program will be done through teacher observation and student oral and written responses. Teacher observation is key to this program because many activities require students to follow steps independently. Written answers may be in journals, expository paragraphs, or narrative stories. Some writing prompts are included as suggestions for this component.

In conclusion, the following pages contain the lesson plans for the study of the solar system to be used with third and fourth grade students. Each lesson is divided into three main parts: a vocabulary building activity, a read aloud story, and a science activity.

Space: The Final Frontier

An Integrated Unit Connecting Nonfiction Children's Literature with Our Solar System for Grades 3 and 4

By Kelly McCann

Table of Contents

Lesson One: Solar System: Past and Present

Objective: To introduce students to how the solar system was viewed in the past and contrast with how it is seen it the present.

Activities:

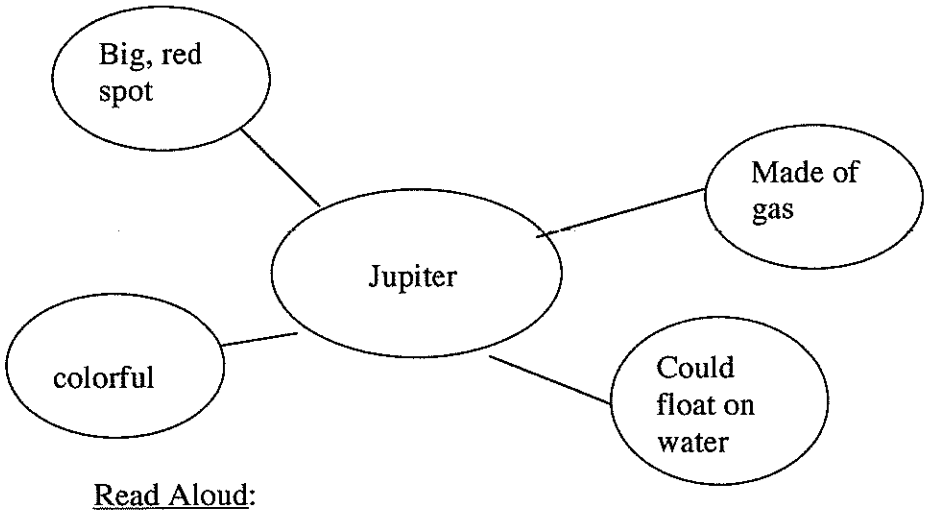
Vocabulary Development:

Materials:

- Class set of Seymour Simon Our Solar System books
- Chart paper or overhead transparencies
- Pens
- Vocabulary list

Working in pairs students will write down a list of all the words that they are unfamiliar with as they explore the Solar System book. After students have made their lists they will add their words to a class list of new vocabulary on chart paper or on an overhead transparency. The teacher will lead a discussion about the word meanings and demonstrate how to make a word web (see below). Many possible vocabulary words could be chosen by student pairs. After seeing teacher modeling students would be asked to create one on the board as a class.

Example One: Word Web



Read Aloud:

Simon, S. (1992). Our Solar System. New York: Scholastic.

Description: This book provides a general overview of our Solar System. It is full of colorful, real pictures of space. It has detailed descriptions and realistic charts and figures.

Hands-on Science Activity:

Solar System model- This activity allows students to make a model of what early astronomers thought our Solar System looked like. The purpose of this activity is to provide and opportunity for students to compare and contrast the old view with current views of the Solar System.

Materials:

- Meter stick
- 22-by-28-inch piece of poster board
- Pencil
- 26-inch piece of string

- school glue
- 2-inch craft balls
- marking pen

Procedure:

1. Lay the meter stick across the middle of the poster board, parallel with the long sides.
2. Using the pencil, make nine small dots on the poster board next to the meter stick, one every three inches from the end. The last dot will be 1 inch from the edge of the poster board.
3. Tie a loop in one end of the string.
4. Place the pencil point through the loop and stand the point on the second dot from the left side of the poster board. Pull the string on the first do with your thumb as you move the pencil point across the poster board to draw the largest part of the circle.
5. Repeat step 4 for each of the remaining dots.
6. Glue one Styrofoam ball to each of the first eight dots.
7. Using the marking pen, add labels to each of the balls.
8. Discuss how this model is similar and different than the solar system in the book by Simon.

* adapted from Solar System by Janice VanCleave

Extension /Assessment Opportunities:

- Have students write a story about the planet they would most like to visit

Lesson Two: The Sun: Our shining star

Objective: To explore our sun and how it is the center of our universe.

Activities:

Vocabulary Development:

Materials:

- Chart paper or overheads used in previous lessons
- Pens
- Vocabulary lists from previous lesson
- Various sources of information on the Solar System

Students work in pairs to quiz each other on the words they selected and wrote on the chart paper or overhead in the previous lesson. Students will be asked to add to their list new words they learned today. Next, students will chose one word to create a descriptive word web of, as demonstrated earlier (see example one). Students may use other resources to learn more about their word. Finally, students will share their webs either in their groups or as an entire class.

Read Aloud: Simon, S. (1986). *The Sun*. New York: Scholastic.

Description: This book is full of vivid, descriptive vocabulary, along with quality pictures and diagrams to help students comprehend the material.

Hands-on Science Activity:

Sun Study: In this lesson, students will see the Sun's reflection. The purpose of this activity is for students to safely view the sun to see its power rays firsthand.

Materials:

- Mirror
- Pencil
- 1 sheet of yellow paper large enough to cover the mirror
- 1 sheet of 9"x12" white construction paper

Procedure:

1. Use a pencil to carefully poke a hole in the center of the yellow paper.
2. Take the yellow paper, the mirror, and the white paper outside.
3. Have on member of the group place the yellow paper on top of the mirror and stand facing the Sun.
4. Have a second group member hold the white paper and stand with his/her back to the Sun about three feet away from the first group member.
5. Instruct the child holding the mirror to gently adjust the mirror until it reflects the Sun's image onto the white paper.
6. Direct the third group member to study the reflection of the Sun on the white paper.
7. Have the students change places and repeat the experiment until each child has had a turn looking at the Sun's reflection.

* adapted from Solar System by Mailbox Magazine

Extension /Assessment Opportunities:

- Have students find and cut out pictures out of magazines that show examples of things that depend on the sun. Make a class collage and discuss. By listening and viewing student responses, the teacher can assess understanding.

Lesson Three: Twinkle, Twinkle Little Star. . . but why only at night?

Objective: To study stars other than the Sun and why stars can only be seen at night.

Activities:

Vocabulary Development:

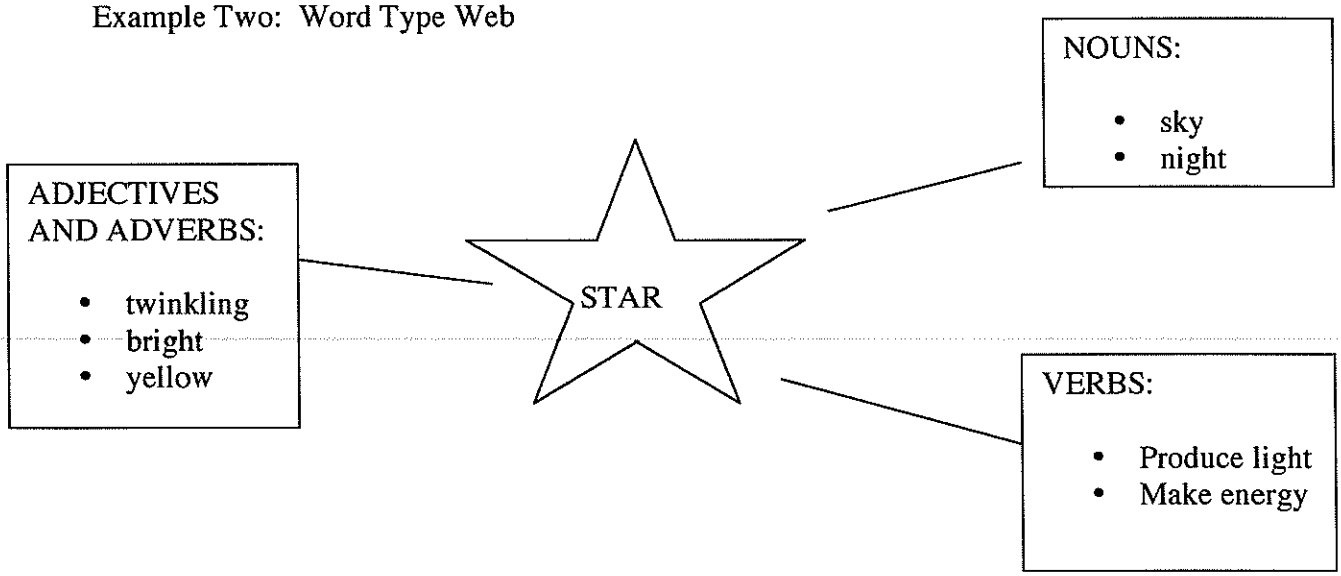
Materials:

- Chart paper or white board
- Pens
- Index cards
- Vocabulary words to introduce

Procedures:

1. On the white board or chart paper, write the word star in the middle. Then write action words (verbs), descriptive words (adjective, adverb), and person, place, or thing (nouns); each in their own corner of the paper (see Example two).
2. Have students think of words they know about stars and write them in their respective categories.
3. Introduce new vocabulary and have students predict where that word would fit on the chart. The new vocabulary words are: white dwarf, galaxy, dense, nebula, supergiant, and supernova.
4. After reading the story check prediction and discuss further.

Example Two: Word Type Web



Read Aloud:

Simon, S. (1989). *Stars*. New York: Scholastic.

Description: This book, the previous two by Seymour Simon, is full of pictures, descriptions, and graphics. The pictures compel the reading to keep reading.

Hands-on Science Activity:

Stars in the daylight- In this activity, students make a model of a starry sky. In this activity, it shows that stars are always shining even in daylight. The results show that when light shines in front of the index cards, stars are not seen, but when the light comes from behind, the stars are easily seen.

Materials:

- Paper hole punch
- Index card
- One white letter envelope
- Flashlight

Procedure:

1. Cut 8 holes in the index card with the hole punch.
2. Insert the index card in the envelope.
3. In a well-lighted room, hold the envelope in front of you with the flashlight about two inches from the front of the envelope and over the index card.
4. Move the flashlight behind the envelope.
5. Hold the flashlight about two inches from the back of the envelope.

Extension /Assessment Opportunities:

- Assessment can occur through teacher observation and written responses in student journals
- Read other books on stars
- Use the internet to research stars further
- Write a paragraph about one type of star.
- Study black holes and pulsars

Lesson Four: Solar eclipses

Objective: Learn about solar eclipses and how it is possible for the moon to cover the Sun.

Activities:

Vocabulary Development:

Materials:

- White board
- Pens
- Sentence strips

Procedure:

1. Discuss and define on the board new vocabulary words: eclipse, total, partial, solar corona, astronomers.
2. Give one word to each pair. Have each pair write that word as in a sentence. After editing, the pair may then write their sentence on a sentence strip.
3. Tape sentence strips up around the room.
4. Have students peer edit for 3 minutes , then move on.
5. After 3 switches, have the original authors find their sentence and give them one more opportunity to edit.
6. Share sentences as a group.

Read Aloud:

Branley, F. M. (1973). *Eclipse: Darkness in Daytime.* New York: Thomas Y. Crowell.

Description: Although this book is older, it still has very clear information about eclipses. The writing form of this book is less scientific than the previous books by Simon.

Hands-on Science Activity:

Eye on Eclipses- In this activity students see how by moving models of the Earth and moon, eclipses are possible. The purpose is for students to show how an eclipses can cause day turn to night.

Materials:

- Grape-size ball of modeling clay
- Two sharpened pencil
- Three-inch Styrofoam ball

Procedures:

1. Place the ball of clay on the point of one of the pencils and the Styrofoam ball on the other pencil's point.
2. Hold the pencil with Styrofoam ball at arm's length in your left hand so that the ball is in front of your face.
3. Close one eye and hold the pencil with the clay ball in your right hand so that the ball is in front of but not touching your open eye. Slowly move the clay ball away from your face toward the Styrofoam ball. As you move the clay ball, observe how much of the Styrofoam ball is hidden by the clay ball at different distances.

Extension /Assessment Opportunities:

- Assessment will occur through teacher observation and student's ability to complete the task and explain how an eclipse can occur.
- Read more about eclipses.
- Write a story about what it is like when day turns to night during an eclipse.

Lesson Five: Constellations: Shapes in space

Objective: To expose students to the patterns in the night sky.

Activities:

Vocabulary Development:

Materials:

- Small scraps of white paper
- Pens or pencils

Procedures: Vocabulary Balderdash

1. Read a new vocabulary word. Suggested vocabulary words are: constellation, Ursa Minor, Polaris, pointers
2. Pairs or trios make up a definition for that word.
3. Read all the possible choices and the correct answer.
4. Have students guess the correct answer.
5. Give points for all correct answers.
6. Repeat steps 1-5 until all vocabulary words have been discussed.

Read Aloud:

Branley, F.M. (1987). *The Sky is Full of Stars*. New York: HarperCollins.

Description: This book is full of quality pictures and clear descriptions. It shows constellations and the ways they move throughout the night sky.,

Hands-on Science Activity:

Constellation Clock- Teacher will put on stars in configurations of several notable constellations such as the Big Dipper. By turning the umbrella clockwise, the teacher can show how constellations move in the night sky. The purpose is to show that constellations move in a circular path through the sky.

Materials:

- A dark umbrella (with eight sections)
- Stick on stars

Procedure:

1. Using an umbrella, with the handle being polaris (the North Star), Stick on stars in the pattern of different constellations.
2. Put the umbrella on a table to represent the horizon (the imaginary line where the sky seems to meet the Earth).
3. Turn the umbrella to show how the constellations rotate in the sky.

* adapted from Solar System by Janice VanCleave

Extension /Assessment Opportunities:

- Assessment will be through teacher observation of student responses and written answers in student journals
- Keep a nightly journal of constellations
- Study the mythological stories based on the constellations

Lesson Six: Planets: Earth and beyond

Objective: To explore and know the nine planets in our Solar System.

Activities:

Vocabulary Development:

Materials:

- Large construction paper circles
- Pens

Procedures:

1. Assign each group of 3-4 students one planet.
2. Have students write everything they know-words or phrases about that planet on that circle.
3. Post all circle (planets) and give an opportunity for other groups to add to other planets.
4. Teacher may lead a discussion or add to the circles with key vocabulary from the story.

Read Aloud:

Gibbons, G. (1993). *The Planets*. New York: Holiday House.

Description: This book is written with children in mind. It is bright and youth-oriented, but is still challenging in its information.

Hands-on Science Activity:

Scale model of the planets- In this activity, students construct a scale model of the Solar System. The purpose is to show how the planets are placed and how their sizes compare.

Materials:

- A wall at least 16 feet long
- Construction paper (two feet wide or wider)
- Poster board

Procedure:

1. Measure 16 feet in a hallway or classroom. Make sure it is free from clutter.
2. Cut out a sun, at least two feet in diameter.
3. Cut out the planets from the poster board with the following dimensions: Mercury- 3/8", Venus- 7/8", Earth- 1", Mars- 9/16", Jupiter- 11", Saturn- 10", Uranus- 4", Neptune- 3 3/4", and Pluto- 1/4".
4. Place the planets on the wall, the following distances apart: Mercury- 2 inches from the Sun, Venus- 3 inches from the Sun, Earth- 4 inches from Sun, Mars- 6 inches from the Sun, Jupiter- 1 foot and 9 inches from the Sun, Saturn- 3 feet and 2 inches from the Sun, Uranus- 6 feet and 5 inches from the Sun, Neptune- 10 feet and 1 inch from the Sun, and Pluto- 13 feet and 3 inches from the Sun.
5. Discuss misconceptions in the creation of the earlier model. Compare and contrast similarities and differences.

* adapted from Solar System by Mailbox Magazine

Extension /Assessment Opportunities:

- Assessment will be decided on students ability to complete their task and through observation.
- Have student groups research two facts about a planet and put them together on the wall with their respective planet.

Lesson Seven: The moon and its changing appearance

Objective: To study the moon and its phases.

Activities:

Vocabulary Development:

Materials:

- List of Vocabulary words
- Definitions of vocabulary on the overhead or white board
- Paper
- Pencils, pens, colored pencils, or crayons

Procedures:

1. Assign one vocabulary word to each group. The vocabulary words are craters, mares, rays, gravity, waxing and crescent.
2. Have each student draw a picture of their word.

Read Aloud:

Gibbons, G. (1998). *The Moon*. New York: Holiday House.

Description: This book is full of brilliant language on a child's level. It has detailed pictures and holds student attention.

Hands-on Science Activity:

Moon Phases- By constructing a small model of the moon and moving a flashlight, students can observe how light and shadows change the moon's appearance. The purpose is to show the phases of the moon.

Materials:

- Walnut-sized piece of dark colored-clay
- Flashlight
- Pencil

Procedures:

1. Mold the clay and place it on top of the pencil.
2. In a darkened room, ask a student to hold the flashlight so that the light shines toward your face. The flashlight represents the Sun and the holder of the flashlight is the Earth.
3. By adjusting the position of the Earth(flashlight holder), the Sun (the flashlight), and the Moon (clay), you can show the different phases of the Moon.

*adapted from Solar System by Janice VanCleave

Extension /Assessment Opportunities:

- Assessment will occur through observation and student completion of the task
- Make a book or poster of the moon phases

Lesson Eight: The final frontier: Travel into space

Objective: To study space exploration.

Activities:

Vocabulary Development:

Materials:

- Pictures of the moon, space ships, and space stations
- Paper
- Pencils

Procedures:

1. Discuss as a class, vocabulary words including space station, astronauts, satellites, probes, NASA, and lunar module by looking a pictures of each of them.
2. Pass out one picture to each student pair
3. Have pairs write a story about their picture, including at least 2 new vocabulary words.
4. Share stories

Read Aloud:

Hehner, B. (1999). *First on the Moon.* Toronto: Madison Press Books.

Description: This book combines real photos of the first trip to the moon, diagrams and interesting writing including quotes from the astronauts.

Hands-on Science Activity:

Blast off- In this activity, students and teachers create a model of a space craft launching. The purpose is to show the force and work involved in launching a space craft.

Materials:

- Two long party balloons
- Cornstarch
- Nylon fishing line
- Two plastic drinking straws
- One Styrofoam cup
- Two binder clips
- Masking tape
- Regular tape
- Scissors

Procedures:

1. Thread the fishing line through both straws. Stretch the line taut across a room and use masking tape to tape each end of the wall.
2. Cut the top off the Styrofoam cup, creating an open-ended ring.
3. Stretch out both balloons; then inflate one balloon about three-quarters full. Twist the nozzle end through the ring.
4. Partially inflate the second balloon and slide the front of it through the ring; then fully inflate it. Attach the binder clip.

5. Use regular tape to tape both balloons to the straws on the fishing line. Slide the balloons to the end of the fishing line so that the nozzles are facing the closest wall.
6. Remove the binder clip from the first balloon and pinch the end closed. Then, together with students, begin a countdown for a rocket blastoff. Remove the binder clip from the second balloon and let the balloons go.

Extension /Assessment Opportunities:

- Assessment will include a written research paragraph on astronauts and their trips to space and observation of student participation.
- Write a paragraph about one of the astronauts.

Lesson Nine: How much do I weigh in space?

Objective: To study weightlessness in space

Activities:

Vocabulary Development:

Materials:

- Dictionaries
- Dry Erase Markers

Procedures:

1. Start by having a dictionary scavenger hunt with partners looking for new vocabulary words. The vocabulary words are: cells, habitation, anchored, capsule, laboratory, and backbone.
2. Share definitions and write them on the board.
3. Discuss the multiple meanings of several of the words. As a class decide which definitions seem to fit best.

Read Aloud:

Branley, F.M. (2000). *The International Space Station.* New York: HarperCollins.

Description: This book has colorful illustrations with expressive captions. It is kid-friendly and keeps student attention.

Hands-on Science Activity:

Space Station Model- Students build a model of a space station and to use the internet to see a website on weightless. The purpose is create a model to illustrate space stations and to use the internet to make further connections about weightlessness.

Materials:

- Plastic drinking glass
- String
- Ruler
- Scissors
- Masking tape
- Modeling clay
- Computer with internet access

Procedure:

1. Cut a 24 inch piece of string.
2. Use tape to attach the ends of the string to the top of the cup, on each side.
3. Tie a 6 inch piece of string in the center of the longer string.
4. Mold the grape-sized piece of clay around the end of the short string.
5. Ask a helper to hold the top of the short string and raise the cup and clay ball as high as possible, and then release them.
6. While sitting in a chair, observe the position of the ball and cup as they fall.
7. While students are working send them in small groups to a computer station to try www.nasa.gov where they can type in their weight and see what they would weigh in space.

Extension /Assessment Opportunities:

- For assessment students will write a story about how different life would be if there was weightlessness on Earth? How would our lives change?

Lesson Ten: Comets: Not a desk cleaner

Objective: Study how comets travel through space as well as make a model of a comet.

Activities:

Vocabulary Development:

Materials:

- Index cards
- Pens

Procedures:

1. Show students pictures or give definitions of the following vocabulary words: telescope, binoculars, nucleus, gas tail, dust tail, and coma.
2. Write vocabulary words and definitions on separate index cards.
3. Lay the cards on the floor. Have students take turns matching definitions to vocabulary words.
4. After more practice, the cards may be used to play the matching game Memory or Concentration.

Read Aloud:

Simon, S. (1982). *The Journey From Space*. New York: Crown Publishers, Inc.

Description: This book is full of black and white photographs, some dating back to the 1800's. It like Simon's other books, is packed with factual information.

Hands-on Science Activity:

Model of a comet- Students will make a model of a comet. The purpose is to have students use and apply their knowledge about comets to make a model.

Materials:

- Styrofoam ball
- 18" x18" white tissue paper square
- three cotton balls

Procedure:

1. Wrap the Styrofoam ball in the center of the tissue paper so the corners of the tissue paper make the comet's tail.
2. Gently stretch the cotton balls out.
3. Glue them on the comet over the tissue paper and Styrofoam ball.

Extension /Assessment Opportunities:

- Read about Haley's comet
- Study how comets can be seen without producing their own light.

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Other Helpful Resources:

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CHAPTER FIVE

Summary, Conclusions, and Recommendations

Summary

The project presented in the preceding pages dealt with the integration of expository children's literature and a study of the solar system. The project provides many benefits. It encourages students to experience science in a different style than is traditionally taught in elementary schools. It also gives teachers a guide for how to infuse vocabulary lessons, science trade books, and hands-on science experiments.

In the development of the project, consideration was give to the current school curriculum requirements, as well as state guidelines for reading and science. It was designed to fit with my current teaching assignment in the Mount Vernon School District, however, the point was made with the project that integration can happen in any teaching environment regardless of the structure of any given school.

The project was divided into 10 lessons. Each lesson had three main components. The first component was a vocabulary building activity. These activities were designed to increase student independence with the material. The second component was a non-fiction trade book to be read aloud to the entire class. This gives another opportunity to build background knowledge and provide new material to students. The final component included in each lesson is a science experiment. These experiments are designed to give students the opportunity to use their hands and minds to create and explore the topics further.

Other components were considered in the creation of this project. A writing component could naturally be added to further the integration of subject matter. Writing

prompt suggestions were made as extension activities, however, they could have been their own component or assessment opportunities. Another possible component would be to include fictional children's literature. The decision was made to not include this because nonfiction can include misleading material, diagrams, and pictures. Nonfiction is also widely available and many integration opportunities fusing nonfiction and science already exist.

Conclusions

The author learned a great deal in the creation of this project. She learned that there are a plethora of wonderful information trade books on the market. She has learned to be more critical of the texts available and in selecting books for her classroom library.

The author also learned ways of integrating even within the parameters of strict district curricular programs. With Success For All reading it is often difficult to integrate any other subject matter with reading. The author found an acceptable way to try creating a new science program while still fitting within her district's stringent curricular guidelines. This project has opened the author to more opportunities to "break the mold" and to try to be a more inventive creative teacher.

Recommendations

The author would like to recommend that more integration of subject matter happen in the future. With all the pressures put on teachers and students to perform and complete an unbelievable amount of subject matter, integration provides an opportunity to complete more than one goal at a time. Not only does this save time, but it also takes students out of their normal routine and provides memorable learning opportunities.

Another recommendation would be to increase the use of nonfiction trade books in all elementary classrooms. Not only do they provide opportunities to explore a world of topics, but they are often very interesting and visually stimulating. In an age of technology and fast paced lives, these books give each of us a glimpse into something intriguing and possibly new.

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