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Integration of language arts and science programs through a literature base

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Abstract

Based on professional reading on the values of an integrated curriculum and a literature-based approach to integrating the language arts and the science areas, a unit on energy--fossil fuel, solar, wind, hydroelectric, nuclear, and geothermal--was developed for grade five. By integrating the content and processes of science and the processes of the language arts, students' understanding of the science concepts and their thinking-language abilities could be extended. A literature base, represented by several genres, enriched the learning environment of this unit. The learning experiences were presented through centers, many of them literature-based, and teacher-directed sessions. The students' responses to the unit were assessed by qualitative means--student journals, Venn diagrams, and a rubric. The students found the options for learning energizing. As a result, they took charge of their learning.

Integration of Language Arts and Science Programs Through a Literature Base

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Abstract

Based on professional reading on the values of an integrated curriculum and a literature-based approach to integrating the language arts and the science areas, a unit on energy--fossil fuel, solar, wind, hydroelectric, nuclear, and geothermal--was developed for grade five. By integrating the content and processes of science and the processes of the language arts, students' understanding of the science concepts and their thinking-language abilities could be extended.

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The science, mathematics, and social studies areas of the elementary school curriculum are usually taught in separate units. As a result, the topics in these areas are independent of each other in the mind of students. In this type of instructional program, no connections are made with the curricular areas or to the real world.

Content classes have been taught and, in many cases, still are being taught in the "Pour/Store" method. Teachers pour information into students' minds through lecturing and text reading, expecting students to retain and later repeat the facts (Lindberg, 1990). Students do not remember isolated information because it is not meaningful to them. No relationship between facts and how they relate to the students' world is made.

Justification of Integration

Integration promotes relevance in learning. Thematic integration should not only help accomplish efficiency in teaching but also encourage students to pursue important ideas, thus developing more thorough understandings. Helping children find relevance in their learning experiences and making connections with the content, concepts, and processes of the different areas of the school program are the bases of integration. Integration also can take into consideration the

interrelationship of the language processes--reading, writing, speaking, and listening (Routman, 1991).

Integration comes in many forms. For example, a language arts teacher might integrate the reading, writing, listening, and speaking aspects of the language arts program. A self-contained classroom teacher might integrate two or more of the curricular areas.

With any instructional development activity, pitfalls need to be avoided. Some areas of the curriculum are not adaptable to a given theme or unit; therefore, they need not be included (Shanahan, Robinson, & Schneider, 1995). Routman (1991) says, "A thematic unit is an integrated unit only when the topic or theme is meaningful, relevant to the curriculum and students' lives, consistent with whole language principles, and authentic in the interrelationship of the language processes" (p. 278).

The role of the teacher in integrating the curricular areas is that of a facilitator who nurtures the connections (Fogarty, 1991). Teachers are constantly assessing the program to ensure that it focuses on the more significant aspects (Silva & Delgado-Larocco, 1993).

Literature-Based Language Arts Extended to the Science Area

A literature base can greatly enrich an integrated school program. A strong literature-based program representing the

different genres, or types of literature, can immerse students in learning and, as a result can foster their exploration of concepts in meaningful ways and their connections with the different areas of the curriculum. Such an instructional development approach can energize students to engage in learning and to become sensitive to issues in ways that go beyond a list of facts (Short & Armstrong, 1993). Through literature experiences, students can move beyond acquiring knowledge of literal concepts to using higher-order thinking abilities, such as application, analysis, synthesis, and evaluation (Bloom, 1956).

In the case of the science area, a literature base can assist children in satisfying their natural curiosity about the world. They naturally ask many questions about the world and its workings. This inquiry is a part of their means of discovering the world. It begins when learners are immersed in a topic. When children's questions are addressed, they gain a sense of purpose in their learning (Short & Armstrong, 1993). Students need a literature base to provide content in order to explore the questions they have generated.

Literature can provide alternate perspectives and support inquiry in ways textbooks cannot. "It is especially important for children to confirm what they are learning from informational

sources by meeting similar ideas in the more human frame of literature" (Huck, Hepler, & Hickman, 1993, p. 695). For example, when students read Phoenix Rising (1994), by Karen Hesse (New York: Henry Holt and Company), they share the experience of a nuclear power plant accident through the eyes of thirteen-year-old, Nyle.

Rosenblatt (1978) distinguishes two purposes for reading--the efferent and the aesthetic. When readers take the efferent stance, their focus is on reading for a definite purpose. Science readings are typically efferent. The reader purposefully studies the text to extract information. When readers take the aesthetic stance, they immerse themselves into a reading experience for its sake. Sloan (1991) urges readers to read both efferently and aesthetically. Both purposes allow readers to enter into a transaction with a text to create meaning, thus achieving a more in-depth understanding.

Selecting works for a literature base requires careful consideration. Quality works pull readers into memorable experiences through well-defined characters and well-developed plots (Lauritzen, Jaeger, & Davenport, 1996).

A literature base can assist in the integration of all language arts components (Silva & Delgado-Larocco, 1993). In discussing their listening and reading experiences from more than one genre, students can extend their understanding of concepts

and can find reasons to express their own ideas through speaking and writing. Discussion experiences can assist students in elaborating, probing, and sharing (Villaume & Worden, 1993).

A reading-writing connection can be fostered among students through journal writings. Tierney, Carter and Desai (1991) suggest using project journals to focus on a unit of study. A section of the journal may be designated as an observation section.

Shared book experiences, drama, and other response activities can also be used to assist students in acquiring a greater level of understanding. Students then generate work that reflects thought, ownership, and personal relevance.

Energy - A Literature-Based Unit

This thematic unit on energy, developed for grade five, was supported by a literature base. Six energy sources--fossil fuel, solar, wind, hydroelectric, nuclear, and geothermal--were the focus of the unit. A socioconstructivist framework was developed for the learning environment. In this environment, learning is viewed as a social process. Most activities were conducted in small peer groups, such as literature circles, research teams, and ad campaign committees. Individual journal writing supported self-reflection. Two kinds of centers--sustaining and specific to the unit of study--were offered. Sustaining centers remain

constant; however, the contents reflect the specific unit of study.

In planning this unit, a team of three teachers met several times to integrate objectives from the content areas of science, language arts, social studies, mathematics, art, music, and Positive Action. Positive Action is a counseling program adopted by our district which focuses on positive peer interactions. A graphic organizer outlining the unit objectives was developed and presented to administrators who approved the project. Due to scheduling conflicts, the teachers implemented the unit in their self-contained classrooms. My class had a ninety-minute continuous block of time each day to study the unit.

The unit was introduced by constructing a class chart of what the students knew and what they wanted to find out about the six energy sources. The responses were recorded for display on the chart. Every Friday the class reviewed the list, making additions, deletions, and corrections with a different colored marker.

A listening circle was formed after the class chart of ideas about the unit was initiated. The teacher read the students A River Runs Wild, (1992), by Lynne Cherry (New York: A Gulliver Green Book). At the conclusion of this listening experience, the students took their seats and responded individually in their journals to the question: "How did this story make you feel?"

Later students were introduced to the various learning centers which provided many types of literature experiences and were given a brief description of the accompanying activities.

A bulletin board was used throughout the unit by students to display their projects and share their findings. During Open House, students used the board filled with student generated maps, charts, and graphs to explain the classroom activities to parents and guests.

Centers to Enhance the Unit

Sustaining Centers

Aesthetic center. This center was to extend the pleasure of reading with themes related to the unit. It offered picture books from many genres, chosen for their lyrical quality as well as other literary elements--imagery, figurative language, characterization, plot, theme, and emotional response. The students were asked to respond to their literature experiences through journal reflections. Later literature circles were formed to generate discussions. Students were assigned to a literature circle based on the books they had read and the responses in their journals. The size and number of the groups varied weekly. Examples of books that enriched the aesthetic experience specific to the unit were:

Old Henry (1987), by Joan Blos (New York: William Morrow & Company, Inc.)

Miss Rumphius (1982), by Barbara Cooney (New York: The Viking Press)

The Lorax (1971), by Dr. Seuss (New York: Random House)

The Paper Bag Prince (1992), by Colin Thompson (New York: Alfred A. Knopf)

Heron Street (1989), by Ann Warren Turner (Lisa Desimini, Ill. New York: A Charlotte Zolotow Book)

Just a Dream (1990), by Chris Van Allsburg (Boston: Houghton Mifflin Company)

Inclusion of poetry enriched the aesthetic center. Appropriate pieces included:

Without Words (1995), by Joanne Ryder (Barbara Sonnedorn, Ill. San Francisco: Sierra Club Books for Children)

Advice for a Frog (1995), by Alice Schertle & Norman Green (New York: Lothrop, Lee & Shepard Books)

Something New Begins (1982), by Lilian Moore (New York: Atheneum)

"Go Wind"

"Wind Song"

"Partners"

Flights of Fancy and other Poems (1994), by Myra Cohn Livingston (New York: Margaret K. McElderry Books)

"Prayer for Earth"

Earth Songs (1986), by Myra Cohn Livingston (Leonard Everett Fisher, Ill. New York: Holiday House)

4-Way Stop and other Poems (1976), by Myra Cohn Livingston (James J. Spanfeller, Ill. New York: Atheneum)

"Pollution"

"Power Lines"

Sky Songs (1984), by Myra Cohn Livingston (Leonard Everett Fisher, Ill. New York: Holiday House)

A Tree Place and other Poems (1994), by Constance Levy (Robert Sabuda, Ill. New York: Margaret K. McElderry Books)

"Power Failure"

"Volcano"

The Singing Green (1992), by Eve Merriam (Kathleen Collins Howell, Ill. New York: Morrow Junior Books)

"TV"

"Leak"

Fresh Paint (1986), by Eve Merriam (David Frampton, Ill. New York: Macmillan Publishing Company)

"Quaking Aspen"

Efferent center. This center provided students with texts, periodicals, pamphlets, and non-fiction works for reference to fulfill their specific goals for the unit study. Students worked individually or in groups gathering information for their projects. Some books provided in this center were:

Energy (1982), by Illa Podendorf (Chicago: Children's Press)

Energy Demands (1990), by Brian Gardiner (New York: Gloucester Press)

The Great Nuclear Power Debate (1985), by Gail Kay Haines (New York: Dodd, Mead)

Morning Star, Black Sun: the Northern Cheyenne Indians and America's Energy Crisis (1982), by Brent K. Ashabranner (New York: Dodd, Mead)

Nuclear Energy (1984), by D. S. Halacy (New York: F. Watts)

Nuclear Energy: Troubled Past, Uncertain Future (1989), by Laurence Pringle (New York: Macmillan)

The Coal Question (1982), by Bertha Davis and Susan Whitfield (New York: Franklin Watts)

Car of the Future (1986), by Ross R. Olney (New Jersey: Enslow Publishers, Inc.

Recycling Meeting the Challenge of the Trash Crisis (1992), by Alvin, Virginia, and Robert Silverstein (New York: G. P. Putnam's Sons)

Small Energy Sources: Choices that Work (1988), by Augusta Goldin (San Diego: Harcourt Brace Jovanovich)

Nuclear Power: Examining Cause and Effect Relationships (1990), by Neal Bernards (San Diego: Greenhaven Press)

Technology center. This center provided opportunities for the students to use the VCR, laser disc, and Apple Macintosh with CD-ROM. A variety of video cassettes were available for viewing. A laser disc and the Groliers Encyclopedia on CD-ROM provided research opportunities.

Centers Specific to the Unit

These centers were designed specifically for the energy unit.

Recycle/puppetry center. This center began with a meager supply of scrap materials including cloth, buttons, zippers, lace, fringe, lids, and milk jugs. Throughout the study, students brought in other interesting "recyclables." Scissors, hot glue guns with glue sticks, and tape were provided. Students used this center to create a puppet using recyclable materials. These puppets were showcased during a musical performance of the tune "R-E-C-Y-C-L-E."

Ad campaign supply headquarters. This center provided students with supplies that could be used as they developed their culminating project. After weighing the benefits and potential

problems associated with each energy type, students joined a team to develop an ad campaign to promote the use of one energy type over another. A video recorder, tape recorder, blank cassettes, poster board, colored markers and pencils, scissors, glue, rulers, and stencils were available for use.

Teacher-Directed Activities

The teacher presented these activities.

Guest Speakers

The teacher invited several guest speakers to present ideas related to the unit. A representative from the local power plant brought a video tape of the plant because we were unable to tour the facility. He answered students' questions about the use of coal to power the plant.

A member of the extension service brought many models of different energy types--a windmill, a hydroelectric dam, solar cells, and fossil fuel samples--and several hands-on activities. One of the most interesting experiences involved a potato clock. When electrical probes were inserted into the potato, the second hand began to move. Another interesting object was a solar music box.

Another guest from the extension service brought ground water and oil slick models. Students had an opportunity to experiment with various methods for removing the oil.

Field Trips

The class visited the local recycling plant. They witnessed the sorting process and visited the storage areas. After the tour, the director shared examples of products made from recycled materials.

Whole Class Novel

The full-length fiction work, Phoenix Rising (1994), by Karen Hesse (New York: Henry Holt and Company), was chosen for whole class reading. Several copies afforded pair/share and dialogue reading. Frequently throughout their reading of this book, the students stopped to discuss, reflect, and predict. Individual children made character comparisons, written or illustrated, through Venn diagrams. These graphic designs usually took the form of intersecting circles. They provided the students a way of organizing information to compare and contrast the behavior of the main characters. The class worked together to complete a story map. In outline form our story map includes setting, problem, events, and resolution. After completing the outline version of the class story map some students chose to draw a detailed map including all the elements.

Assessment of the Unit

Several qualitative assessment techniques were used.

Student Journals

Students reflected on their activity in the aesthetic center through journals. The teacher responded to the reflections by writing in each journal. This exchange provided opportunity for sharing ideas and probing for more information as well as assessing their growth.

Venn Diagrams

Venn diagrams, or narrative descriptions, were used to assess the students' ability to compare and contrast characters in the fiction work, Phoenix Rising.

Rubric

A rubric was designed to help guide the students through the expectations of conducting an ad campaign for their choice of energy. The rubric was also the main criteria for assessment.

Conclusions

The process of instructional development was engaged in to integrate the language arts with the science area. As a result, a literature based thematic unit on energy for grade five was developed. The goal for the project was to develop a rich environment in which the processes of the language arts were integrated with the content and processes of the science area. Such a learning environment fostered students' in-depth study of the concepts of the science unit and their thinking-language

abilities. The unit was presented through learning centers and teacher-directed activities.

Students while engaged in this integrated unit were energized as they became engaged in the literature experiences and related activities. They took charge of their own learning as was evidenced in their approaches to project work.

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