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Literacy: A Construct Crossing All Curriculum Areas

An Abstract for Conference Proceedings
for the Hawaii International Conference on Education
January 7 - 10, 2003

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Submitted August 21, 2002

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Introduction

Working with and meeting the literacy needs of learners in the 21st century is a dynamic proposition that goes well beyond reading and writing associated with stories, essays, and books. Literacy assumes a global and even cross-cultural connotation as it spans curriculum areas and national boundaries. "Being literate involves integrating reading and writing, navigating through information sources, discriminating between important and unimportant information, responding to e-mail, or engaging in electronic chat sessions" (Leu & El-Hindi, 1998). Numeracy, computer literacy, cultural literacy, and visual literacy are just a few references and associations that have been made as this broader definition has come into being. Literacy involves reasoning, understanding, and making connections. Acknowledging and employing literacy elements among all the content areas may help dissolve artificial boundaries that have traditionally been found in schools. K-12 science and mathematics education has traditionally been taught as a series of facts and procedures bearing little or no resemblance to the inquiry based or problem-finding practice of real scientists and mathematicians. Well-written literature may be used to stimulate interest and help students see and understand real-life applications for scientific and mathematic concepts.

This proposed presentation describes a multi-year, still-in-progress project designed to equip elementary teachers with some "best practices" for crossing and connecting curriculum and cultural boundaries. The project focuses on providing a means for making use of literature as a beginning point and natural connector for teaching science and mathematics concepts, principles, and skills. Beginning within the College of Education with one mathematics and two literacy educators the project has grown over a three-year period to involve three colleges within a university including a mathematician, a scientist, a math educator, a science educator, and two literacy educators. This project was funded by a series of Dwight D. Eisenhower Professional Development grants over a period of three years and has provided a variety of learning experiences for building content knowledge and pedagogical practices for over fifty urban educators.

Objectives:

The objectives of this project were to:

1. develop familiarity with literary works that present opportunities for making science relevant and interesting for elementary students;
2. prepare a unit of lesson plans and learning activities that begin with selected pieces of literature and integrate scientific reasoning and mathematics skills and concepts related to space, oceanography, earth science, weather, and simple machines;
3. demonstrate a firm grasp of the major concepts relating to space, oceanography, earth science, weather, and simple machines and the conceptualization and manipulation of data sets.

Procedures:

Each of the three grants in this project included a two-week summer institute followed by two follow-up sessions each fall and two follow-up sessions each spring. Summer institutes included the following activities and learning experiences:

1. Institute participants completed information sheets and surveys to provide a measure of their perceived knowledge and comfort levels for teaching science and mathematics concepts required by state standards.
2. Five or more works of fiction and non-fiction were distributed to institute participants.
3. Demonstration lessons and content instruction and explorations were conducted to provide ways and means for connecting literature to scientific and mathematic concepts.
4. Groups were organized for creating and designing cross-curricular lesson plans and units around selected pieces of literature.
5. One day each week related field trips were organized to nearby museums and related points of interest that could be used for classroom and curricular connections.
6. Some time was provided each day for discussion and groupwork, and individual reflection time for journaling was provided at the close of each day.
7. Final unit and lesson plans were presented by the groups at the end of each week. These were then posted to the project web site.
8. Ongoing discussions and threaded discussions took place over each school year via computer connections.
9. Follow-up sessions were conducted each fall and spring focusing upon the expressed needs and interests of the participants. These also served as a time for participants to share related successes and challenges.
10. Science and math lesson and unit plans developed during the year following each institute were submitted and collected for analysis.
11. Final surveys were administered during the last follow-up session for each year.

Results:

Although the project is still in progress results from data collected from the first two years indicate that teacher participants are using more literature during math and science lessons to help student make application and personal connections to concepts being taught. The data indicate that the professional development activities were successful in training teachers how to introduce into their teaching more critical thinking, questioning, manipulatives, computer applications, and reading. There were significant improvements in both the self-report survey data on comfort levels in teaching the state standards of learning strands for mathematics and science and the design of lesson plans to include strategies, teaching aids, and techniques demonstrated and taught.