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AUTHOR Allen, Nancy J.

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ABSTRACT

Cultural inclusion is more than equal access to learning. It also involves recognizing and valuing the unique cultural capital that students of diverse ethnicity bring to the learning environment. Native American students in reservation schools have experiences that differ from the mainstream, experiences that are rarely reflected in text material or on standardized tests. This study was an effort to allow these students to demonstrate learning in ways that value and build upon their real-life experiences. Students in eight classes, pre-kindergarten through sixth grade, were challenged to demonstrate through the use of student-created computer presentations their knowledge of science topics. Students worked in small groups to plan, complete, and share Hyperstudio (TM) stacks composed of digital photographs, scanned images, and computer-generated graphics enhanced with text and audio explanations. All teachers in the study identified areas in which their previous assessment of student knowledge had been either incomplete or erroneous. Findings suggest that use of such alternative methods of assessment may be a valuable strategy for the culturally different student of science. (Author/PVD)

Not in Our State

Authentic Assessment for Native American Students Using Digital Photography

Nancy J. Allen
Learning Technology Center
College of Education
The University of Texas at Austin
njallen@tenet.edu

Paper presented at the annual meeting of the National Association for Research in Science Teaching, San Diego, CA, April 19, 1998.

Abstract: Cultural inclusion is more than equal access to learning. It also involves recognizing and valuing the unique cultural capital that students of diverse ethnicity bring to the learning environment. Native American students in reservation schools have experiences that differ from the mainstream, experiences that are rarely reflected in text material or on standardized tests. This study was an effort to allow such students to demonstrate learning in ways that value and build on their real-life experiences. Students in eight classes, pre-K through sixth grades, were challenged to demonstrate through the use of student-created computer presentations their knowledge about science topics. Students worked in small groups to plan, complete, and share Hyperstudio™ stacks composed of digital photographs, scanned images, and computer generated graphics, enhanced with text and audio explanations. All teachers in the study identified areas in which their previous assessment of student knowledge had been either incomplete or erroneous. Findings suggest that use of such alternative methods of assessment may be a valuable strategy for the culturally different student of science.

Introduction

This study was conducted as part of the Four Directions Challenge in Technology project, a five year grant funded by the Department of Education. Partners in the project include nineteen Native American schools and four universities. The goal of the project is to use technology to enhance and preserve Native culture and to facilitate the acquisition of skills among school staff to develop culturally-responsive curriculum that reflects the real-life needs and experiences of the students.

As curriculum director for the project, I have been most impressed and challenged by the diversity among the nineteen schools. They represent sixteen tribes and span the nation, from Maine to Washington state, from Florida to Arizona. They differ in myriad ways. Among the characteristics they share, however, are the traits of being culturally different from the mainstream, being devoted to preserving the uniqueness of their heritage, and having student populations who too often score below national norms.

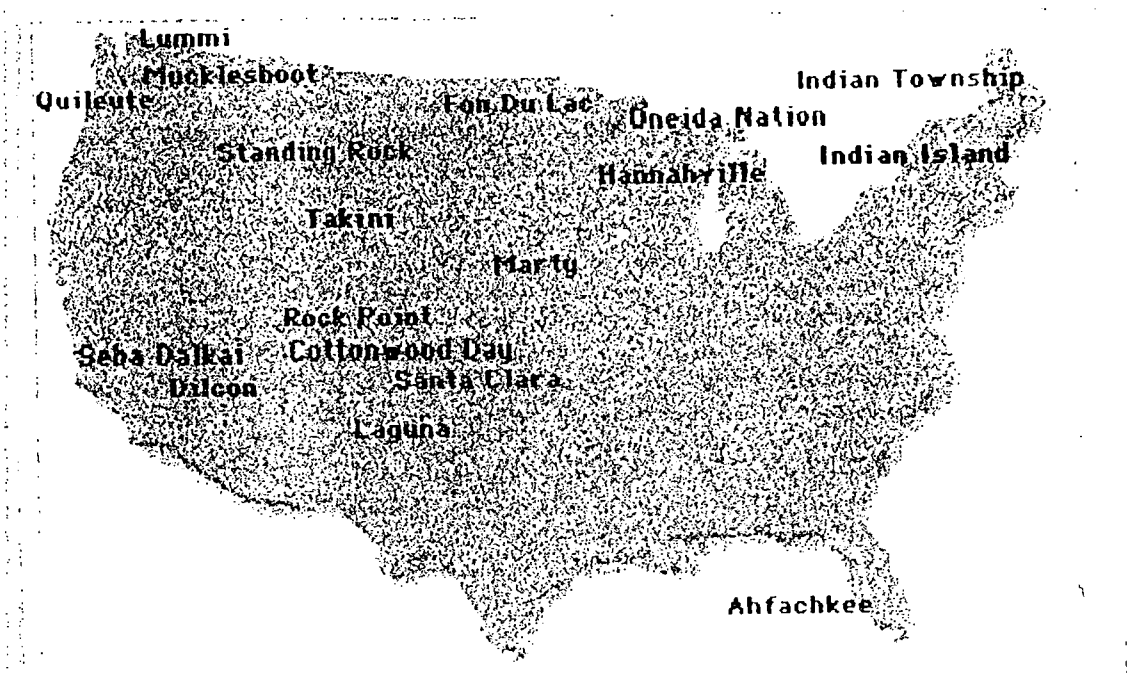

Figure 1. The nineteen schools in the Four Directions Challenge in Technology Project.

Significance

As a science educator, one of my goals in working with the Four Directions schools is to help the teachers identify culturally-appropriate ways to facilitate academic success in science, an area which has historically been problematic for many Native American students. (Allen & Seumptewa, 1988; American Council, 1989; Toward True Native Education, 1992). The term "academic success" was chosen purposefully and should be differentiated from "scientific knowledge." An assumption underlining the choice to use alternative assessment methods is that students, in this case Native American students, often have more knowledge and understanding than they are able to demonstrate through conventional assessment methods. Researchers have suggested several culture-dependent reasons for this lack of success through conventional assessment, such as cultural incongruence, language patterns, and world view conflicts (Allen, 1998; Cajete, 1986; Chrisjohn, Towson, & Peters, 1988). This research may help clarify the factors that hinder achievement and to identify strategies that facilitate success.

Theoretical Underpinnings

This study assumes a strong cultural element in the interactive process of meaning-making. As such, it draws from the theoretical heritage of constructivism and world view theory.

Constructivist theories (Vygotsky, 1978) suggest that robust knowledge is socially constructed around meaningful, authentic problems and tasks (Rosebery, Warren, & Conant, 1992). Instruction will therefore, within a constructivist model, engage students working together to solve problems in meaningful ways. Since research further indicates that assessment methodologies shape instruction (Darling-Hammond & Wise, 1985; McNeil, 1988; Shepard, 1996), it follows that assessment that targets socially constructed learning around meaningful tasks may lead to meaningful instruction, and therefore be an appropriate method for facilitating complex science thinking and skills.

World view theory is in effect a bridge between constructivist epistemology and culture. Constructivism suggests that individuals bring to the learning task a knowledge structure that

interacts with new knowledge to make meaning. World view theory defines that cognitive structure as "world view" and suggests that it is to a large extent culturally dependent (Kearney, 1984). World view, according to Kearney, may even be described as "a variant of the concept of culture" (p. ix). Since the problem of interest in this study is cultural in nature—to enhance the academic success of Native American students of science—a theory rooted in culture is appropriate to provide the theoretical underpinnings.

Design and Procedures

Definition of Terms

It may be helpful to define terms used to describe assessment. "Authentic assessment" is a term that is commonly used to describe a valid assessment procedure, one that actually measures what it is designed to measure. It further implies a context that is as close to real-life as the school experience can provide. I am using the term "alternative assessment" in its most basic meaning; i.e. assessment that differs from conventional single answer, print-based formats (Shepard, 1996). Alternative assessment is also commonly used synonymously with performance-based assessment (Zessoules & Gardner, 1991). The procedure used in this study is both alternative and performance-based, and was designed to be authentic as well.

Population

Eight classes in each of two schools were involved in the study. Both schools were in the same geographic region but represented different tribes. Four of the teachers in the study share the ethnicity of the students, three are Caucasian, and one is African-American. Class sizes were similar, ranging from eighteen to twenty-five students. All students are Native American.

Each of the schools had requested help in encouraging teachers to use technology in instruction. It has been my personal experience that teachers accept technology more readily if they actually see it being used effectively with their own students in their own classrooms. For that reason, I asked the teachers to allow me to teach their science classes so that I could demonstrate

the use of technology for alternative assessment. In each of the two schools time limitations defined the number of classes that participated.

Data Collection and Analysis

An inductive, qualitative method was used for data collection and analysis (Bogdan & Biklen, 1982). Sources of data included informal conversations with the teachers and students before, during, and after the activities, review of student products, and personal notes. Data collection and analysis were informal, and the reported results are intended only to suggest a strategy for science instruction that may be worth additional research.

Procedure

To demonstrate to the teachers that this procedure could be integrated with current classroom procedures, I went into each classroom "cold," without previous interaction with the students or preparation in the content area. Students were led into the activity with conversations such as the example that follows.

Researcher:	Who can tell me what you have been studying in science?
Students:	Land forms. All about the land. Different rocks and stuff.
Researcher:	What have you learned?
Students:	All about how the earth was made, and what makes mountains and rocks and stuff.
Researcher:	What if I asked you to let me know what you have learned about land forms, but you couldn't talk? How could you let me know what you have learned?
Students:	(long silence)
Researcher:	If you couldn't *tell* me, what could you do?
Students:	We could take a test. We could write it.
Researcher:	Is there any other ways you could show me?
Students:	(silence)
Researcher:	Could you maybe show me with a picture?
Students:	Yeah, we could draw pictures. We could show you pictures in our book.
Researcher:	(leads students to consider other ways to demonstrate knowledge, for example with models, lab activities, through music, art, dance, creative writing, etc.)
Researcher:	Well, today I am going to show you how to demonstrate what you know through using this camera and the computer. This is just one of many ways to demonstrate what you know, but it's a fun way. I'm going to divide you into groups, and each group is going to make a computer "book" about what you have been learning.

> These books are called "stacks" and they will have pictures, sound and text that you will put on them. When we finish, we are going to share our stacks with other classes so that they can learn from you.

Following this initial introduction, I explained the basic principals of Hyperstudio™ to the students and showed an example. I divided the students into groups of about 5 to 6 students and instructed them to plan their project. Each student in the group was responsible for providing one picture for the project. The set of pictures were to explain what they had learned in the unit. Student groups were given the camera and allowed to take several pictures each, from which they were to choose the ones to be included in the project. Depending on the age of the students, the procedure differed at that point. Older students were shown how to download the images from the camera, upload the images onto Hyperstudio™ cards, sequence the cards, and add sound, text, and linkages. Because of time restraints, I prepared cards for the pre-K and first grade groups, but had the students sequence the cards and add sound. Student groups presented completed stacks to their classmates and were asked to share the projects with other classes and other grade levels. At that point students almost always began to volunteer the names of other people with whom they could share their products.

Findings

What was revealed during the process and in the final products differed from group and from class to class, as is appropriate to this type of assessment. Examples will be discussed individually.

Example 1: I didn't know they knew that much." (First Grade Teacher)

In most instances, the teacher was pleasantly surprised by the knowledge and understanding revealed in the projects. Three of the classes at one school were involved in a garden project. The project was thematic in nature, involving science, cultural studies, language arts, and fine arts. The teachers believed that the cultural implications of

gardening—the values, skills, stories, and history—were important enough to warrant the investment of time. Their objectives were unstated and affective in nature. They were not too concerned with assessing for content or skills, and actually did not know how such assessment would look. They had opted for teacher observation, with a passing standard of engagement and participation.

The products revealed that students had a good understanding of the processes and skills needed for successful gardening, understood the sequence of stages in the life cycle of plants, and could identify and illustrate the basic needs of plants. Students also explained how modern gardening techniques differs from traditional gardening techniques. "Wow," commented one teacher, "I didn't know they knew so much."

Example 2: "But we don't have an ocean!"

The procedure in one class differed in that they had been studying the ocean, and the nearest ocean was several hundred miles away. I did not provide any solutions for the students, but allowed them to problem-solve together. They asked and were granted permission to use the scanner (a new technological skill for this group), took pictures of pictures (which led to a just-in-time discussion of copyright laws), and took additional pictures of models and student products, and used photographs of individuals to which they added audio explanations. The teacher commented that the problem-solving skills demonstrated by the students were probably as valuable as content knowledge they demonstrated though the projects. They also practiced skills in locating and prioritizing resources and organizing information.

Example 3: "This is so good for my students."

Although the schools which participated in this study exist specifically for the purpose of preserving and honoring Native American culture, most educators in these schools recognize that some amount of border crossing (Aikenhead, 1995; Phelan,

Davidson, & Hahn, 1991) is necessary if students are to experience academic success within the global community. For most Native American groups public speaking, especially among young people, is not highly valued; rather, youth are encouraged to listen and learn (Diessnir, R. & Walker, 1989). Success in Western education, however, often requires students to "Stand and Deliver." One teacher, who was a tribal member and leader in the community, commented on the way that this method of assessment blended the need for public demonstration of knowledge and the quiet cultural ways of the students. "They can practice and correct their sound contributions. They can record in private, yet see how they come across in public. This is so good for my students."

Example 4: But not in our state

Perhaps my most enjoyable experience during the project was, ironically, one in which the teacher was unpleasantly surprised by the scientific knowledge and understanding of the students. The teacher told me before I went into the classroom that the students had just completed a unit on adaptation. They had spent a great deal of time of the unit—one of the teacher's favorites—and had been quite successful on the exam. I asked permission to reassess through the use of digital photography. The conversation with the students was as follows:

Researcher:	Ms. (*) tells me that you have just studied adaptation. Can anyone tell me what an adaptation is?
Students:	An adaptation is any structure or behavior that helps an organism survive in the environment.
Researcher:	Good. Can anyone give me examples of adaptations?
Students:	(examples included alligator's thick skin, whale's blubber, chameleon's color changes)
Researcher:	Great! Great! We are going to have fun. What we are going to do today is create computer programs that teach about adaptations. I'm going to give you this camera and let you take pictures of adaptations all around the schools here. You can go with an escorted group anywhere within walking distance of the school, and then tomorrow we are going to put them into this computer program and ....what's the matter? Why the long faces? This is going to be fun!
Students:	But Dr. Allen! We don't have adaptations in (our state)!

We decided reteaching was appropriate. Afterwards, the students filled the camera with pictures taken of plants and animals in the local environment, including numerous pictures of each other.

Summary of Findings

The findings taken together suggested that this form of assessment revealed to the teacher different, often conflicting, data concerning the depth and breadth of student knowledge and understanding. Students also continued to learn—science content, thinking skills, and academic survival skills—during the process. Perhaps most importantly, students were able to connect their science learning with their real-life experiences.

Discussion

This study suggests that digital photography and computer-based presentations may be effective strategies for assessing science understanding for Native American students. It is a preliminary study only, an exploration into less-traditional strategies of instruction. More in depth and long-term studies, especially those comparing the effectiveness of such strategies with conventional assessment, would add much to our understanding of emerging technology in teaching and learning science.

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ericse@osu.edu (e-mail)

Nancy Allen, Ph.D.
Curriculum Development Specialist

The University of Texas at Austin
College of Education
George I. Sanchez Bldg. 438B
Austin, Texas 78712

(512) 232-3526
Fax (512) 471-4655
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