DOCUMENT RESUME

ED 297 917 RC 016 724

AUTHOR Taylor, Gene
TITLE Hands on Science.
PUB DATE 1 Apr 88
NOTE 7p.; Paper presented at the Annual Conference of the Council for Exceptional Children (66th, Washington, DC, March 28-April 1, 1988).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141) -- Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *American Indian Culture; American Indian Education; Elementary Education; *Elementary School Science; *Experiential Learning; Instructional Innovation; Science Activities; *Science Instruction; Student Attitudes; *Teaching Methods

ABSTRACT

Teaching science at the elementary school level requires an experiential approach to engage students' interest. One teacher at a small American Indian tribal school volunteered to teach one science lesson per week to each elementary class. Untrained in the techniques of teaching science to young children, he began with a discussion of the four steps of the scientific process: question, hypothesis, testing, interpretation. Student boredom and teacher despair led him to attempt a physical demonstration simulating a dust explosion in a grain elevator. This demonstration illustrated the steps of the scientific process and created student enthusiasm and involvement. Currently, most contemporary scientific knowledge is passed on via textbooks and rote memorization. In contrast, ancient Indian science was practical, involved a working knowledge of the environment, and was passed on to new generations via stories, games, and the experiences of daily life. Experiential instruction of contemporary science can be compatible with the native American viewpoint by using ordinary life experiences, shared in a scientific context. Such an approach requires an enthusiastic and innovative teacher but is well worth the extra effort. The report includes three references. (SV)

HANDS ON SCIENCE

by

Gene Taylor

Paper presented at the Annual Conference of the Council for Exceptional Children

(66th, Washington, DC, March 28-April 1, 1988)

Abstract

I have been teaching in special education resource settings for the past 17 years. During that time I have been asked to teach students a wide variety of subjects ranging from home-ec to algebra. Most of the courses were challenging and fun with the exception of one, SCIENCE. I tried to teach high school biology my first year and found the task impossible. I blamed my failure on not having a lab. And there after, whenever my supervisors talked to me about teaching science in my resource room I gave them long and careful explanations detailing my previous attempts. At the end of these sad dissertations I would agree to try again if the administration would construct a well-stocked science lab in my classroom. Fat chance!

My bluff worked for 12 years until early one morning as I sat with my colleagues from a small tribal school in the Northwest, listening to the superintendent lament about losing our state accreditation because we were not teaching science in our school. When I first heard his passionate plea for a volunteer to teach science, I had, like the other members of our stretched staff, looked at length, to see if my shoelaces were untied. Then, as if it were acting on its own, my arm raised and I heard my voice volunteer me to teach science.

This article tells the exciting story of how one teacher learned to love teaching students science.

Hands on Science

I have been teaching in special education resource settings for the past 17 years. During that time I have been asked to teach students a wide variety of subjects ranging from home-ec to algebra. Most of the courses were challenging and fun with the exception of one, SCIENCE. I tried to teach high school biology my first year and found the task impossible. I blamed my failure on not having a lab. And there after, whenever my supervisors talked to me about teaching science in my resource room I gave them long and careful explanations detailing my previous attempts. At the end of these sad dissertations I would agree to try again if the administration would construct a well-stocked science lab in my classroom. Fat chance!

My bluff worked for 12 years until early one morning as I sat with my colleagues from a small tribal school in the Northwest, listening to the superintendent lament about losing our state accreditation because we were not teaching science in our school. When I first heard his passionate plea for a volunteer to teach science, I had, like the other members of our stretched staff, looked at length, to see if my shoelaces were uni ed. Then, as if it were acting on its own, my arm raised and I heard my voice volunteer me to teach science.

It was decided I should spend one day a week moving from room to room until I had given each class a science lesson. I was given two weeks to prepare my curriculum. I began by looking through science textbooks to see how and what the publishers thought we should learn. Each of the texts I reviewed began with a discussion of the scientific process. Basically, they listed four steps that scientists go through to arrive at a conclusion: QUESTION--HYPOTHESIS--TESTING--INTERPRETATION. The interpretation should lead to other questions and the process begins anew.

Using a pizza pan I cut a circle out of poster board and listed the four steps in clockwise fashion around it. But as the day approached for me to begin my instruction I wondered again what I had been thinking when I volunteered. I had not been trained to teach SCIENCE. I entered the first classroom to explain the wisdom of science to young children with some doubt about my methods and materials. They were quiet and polite as they stared blankly while I struggled through the pizza wheel. I found that I really didn't understand the process well enough to share it with anyone. The rest of the classes were about the same as the students and I struggled with a mysterious concept until we rendered it boring.

I knew if I returned the next week with the same kind of material they wouldn't be quiet or polite and I would reaffirm there initial impression that science was an overrated necessity of our curriculum. So I went to the chemistry college of a university in the vicinity. A compassionate professor and jogging buddy listened to my tale of woe. He told me he thought I was on the right track, but I needed something concrete to make the scientific process easy to understand. He loaned

me an old milk can that had been redesigned to simulate a dust explosion in a grain elevator.

Inside the can there was a candle holder on one side and a funnel on the other. A flexible tube that ran from the funnel through the wall of the can was attached to an air squeeze bulb on the outside. The good professor suggested I begin my next class by filling the funnel with lycopodium powder, lighting the candle, closing the lid, holding up my pizza wheel, and squeezing the bulb. The result was a small explosion inside the can which blew the lid off and shot flames three feet into the air. The students and I screamed and then someone yelled, "what happened?" I looked at my pizza wheel and retorted, "that's a "QUESTION!" Another suggested that the powder I had put in the funnel had caused the explosion. I explained that thinking the powder was responsible for the explosion was a guess or HYPOTHESIS based on seeing the event. We initiated the TESTING phase of the scientific process by pouring some of the powder into a dish and attemping to light it. When it didn't ignite I asked them what their INTERPRETATION of our test was. They decided that something else must have been involved in the explosion, but what? We had come full circle with a new QUESTION. The pizza wheel went round and round that day in each of our classes as we learned how the air inside the milkcan had become saturated with lycopodium powder when air was pumped from the bulb through the funnel holding it. The lighted candle had ignited the air and powder and the result had been the explosion they had seen.

I began to consider an encore. Once a week, for the remainder of the year, I visited the university where someone taught me how to use a physical or chemical demonstration and explain the principles behind it. Back in the classroom, I held steadily to my pizza wheel as discovered that science was a way to explore things that happen around us.

Gradually, I've discovered I was not alone in feeling unprepared to teach science. Most elementary teachers report feeling that way (Manning, 1982). I also found that most teachers teach science using textbooks and memorization of principles, just as I had tried to do the first time (Marcuccio, 1983). In addition, grade school students spend, on the average, about one hour a week studying science (Sigda, 1983). Considering the above, it was not surprising to learn that the majority of grade school teachers rate science as their least favorite subject to teach.

Recently, I asked elementary school teachers at a tribal school in the Northwest the question, "What is science?" They provided the following comments:

"the knowledge of facts that are helpful to life;"
"all around us, nature, our very being;"
"it scares me because I don't know anything about it;"
"the study of the elements, your surroundings and how they affect you;"
"discovery;"
"exploring;"
"love;"

"stars, molecules, you're serious about this aren't you? Okay, from my Native American viewpoint, science is accepting healthy ceremonies and celebrations of life eventhough I don't understand how they work. Researchers are discovering that old practices, like sweats and smudging are healthy. My ancestors knew how to live healthy lives without analyzing them like western science does. They just knew in their hearts how to live."

Ancient Indian science was practical, intuitively analytical, mystical, religious, and artistic. In other words, it was the way of life, or the culture of Indian Peoples who lived in harmony with the life around them. They prospered for centuries using inventive technology and a working knowledge of the seasons, weather, animal habitat and migration, agriculture, and medicine, as well as the making of tools, clothing, and shelter. This knowledge was passed from one generation to another through stories, games, legends, modeling, and experiences in daily living.

Currently, the majority of contemporary scientific knowledge is being passed on via textbooks and rote memorization. The methods and materials teachers use to teach science have been the subject of much concern since Soviet scientists and engineers launched Sputnik 30 years ago. At that time, science was a remote profession practiced by an elite few in obscure labs. But during the last three decades the speed and agility of electronic technology for analyzing and communicating scientific information has brought science into each if our lives. Contemporary science effects the quality of our lives in a myriad of ways from the taste of our toothpaste to the threat of nuclear destruction. It has come full circle and now holds a status of similar stature to that of ancient Indian science, in that without it, we could not live.

Elementary tribal school students related the following comments when I asked them what science was:

"how the universe began;"
"mysterious findings out;"
"it means, like, if there's an a-b-c, and if it's science, you can't hear it;"
"a thing you learn everyday;"
"art;"
"too boring;"
"it tells you about the world;"
"something we had today;"
"science things, like science books, experiments, the science fair;"
"discovering things, like, what you need to make things come true;"
"adventure;"
"life;"

These comments should remind us that the experience people have with science becomes what they think of it. The student who answered, "too boring," had probably not experienced much art or adventure in their science curriculum. Instruction of contemporary science should perhaps come full circle to embrace the teaching methods of Pre-Columbian

American Natives: stories, legends, games, practice, modeling, and experiences of daily life shared in a scientific context.

My teaching experiences in tribal schools have led me to consider the concept of roundness. I've learned that time is round, not linear, it's cyclical and it repeats itself. I used to think there was only so much time. But there, on the Coeur d' Alene Reservation, I could see time, and it became evident that nothing dies. If left to nature, things live again and again, like water evaporating and falling again as rain, or decaying animals providing nutriments for new soil; or energy for scavengers. I am working to make my teaching round; so the concepts I share will connect people with life in the universe.

Most recently, I've put together an experiential science curriculum for teachers and students that's designed to stimulate an interest in practicing the scientific method. All of the items in the curriculum can be purchased from a supermarket and a hardware store for less than $100. Reading, writing, verbal communication, math, art, and social competence can be learned through the study of science. I am most impressed with the action and interactions that can take place in the classroom as a result of studying science. Classrooms that may have become flat or boring can explode with excitement and wonder. For teachers and students it's a viable alternative to burning out, rusting out, or getting out of the classroom.

The demand for knowledge of science is growing rapidly. It is a national resource that we have to develop. It's alarming to think 83% of our high school juniors and seniors don't take any science (Sigda, 1983). Learning to teach anything well takes time and effort. There are no sure-fire methods. It helps if a teacher likes teaching kids and is willing to work enthusiastically at finding ways to make learning meaningful. In our effort to become better teachers it might be helpful to remember what one fifth grade tribal school student said, "Science is, discovering things, like what you need to make things come true."

Good teaching to you.

List of References

Manning, P.C., Esler, W.K., & Baird, R.J. What research says. Science and Children, 1982, 19 40-41.

Marcuccio, P. Responding to the economic Sputnik. Phi Delta Kappan. 1983 64, 618-620.

Sigda, R.B. The crisis in science education and the realities of science teaching in the classroom. Phi Delta Kappan, 1983, 64 624-627.