Summer Adventure in Yosemite National Park

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How many times have I wished that I could take my students outside the classroom for a unique, first-hand learning experience? Probably more times than I care to admit. Botany, zoology, ecology, geology, and astronomy are all scientific disciplines that are difficult to teach to secondary students confined to a school building. Like other science teachers, I was aware that filmstrips and preserved specimens cannot provide the excitement and challenges offered by exploration and serendipitous discovery. Still, it required a visit to several national parks during summer vacations and my husband's enthusiastic support to spur me to plan a special course for my students.

An Alternative to Classroom Science

"Natural Science" became a reality during the two weeks from August 16 through 30, 1979. One credit of science was granted to the eighteen students accepted to participate in our study in Yosemite National Park, California. This was quite an adventure for all the parties involved—the students from Bishop Ford Central Catholic High School, my husband, and myself. My students live in a densely populated urban environment of 4 million people—Brooklyn, New York. Our school is typical of urban high schools—traditional scheduling, large brick building set on one square city block with a neatly manicured lawn and hedges by the front entrance. One side of the building faces a highway, the other, a cemetery. Due to internal scheduling problems, students interested in science find it difficult to schedule as many science courses into their programs as they would like. These students, many of whom were members of the school's Ecology Club, were encouraged to consider spending two weeks studying a natural environment. They enrolled in "Natural Science," the course I developed, which was offered through our high school's summer program.

On August 16, we began our 12-hour journey to Yosemite National Park via two jet airplanes and a bus, and arrived at Yosemite Institute's Campus at Crane Flat. Because I was not familiar with the Park, I arranged our program for the two weeks through the Institute. Everything was provided, from arrangements for food and lodging to instructors. The course was designed to include components of botany, zoology, ecology, earth science, and astronomy (table 1).

Student Responses

Our "classroom" was the terrain we hiked every day; our "audio-visual aids" were everything our eyes

TABLE 1. "Natural Science" Course Outline

I. *Biology*
- A. Botany: identification of local species
- B. Zoology
  1. Entomology
  2. Aquatic organisms
  3. Amphibians and reptiles
  4. Mammals
- C. Ecology
  1. Fire ecology
  3. Ecology of a Sequoia grove
  3. Conservation and preservation
  4. Succession

II. *Earth Science*
- A. Minerals
  1. Granite
  2. Sedimentary rocks of the foothills
- B. Geological Forces
  1. Uplift as a mountain building process
  2. Glaciation
- C. Compass Skills

III. *Astronomy*
- A. Summer constellations
- B. "Stationary" features
- C. Observation of Perseid meteor shower

IV. *Miscellaneous Studies*
- A. History
  1. Indian inhabitants
  2. Role of the white settlers
  3. John Muir
- B. Safety
  1. National Park wilderness regulations
  2. Survival techniques
  3. Identification of poisonous plants/animals
- C. Physical Education
- D. National Parks

FIGURE 1. Students examine a garter snake they found in the meadows around Crane Flat. Handling living animals for observation and returning them to their proper environment was a new experience for some students.

FIGURE 2. Frank Baele, instructor from the Yosemite Institute, recounts some of the Miwok Indian legends for the group. Here they search the surface of Half Dome for the face of the old Indian Woman who, according to legend, was banished there by her angry husband.

could behold, our ears detect, and our senses perceive. The students did not realize until the conclusion of the program that each day's "class" was 24-hours-long. Students were required to keep a journal, which I used as one component in determining their grades for the course. At first, they were unsure of what to include, and their initial entries read like a log of each minute's activity. Eventually, the style of most students' journals developed into a notebook of factual material and a record of their impressions of places and people. Some of their insights were quite fascinating. After the first day's hike, they recorded observations such as the following: "None of this seems real to me. I can't believe I am seeing this with my own two eyes. It seems like a beautiful painting," wrote one 15-year-old girl. Another 16-year-old girl observed: "The trees are none alike and go on forever. There are boundless hills, fields, meadows, trees." A 16-year-old boy wrote: "The park is beautiful, and I think I'm going to like it here." One of my favorites, which probably sums up the feeling of the entire group was: "I have never seen anything so nice in person."

The types of environments the students investigated were varied. The first few days were spent exploring the meadows around the Crane Flat Campus. The students became acclimated to the altitude of 6,200 feet and developed their hiking legs before we started backpacking trips to higher elevations. Backpacking proved to be a true test of determination and stamina on their part (and ours) because this was a new experience for all of us. As one 16-year-old girl put it after a two-day hike: "...we left for Crane Flat, that little piece of heaven on earth."

On these backpacking trips, the students could observe tundra-like plants and animals and gain new perspective on the geology of Yosemite Park. As we camped on North Dome, we looked at the stars and constellations with amazement. The students demanded to know

where all these stars came from because in the city only about 25 stars are visible in the sky even on clear nights. As they continued to stare, tiny flashes of light appeared and were gone before students could utter a word. Shooting stars, the Perseid meteor shower, put on quite a display for them that night. The Giant Sequoia groves also held a special fascination for many students. "The trees were like kings on thrones watching us. The forest was so quiet (that) it made a noise," observed one girl.

A large proportion of the success of this experience was due to Frank Baele, our instructor from the Yosemite Institute. Frank was more than an instructor; he also served as tour guide, trail guide, chauffeur, medical advisor, camping authority, search party director, and bear chaser. We genuinely regretted saying goodbye to him at the airport. Through an inimitable combination of first-hand knowledge, earnestness, and humor, he won the enthusiastic admiration of our entire group.

A Change in Attitude

Perhaps the most impressive lesson the students learned from our trip was that the Park is a trust belonging to everyone. I observed a complete shift in attitudes by the final day of our trip when we discussed park management. At the beginning of their two-week stay, they could not understand why there was "nowhere to go" and "nothing to do" at night or during their free time at Yosemite. During our visit to Yosemite, we spent two nights in the tourist area of Yosemite Valley where there was plenty to see and more places to go with more people than they would see in the other twelve days combined. After leaving the Valley, they learned to provide their own amusements—games and quiet activities. By the end of our stay, students wished the Park could be returned to its former unspoiled state; they wanted to reduce the number of automobiles and recreational vehicles, discontinue "artificial" amusements, such as the ice skating rink, swimming pools, and stables offering horseback riding. They wanted to take the tourists from the Valley and put them on the hiking trails so that the tourists could learn some of the many lessons the students themselves were absorbing so eagerly.

And from the Teacher's Perspective . . .

If you have ever considered offering your students an extended outdoor learning experience and then decided against doing so for whatever reason, why not take those plans out and dust them off? I experienced problems and disappointments, too. And it is not necessary to travel quite as far as our group did. Perhaps our school's next trip will be closer to home. The curriculum for "Natural Science" can be modified to fit any natural area. However, I can say with certainty that none of my eighteen students nor my husband and myself will ever forget the extraordinary summer adventure we all shared in Yosemite National Park.

The Bacteriophage: A Functional Model for Demonstrating a Viral Life Cycle

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Viruses play an important role in our everyday lives. They affect our well-being. Students, throughout their school careers—from kindergarten through college—miss classes due to viral diseases such as measles, mumps, chicken pox, influenza, as well as the "common cold."

The field of virology is a young, developing area. Although most high school and college students can explain the basic life cycle of a cell, few can describe the function of a virus particle. The sequence of events in a one-step growth curve remains equally unclear.

In recent years, students have become aware of the role viruses play in their lives. Many colleges have included sections on viral agents in their biology courses or have added courses in general virology. The virology research projects many students are doing for regional and state science fairs require a great deal of preparation (Speece 1975).

Virions can only be visualized with an electron microscope, so equipment and supplies for demonstrating their shapes and life cycles are not available in many schools. Viral particle sizes range from the large pox virus, about 300 nm, to the small polio virus of 17 nm. Because most available viral models were either too expensive or nonfunctional, we recognized the need to develop models demonstrating the life cycle and unique assembly procedures of viruses. The development of models for classroom use is not unique. Walter (1968) explained how to make