Interweaving Traditional and Modern Science for Adult Education

A handful of sweet, mouth-melting blueberry blossoms, a succulent spicy grass called Goose Tongue, the licorice taste of a horse fern, and the sweet inner bark of the deadly and prickly Devil's Club: it was April in the rainforests of Southeast Alaska. I was munching and walking through the forest with two Tlingit friends, participating in a traditional biology where knowledge of plant usefulness is transmitted from adult to child verbally and through practical applications. "This is only good for eating," one commented as she picked a succulent grass which tasted like sweet celery. I learned that the wilds are their equivalent of a supermarket. We were on a trip to gather basket-making materials; edibles were merely snacks on the trail. I was learning biology from the users' perspective.

Our friendship had begun over a year before, when the mother and daughter attended a "Cleaning and Re-Shaping Baskets Workshop" in Sitka, Alaska. Both women are spruce-root basket weavers, having learned by watching their mother and grandmother, by studying museum pieces, and by experimenting. Both have expanded their skills into traditional fabrics and have woven the revived Ravenstail robes. They are artists of merit within their culture. Neither of them has had much science instruction. My challenge with the workshop was to teach them the basics of deterioration, and to slip in scientific theory and reasoning without scaring them off. Also in the class were 12 other nonscientist women including Native elders, antiquities collectors, and museum curators. Starting with the assumption, which proved correct, that Alaskans understand their local biology through practical applications and are familiar with the concept of experimentation, it was a relatively easy matter to teach theories and explanations for what they know to be true from physical manipulation. A measure of the workshop's success was the nearly 100% return of students for a second course the following year on "Basket Repairs."

Students entered the courses—three full days and evenings of instruction and hands-on activities—thinking that they would learn "how-to's" similar to learning how to knit. I feel strongly that the "whys" give a better foundation for understanding and explaining applications than a cookbook approach of "do this and this and this to achieve this." As it turned out, the excitement that the courses generated was a result of students finally understanding some of the "whys": why spruce roots are so strong, why sunlight degrades materials, why old baskets shouldn't be washed, why we make such a fuss over humidity fluctuations.

Both courses required a large amount of preparation and equipment from the instructors. In the first course we discussed energy, free radicals, and the chemical degradation of materials. We discussed the physical structure of plant materials and then took cross sections for analysis under a microscope. For the basketmakers, it was exciting to use a microscope to see spruce roots collected from different time periods. Viewing the cell structures provided graphic illustration of the mechanical properties of the roots, with which all of the participants were familiar. One student was having a hard time splitting her spruce roots. She looked under the microscope at roots her grandmother had once gathered, and saw that they had a more consistent cell structure. The cell structure explained why some roots work better than others when they are used to weave a basket. Her grandmother, who is no longer alive, had known how to gather the best spruce roots. There are few people still alive who have traditional knowledge. Thus, the information obtained from a modern scientific analytical technique was invaluable to this novice weaver for improving the quality of her work.

Other plant materials in Alaskan baskets were identified through examining their cell structures. For the craftspeople it was an exciting idea that the usefulness of a material, traditionally determined through trial and error experimentation, could be determined almost as easily by cell-structure analysis. Museum staff were interested to find out whether their assumptions about materials were correct or incorrect. One basket was found to be an import from a hot, dry climate, although the weaving technique and external appearance was similar to locally produced baskets.

In order to discuss basket repairs, it was necessary to discuss adhesion and adhesives, which brought us to discussions of polymers, chemical chains, and physical properties. This was difficult to teach. We found that the most familiar parallel we could find was human interrelationships. We also used parallels with bar magnets, which graphically showed repulsion and attraction. The structure and behavior of cellulose was successfully explained using a packet of dried Top Ramen noodles. Most of the students understood the principles of "like attracts like" after experimenting with a variety of natural and synthetic adhesives, and seeing how well they stuck to a variety of natural and synthetic products. Isinglass, a fish glue, was an excellent adhesive for porcupine quills, fish skin, and other proteinaceous materials. Conversely, wheat starch paste did not hold quillwork or fish skin together, although it was an excellent adhesive for paper and other cellulosics. The students' favorite aspect of all the workshops was the interrelationship of natural materials and science.

My latest teaching technique is to have the audience tell me about the subject. This is only successful with a group with whom I am familiar and have lectured to on previous occasions. I act as moderator, providing explanations if needed, and each adult presents something on a specific topic. This symposium approach is well-received when the information is transmitted from peer to peer, making it more accessible to the audience. Talk abstracts are passed out to the audience to supplement the speaker's presentation. By researching and presenting a specific topic, the speakers found that they learned the topic better than by listening and reading.

It is important when teaching science to adults to relate it to the practical experiences of their lives. Theories and equations make little sense without grounding in reality. I draw examples from cooking, cleaning, and crafts for most of my largely female audiences. I keep the instruction as informal as possible, allowing large amounts of time for discussions to initiate and develop. Often students have questions which have been bothering them for awhile, or there is something they recently read or heard. This information, in turn, becomes the catalyst for a discussion. I write out detailed outlines for talks and cover all the points either as a result of a discussion or through more formal presentation.

In a longer workshop, the day is broken into segments of different types of instruction. Usually the mornings are for theories and lectures and the afternoons are for more active hands-on activities (even adults need to play). There are regularly scheduled breaks where quiet students feel more comfortable asking questions and discussing what they didn't understand. Breaks are always longer than 15 minutes. I give slide presentations, but I try to keep them under an hour and to have some light in the room. This way the audience can feel comfortable about interrupting me as questions come to them. Humor is an important teaching tool, and I will shamelessly steal any visual joke I run across if it will help make my point. If possible, I try to preview all jokes and slides on unsuspecting friends to see if they are really effective. I also rely heavily on magic tricks and kitchen chemistry. Practice on a pre-audience of friends is also important for magic tricks. But what is most important is to make the talk inclusive, allowing the audience to feel free to participate.

On one of my visits to Sitka I was sitting in a public place, talking to a former student. She is an older Native woman—another accomplished basket weaver, shy and soft spoken—who had attended both basket workshops. I had often wondered how much she retained from my talks, because I tend to speak fast, and within her culture, speech is slower, longer, and allows time for absorption. An acquaintance of hers came up to us and began asking her about how to care for a basket she had just purchased. My friend gave a concise, informative, and correct explanation of what the woman needed to know. As the acquaintance turned away, my quiet friend gave me a backhanded swat, laughed loudly and said "See teacher, I learned!"

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Helen Alten is the State Conservator at the Alaska State Museums in Juneau, Alaska. She serves as a resource on material culture preservation to the state of Alaska. Readers may be interested in her paper on glass deterioration in the MRS Symposium Proceedings, *Vol. 123,* Materials Issues in Art and Archaeology.

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