Science for the Whole Student
By Jean Tepperman

One day each student took home a cup with a butterfly larva and some food. Then sometime later, “they came in so excited, telling each other, ‘Mine turned into a butterfly!’ ‘I can’t believe it didn’t die!’”

The students were not children. They were adult women, some middle-aged, taking a course in teaching science to young children. Teacher Marion Cowee designed this course at Solano Community College to give students the experience of excitement and joy in discovery that she wants them to share with children.

They do study a textbook, *Worms, Shadows, and Whirlpools: Science in the Early Childhood Classroom,* by Karen Worth and Sharon Grollman, which details techniques for using the inquiry method with young children. But the heart of the class is the transformation of the students’ own relationship with science.

Science—eeeeww!

Like many ECE students, Antoinette Moore entered Cowee’s class with dread. “As a child,” she says, “I remember sitting in science class and feeling lost. It was abstract, the language was confusing. When we took standardized tests I scored really low in science and math.” So she, like many girls, concluded, “I’m not good at math and science.”

The first assignment in this ECE class is to write a “science autobiography,” in which many students share experiences like Moore’s. All the students are women, says Cowee, and many also got turned off by the assignment to dissect animals. In science class, says Cowee, “the emotional or spiritual awareness of this animal as having been a living being was usually not acknowledged. A lot of girls are sensitive about this.”

Observation key

The class does not run students through the activities they will do with children, but provides them with adult experiences of carefully observing the natural world: “Looking at things more than once, more closely, not being afraid to touch,” as Moore explains. In one of the first classes, she recalls being handed a lemon and directed to “look at it, smell it, cut it, write down questions you have about it.”

Cowee says she doesn’t teach students how to ask questions: “The questions arise out of good observation.” Students spend the first 15 minutes of each class drawing and writing detailed descriptions: of a flower, a twig, a rock, a lit candle. They are encouraged to draw the object from different angles, to touch and smell it, to take it apart and study each part, to “draw a portion of it blown up big, like Georgia O’Keefe.”

“It’s not important to know the names,” Cowee adds, displaying a student drawing labeled “five little white things and five little yellow things” from the center of a forget-me-not. What’s important is “to enjoy science as an exploration of nature. . . . I want them to feel the joy, to experience this as an adult, so they

know what children experience through their own emotions and sensations." Moore comments, "She's trying to get people to connect to it so they'll take it with them."

Moon journal

Student journals detail observations over time. Early in the course students keep a "moon journal," including drawings and writings from observing the moon for six weeks, at least four observations a week. "That's all I tell them," says Cowee. "Draw a picture, write a poem, write about memories that get sparked. I don't tell them what to look for. One thing people say is: 'I didn't see the moon. It wasn't raining. I wonder why. Maybe I wasn't looking in the right part of the sky, or at the right time of day.' So they are beginning to develop hypotheses. Some look on the Internet for answers."

They also "develop a relationship with the moon. It becomes anthropomorphic. They write, 'Moon, where are you?' Then there's a gorgeous full moon and some will write an ode to the moon." Fostering that emotional connection to nature is also one of Cowee's objectives.

Tree journal

Each student also chooses a deciduous tree she sees every day and keeps a "tree journal" during the entire semester, January to May, with at least one entry a week. Cowee showed me a journal describing an apricot tree, with photos, drawings, writing, and some glued-in samples of sap, leaves, and blossoms. Early on the student wrote: "I notice ladybugs coming to this tree. I wonder if they like the sweetness in the sap." She speculated about whether the blossoms would come before the leaves (they did). When the blossoms came, she noticed that the sap changed color. And she was puzzled because a neighboring peach tree was already covered with both flowers and leaves: "Aren't peaches similar to apricots? Shouldn't they look the same?"

Under a photo of tiny leaves, the student wrote "The leaves are coming soon!" Cowee observed, "That excitement is what's going to communicate to a child." A later entry: "I wonder what is the purpose of the flowers and the pinecone things. I can't wait to find out." Then still later, "The most exciting thing I see is a pea-sized sphere, green and fuzzy. I'm convinced it's an apricot."

Classroom observation

Each student also wrote detailed observations and comments on the way science and math appeared in an ECE classroom of their choice. They described the environment and materials as well as the way the teachers used the materials – or didn't. "One class had good materials," Cowee says," but the teachers didn't know how to use them. So the students see that it's not enough to just have the materials – it's about the interactions."

Moore, who was simultaneously doing a practicum class, brought worms into her classroom, then "just sat and watched the children and wrote down what they said. Their questions gave me all the direction I needed: Where's their head? Where's their Mom? Where's his home? Where does he live? Where did

you get them?” She got books from the library, took the kids outside to look for worms. “I didn’t answer the questions,” she says. “We tried to find the answers together.”

They can be knowers

What Cowee wants her students to get from the class, she says, is the confidence that “they can be knowers. They don’t have to get information from the Internet.” Or, as Moore put it, “If I think I can learn science, anybody can.” But it’s not just an intellectual exercise, says Cowee. “It’s holistic – science, art, spirituality.” She wants the students to “make an emotional connection to nature.”

“I live in the foothills,” Moore says. “There are lots of trees, wildlife. I never appreciated looking at it scientifically—the natural world. Now I look at my whole surroundings differently.”