

For the past million years or so, science courses usually have been taught by the venerable method of “tell-’em-and-test-’em, chalk-and-talk.” However, OU educator Edmund A. Marek claims that public school students are better served if their instructors are trained to spend less time at the lectern and more time in the lab.

Marek, professor of science education and director of OU’s science education center, outspokenly endorses a hands-on approach to teaching science. He bases his fervor on data gathered from several years of center-sponsored research projects, which have led him to the conclusion that today’s students “aren’t learning science, and they don’t like science.”

In one study, Marek sampled 58 tenth-grade students from two classes, asking them to define the terms “ecosystem” and “food chain.” Two-thirds of those sampled either misunderstood the concept of food chain or had no response, while only one student showed a full understanding of the concept. Meanwhile, none of the sampling displayed a sound understanding of an ecosystem. The students did not learn the concepts, Marek reported, despite the fact the two classes had spent one to two weeks covering ecological material.

To explain the students’ failure to grasp what they were taught, Marek points to a National Science Teachers Association statistic: 90 percent of science classrooms stick to the textbook 95 percent of the time. This is the wrong way to teach a subject that, he says, “by its very nature should require a student-centered, materials-rich environment, where the kids are taught to think critically.

“If science really is a quest for knowledge, then as a teacher I should have students solving problems — gathering data — interpreting phenomena. I’ve got to take them out to the field or into the lab . . . that’s not what usually happens in a class.”

Marek learned the value of demonstrative learning not only from academic research, but also from experience. A native Oklahoman who grew up in Arizona, New Jersey, California, Michigan and Texas, Marek decided to teach after beginning studies at OU in the late 1960s. Although his academic record showed a strong aptitude for science



*Marek confers with Education Dean Fred Wood.*

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and math, he was left cold by the lecture-heavy content found in much of his science course work. One factor that led him to choose science education as a career was the encouragement of “certain professors with whom I had good experiences,” chief among them John W. (Jack) Renner, Marek’s major advisor. Renner, who retired in 1989 after being the mainstay of science education at OU for three decades, impressed Marek in part because Renner did more than lecture on methodology — “he demonstrated the methods he taught.”

Marek earned his education degree from OU in 1970 and spent several years teaching in central Oklahoma public schools. He completed his M.Ed. and Ph.D. work in science education, then spent four years as an assistant professor of biology at Southwest Texas State University, until 1982, when an opportunity beckoned to work with Renner at OU.

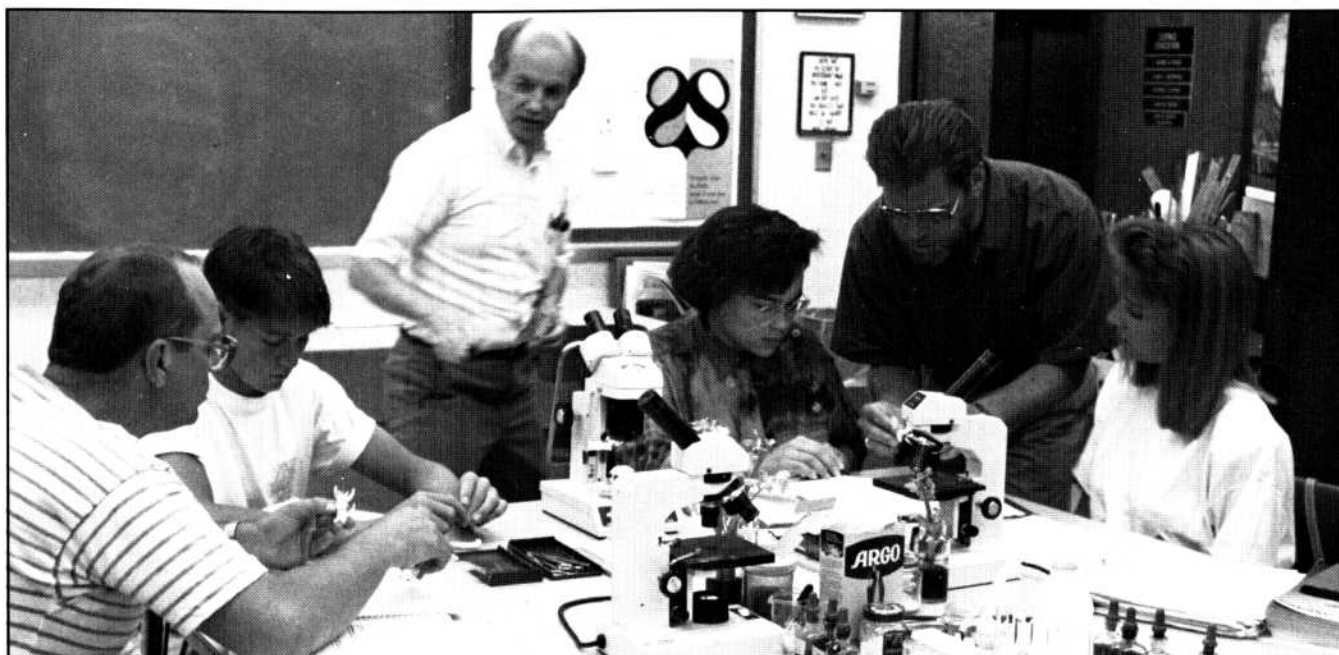
“A second position in science education was created here . . . I really was torn about returning to the institution where I’d done my degree work. But this was an opportunity to be a part of a program with productivity, personnel and a national reputation — all due mainly to Dr. Renner.”

Marek served as an assistant professor of science education from 1982-85, as associate professor from 1985-89, and worked with Renner on research projects funded by four different National Science Foundation grants. After Renner retired in 1989, Marek assumed the directorship. In the course of his own two-year study funded by the NSF, Marek has continued Renner’s efforts to weigh the effectiveness of lab-centered and textbook-centered science curricula.

The NSF grants have funded not only research but also summer institutes for practicing teachers. Held at the center’s office and lab facilities in the Physical Sciences Center, the institutes provide teachers with a theoretical basis for student-centered instruction, assist them in curriculum development and seek feedback on the effectiveness of hands-on instruction. In one study Marek found workshop participants “cited more than twice as many strengths as weaknesses” in the materials-centered approach.

Marek is quick to credit the other players who make possible the center’s research and teaching activities. He

# EDMUND A. MAREK ●



Marek, second from right, and Carl Surber of Norman public schools, standing, guide future teachers in prerequisite science.

salutes an "outstanding" partnership with science educators in the Norman Public Schools who have helped the Center in designing high school biology, physics and chemistry curricula that focus on the laboratory.

In addition, donations from the Kerr and Sarkeys foundations have provided funding for curriculum-writing. And though most of the center's funds come from federal and private sources, departmental funds help replenish the laboratory's supply of consumable materials such as microscopes, aquaria, guppies, sea shells, chemicals and soil.

All these sources of support will be needed in the future to help reach the goal of making young people more science-literate. While Marek says many school districts have no trouble attracting credentialed teachers, many other districts — chiefly the poorer rural ones — face severe shortages of qualified personnel in that regard. "These are the schools that have one science teacher who must be credentialed in biology, chemistry, general science, physical science, earth science, and so on."

He adds, "One of the biggest problems created by this situation is that you get science teachers who are not credentialed, or they may have a tem-

porary sort of credential. And when we end up with poorly credentialed teachers, we exacerbate the problem of students not learning science, and not liking science."

The professor is unsure whether encouraging scientists to teach will have much of an impact, although he says better salaries can help alleviate shortages of personnel. Again, however, he suggests lab-centered instruction as a way to compensate for teacher shortcomings and to boost the value of science instruction to society as well — by helping students learn to "analyze and classify and evaluate and synthesize."

Marek will return to the classroom this fall after a one-year absence, during which he served as interim chair of the College of Education's instructional leadership and academic curriculum department. He admits he has missed teaching his course work in research objectives, teaching methodology and learning theory. "But frankly, I'm very satisfied with this past year's experience as department chair."

He adds, "I learned a great deal about not only the administrative activities, but also I'm pleased to have had that experience in a year when

we've had four new positions awarded to our department, plus filled two vacancies, doubling our faculty size . . . we have someone coming from Syracuse in science education, someone coming from Purdue, from California State, from the University of Illinois . . . people coming here from great programs all over the country because we're competitive."

A serious educator but hardly a grim one, Marek rates his work "a distant second to my family." His wife, Letitia, is an assistant vice president at a Norman bank, while son Trey and daughter Megan are set to begin their junior years at OU and Norman High School, respectively.

In a 1987 article for *The Science Teacher* magazine, Marek cited the words of the French mathematician Jules Henri Poincare: "Science is built with facts just as a house is built with bricks, but a collection of facts cannot be called a science any more than a pile of bricks can be called a house."

Thanks to the programs and ideas generated by Marek and his colleagues, students may find in tomorrow's science classrooms an exhilarating challenge to help construct huge, glittering edifices from the raw materials of nature and technology.

—MICHAEL WATERS