

Growing Demand for Computer Courses Spurs Retraining of College Teachers

Hundreds of faculty members, including many outside the sciences, attend classes

By **JUDITH AXEL TURNER**

Nearly 400 faculty members in mathematics, physics, chemistry, and a host of other disciplines—scientific and nonscientific—are going to colleges and universities across the country this summer to learn to teach computing.

Some of them see retraining in computer science as an opportunity to move into an exciting, growing field. Others are going because they recognize—or have been told—that the future in their present fields is bleak.

All of the retraining programs prepare graduates to teach computing courses, but they vary from two weeks at the National Computer Educator's Institute to three full summer and one on-campus semester at the university of South Carolina.

Raised Eyebrows

Program directors recognize that such a discrepancy causes raised eyebrows: Can two weeks be as effective as three years in preparing a faculty member to teach a computer course?

Of course not, says William J. Weber, chairman of the computer-science department at Southeast Missouri State University. Mr. Weber is himself a retrainee, having switched from mathematics to computer science by taking standard graduate courses during his summers. "It was a hard way to do it," he says.

None of the 13 faculty members in his department have a doctorate in computer science. "We couldn't afford them if they did," he says. Instead, the university has made a commitment to retraining.

Many of the faculty members have taken two-week courses, in part because the price is low, in part because the instruction focuses on how to teach undergraduate computer classes.

"It has worked very well for us," Mr. Weber says.

One reason for the differences in the length of the programs is that they are retraining faculty for different needs. Some will teach introductory or vocationally oriented computer courses, many of them in community colleges: computer-literacy courses designed to give students an overall view

of the computer; courses in computer applications, such as data-base management and electronic accounting programs; or programming courses. Others will teach in full-fledged computer-science degree programs designed to turn out researchers.

"After retraining, even if a professor has taught the course before, he teaches it better," says William M. Mitchell, chairman of the computing-science department and director of the retraining program at the University of Evansville.

Retraining programs in computing are a new phenomenon, established to meet the desperate need for faculty members to teach increasingly popular computer courses.

According to a study by the New Jersey Department of Higher Education, there were 650 openings nationwide for computer-science faculty members in 1980, yet only 60 of the 200 people who received Ph.D. degrees went into academe that year.

"Three thousand colleges would like to teach computer science in one form or another," says Ed Dubinski, professor of mathematics and computer science at Clarkson University and director of its retraining institute. "While retraining courses are not the way to produce computer-science faculty members in the best of all possible worlds, the other way isn't working."

"Panic State"

As a result, many colleges and universities are staffing their computing programs with professors from related fields such as physics and mathematics. Other institutions, anxious to offer the courses that students clamor for, draft faculty members in any field who know how to program.

"People come to us in a panic state," says Stephen D. Mitchell, president of Mitchell Publishing, which runs three two-week National Computer Educator's Institute programs at three different colleges. "They have just found out that they are teaching a new course, or they taught a course last year and did not do a good job. We give immediate aid. They go through a tough two weeks and leave feeling competent to teach that course."

The National Computer Educator's Institute is the oldest of the retraining courses—although it was not intended as a retraining program when it was started 11 years ago.

It was set up to help information-systems and data-processing professors keep up with changes in computer technology. This summer, however, the 250 students who will attend the two-week sessions at California State University at Fresno, Central State University in Oklahoma, and James Madison University are about equally divided between faculty members experienced in computing and “professors migrating to the computing area from other disciplines,” Mr. Mitchell says.

“A lot of teachers think that because they have a microprocessor and know BASIC that they are computer-proficient,” he adds. “Those who realize they are not computer-proficient are the ones we attract.”

In the institute, courses such as data-base processing, structured system development, and advanced programming in COBOL (a computer language designed for business applications), are taught by computer-science professors and computer consultants, many of whom have written textbooks. The emphasis is on how to teach the courses, rather than on the course material, Mr. Mitchell says.

Master's Program at Stevens

The newest retraining program is a master-of-science curriculum that Stevens Institute of Technology is offering for the first time this summer. It was established by Stevens and the New Jersey education department after a consultant pointed out that New Jersey was losing students to other states where they could get computer-science courses. The state lends the nearly \$10,000 in tuition to professors from New Jersey colleges and universities—public and private—and forgives repayment if they continue to teach computer science in the state for four years.

In the 15-month program, professors in mathematics and computer science learn to teach the entire undergraduate computer-science curriculum.

The 25 professor-students at Stevens are taking four courses in this summer's 10-week session and will take six during the academic year and another four next summer. The participants' institutions must release them from all but six hours of teaching during the academic year.

The program is based on one that Stevens offers to its regular master's candidates in computer science, but the courses are more concentrated. Stevens also added one required noncredit course, Introduction to Programming, to bring all the participants up to the same beginning level, says Lawrence E. Levine, professor of pure and applied mathematics and director of the program. There is only one elective, and it doesn't come until the second summer.

The 15-month model used at Stevens is a popular approach to retraining mathematics and physics professors—or others with a strong mathematics background—to teach undergraduate computer science.

The Clarkson program, which also takes 15 months, is a year older than Stevens's. Its first class will graduate at the end of this summer. The 60 participants took four courses last summer, completed a large programming project at their home universities during the academic year, and are back for another four courses this summer. Clarkson's program costs about \$7,200, including room and board, but all of the first group and many in the second are supported by a grant from the Alfred P. Sloan Foundation.

The Clarkson program does not offer a degree.

“What degree would you give?” Clarkson's Mr. Dubinski asks. “These people have doctorates. They don't want a B.A., although the content of the course is at a bachelor's level.

Clarkson's graduates will be qualified to teach about four undergraduate computer-science courses in the standard curriculum—the more basic courses. Mr. Dubinski says, “They are as good as everyone teaching those four courses.”

As for the rest of the computer-science curriculum, “they are certainly not as good as someone who went to graduate school, studied, and did research in the field,” Mr. Dubinski says. On the other hand, he points out, these are professors who will have both the equivalent of a bachelor's degree in computer science and a Ph.D. in some other subject.

Stanley P. Franklin, professor of mathematical science at Memphis State University and first director of its retraining program, believes that the undergraduate curriculum in computer science, plus the Ph.D. the faculty members already have in their first fields, qualifies them to teach any course they prepare for. “A person with a Ph.D. is supposed to learn enough so if he gets interested in an area he can learn and do research in it on his own,” Mr. Franklin says.

The Memphis State program uses standard courses in its interdisciplinary mathematical science master's program, packaged to be taken over two summers.

The University of Evansville gives a Master of Science in Computer Science Education to participants who complete its 15-month, \$4,500 program. William M. Mitchell, director of the program, admits the degree was created because "some people need the right piece of paper to be acceptable in the department they want to teach in."

A different approach is taken by the Central Ohio Consortium for Retraining in Computer Science, comprising seven Ohio colleges. The consortium brings faculty members from the colleges to the Ohio State University to take courses in the university's regular computer-science program. Many of the faculty members in the courses are already teaching computing courses at their own institutions but need a stronger grounding in computer science, says the program director, Stuart H. Zweben, associate professor and acting chairman of the computer and information science department at Ohio State.

Mr. Zweben meets with each professor, and with an administrator from the professor's college, to arrange the course schedule to meet the institution's needs.

Mr. Zweben says he encourages faculty members in the retraining program to go for a degree at least one level higher than the courses they teach. A faculty member teaching introductory-level courses needs the equivalent of an undergraduate education in computer science; someone teaching the entire curriculum needs at least a master's, he says.

Fees for the Ohio State program are paid by a grant from the U.S. Department of Education's Fund for the Improvement of Postsecondary Education.

Local Professors Used Most

Most of the teaching of retraining courses is done by computer-science professors from the institution that sponsors the program, although

occasionally a faculty member from another campus will be invited to fill in. Clarkson imports computer-science professors from Carnegie Mellon University, the Massachusetts Institute of Technology, Stanford University, and similar institutions.

Hiring from outside the university may be the more effective approach for getting good faculty members, program directors say. Persuading on-campus computer-science professors to give up their summer research and consulting can be a hassle.

In fact, the University of South Carolina may have to suspend its five-year-old program because computer-science professors at the university are eager to get back to their research and consulting, says Carter Bays, the program's director. The South Carolina curriculum takes three full summers and, often, a semester on campus.

The program is so grueling, Mr. Bays says, that of the first 25 faculty members who began their three years in 1979, only 15 finished. The enrollment dropped to 14 for the second three-year program, which began in 1982, because, he says, "word had gotten out that this was no piece of cake."

Because the courses are so rigorous, participants are required to have a strong mathematics background and must know how to program.

"They have to be able to handle the work," says Mr. Bays. "It is unfair to take someone in and have them fail in the program through no fault of their own."

Other program directors agree that the course is a challenge event to the well-prepared student. "The best time to see this program in action is 3 a.m.," Clarkson's Mr. Dubinski says. "These people are working 30 hours a day, eight days a week. You can't get through without a tremendous amount of work."

A shorter course does not guarantee an easier time. Mr. Mitchell of the National Computer Educator's Institute says that there are never fewer than three people crying from frustration and fatigue by the third day of the program.