VOLUME XIX, NUMBER 11

INNOVATION ABSTRACTS

PUBLISHED BY THE NATIONAL INSTITUTE FOR STAFF AND ORGANIZATIONAL DEVELOPMENT (NISOD), COLLEGE OF EDUCATION, THE UNIVERSITY OF TEXAS AT AUSTIN · WITH SUPPORT FROM THE W. K. KELLOGG FOUNDATION AND THE SID W. RICHARDSON FOUNDATION

Computers as Scientific Instruments

At Fort Scott Community College we asked ourselves these questions: (1) Would the extensive use of computers as scientific and computational tools in the chemistry laboratory, and not in a separate room, make the laboratory more interesting and relevant? and (2) How would students react to such a laboratory? Consequently, we made an application to the National Science Foundation, Department of Undergraduate Education, Instrumentation and Laboratory Improvement program. Its funding, with local matching funds, provided $44,000 to purchase computers, balances, spectrophotometers, software, and networking and interface hardware for a completely interfaced freshman general chemistry laboratory.

Six stations in a 24-student lab are now equipped with state-of-the-art computers interfaced to milligram digital balances, digital pH meters, and digital visible spectrophotometers. Computers are loaded with Windows 95; Microsoft Excel, a spreadsheet program; Wedge for Windows, a bridge program for interfacing; Scientific WorkPlace, a word processor that includes the algebra program Maple; and HyperChem, a molecular modeling program. Four identically equipped computers on rolling tables but without the interfaced instrumentation are also available for student use in the laboratory.

Depending upon the laboratory exercise of the day, students work in cooperative groups or as individuals. When working as individuals each student uses a different page on the spreadsheet. Initially, the bridge program is set to accept data from the balance. The student simply presses the print key on the balance, and the data appear in the active cell of the spreadsheet. In later exercises students learn to configure the bridge program for a particular instrument and take advantage of some of its capabilities. For example, students were successfully able to program the computer to ignore the first three output characters from a spectrophotometer, print the next three in a column labeled "wavelength," move the active cell to the right, ignore two more and then print five in a column labeled "absorbance," ignore remaining characters, and move the cursor down and to the left, ready to start again on the next line with a new wavelength reading. This all happens with a single depression of the print button on the spectrophotometer!

Instruction on the use of computers was on a need-to-know basis. In the first computer exercise the computer was used as a typewriter. Students without spreadsheet experience used pocket calculators for calculations. As time went on, students received tips and tools from other students and the instructor.

Compared to previous traditional laboratory classes, there was a noticeable change in the attitude of students. Students spent more time in the laboratory and were more involved in the process but perceived the laboratory to be easier. Groups worked together better, and there was more cooperation between groups. Students with computer experience became instructors, as did those with prior background in chemistry. When a group including the college president, three deans, and the Kansas State Commissioner of Education visited the laboratory, students were visibly offended by the interruption. The commissioner observed, "I am convinced that your integrated approach to learning will not only make more sense to your students but will result in your students being more intrinsically motivated to learn."

In an evaluation questionnaire completed by 34 students on the last day of class, 72% had not used computers in previous chemistry classes. Four of five had previous computer classes. Only 29% were frightened by the use of computers. Fully 91% felt the computers made the laboratory more interesting.

Over 79% felt the computers made the *laboratory* more relevant, and 88% felt the laboratory made *computers* more relevant. None thought that too much time was spent on computer instruction, 71% thought it was about right, and the remaining 29% would have preferred more computer instruction.

In one of the most telling evaluations, students were asked: Knowing what you know now, if you had a choice between otherwise identical chemistry courses with or without computerized labs, which would you choose? A large majority, 79%, said they would choose a computerized lab. Only 6% preferred a non-computerized lab; the remaining 15% felt it made no difference.

One criticism that is frequently made of this program is that the computers do the computations for the students and they do not learn the math. It should be pointed out that to do the computations on the computer, the student must tell the computer what computations to make, after translating them from mathematical symbolism. Thus, doing the computations on the computer is a higher level thinking activity than using a pocket calculator. Also, in each experiment students were asked to do sample calculations using Scientific WorkPlace. Students were then asked, Did the computers keep you from learning the lab math? Only 9% answered yes. The remaining 91% answered no; one student commented that the computers helped.

The program was initiated fall 1996. Our prior experience was an incomplete pilot run for three semesters. Thus, our experience is limited. We are not a large school; the number of students affected to date is small. However, we do feel that the experience has been positive and offer this description as a preliminary progress report.

Howard A. Kivett, *Instructor of Chemistry*

For further information contact the author at: Fort Scott Community College, 2108 S. Horton St., Fort Scott, KS 66701.
e-mail: howardk@fsccax.ftscott.cc.ks.us

Women's Support Services

Women's Support Services (WSS) at Houston Community College System offers educational and social services for displaced homemakers, divorcees, single mothers, and socially and/or economically disadvantaged women. Training includes occupational and vocational instruction in addition to academic transfer preparatory coursework. WSS encourages certificate or associate degree completion; however, women are welcome in the program if they desire only to upgrade job skills.

WSS offers a variety of free seminars for both potential and currently enrolled students. These seminars relate to career counseling, job interview skills, resumé preparation, community social services, parenting, mental health issues, study skills, financial planning, legal assistance, and other topics of general interest to women. Personal, group, and academic counseling sessions are also provided. Peer mentors are assigned to new members, and free academic tutoring services are available. Community leaders and experts in selected business fields are featured in monthly seminars and provide a working network of professional contacts. Receptions are held as program introductions and as public acknowledgment of accomplishments.

Financial scholarships for tuition and books are awarded regularly to qualified women. Subsidized partial payments to the child care center of a WSS mother's choice provide child care assistance. Free city bus tokens are given to those in need of public transportation. Other resources for WSS members include job placement services and a lending library of textbooks and general interest books.

Publication of program information within the college and in the general community is critical. Mass mailouts to selected geographical areas in the city are useful. In addition to printed and audio-visual advertisements, regular contact is made with community organizations, governmental agencies, churches, and other networking institutions to establish business relationships and serve as resources for program referrals, speaker networks, and potential contacts. Board of trustees members are selected from local businesses and attend monthly meetings.

Suggested variation

One significant variation in 1991 was to include men in the target population. The program is now called "Support Services" (SS); however, few men have yet to participate actively.

Estelle S. Jeu, *Graduate Student, Community College Leadership Program*

For further information contact the author at The University of Texas at Austin, SZB 348, Austin, TX 78712-1293.

Suanne D. Roueche, Editor
April 4, 1997 Vol. XIX, No. 11

INNOVATION ABSTRACTS (ISSN 0199-106X) is published weekly following the fall and spring terms of the academic calendar, except Thanksgiving week, by the National Institute for Staff and Organizational Development (NISOD), Department of Educational Administration, College of Education, SZB 348, The University of Texas at Austin, Austin, Texas 78712-1293, (512) 471-7545. Periodicals postage paid at Austin, Texas. POSTMASTER: Send address changes to INNOVATION ABSTRACTS, SZB 348, The University of Texas at Austin, Austin, TX 78712-1293.
E-mail: sroueche@mail.utexas.edu