A LAB FOR A

The PC in Tennessee: Innovation and efficiency in the volunt

California's Silicon Valley may reign as this country's most productive spawning ground of computer research and development. And tough, mostly young computer companies may feel compelled to scour the archipelagoes of the Pacific for cheap manufacturing sites in order to meet projected product demand. But without training grounds, the computer revolution would be mired in strategy sessions. In the cause of training the troops—or what has come to be known as computer literacy—college and university campuses are converting to computer boot camps. No school has joined the crusade with more enthusiasm than Memphis State University in Tennessee, site of the recently opened Computer Literacy Lab.

In mid-1981 college computer courses more often than not either focused on programming or carried titles such as "Computers in Society." Neither approach was satisfactory. The first was designed for up and coming specialists, apprentice macrowizards, and robot designers. The second appealed to anyone in need of extra credits for graduation. Classes offering hands-on experience were rare; at Memphis State they were nonexistent.

Like the microcomputer industry that created it, the problem of training users was new. It's still new, and solutions must be considered experimental. But after a

LL SEASONS

year, our experiments at Memphis State exhibit many satisfying signs of success. We're well on the way in our pursuit of computer literacy—at least locally.

We knew where we wanted to go even if we weren't sure how to get there. The plan required a laboratory, computers to stock it, faculty, the blessing of the administration, and money. Bureaucracies, even benign and enlightened ones, prefer proposals to dreams. The dreamers at Memphis State weren't prepared to write a proposal. Who, after all, was the course supposed to attract? Should there be prerequisites? How do you teach microcomputing? Guidelines were scarce.

Interested faculty members formed a committee and talked the plan over with local computer consultant Charles Brandon III. "Why not a course like this?" someone asked him, thrusting forth a syllabus. But Brandon had already come up with a plan.

He sketched out a broad-based liberal arts approach that would introduce students to hardware, systems applications, organizational impact and related societal issues. With his suggestions we wrote a concrete, comprehensive proposal.

Brandon agreed to join the University faculty for a year. For him it was a labor of love. He and an attorney friend, Frank Watson, raised $135,000 from local indus-

try to remodel and equip the laboratory and to support the course during its initial run. Most of the money came from the Federal Express Corporation, headquartered in Memphis. In addition to its philanthropic motives, this nationwide delivery service hoped to benefit from computer training for its employees. Several gifts came in anonymously. The Memphis-Plough Community Foundation, established by Abe Plough, the pharmaceuticals magnate, volunteered to administer contributions.

The mad race to be operational by spring semester 1982 was on. We met with the dean and the president to solicit their support. Someone talked to the director of the Memphis State University Foundation to make sure there was no conflict between fundraising efforts. University attorneys drafted a contract with Memphis-Plough that would allow Memphis State to accept the gift of a laboratory. We discovered that universities think 12 times before accepting contributions of services and equipment.

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Every decision was important and no details were trivial. The physical plant people had to approve the remodeling plans, and the plans themselves required a hundred amendments. How many stations? How many students to a station? How wide? How deep? One shelf or two? What colors? How much memory for the computers? Which computers? One or two disk drives? How many printers? Modems?

Choosing Hardware

Of all the questions our most pressing was, "Which computer?" We needed 20 units, a difficult order to fill for the brand new, if already burgeoning, industry. Choosing the best make for our purposes was a shared but nonetheless enormous responsibility. Four of the faculty members on the committee owned Radio Shack Model IIs and were comfortably familiar with them. With 64K RAM, 8-inch disk drives, and an array of compatible software, the Model II was an attractive contender.

Just before decision time, rumors of an impending IBM microcomputer began circulating through the corridors. Within a few weeks IBM confirmed the rumors, but it could not promise delivery of 20 PCs during November, our delivery deadline. We heard that IBM had committed much of its production to ComputerLand. The ComputerLand of Memphis was prepar-

Computer Literacy for the People

Now is the time for all good colleges to come to the aid of their students.

"There's a battle outside and it's raging." Actually the battle for computer literacy rages inside, more often than not within the halls of academe. And it's more a struggle than a battle. True, it's not exactly raging, but it is growing. So modify the motto: "There's a struggle inside and it's growing."

Many colleges have boasted computer science departments (or computer divisions of their math departments) for years. The introduction of personal computing, however, has stimulated demand for computer instruction. Previously, computer science departments trained programmers and provided assistance to nonspecialists—in genetics, library science, and history, for example—whose disciplines require at least some facility with computers.

As the number of applications increases and micro hardware becomes more accessible, everyone from math-phobic humanities students to assistant managers of local supermarkets is looking for a place to sign up. Some colleges such as Memphis State have adopted the sensible, but at this early stage, still experimental, lab approach to computer literacy. Others have set goals that incorporate more than one strategy. Duke University provides an excellent example. The venerable Durham, North Carolina institution is charging forward on several fronts. During the past 2 years, it has implemented a campus-wide computer networking system, initiated summer computer camps, established a large computer lab, and introduced micros to clerical levels of the university administration. The IBM PC figures prominently in all these applications.

Duke required a minimum of 100 microcomputers that would not become obsolete for at least 8 years. Its PC specs included 64K RAM, two floppy disk drives, Zenith monochrome monitors, the UCSD p-System, color adapters, and asynchronous adapters. The university decided on the IBM PC due in part to an arrangement proposed by IBM. The corporation offered a break in the price for its PCs in exchange for Duke's commitment to create a users guide/student workbook, introductory course description, and syllabus. This joint venture agreement is typical of IBM's support of universities.

DUCK Season

Duke University initiated a computer youth camp during the summer of 1981. The first courses, collectively referred to as DUCK (Duke University Computer Kamp), enrolled 236 students. They chose from four 2-week residential sessions and a 1-week nonresidential session. Resident computer campers stayed in undergraduate dorms and shared meals in the cafeteria with university students and faculty. The youths were divided by age and experience into teams, each of which was assigned a camp instructor.

The academic staff included university instructors and local high school math and science teachers who adapted well to the material and were especially good with young people. The camps maintained a one-to-six staff/student ratio for PC lab periods by relying on assistants, many of whom were computer science majors from the university.

Instructors taught general hardware and software principles as well as science, business, education, government,

ing to open but it wasn't ready to deliver such a sizable order. Unable to lay our hands on a real live IBM PC, not to mention 20, we opted for Radio Shack. Then another rumor drifted in from Arkansas: ComputerLand had opened a store in Little Rock and yes, it could deliver 20 IBM PCs during November.

"Which will it be," we asked ourselves again, "Model II or the PC?" One was familiar and trusted with reliable local service and ample software. The other was completely new and unseen and came with only a modest retinue of software. Despite IBM's outstanding service record with mainframes, the availability of local servicing for the PC was untested. With 20 computers in nearly constant use, servicing was a crucial consideration. Still, IBM's record carried some weight. And Charles Brandon predicted exponential growth in software for the PC.

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The PC's potential usefulness to our computer science program gave it the lead. It is a 16-bit machine at the beginning of its life cycle, as opposed to an 8-bit machine at its peak. Its capacity for expansion—an empty 8087 numerical processor socket and five expansion slots—made it more alluring. A cottage industry was already beginning to produce components and software to extend the adaptability of the PC and IBM was talking about producing a series of operating systems, including a version of UNIX. After assessing these considerations, we decided to go with the IBM, and none of us at Memphis State has regretted it.

The Lab

With the computer order placed, we shifted our attention to the Computer Literacy Lab. There was still plenty of work to do. A separate air conditioner was installed, not for the summer, but for winter. The University's cooling system worked fine but its heating was overwhelming. The first antistatic carpet threw ½-inch-long sparks. Carpenters and electricians crawled all over the walls and ceilings. Committee members struggled over course outlines and plans for lab sessions.

Courses at the Computer Literacy Lab are open to the community as well as to full-time university students. An observer

(continued)

Instructors taught general hardware and software principles as well as science, business, education, government, and entertainment applications. The entertainment angle proved itself particularly useful as a teaching device. The course load was distributed over 17 classroom lectures and 26 lab sessions. Guest speakers described applications in detail and field trips provided opportunities to observe the PC beast in its natural habitat. Novice campers learned BASIC, intermediate students computed in Pascal, and undergraduates used the UCSD p-System.

In 1982 enrollment jumped to 600. The course emphasis shifted to programming. The previous year's experience indicated that the students were most highly motivated by games, so the new DUCK season stressed game creation rather than participation. At times instructors had to reign in their charges, who, they discovered, preferred games to meals.

Down the Road

The year 1982 also marked the debut of Duke's two permanent computer teaching labs. Both have at least 40 IBM PCs and four or five printers. Instructors expect to minimize reliance on hard copy by requiring floppy disks for homework assignments. Dr. Kevin Bowyer, assistant research professor in computer sciences, explains that disk assignments allow for better evaluation of students' work and more realistic preparation for careers in business, government, science, or education, in which the importance of hard copy is likely to diminish. Bowyer expects that handing out and receiving class assignments electronically may become routine in the near future.

To prepare for that day Duke has placed clusters of five or six PCs at various locations on campus. The IBM PC population at Duke now exceeds 180 units, which inspires Dr. Bowyer and others to envision an extensive networking system that would facilitate file transfers and homework distribution.

The introduction of personal computers has greatly enlarged the role of the computer science department at Duke University. The math and engineering departments have discovered the labs and frequently reserve them for their own purposes. Medical and technical personnel are interested in using the PC to monitor scientifically controlled experiments. Clerical staffers have broadened the university's technical support base by engaging the PCs for word processing and other administrative purposes.

Dr. Bowyer believes these applications are just the beginning. He observes that many faculty members, administrative staffers, and students are unaware of the personal computer facilities available to them or have otherwise not begun to exploit them fully. He expects that once the campus discovers what the PC can do, it will generate greater demand on the network. In fact, Bowyer anticipates that enrollment in the computer sciences will soon reach 80 percent of the student body.

The growing popularity of PCs at Duke and at other institutions has created at least one problem for which a solution is nowhere in sight. If Duke needs 180 copies of a particular copyrighted program, it must buy 180 disks. Software manufacturers devise copyright policies to protect themselves from the abuses of individual users, but the effect on institutional users with limited finances can be very inhibiting, if not disastrous.

By pressing ahead in the struggle to assure computer literacy to anyone who desires it, Duke University provides a model for other schools across the country. The overall effect of the rush to establish new microcomputer applications and literacy labs, camps, and courses is the democratization of computers in America. And that's what revolutions are all about. – Morgoret Brooks

stepping into a lab session could find businessmen, housewives, professors, retired couples, and popular rock singers among the 24 students working in the carrels. They use their 3 hours a week to write simple programs; experiment with word processing, electronic spreadsheets, and data base packages; and extract information from public access data banks such as The Source.

Many students were skittish at first. Now excitement and enthusiasm are more evident. A constant clamor fills the room. "Do you know how to fix titles on VisiCalc?" "Can you help me? I can't get THDB (Tiny Hierarchical Data Base) to print out what I want." "Come and see what this little program is putting on the screen!"

The Course

The Computer Literacy Course eases students in. Starting with "What Makes a Computer Compute?" it goes on to discuss the impact of computers on organizations and society. Technical subjects such as digital logic and the manufacture of silicon chips are treated lightly. The lecturers cover other subjects, such as the gross architecture of a computer, with more care and attempt to make unfamiliar words (or unfamiliar contexts of familiar words) such as *assembler*, *compiler*, *interpreter*, and *operating system* meaningful concepts to the students.

We rely heavily on case studies as aids in learning applications. And because many of our enrollees are considering purchasing microcomputers for their homes and/or businesses, we discuss these applications and study the life cycle of business computers. We culminate the course by studying such societal issues as privacy, the effects of computers on the labor force, and computer crime.

Students spend as much time in the lab as in the classroom. In the first lab session they combined NAND and NOR gates into flip-flop circuits and half-adders. By midsemester they had embarked on course projects. They were required to produce their reports on a word processor and use at least one of the other software packages they had studied (or perhaps a program of their own).

One student combined a voice synthesizer with an IBM PC to give lessons in French. Another produced and analyzed student surveys for an exercise class. One of the more unusual projects was a program to teach the Lord's Prayer to deaf children. The most sophisticated was a load analysis program to determine cargo and fuel weights and placement for aircraft.

The lab sessions are headed by Austin Smith with two assistants. For some applications programs they relied on tutorials from the manuals. For others, we prepared our own detailed instructions. We assigned regular graded lab assignments. After discovering that the original 3-hour lab sessions were too long (the last half-hour was usually unproductive), we adjusted the format to two 90-minute sessions per week. This schedule is working well.

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Other Uses of the Lab

This past summer we offered two 1-week computer day camps for junior high school students. In each, 30 seventh and eighth graders spent 3 hours in the lab every weekday morning learning to program the IBM PCs in BASIC. We taught by experiment; the students were given brief instructions and encouraged to experiment for themselves. For example, an instructor would ask them to fill the screen, draw a triangle, or build a Christmas tree using the commands Locate, Print, and For...Next. By the end of the week the students were flying solo, making pictures on the screen and printer, designing games, and generally having a ball.

In September we added a Seattle Computer memory board with an additional 64K RAM (expandable to 256K and containing a serial port) to each PC. This allowed us to use IBM's Macroassembler for teaching a graduate level microcomputer programming course in the Literacy Lab. This course concerns itself with the organization and assembly language programming of the IBM PC. Enrollment is restricted to 15 students, one per lab station.

The Lab has been used by students of a finance class from the School of Business and by various elementary math classes. University instructors with 200-student sections use the lab's VisiCalc for record keeping. Marathon Saturday workshops entitled "The Personal Computer for Home and Office" are scheduled for fall and spring. Three-day training seminars for Federal Express managers are to be held once a month beginning in January. The corporation will limit enrollment to 15 participants, one for each computer. We are considering using the lab for beginning computer science courses. To this end, the department has acquired a Pascal compiler. The possibilities seem endless.

One Year Later

We circulated a questionnaire the last day of class that confirmed student enthusiasm for the course. "I've lost my fear of the computer/techno revolution," one student remarked. "I now realize that computers are here to stay and I'll devote my energies to using them instead of fighting them. Big change for me!"

The IBM PCs valiantly withstood inexperienced use and abuse. One even survived the overflow of an air conditioner drain onto its keyboard. During 9 months of operation, we've had only a couple of minor disk problems and have replaced only three memory chips. Austin Smith has learned computer maintenance from IBM technicians. Equipped with a full kit of replacement parts, he has had little trouble keeping the equipment running.

The Epson MX-80 printers, which are essentially the same as IBM printers, interface with no effort. Our supervisor's station contains a two-drive IBM PC with a Radio Shack Daisy Wheel II letter quality printer attached. Again, interfacing these two pieces of equipment posed few problems. The Radio Shack direct-connect modems allow our PCs to communicate with other computers via telephone.

Our first semester is over and the second is under way. We are pleased with the students and faculty and are proud of our Computer Literacy Lab. */PC*

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