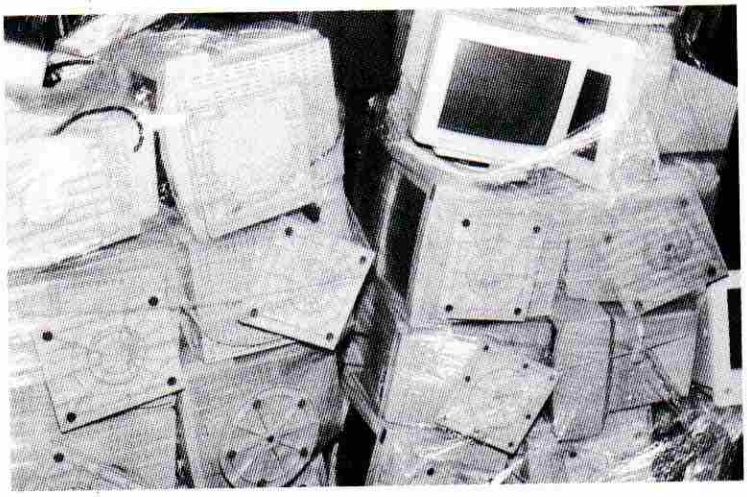
Peter Zelchenko

Exploring Alternatives to Hype

Don't be fooled by the frenzy to get the newest, fastest, trendiest, and most expensive technology into the classroom.

During a recent campaign debate, one candidate for an Illinois office made a comment typical of policymakers today. The candidate lamented that Illinois ranks 44th among U.S. states in terms of the number of computers in each school—and he associated the ranking with low computer literacy among state employees. Although his numbers may have been accurate, such a connection between the number of computers and the degree of computer literacy is one-dimensional.



Old, 14-inch monitors are stacked in warehouses, probably never to be used again.

The question should not be how many computers there are, but how well our schools make use of what they have. This is particularly true in an atmosphere in which money, and the equity it can bring, is not likely to materialize on its own. For obvious reasons, the captains of industry—and their witting or unwitting promoters—are unlikely to acknowledge the value of older technologies; they want us to buy new. Therefore, we must dig into our warehouses and discover the value for ourselves.

From Railroads to PCs

Today's technological robber barons are Gates, Barksdale, McNeely, and Dell. When Vanderbilt, Stanford, and Pullman were building the railroads, they preached "a better world for all," but in reality their empire primarily functioned to transport goods and privileged urbanites. Though the poor could not afford to ride the trains, they did hold service occupations—typically backbreaking labor—building and maintaining these railroads.

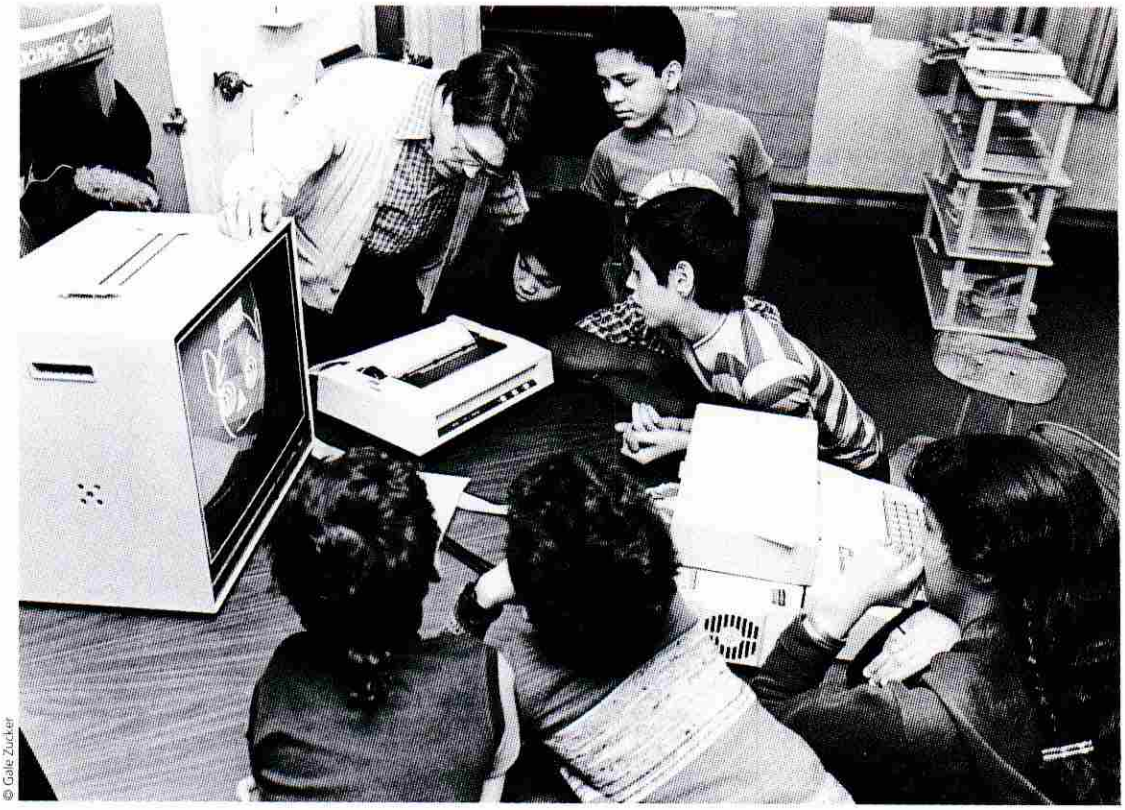
Now, with computers and networking technology the fastest growing industry in history, not even the menial jobs are going to the nation's poor. This new labor remains mostly in the hands of the college-educated middle class, whereas manufacturing is increasingly handled overseas. Although the sheer numbers of the U.S. working class are greater today than they were in the heyday of the railroads, these new workers are less in demand.

Nevertheless, we want to improve the odds by giving all young people broad, early exposure to computers so that each graduate can learn any new computer application quickly. A networked computer, after all, is not very different from a table saw or a food mixer: It is merely a tool, with a finite set of core controls and functions. To the computer literate, there is little difference between one computer and another, one software version and another, or one operating system and another.

After the turn of the century, the railroads began to take a second seat to newer, faster, and more costly transportation. In like manner, educational technology that 25 years ago was to be the wave of the future now collects dust in most schools. Filmstrips, LPs, audiotapes, and, more recently, videos and CD-ROMs waste away on musty shelves in the back rooms of thousands of school libraries. Now our school systems are getting rid of early film- and computer-based technology only because we are told that it is old.

The material on these older media looks similar, from a strictly pedagogical standpoint, to what is packaged and sold today as new. In fact, today's instructional designers review the old media for tricks and techniques, and companies scour their older content for materials to repackage or license. Sometimes the new products are identical to material that has been available for decades. I was surprised to see Magellan, the highly touted Internet-based brainchild of Lotus and IBM,

offering software that I wrote for the PLATO system more than 20 years ago. Scholastic sells a math game for the Macintosh that was originally created almost 30 years ago. These are the same products that the school systems paid for long ago, but they come in sexy, new packages and can cost a school system millions of dollars. To make them appear novel, exciting, and generally more salable, companies are reusing and repackaging the identical concepts and products under brand new names and on brand new platforms.



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Bringing Back Old Technologies

In the midst of all the hype, it is refreshing to see some schools still using older technologies. On the South Side of Chicago, in a yellow trailer extension of South Loop Academy, a number of Borg-Warner System 80 consoles light up several times a week for students needing remedial phonics practice. These archaic devices are fully photomechanical, with color-slide cartridges and accompanying audio LPs. They give visual and audio stimuli, and the students select their answer from among five choices. Slots in the cartridge deliver appropriate feedback and advance to the next frame.

The machines are 25 years old, with designs dating back to such educational ancients as Norman Crowder, who developed the Autotutor in the 1950s, and his predecessor, B. F. Skinner. Yet as obsolete as they seem—they would never make the pages of *Wired* magazine—the Borg-Warner machines are still productively used today. In fact, educators are now using many drills, for years derided as overly repetitive, as a viable counterpart to more progressive techniques.

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Other educators are experimenting with repurposing old PCs. Whereas students may learn from dissecting the inner workings of 8-bit and 16-bit machines, later-generation equipment, including 80386s and 68020s, may actually play an important role in schools. These machines typically have color displays and can run Windows 3.1 or Macintosh System 7; they are perfectly adequate for powerful word processing and a mass of other core competency software.

In fact, some technology specialists are exploring the notion of making these machines network-capable. Stacked by the thousands in warehouses of the largest school systems, these computers could be reborn into classrooms if the networking dreams of Sun Microsystems and other companies become a reality. Recently dubbed "thin client computing" and populated by inexpensive network computers, Sun's designs spell a renaissance for server-side computing, which in many ways fits the Internet model better than today's designs.

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In Sun's brave new world, client computers are machines of very limited capability, with the minimum hardware and software needed to bring them up on a network. More powerful servers feed these machines with application data. This kind of system architecture, on whose philosophy the Web itself is based, falls somewhere between mainframe computing, in which terminals

are simply remote-control typewriters, and peer-to-peer computing, in which every computer must be expensive, lightning fast, powerful, and overburdened with cumbersome and conflicting hardware and software.

A few technology specialists are thinking about how to use older PCs in this environment. The machines, sometimes even stripped of their hard drives, would have minimal network support for a few dollars per unit. They would boot from read-only memory on the network cards, searching the local network for a nearby boot server. They would then load only rudimentary graphical interface controls or a stripped-down Windows operating system. The server would do the rest of the work.

Applications could also be downloaded on demand to client workstations. These applications would be placed in temporary caches on the local hard drives. If the hard drive ever failed, or if the application were ever updated, the old material would be erased and the application automatically reloaded from the server.

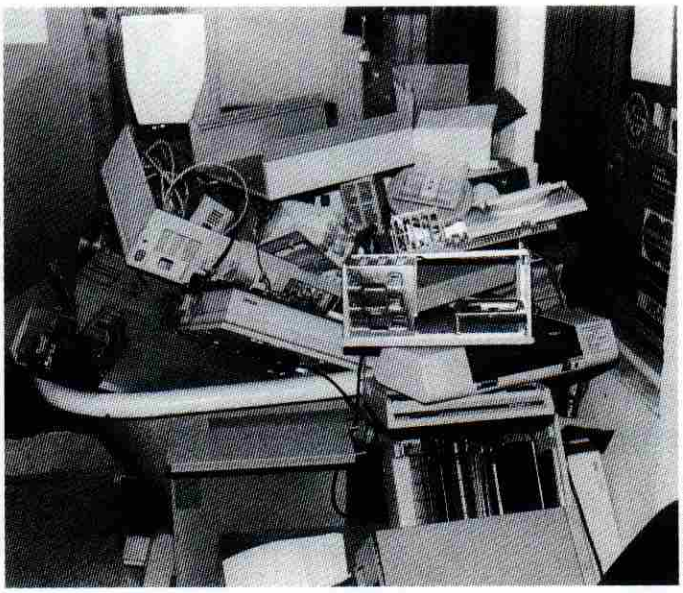
Administrators may be surprised that both Macintosh and Windows networks of 10 years ago were already capable of doing something very close to this slimmed-down client computing by loading applications over the network instead of installing them locally.

Indeed, we are finding that there is nothing new under the sun. Mainframe computing, ancient hardware and software, direct instruction—all are coming back in various ways. Dollar for dollar, reuse of this sort is eminently cost-effective and should not be underestimated by school systems.

Computer As Innovator, Informer, and Instructor

We must continually ask ourselves what computers truly do best and how many computers of what capabilities a school really needs to invest in. I subdivide computer capabilities into the "three I's"—the computer as innovator, informer, and instructor.

By *innovator,* I mean a machine that aids the user in producing creative new work in composition and tabulation. This simply means that the student is the active creator in word processing; image or audio manipulation; and spreadsheet, database, and programming work, whereas the computer is largely a passive tool for entering or editing the student's work. Obviously, word processing is by far the most important activity in this group—indeed, most people use a computer as a word processor 9 out of the 10 times that they sit down at it. And older computers—some older than the students using them—can adequately provide this service. Tens of thousands of old computers are functional, and there is no reason to upgrade either hardware or software. Basic database and spreadsheet software, also as old as the hills, can run even on the slowest black-and-white computers. As for higher-order innovative operations, such as image and audio manipulation and high-level programming, a school needs only a small number of these powerful machines.



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The famous "bathtub of parts" at Chicago Computer Exchange offers free parts to anyone who can figure out how to use them.

The great majority of student computer time has been and will continue to be spent in this innovative mode, where the student uses relatively low-power applications to produce new work. The other two categories—the computer as informer and as instructor—occupy, as they should, lesser roles in schools.

Computer as *informer* occupies the middle tier of student computer use. In this relationship, the student and the computer share equally in the role of revelation. The most obvious manifestations are World Wide Web browsers, computerized library search engines, and CD-ROM information bases. The student actively refines the search strategy while the computer and servers work hard to process the search. The operation is balanced in mutual effort.

This is really a "get it and go" activity, on which students shouldn't spend more than 30 minutes at a time. To keep students from drifting away from their tasks and getting lost on the Internet or inside a CD-ROM, teachers increasingly reserve Internet resources for library research only.

Many librarians have identified Internet work as a standing operation and do not allow chairs at the stations. Some schools have Internet stations only in libraries or hallways. In addition, schools frequently place time restrictions on Web use. This not only gives everyone a chance to use often scarce network resources, but it also reinforces the notion that students should have a specific goal before sitting down at an Internet-enabled workstation.

For these reasons, schools do not need more than a few Internet-connected computers—preferably in the library, where students can appreciate that printed publications and the Internet are both tools for research. With slim funds allocated to public

schools for technology, the best solution is to have a few good machines strategically placed and online through a small, shared, permanent connection to the Internet.

Drill-based activities occupy the third capability of technology, that of the computer as the fully active *instructor.* We are already seeing how older equipment—even ancient audiovisual tools whose book value is below zero because of the shelf space they occupy—can offer repetitive drill-based activities just as well as a $2,000 networked computer and can bypass high annual costs of upkeep and networking. In countless trials, we have seen that a human teacher does a significantly better job than a computer in terms of individually tailored, interactive instruction. In contrast, computers are cheaper and better at repetitive drill training. Although computer types might want the opposite to be true—that computers should be better at individually tailored instruction—educators are wisely using the old drill software more and more often. As drill sergeant, the computer supplies the task, and the student reacts accordingly.

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Newer Is Not Always Better

We have seen and heard the endless hype over computers in education today. Unfortunately, we live in a climate in which big business is welcome to walk into our schools and convince administrators how badly we need the latest and greatest. Fast-talking educational consultants tell us that they know what's best for students.

This hype should be tempered by our understanding of what computers can do in schools; computer applications fall into different categories, the majority of which can be satisfied with existing investments. We can find hundreds of alternatives to surrendering our education dollars to the barons of industry on so-called cutting-edge products. On the contrary, with keener eyes we will see that the new is often the old in a new package and that the old works just as well. ■

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