



IDEAS

BENEFITS OF INTERACTIVE TECHNOLOGIES

■ According to Rockley L. Miller, editor and publisher of the Videodisc Monitor, videodisc education has the following advantages:

- **Reduced learning time.** Studies find videodisc systems cut learning time by as much as 50 percent.
- **Instructional consistency.** Technology-based systems do not have "bad days" or tire at the end of a long day.
- **Privacy.** Students are free to ask questions and explore areas that might cause embarrassment in groups.
- **Mastery.** Unlike a normal classroom situation, the interactive system will not move on to new material until current material is mastered.
- **Increased retention.** In some studies, retention is increased by as much as 25 percent.
- **Increased safety.** Students can explore dangerous areas, such as the chemistry of explosions, without risk.
- **Reduced behavioral problems.** Interactive systems focus attention and increase individual involvement, thereby reducing the potential for misbehavior.
- **Increased motivation.** The high level of feedback and individual involvement encourages persistence.
- **Increased access.** Systems can deliver courses to one or two students in situations where it would not be economical to hire a special teacher; students can use simulated laboratory equipment instead of actual equipment that might cost tens of thousands of dollars.

— S.L.G.

COMPUTERIZED TEACHERS

Videodiscs Liven Up Learning

Desktop, computer-controlled systems give students new ways to do research or develop skills

By **Simson L. Garfinkel**

Staff writer of The Christian Science Monitor

BOSTON

EVA PAWLOWSKA, Heather Dinallo, and Jenny Shulman know what the United States would be like if Michael Dukakis had been elected president.

Using resources stored on a single videodisc, the three seventh-graders examined Mr. Dukakis's positions on abortion, drugs, education, and the environment, then compared each with the views held by George Bush. They examined commercials by the candidates, answers to reporters, and remarks during the presidential debate, and then looked at maps and exit poll data to determine which answers were the most important to voters. And they did it all without leaving their classroom in Shrewsbury, Mass.

What made the project possible was a desktop computer, a computer-controlled videodisc player, and a single plastic disc containing thousands of still photographs and dozens of short segments of ABC News television footage. Similar videodisc workstations are being introduced in the United States military and businesses around the US are using them to train workers at a fraction of the cost of warm-blooded teachers.

The system is so easy to use, Eva says, that "a first-grader could use it."

"We were just playing and found a lot of different things," adds Heather.

"You don't have to do anything but sit and press buttons," Jenny says.

Even so, teachers report that the systems are good at helping students learn — perhaps because the systems force the students to think very hard about which buttons to press.

Although videodiscs, first available in the late 1970s, haven't caught on in the home entertainment market the way videocassette recorders have, the technology has created an industry all its own: interactive video-training, which combines printed text, sound, still photographs, and full-motion video to teach students or develop business skills. A single 12-inch disc can hold 50,000 individual photographs or two hours of video; under computer con-

trol, any frame on the disc can be displayed in a few seconds. On a high-quality color monitor, the images look as good as color photographs in glossy magazines.

Another videodisc at the Shrewsbury High School contains a photograph of every painting in Washington's National Gallery of Art, with video segments in which art historians explain details such as brush stroke technique.

A third videodisc contains tens of thousands of photographs of plants, animals, and fungi, as well as a dictionary of biological terms, each one with a written explana-

tion and a full-color photograph. Promoters of the technology say one of its key strengths is that videodisc education is self-paced. The students agree: "You can go back to the issue and take out every detail that you missed," says the button-pressing Jenny.

"It captivates the interest [of students] who are very difficult to motivate in the traditional sense," says Ruth Adams, a Shrewsbury teacher who has taught with the system. "It's one thing to talk about cell division and see still-life pictures of it in a textbook, . . . [and another for students] to see a cell actually dividing in a video sequence before their very eyes." Unlike movies, Ms. Adams says, students have control over a videodisc system. "They can stop it at any time, they can interact with it, they can look up more information."



PUSHING BUTTONS: Lessons come alive through interactive videodisc programs.

While each videodisc system is different, most of them use a mouse, keyboard, or touch-sensitive screen to allow the student to

navigate through the vast multimedia database. Some systems ask questions and give students extra reinforcement when they make mistakes; others are more like computerized encyclopedias.

Shrewsbury's public schools are one of a handful across the nation where videodisc systems are being used by students on a daily basis. Far more "multimedia workstations" are being used for employee training in large corporations. One of the first systems, InfoWindow, was developed five years ago by IBM to train its own employees.

IBM isn't alone in discovering the benefits of the technology. "Well over 30 studies compiled to date have found that interactive technologies reduce learning time requirements by an average of 50 percent," says Rockley Miller, editor and publisher of the Videodisc Monitor, a trade publication.

One of the largest users of multimedia training is Federal Express, with more than 1,000 installed systems, says David Lubin, co-founder of Applied Learning in Bedford, Mass., which designed the Federal Express system.

"Everybody who is involved in dealing with the public is trained on one of these interactive systems," says Dr. Lubin. The computer, Lubin explains, teaches the employee what he or she needs to know, then administers a test and remembers the results. "The training is designed to help an individual do better on that test," he says.

Each month, when employees are retrained, the computer automatically gives each one the material that he or she didn't do well on before, as well as any changes in corporate policy.

For those who think these systems sound too much like George Orwell's "1984," Lubin says not to worry. "It's actually better than that; it's 1989. The difference between 1984 and 1989 is that 1984 people were viewing computers as a device that was there to keep track of you, keep a file on you. In 1989, our employees view this computer-based system as a device that helps them get a promotion, earn a raise, or be better prepared to meet the need of a client or the company. It's the carrot, not the stick."

The systems are also making a big difference in the US military, says Mr. Miller. The most impressive ones that he has seen have desktop mock-ups of tank instrument panels and are used to train gunnery personnel.

"You look through an eyepiece very similar to what you would actually be looking through in a tank," says Miller. Inside the eyepiece is a tiny television screen connected to a videodisc player.

"We spend \$1 billion a year on internal education programs," says James Dezell, vice president and general manager of IBM Education Systems. "We were looking for ways that we could deliver that knowledge more effectively at less cost."

"One of the first courses that we developed . . . was to train that young person coming out of college [to sell computers to] a specific industry," says Mr. Dezell. One course consisted of "11 hours of self-study, followed by 40 hours at Duke University to orient people into the health industry. We replaced that with a nine-hour interactive course. We find a 35 percent increase in knowledge retention," he says.

More important, says Dezell, "the reaction of the participants was that this was a much better, much more enjoyable, and much more effective way to receive knowledge."

Even though a multimedia workstation can cost \$10,000 or more, the money saved with the

PETER MAIN — STAFF

BOOKS

The Nonprofit

By R. Cort Kirkwood

If you never thought nonprofit organizations were worth thinking about, much less reading about, you ought to think again and read "Unfair Competition: The Profits of Nonprofits," by James Bennett and Thomas DiLorenzo.

This extensively documented and instructive book reveals how many nonprofit institutions are legally involved in more than the charitable or educational work they advertise. In fact, only 10 percent of nonprofits are involved in charitable work of any kind, leaving a huge percentage of the rest selling products on the

UNFAIR COMPETITION: THE PROFITS OF NONPROFITS
 by James T. Bennett and Thomas J. DiLorenzo
 Lanham, Md.: Hamilton Press
 214 pp., \$19.95 cloth; \$10.95 paper

free market in direct competition with profit-seeking companies. The private nonprofit sector, which includes groups ranging from the United Way to huge hospital chains, is composed of 1.2 million organizations that produce 10 percent of the gross national product.

The problem is not that nonprofits sell goods and services, but that they sell them at an advantage over for-profits by using a wide variety of governmental favors. Nonprofits pay no federal income tax, state income tax, or property taxes, and they are not regulated by bureaucracies such as the Federal Trade Commission. Nonprofit employees can contribute more in tax-free money to retirement accounts than employees of for-profits. Nonprofits receive special prices from the taxpayer-supported postal service.

Some of the most painful side effects of this unfair competition have been felt in the hospital industry. In 1910, 56 percent of the 4,359 hospitals in America were profit-seeking entities; by 1984, thanks to government favoritism to nonprofits, only 15 percent of 6,782 were profit-seeking. The rationale for promoting nonprofits is that they provide better care because they have no incentive to reduce quality in order to maximize profits, and they more readily offer care for the indigent. Don't believe it.

The authors provide compelling evidence that for-profit hospitals are more efficient and cheaper and that they provide better care than nonprofit and

government seeking hospitals not more, to. And nonprofit considered conditions. While hospitals direct or shareholders net revenues (teachers, administrators in the benefits, and p

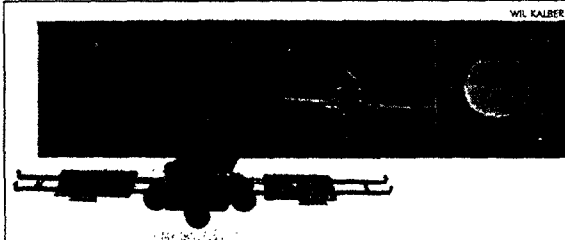
So great is nonprofit hospitals that some are profitable catering general public, become middle maceutical business the detriment of ers. Using tax relief, "an entire pharmaceutical profits] special the excess being; price to "broker on the retail ma

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■ R. Cort Kirkwood
 writer for the Was



SOVIET PHOBOS 1 AND 2 SPACECRAFT

SCIENCE COMMENTARY

Soviet Mission: Mars

LOSS of contact with the Phobos 2 spacecraft when it was studying that martian moon last March was a great disappointment for Soviet - and world - science. But it's a mistake to continue to consider the twin spacecraft mission only in the light of that failure. It pioneered new types of Mars study and returned data whose value is becoming evident. The Soviets say they will learn from the mistakes and carry on.

We should take them seriously. They had failures at Venus, too. In the end, they succeeded brilliantly. Their craft even returned data from the sizzling (455 degrees C) surface. Vassily Moroz of the USSR Academy of Sciences' Institute of Space Research noted during a recent United States visit that the Soviets sent 15 spacecraft to Venus over 20 years. Now, he said, "We have decided that our next beloved planet will be Mars."

The limited success of the aborted Phobos mission shows what the Soviets can do - especially when they draw on outside strength. The project had 15 international partners, including the European Space Agency. The Phobos 1 and 2 spacecraft were equipped to study Mars, the sun, and the interplanetary medium, as well as the moon Phobos.

Yuri Zaitsev, who heads the academy institute, detailed the data harvest recently in New Scientist. He says that Phobos 1, launched in July 1988, returned 140 "high quality" photos of the sun, and other important solar data before operator-error disoriented the craft. Phobos 2 made even more extensive solar and interplanetary measurements.

The Mars data include the first detailed infrared images of the planet - images that literally picture the surface by its heat emission rather than by reflected sunlight. They cover an equatorial band about 1,500 kilometers (932 miles) wide showing details as small as 2 km across. Other instruments recorded emissions at many wavelengths that should help in analyzing mineral composition of some surface rocks. A profile taken through the atmosphere records the distribution of various gases with height.

Intriguing data that show the interplay of magnetic fields and particles around Mars suggest how the planet loses its atmosphere to space. Electrically charged gas particles in the upper atmosphere leak away along magnetic channels. Mars' atmosphere is losing between 1 and 2 kilograms of its substance a second. At that rate, Zaitsev says, Mars could lose its atmosphere in a time much shorter than the age of the solar system.

At Phobos, the craft took 40 TV images from distances between 200 and 400 kilometers, showing details down to 40 meters (131.25 feet) across during its closest approaches. These and other data have enhanced knowledge of this moon even though the craft lost radio contact on March 27 before it could close in and land instruments. The new data tend to confirm speculation that this dark moon (4 percent reflectivity) is similar to carbonaceous chondrite meteorites. Its surface temperature was about 27 degrees C. Gravitational interaction between spacecraft and moon will help scientists pin down the moon's mass, density, and internal structure.

The Soviets have shown the potential for advanced martian research. Their next challenge will likely be a 1994 mission, now awaiting final approval. It would include surface probes and instrumented balloons as well as a Mars orbiter. If Soviet space scientists become as successful at Mars as they have been at Venus, they will open valuable opportunities for international collaboration, including US-USSR cooperation. Let's wish them well.



ROBERT C. COWEN

"You select your ammunition, aim, and fire your weapon."

The simulation is so good, Miller says, that when students move to live ammunition, more than 93 percent score hits on their first try. Since live ammunition costs almost as much as the computer system, he says, "they pay for themselves almost every time they are used."

The systems also make training fun: "This is one of the first training systems ever to be placed in the military where recruits have been known to break into a training center in order to be trained. . . . We often joke that if you put a quarter slot on it, you could reduce the defense budget."

According to Miller, there is an installed base of nearly 140,000 videodisc players being used for purposes other than home entertainment. Approximately 68,000 of those systems are used for industrial training, 20,000 in education, 13,000 in military training. "We are finding that the industrial market is growing at a 30 percent growth rate annually," he said.

Only a quarter of the cost of interactive training is hardware, says Miller. The rest is production of the videodisc and writing the computer program. Nevertheless, cost remains a major stumbling block for schools.

"We had to wait weeks to complete our project," complains 12-year-old Eva. Her school has only two videodisc systems - two more than most grade schools in the country.

Another barrier is the difficulty in compiling the multimedia database. Filming and collecting the textual explanations can be a long, arduous process, complicated by securing permission from the copyright owners of the source materials.

Even after all the information is assembled, getting everything to work together properly can be a challenge. "It would show you a picture of a clam and the text was of an octopus," says Ralph Mastrotorio, a Shrewsbury biology teacher, of one of the early videodisc systems.

An even newer technology that might help interactive training involves compact discs similar to those used for music. Called Digital Video Interactive, it uses a special computer-chip to squeeze hours of video onto the tiny disc and another chip to play it back. Right now DVI is still in the research laboratory, but IBM plans to make it - or a competing video compression scheme - standard equipment on its line of personal computers within a few years.

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