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WINTER 1986

AMERICAN Educator

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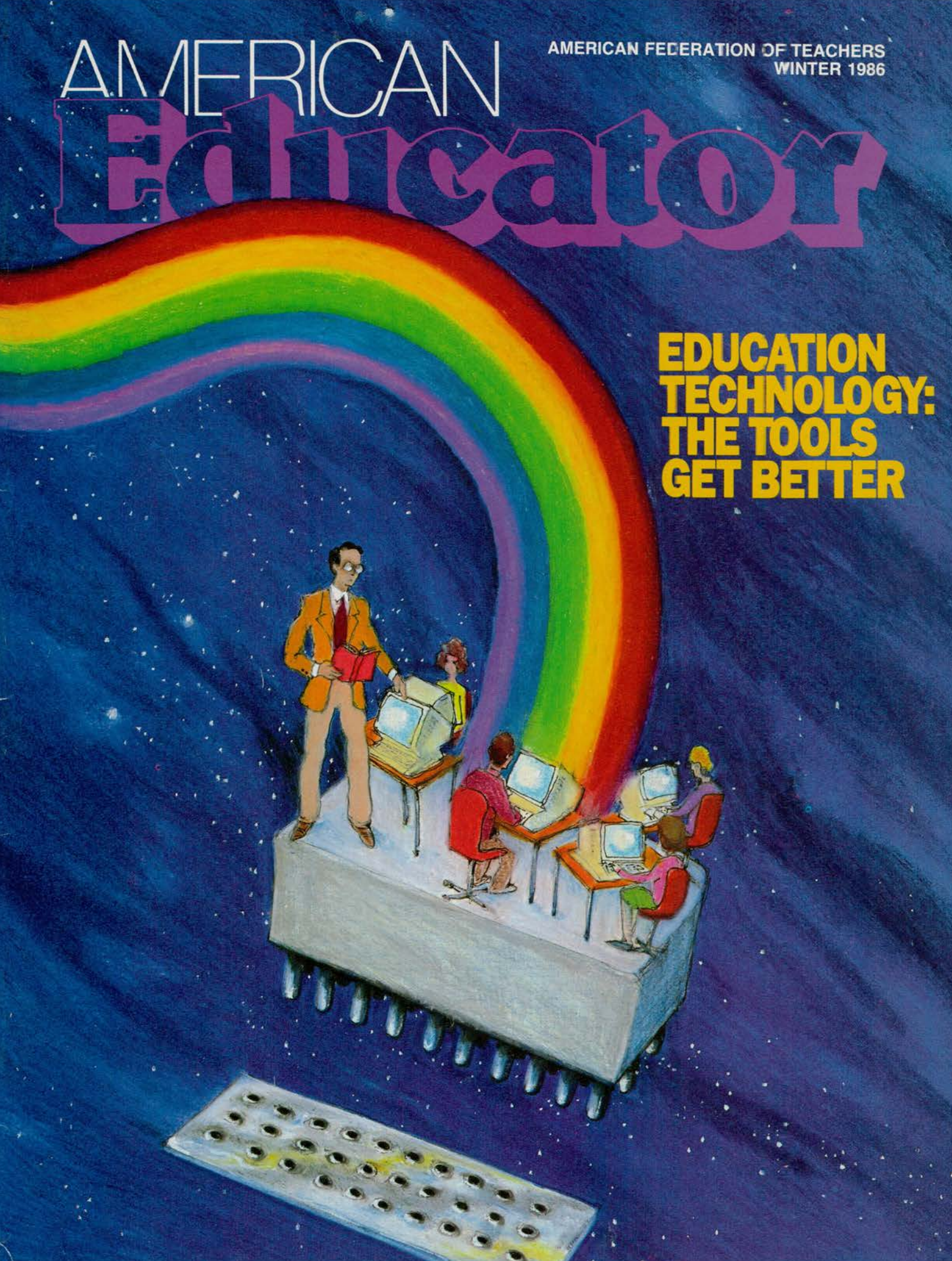

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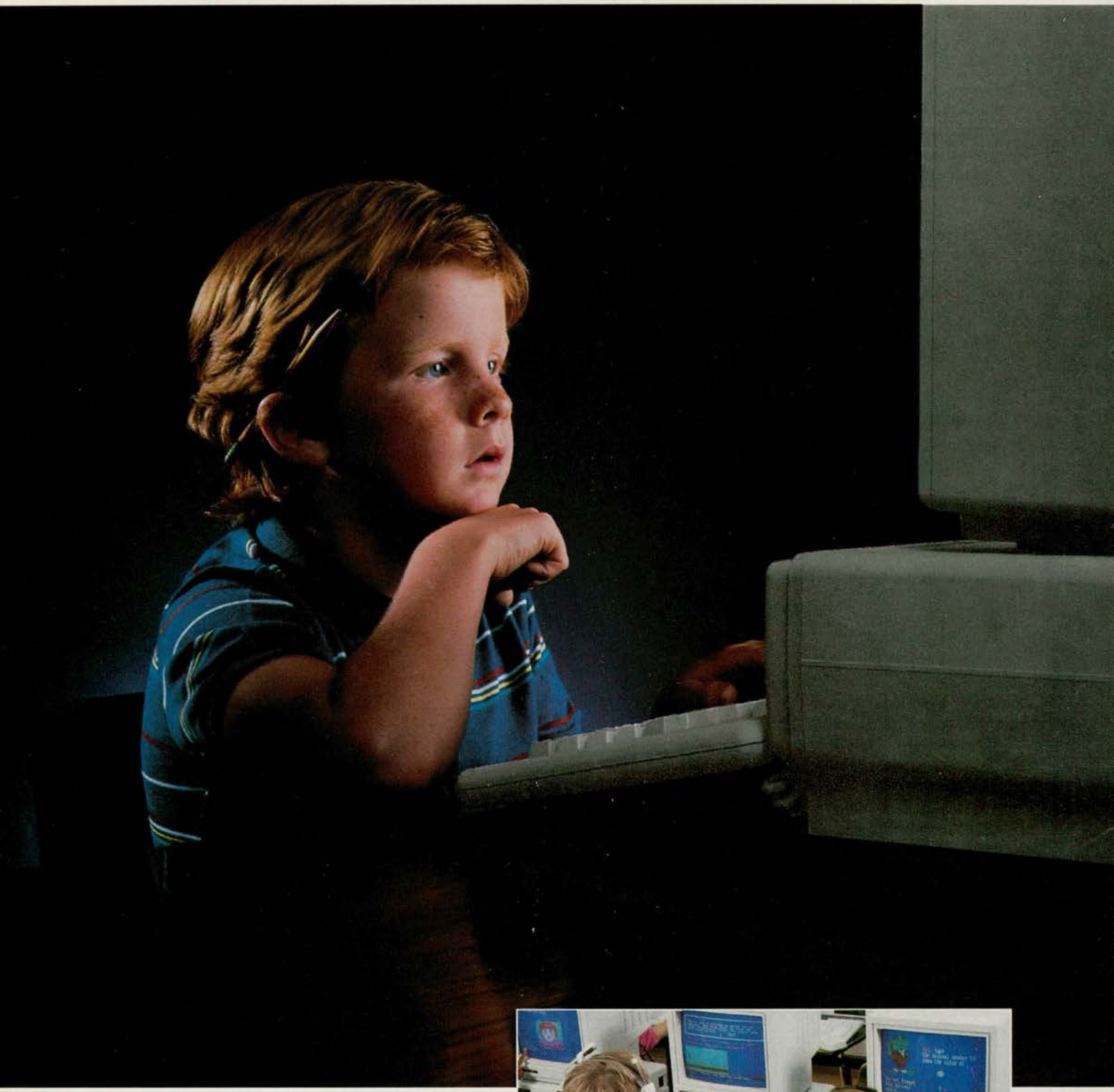

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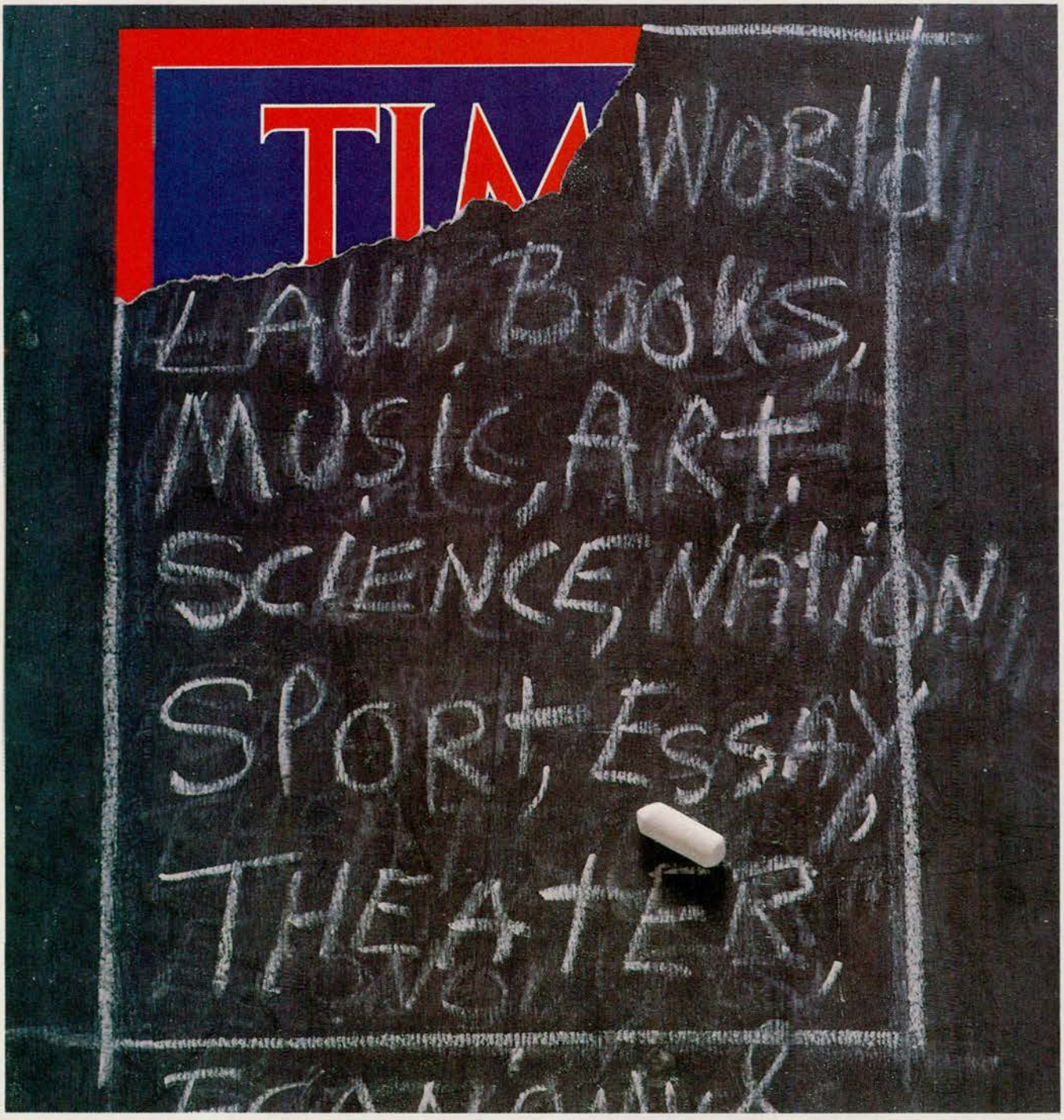

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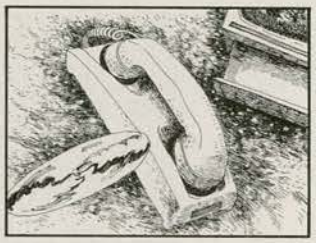

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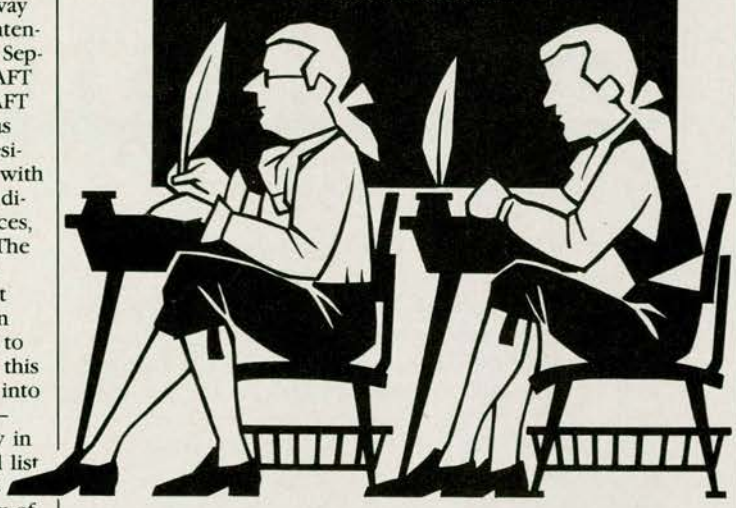
AMERICAN Educator

THE CONSTITUTION IN THE CLASSROOM

Ideas and Resources for Teaching and Learning about the U.S. Constitution



Two centuries ago, in May 1787, representatives from twelve American states met in Philadelphia to revise a document that they hoped would bring unity to their new nation. Four months later, on September 17, they finished their work. They wrote a national constitution that would lay the foundations for our democratic society. A federal government was established of the people, by the people, and for the people.

Celebrations are under way to commemorate the bicentennial of the Constitution on September 17, 1987, and the AFT will be playing a part. An AFT Bicentennial Committee has been formed with Vice President Pat Daly as chair and with Paula O'Connor, the AFT's director of information services, coordinator of staff work. The committee's first goal is to help AFT members find out more about this celebration and give them information to bring the Constitution and this great learning opportunity into the classroom. This page — which will appear regularly in *American Educator* — will list some of the best resources available for teachers. Many of the items listed are free or low cost; some mailing costs may be charged. When using this list, it is best to write to the source listed for full information and always inquire if there is a charge.

Training

The Bicentennial Leadership Project will hold three regional Bicentennial Planning Workshops, which will provide teachers and community leaders with assistance in planning and conducting grassroots projects to commemorate the bicentennial.

Contests

Students love a contest, especially if there are prizes. Several groups are sponsoring writing competitions, and one with high stakes is co-sponsored by the Commission on the Bicentennial of the U.S. Constitution, USA TODAY/ Gannett Co., Inc., and the American Bar Association. The topic is "The Constitution: How Does the Separation of Powers Help Make It Work?" Open to students grades nine through twelve, the contest is for the 1986-87 school year. Essays must be no longer than fifteen hundred words, must be postmarked by April 15, 1987, and accompanied by an official entry form. There will be a national winner who will receive $10,000. Other prizes are $1,000, $500, and $250. For more information and entry forms, write: National Bicentennial Writing Competition, Commission on the Bicentennial of the U.S. Constitution, P.O. Box 50184, Washington, D.C. 20004.

The American Legion is sponsoring a national high school oratorical contest. Contestants must deliver an extemporaneous discourse of three to five minutes on a constitutional provision. Contact: Robert Engel, Assistant Director, The American Legion, P.O. Box 1055, Indianapolis, IN 46206.

Curriculum

A six-week classroom unit on the Constitution, designed to be incorporated into the regular high school curriculum, is being tested in eleventh- and twelfth-grade classes. Materials will be available in the spring of 1987. A unit for fifth and eighth grade is also being developed. Write: National Bicentennial Competition, Charles Quigley, Center for Civic Education, Suite 1, 5115 Douglas Fir Road, Calabasas, CA 91302.

A supplemental teaching unit for secondary school students is available from the National Archives. It includes reproductions of documents and a teacher's guide, which contains suggestions for classroom activities presented at three different learning levels. Write: National Archives Supplemental Teaching Unit, Elsie Freeman, Office of Public Programs, National Archives and Records Administration, Washington, D.C. 20408.

"Framework for Freedom" is a videotape presentation of a series of seminars and accompanying teachers' manuals. Write: Dr. Joseph Mastro, Humanities Extension, North Carolina State University, Box 8101, Raleigh, NC 27695.

The YMCA of Seattle, Washington, has developed a series of programs for high school youth and adults that aims to increase appreciation and understanding of the Constitution. Write: Robin Anderson, Director, Today's Constitution and You, Metrocenter YMCA, 909 Fourth Avenue, Seattle, WA 98104.

Materials

A magazine and posters are available from Project '87, which has been recognized by the Bicentennial Commission. "The Blessings of Liberty" is the title of a series of twelve posters, which depict the events and personalities that contributed to the framing, ratification, and signing of the Constitution. "The Constitution: A Bicentennial Chronicle" is a quarterly magazine that covers everything from contemporary accounts of events at the time of the drafting and signing of the Constitution to historical analyses of individuals and events. It highlights constitutional issues throughout the past two hundred years. Write: Dr. Sheilah Mann, Project '87, 1527 New Hampshire Avenue, NW, Washington, D.C. 20036.

Games

The Supreme Court Trivia Quiz is a compilation of curious facts about the Supreme Court that was published in the *National Law Journal.* Write: Mr. Maurice Kelman, Professor of Law, Wayne State University Law School, Detroit, MI 48202.

Another Trivial Pursuit-type game is based on the Constitution and geared to two levels of play, beginner and advanced. Write: Mr. Charles L. Kennedy, Political Science Department, Pennsylvania State University, Commonwealth Educational System, The York Campus, 1031 Edgecomb Avenue, York, PA 17403.

Plays

"We All Are a Part of It" is a play written for elementary school students. Jean Lutterman has developed this historical musical and supplemental teaching guide to enhance elementary school students' understanding and enjoyment of our nation's history. Write: Jean Lutterman, Norwood School, 8821 River Road, Bethesda, MD 20817.

Dred Scott's struggle for freedom is the subject for a musical "Light Up the Sky" written by Roselyn Winokur. She is also composing a one-act opera entitled "Benjamin" about the early life of Benjamin Franklin. Write: Roselyn Winokur, 35 Gregory Lane, Milwood, NY 10546. □

Items in this list chosen and compiled by Paula O'Connor.

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Today's soldiers would like to thank you, if you're one of the high school guidance counselors or teachers who encouraged them to take advantage of an educational assistance program in the Army.

Not only did you help them to acquire valuable skill training, a sense of discipline, and pride in themselves and their country. You also recommended to them an institution that strongly believes in the pursuit of higher education. So when these soldiers leave the Army, they leave as better people, and better prepared for school; the Army's educational assistance programs guarantee thousands of dollars in financial aid to qualified young men and women who serve two to four years.

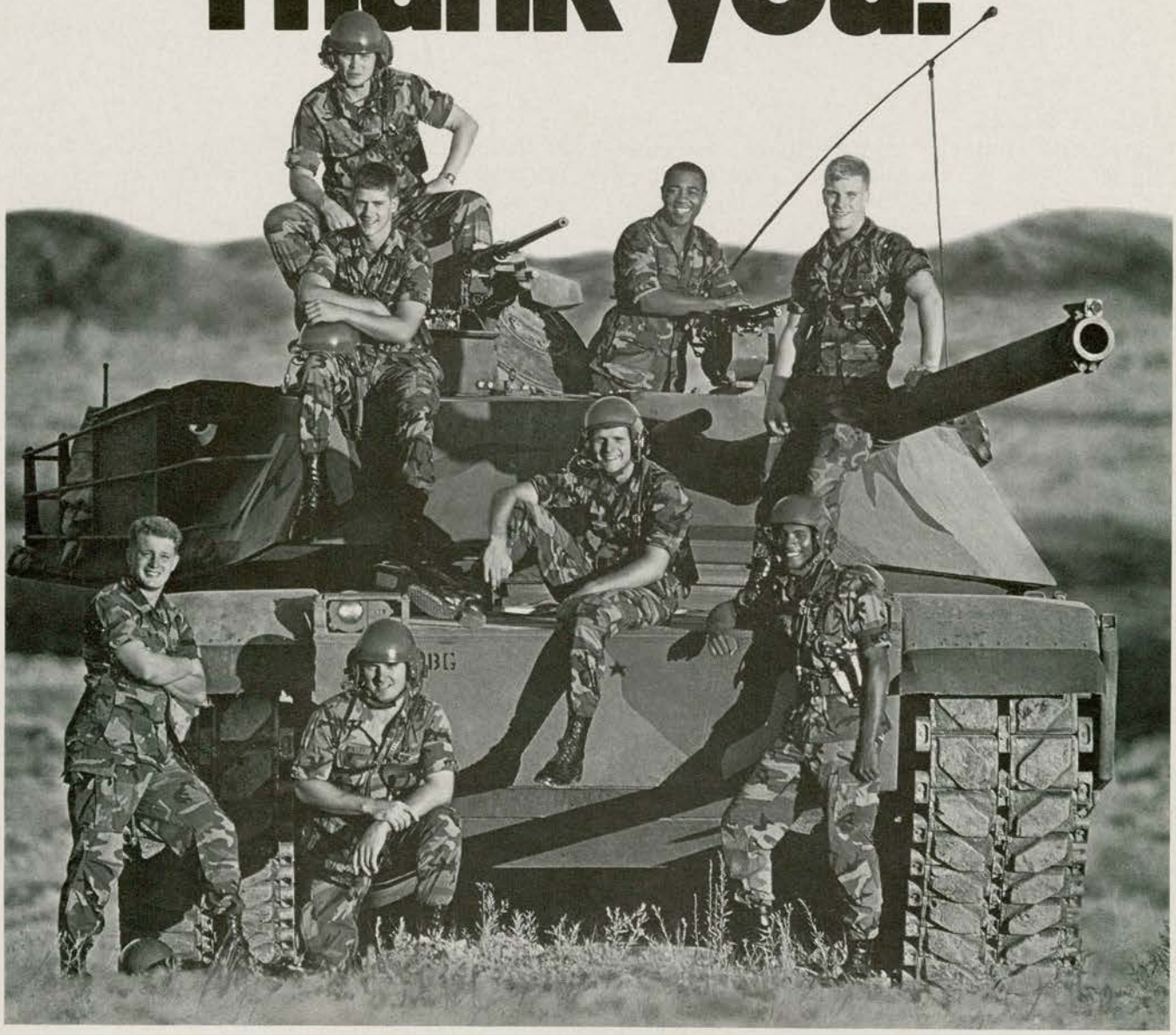
Among our soldiers, some will further their education in two- and four-year colleges. Some will pursue vo-tech training. All will continue their schooling more mature, more experienced, and better prepared financially than they were right out of high school.

The Army leadership would also like to thank you—for the bright, energetic people you've sent us. Without them, a high-technology Army like ours just doesn't roll.

Thanks.

ARMY. BE ALL YOU CAN BE.

"Thank you."



When Technology Enhances Teaching

New Tools Help Students Break Through Conceptually Difficult Topics

By Beth Wilson

MICROCOMPUTERS ARE like Rorschach inkblot tests. When the machines arrive, imaginations go to work: Teachers who like to tinker and experiment see an exciting and powerful new tool; skeptics see the computer as a possible competitor and scoff at the idea of machines that can out-teach people; others simply wonder where they will find the time to learn a complicated new skill. Given the way schools and educational innovations often work, many teachers expect little say in decisions about how the technology will be used, and few anticipate that it will create major changes.

Ironically, the machines themselves are just that, machines. Parts and workmanship are guaranteed, but results are not part of the contract. The learning outcomes computers promote will depend almost entirely on the choices that teachers and administrators make about how to use them. Their decisions will also determine the extent to which technology empowers or alienates those who use it.

Charles Thompson, co-director of the Harvard Graduate School of Education's Educational Technology Center (ETC), thinks microcomputers also reveal a good deal about educational philosophy. The technology itself is so versatile and so rich in possibilities that it can be used to implement virtually any view of what education is or ought to be. When people ponder the computer's educational applications, they "see" in it the means to realize their own beliefs about education. Consciously or unconsciously, they act on those beliefs when they choose particular approaches to the use of computers in education.

ETC, funded by the U.S. Department of Education's Office of Educational Research and Improvement, is in the fourth year of its five-year mission to find ways of using information technologies to improve the teaching of science, mathematics, and computing. In defining that mission and planning its program of research, the center purposely stepped back from the hype and the hoopla about computers. It started instead with a look at the range of educational philosophies alive in schools today, noting how their varying conceptions of teaching and learning shaped their use of technology. The result is a hybrid approach that incorporates the strengths of diverse philosophies and pays conscious attention to what teachers and technology each do best. This approach, which the center calls guided exploration, addresses the need to teach several types of scientific and mathematical knowledge — theoretical, procedural, and factual — and takes advantage of the computer's multiple capabilities. Guided exploration is probably best understood by situating it within the spectrum of current thinking about education in the United States.

Thompson describes current thinking as forming a continuum between two polar views, which he refers to as directed instruction and open education. Most educational theories and practices — whether computer based or not — can be located somewhere along the

Beth Wilson is the publications coordinator for the Educational Technology Center (ETC) at the Harvard Graduate School of Education, where she is also a doctoral candidate. ETC is a research center funded by the U.S. Department of Education's Office of Educational Research and Improvement to find ways of using information technologies to improve the teaching of science, mathematics, and computing.

ILLUSTRATED BY ROBERT BARKIN


R. Barbin

continuum between these two ideal types. The polar approaches are, therefore, useful points of reference for discussing the pedagogical questions raised in educational applications of microcomputers.

IN TRADITIONAL instruction, the teacher directs the learning process. Knowledge is conceived as a body of concepts, skills, and facts that reside in textbooks or experts' — including teachers' — heads. Teaching is the process of doling out that knowledge to students, usually through instructional methods such as lectures, assigned readings, exercises, and papers. Curriculum designers analyze subject matter into bits and pieces that are hierarchically arranged for teaching in a prescribed order. Students move through a series of clearly specified goals and objectives intended to lead to mastery of this clearly defined and carefully organized set of competencies.

The real challenge for technology-based education is to devise ways of integrating intuition with formal instruction.

Educational technologies can and frequently do support this teacher-directed approach to teaching and learning. Most computer-assisted instruction (CAI) amounts to directed instruction in which the computer serves as tutor and drillmaster. In science and mathematics education, this approach has its place in helping students learn the factual knowledge or routine procedures associated with particular subject matters. Because CAI was the first widespread use of computers in classrooms, much of the existing software in science and mathematics embodies this philosophy. As a drillmaster, the computer works like an automated workbook, presenting problems and checking answers. Tutorial programs can interact more with the learner, asking questions or providing prompts when the student responds incorrectly and going back over material not mastered in one exposure. They allow students to proceed at their own pace, to make mistakes privately, and to review as much as necessary. Nevertheless, the computer as drillmaster or tutor gives little importance to student intuition and experience, and it ignores the problem of connecting new knowledge to what children already know.

In a pure form of technology-based directed instruction — so pure that it doesn't exist and probably never could — microcomputers would virtually take over teachers' instructional role. Instead of teaching, teachers would assume a more managerial and administrative function, routing students through a complex network of instructional programs, monitoring their progress within a highly individualized sequence of goals and objectives, and facilitating their relationship with the required technology. Students would interact more with computers than with their teachers or with each other.

IN CONTRAST to directed instruction, open education emphasizes relatively free exploration, propelled not by the teacher's lesson plans but by the student's natural curiosity and intuition. The teacher's role is to design a materials-rich environment and to pose problems that engage student interest. In this view of education, children are sense makers who fashion mental models — or rudimentary theories — of how the world works and then interpret new experiences in light of these models. When their existing models won't accommodate new experience, they adjust them, sometimes tinkering in relatively minor ways, and sometimes reorganizing their thinking completely to incorporate new information. Unlike directed instruction, which construes learning as adding bits of knowledge to those already stored from previous instruction, open education defines learning as the process of knowledge transformation that occurs when students adjust, expand, and reconstruct their understandings of the world. Teaching approaches that are not rooted in students' experience and intuition may produce rote learning of new skills or vocabulary, but they are unlikely to help students transform their naive theories of phenomena into more accurate and sophisticated ones.

LOGO-based instructional approaches are the most common way of using microcomputers to implement an open education philosophy in the classroom. In fact, LOGO was invented partly to provide a computer environment that afforded opportunities for this sort of free exploration, even for elementary school-age children. Initially used mainly to teach the fundamentals of geometry and provide practice with certain procedural thinking skills, the power of LOGO has more recently been tapped to address children's scientific thinking and their mastery of the traditional mathematics curriculum.

In its pure form, an open education approach to teaching and learning would place learners completely in charge of the pace and path of their own learning. Students would explore on their own, interacting mainly with the computer; teachers would play a rather secondary role, encouraging from the sidelines as students discovered knowledge for themselves. LOGO enthusiasts initially had little to say about the role of the teachers whose students were to forge independently into Turtle Geometry and other LOGO-based activities. Some advocates even envisioned LOGO as the beginning of the end of school-based instruction as we know it. Experience has shown, however, that relying only on independent discovery and student "invention" of concepts can sometimes preclude the teaching of important scientific ideas and facts.

Given the range of possibilities framed by these two extremes, Thompson believes the real challenge for technology-based education is to devise ways of integrating intuition with formal instruction. What is needed is an approach that neither requires students to rediscover each milestone of Western scientific

thought for themselves nor consigns them to plod tediously through information that scarcely affects their understanding of the world. ETC's guided exploration or guided inquiry approach is located somewhere between these polar approaches. Far from making teachers into educational technicians or managers, as computerized direct instruction would do, or relegating them to bit parts in student-directed dramas, as open education would do, guided exploration asks teachers to play a central role in science, math, and computing education. By thoughtfully exploiting the unique capabilities of information technologies, ETC is seeking to develop tools that empower teachers intellectually and provide fresh and powerful ways for them to guide and support their students' learning.

ETC'S COLLABORATIVE research groups of classroom teachers, subject matter experts, educational researchers, and specialists in technology have been experimenting with this approach. These groups are developing carefully structured sequences of instruction that prepare students for thinking through puzzling phenomena or solving problems, provide them with guidance and scaffolding as they do so, and then follow through with discussion designed to help them consolidate the transformations and extensions of their thinking. In short, students engage in some form of inquiry or exploration within a framework provided by the teacher and the technology. In general, both teachers and students use the computer as scientists and engineers do: as a tool for modeling, simulation, and calculation, as well as for storing, organizing, and retrieving data.

Understanding the difference between heat and temperature is a conceptual gateway that leads to an understanding of other thermal phenomena encountered later in the science curriculum.

The strategy of guided exploration has emerged gradually from ETC's intensive study of conceptually difficult topics — the center calls them targets of difficulty — in the science, mathematics, and computing curricula and from analysis of students' difficulties with those topics. The approach is a focal point of the teaching and learning activities in laboratory sites the center has recently established in five Massachusetts high schools. ETC associate director Martha Stone Wiske, who directs the lab sites research project, sees the work there as a natural extension of the center's ongoing collaborative process. In the lab site classrooms, researchers will have the opportunity both to document the affects on individual teachers of using a technology-based guided exploration approach and to learn what it takes to implement ETC innovations in regular classrooms and schools.

Wiske knows that teaching with technology and moving away from structured, textbook-dominated instruction or purely discovery-oriented approaches is a big leap for many teachers. She expects that the experiences of teachers and students in lab site classrooms will provide important insights into what is involved in that transition and into the kind of training and administrative support that can facilitate it. She points to the growing body of research showing that effective teachers are themselves learners, both about their subject matter and about the craft of teaching. She thinks that ETC's approach can offer teachers both kinds of learning; by making them collaborators in the evolution and definition of that approach, she hopes that educational technologies will avoid the fate of past innovations — those that sit unused on the shelves and those that have faded quietly into the flow of business as usual. Wiske anticipates that using the ETC approach will affect teachers in at least three ways: by stimulating a rethinking of subject matter and of the ways they organize and teach it; by introducing and facilitating new patterns of classroom organization and shifts in student/teacher roles; and by confronting them with the inevitable uncertainty and ambiguity of a new and more fluid approach to teaching.

ETC believes that while such an approach to using technology asks a lot of teachers, it offers them a lot as well. It asks them to possess a deep and flexible knowledge of their discipline, and it gives them the tools to do so — tools that provide more direct access to phenomena, offer new modeling capabilities, display multiple, linked representational systems, and remove many of the computational and representational obstacles in the teaching and learning of science, mathematics, and computing. Pedagogically, guided exploration asks teachers to have a rich and flexible armamentarium of strategies, and it offers them new or expanded roles as problem posers, facilitators, advisors, and sometimes as direct instructors.

UNDERSTANDING THE difference between heat and temperature is a conceptual gateway that leads to an understanding of other thermal phenomena encountered later in the science curriculum. Unfortunately, according to Robert Tinker of ETC's Heat and Temperature Project, many high school science classes treat this distinction as a vocabulary problem: teach students the right definitions and move on to the next topic. They do so partly because everyday language blurs the two concepts — the word *hotter* means both "has more heat" and "has a higher temperature" — but even more so because they lack an instrument that measures heat as readily as thermometers measure temperature.

Tinker and his colleagues at Technical Education Research Centers of Cambridge, Mass., have devised a set of microcomputer-based laboratory (MBL) tools that give students and teachers direct access to heat as a separate phenomenon. The computer setup includes a heat probe that delivers "dollops" of heat to a beaker of liquid, and software that causes the computer instantly to display a graph of the amount of heat delivered and

the resulting change in the liquid's temperature. Throughout a series of activities that highlight the relation between the two phenomena, the computer serves as a laboratory tool to record and display data. It markedly expands the boundaries of students' exploration by giving them a way to "see" and measure heat as well as temperature. For teachers, the MBL devices far surpass even the most carefully worded definitions and explanations in their power to deepen students' understanding. Rather than talking *about* phenomena, teachers can pose problems and then have shared, on-the-spot access to data for solutions.

For teachers, the microcomputer-based laboratory devices far surpass even the most carefully worded definitions and explanations in their power to deepen students' understanding.

To help students differentiate weight and density — two other distinct but related concepts — the microcomputer increases students' perceptual access in a completely different way, by simulating or modeling particular properties of matter. Although most sixth graders have never heard of the word "density," the ETC Weight and Density Group learned that they do have thoughts about the properties of matter that affect "heaviness" and make objects sink or float. In most youngsters' naive theories, weight, a property of *objects,* figures much more prominently than density, a property of the *materials* from which objects are made. The concept of density is crucial to an understanding of particulate theories of matter, but teachers report that it is difficult to teach: While students can easily perceive an object's weight, size, and the material it is made of, they can't observe its density directly and have to infer it from what they know about weight and size. That sort of inference escapes many sixth graders, despite careful teacher explanations and hands-on activities.

The Weight and Density Group tackled this problem by devising a computer simulation that allows students to "see" density. Project leader Carol Smith explains how students using the simulation can choose from several kinds of materials, each of a different density, and build objects of different sizes. The screen displays as many as three such objects, each one depicted as a rectangle that is composed of rows of square units. Density is shown by the number of dots per square unit of size (see figure 1). Unlike the real world, where weight is highly salient, the computer world shows how, from a slightly different point of view, weight is determined by size and density. By limiting the screen display to only the relevant variables, the program structures the environment. Yet within these planned constraints, students have considerable freedom to explore. The simulation works in conjunction with hands-on activities with objects of different weights, sizes, and densities. Teachers must guage student understanding and move back and forth between the real materials and the simulation, posing problems and questions to help students see the relation between the concrete objects and the more abstract computer representations. Experience suggests that the "visualness" of the computer model aids students in forming mental models of the properties of matter.

BESIDES EXTENDING perceptual access and prompting mental modeling of natural phenomena, technology can enlarge teachers' and students' facility with mathematical representations. Those who possess a deep knowledge of mathematics can represent that knowledge in several different ways — algebraically or graphically, for example — and can move nimbly among the representations. This sort of representation hopping is essential for teachers introducing new concepts, as they try to find the right entry point for particular students. Unfortunately, in mathematics several of the possible representations are often cumbersome and inaccessible. ETC's mathematics education research groups, under the leadership of coordinator James Kaput, have been developing software that harnesses the computer's capacity to display several different representations simultaneously and to link them so that action taken in one representation is immediately reflected in the others.

One of the groups is using this strategy to take on the "word problem problem." Initial research showed that a major source of student difficulty with word problems was the ratios — price per unit or distance per unit of time, for example — that are frequently contained in them. Although the quantities are usually clear, the "per" aspect makes the arithmetic confusing to stu-

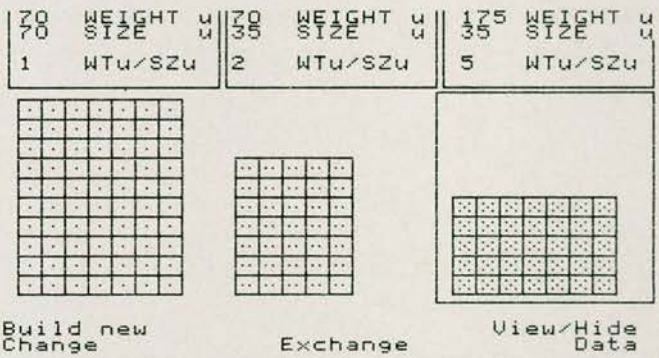


Figure 1

A screen from the ETC weight and density software shows three objects. Size is indicated by the number of cube units from which the objects are composed; density is shown by the number of dots per unit of size. If the student so chooses, the program will display different kinds of materials in different colors. The data display at the top is also optional; when the program is in this mode, any change in the object windows is automatically reflected in the data.

dents: if 5 pounds of coffee is worth $15, its price is $3 per pound; with twice as much coffee, the amount doubles and its worth doubles, but the price is still $3 per pound. Three symbolic representations are relevant to an understanding of ratios, say trees per person in a park. In ETC's word problems software, the most concrete level is an iconic representation, which appears on the screen as boxes containing pictured sets of trees and people. Next in terms of abstraction is a table displaying numbers of trees in one column and the corresponding numbers of people in another. Finally, a coordinate graph representation shows trees on one axis and people on the other (see figure 2).

The computer's talent is that it can display all three representations at once and link them instantaneously. If a student adds a new set of trees and people to the iconic representation, the table of data and coordinate graph automatically change to reflect the addition. This tool promises to be most useful in the upper elementary grades with missing value and proportional reasoning tasks. It gives students more room to explore and lets teachers pose more interesting and demanding problems, again building from the concrete representations that are intuitively easier for students to grasp to the more powerful abstract representations that formerly required laborious calculations and graphing.

POSING THE right problems is crucial to teaching. Yet the traditional geometry curriculum limits teachers' ability to do so by relying heavily on deductive thinking and on memorization of axioms, postulates, and proofs. Teachers and texts must choose problems on the basis of how easy they are to prove, not how interesting or revealing they are. Students must manipulate the laws and formal representations of a mathematical system without being able to try inventing laws and testing properties on their own. They miss the chance to participate in one of the most important and exciting mathematical activities: the making and testing of conjectures. As a result, many students leave the classroom with a superficial and perishable understanding of the subject and an unenthusiastic disposition toward further study of either geometry or mathematics.

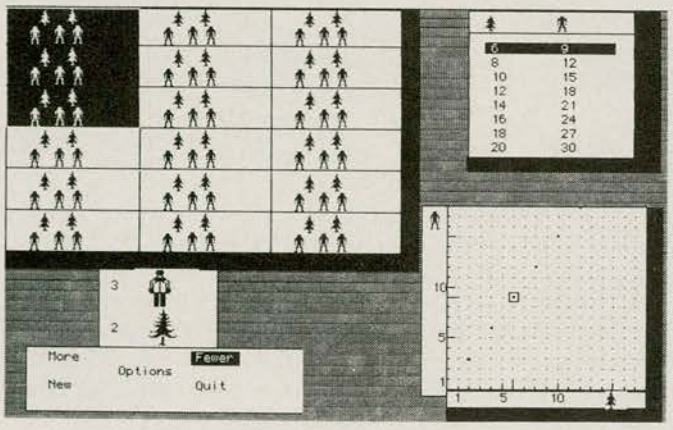


Figure 2

A screen from the ETC word problems software shows multiple, linked representations: at upper left, an iconic representation; at upper right, a two-column table of data; at lower right, a coordinate graph. Students might use a display like this to solve a problem about a park with two trees for every three people picnicking there on a sunny afternoon.

The computer's talent is that it can display all three representations at once and link them instantaneously.

In geometry, making conjectures requires constructing geometric shapes and elements, then exploring their properties and the relationships among them. Unfortunately, the tedium of drawing accurate constructions makes it unreasonable to expect students — or teachers, for that matter — to create large enough sets of examples on which to base conjectures. The ETC Geometry Project is exploring the potential of *The Geometric Supposer*[1] to bring conjecture making and inductive reasoning back into the curriculum. Within this software environment, designed by ETC co-director Judah Schwartz and colleague Michal Yerushalmy in conjunction with the Education Development Center in Newton, Mass., students can make quick, accurate constructions on a primitive shape, such as a triangle or quadrilateral, and can then repeat those constructions on any *other* shape within the same primitive.

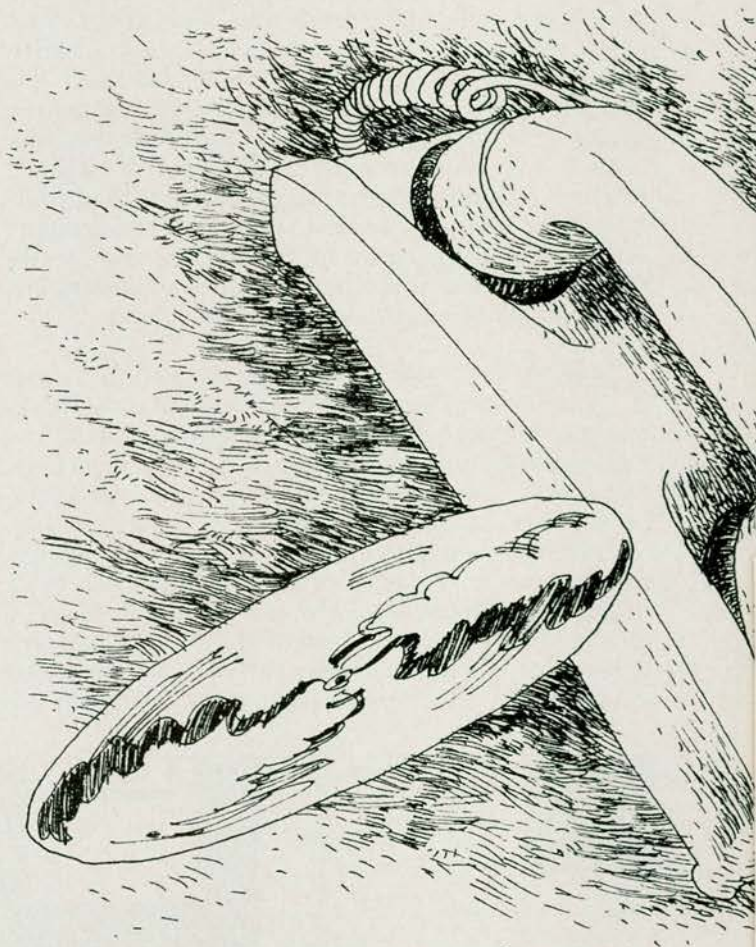
Geometry teacher Richard Houde gives the example of a student who uses the *Supposer* to draw a median from the vertex angle of an isosceles triangle to the opposite side and then conjectures that the median bisects the vertex angle.[2] This student can measure the angles in question and test the conjecture further by drawing other isosceles triangles and performing similar measurements. Data obtained in this way may support a conjecture that the student believes is true, but only a formal geometric proof will turn the conjecture into a theorem. Thus, as a tool, the *Supposer* lets students explore their intuitive notions about the properties of geometric figures and build up what Thompson calls a "hunger for proof."

Having completed her proof about the medians of isosceles triangles, this student might go on to make a further conjecture that the same relationship holds true for all triangles, that is, that a median drawn from the vertex of any triangle to the opposite side bisects the angle. Testing that conjecture will readily elicit counter examples that disprove it.

Houde talks about the way teaching with the *Supposer* has changed his classroom, making things less routine and predictable: "The curriculum is no longer sequen-

(Continued on page 46)

MODEMS AND MORE: THE COMPUTER BRANCHES OUT



By Odvard Egil Dyrli

THE NUMBER of computers in schools is not only growing at a phenomenal rate — Talmis, the New York-based research firm, estimates that the installed base of microcomputers in the kindergarten through grade twelve market has now surpassed 1.6 million machines and will double in the next four years — the machines also are being used increasingly in new ways. In a recent study, Talmis found, for example, that even the primary use for school microcomputers is shifting from teaching students *about* computers and programming per se to using the machines as *tools* for accomplishing academic tasks, such as writing reports, keeping track of information, and analyzing data in every content area.

But the arrival on the market of a steady stream of appropriate new educational software products and "bigger and better" computer models notwithstanding, much of the excitement in the industry is due to the continuing development of specialized "peripherals" — electronic devices that attach to computers. These devices open up a whole new world of source materials and dramatically expand the computer's instructional uses. What follows is a summary of major developments in the peripherals market that promise to profoundly influence computer education.

Readers may feel that, given the budgetary restraints of most schools, the prices for many of the items are quite high. In most cases, however, these devices are intended for large-group, multi-class, or rotational use. In addition, as with all new technologies, the prices will undoubtedly come down with time.

Modems — Linking Schools to the World

One of the most exciting next steps in instructional computing is telecomputing, whereby a classroom computer can be used to search through database information sources and retrieve topical information instantaneously. For example, since a number of major newspapers have been put on databases, students in a government, English, or social studies class could examine how different papers covered the same news event. Or science students studying the relationship between altitude and temperature could chart weather variations in a variety of geographic locations. Not only can access to such data add interest and sophistication to many classroom topics, it can also help students learn to select and secure information efficiently — a skill that has become increasingly important in a society in which the sheer magnitude of information can be overwhelming.

In addition, telecomputing makes it possible to send and receive electronic mail virtually anywhere in the world and to participate in both private and public

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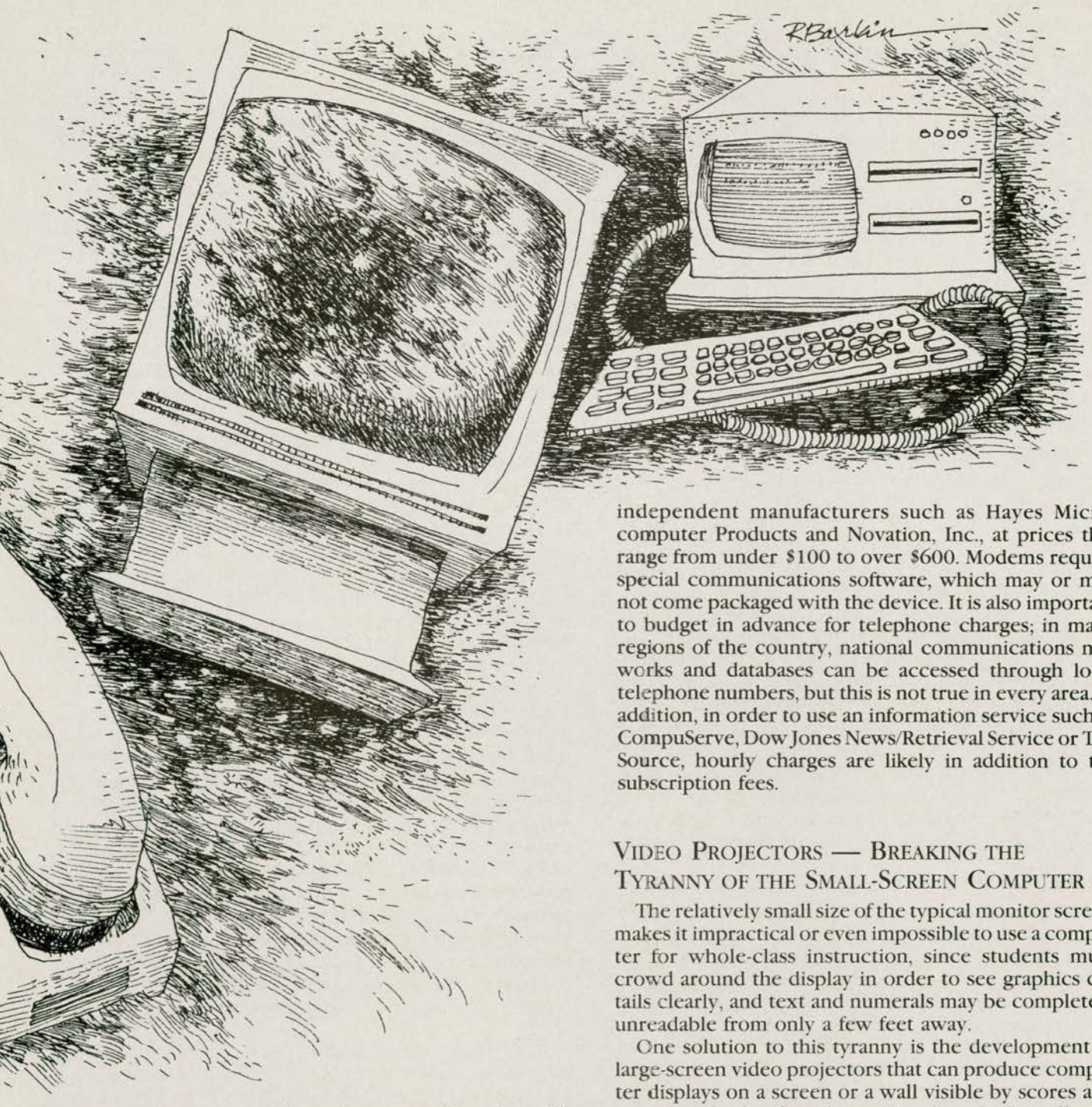
Odvard Egil Dyrli, a professor of education at the University of Connecticut, is technology editor of Classroom Computer Learning *magazine and conducts computer education workshops throughout the United States and Canada.*



conferences on specific topics — or just chat with others having similar interests. For example, students could use the computer to interview and get the perspective of students in other parts of the country, and teachers could exchange instructional materials and benefit from the experience of other professionals working in similar instructional contexts.

What is needed to bring the concept of the global village to reality in the school is a modem, an electronic device that connects a computer to a standard telephone line, translates or "modulates" the electronic impulses of computers into audible tones that can be transmitted, and "demodulates" incoming audible signals back to digital pulses that computers can interpret (hence the name, for MOdulate-DEModulate). While the major computer manufacturers all offer modems for their machines, the devices can also be purchased from independent manufacturers such as Hayes Microcomputer Products and Novation, Inc., at prices that range from under $100 to over $600. Modems require special communications software, which may or may not come packaged with the device. It is also important to budget in advance for telephone charges; in many regions of the country, national communications networks and databases can be accessed through local telephone numbers, but this is not true in every area. In addition, in order to use an information service such as CompuServe, Dow Jones News/Retrieval Service or The Source, hourly charges are likely in addition to the subscription fees.

ILLUSTRATED BY ROBERT BARKIN

Video Projectors — Breaking the Tyranny of the Small-Screen Computer

The relatively small size of the typical monitor screen makes it impractical or even impossible to use a computer for whole-class instruction, since students must crowd around the display in order to see graphics details clearly, and text and numerals may be completely unreadable from only a few feet away.

One solution to this tyranny is the development of large-screen video projectors that can produce computer displays on a screen or a wall visible by scores and even hundreds of students. Developed originally for projecting television/VCR images for business presentations and for use in restaurants, lounges, and home entertainment centers, the typically clothes-hamper-sized electronic devices are now being used in schools for large-group computer applications. Computers such as Apples, IBMs, and Commodores that have "composite video" jacks can be plugged directly into the units; the cord that would normally connect computer to monitor is instead inserted into the projector (it is also possible to buy a "split wire" connector so that both projector and monitor may be used simultaneously). Among the large-screen projectors used commonly for school applications are models from Electrohome Limited, Kloss Video Corp., Panasonic, Sony, and Vivid. Prices vary from approximately $2,000 to over $10,000, depending upon features (for example, not all

models have audio speakers or can project color displays).

Marrying a computer to a large-screen projector conveys information to students more efficiently but can also produce a greater impact upon learners when the computer display is seen on a nine-foot screen as compared to a nineteen-inch monitor. Numerals, text, and graphics stand out more clearly than when crowded together on the conventional video display, and the eye of the viewer can more easily focus upon different portions of the screen. A large-screen video projector can add important new dimensions to computer education and can give the teacher a broader range of instructional options.

Local Area Networks — Sharing Computer Resources

The physical linking together of computers into local area networks, or LANs, is a practice that is expected to grow significantly in schools. In fact, IBM has gone on record stating that it will now market only educational software that can be used on a network, and other software manufacturers are looking similarly toward developing LAN markets.

A LAN allows software from a "host" computer to be shared electronically with the other computers in the network, thus eliminating the need for multiple software copies or the expense of having a disk drive for each machine (this automatically decreases the temptation — and the opportunity — to copy school-owned software illegally). In addition, expensive "peripheral equipment" such as printers and plotters can be shared by many computers, without having to transport software or move connector cables, and student work can be transmitted to the single host computer for centralized storage.

While LANs are most often situated in computer laboratories, it is also possible to link together computers in separate classrooms and use the system to send "bulletin board" messages throughout the school, report administrative information such as class attendance data, and receive information instantaneously. Theoretically, a teacher could, for example, get an immediate copy of a school board's class trip policy and check library resources available on a given topic without leaving the classroom.

Another reason for the growing interest in LANs is the prediction that, eventually, major curriculum and testing programs will reside in large school "main-frame" computers and that students will interact with these complex programs by using individual LAN-linked machines as learning and testing terminals. At least two companies are already working on such network-based curriculum programs, to include all subject areas and all grade levels. And giving further impetus to the concept is the fact that some major corporations — including Apple, AT&T, and IBM — are entering the school LAN market to do battle with Corvus, 3Com, Novell, Radio Shack, and the other LAN pioneers.

While LANs can be expensive — $200 to $500 per terminal is common — they offer teachers tremendous instructional advantages from the standpoint of use of time and convenience. For example, teachers are freed from keeping track of scores of software disks and from having to load programs into each student machine.

Videodiscs and CD-ROMs — Mega-Information for Micros

A description of a videodisc (note that the video industry uses the term "disc" although there is movement toward adopting the spelling "disk" used in the computer industry) sounds like an attempt to define the ideal audiovisual medium. The videodisc — a prerecorded eight- to twelve-inch recordlike platter that operates on a special videodisc player to produce full-color pictures and sound on a television receiver — combines the advantages of text, graphics, photographs, slides, and films in a single medium. And since videodiscs have an amazing information storage capacity (each disc can hold some 54,000 separate frames of information, which translates to about nine hundred carousels of color slides), theoretically, a year's worth of instructional audiovisual materials can be stored on a single platter. Furthermore, videodiscs are virtually indestructible (fingerprints have no effect on projection quality), the color television picture produced is crystal clear and does not deteriorate with time, and both the projection speed and the direction forward or backward are under the user's control.

Joined to a computer, the videodisc player becomes a compelling tool of learning. Since the videodisc is a "random access medium," i.e., the user can jump immediately to any place on the disc, the learner can see particular scenes and view full-color film segments appropriate to the topic being studied. A biology student could, for example, simulate using dissection instruments on an outline drawing of an animal on the computer screen and immediately see the actual results of each motion through a film projected on an adjoining video receiver. Similarly, a social studies student could "actually" take a walk through Hong Kong or climb the steps of an Aztec temple. A number of computer-based videodisc educational programs have already reached the market, and many feel that the medium will in time replace both films and slides for instructional applications.

But a unique excitement is reserved for a specialized type of videodisc, the same 4.72-inch-diameter compact disc (CD) that has radically changed the way over 2 million music lovers listen to their favorite tunes. However, the compact disc is on its way to making an even larger impact upon microcomputer users and will fundamentally change the way in which people get information. By using a computer system with a special CD "drive" player to search through content contained on a disc, a learner has immediate access to prodigious amounts of information. An entire encyclopedia, for example, can fit on a single disc. (Eventually it will be possible for users to store their own data on the medium, but this is not yet economically feasible.)

Instead of converting optical images to audible notes as is true for audio discs, the special CD-ROM drive transmits its information to the computer, to be displayed on the monitor screen. The contents can then be printed out as can data from a conventional disk drive. In using a videodisc, a learner can search the entire

volume and locate the occurrence of any word or combination of words. This capacity alone will make the use of CD-ROM-based reference and research tools distinctly different from the use of their print-medium counterparts. Grolier has already launched a CD-ROM version of its *Academic American Encyclopedia,* and databases of all sorts, including dictionaries, almanacs, atlases, and magazine collections are likely candidates for the new technology.

Laser Printers — Bringing 'Desktop Publishing' to School

The development of the laser printer brought high-resolution printing and professional graphics design — formerly possible only with expensive typesetting equipment — down to the "desktop" level. A rapidly developing movement, precipitated by the immediate popularity of the Apple LaserWriter, desktop publishing should be of interest to all schools that produce large amounts of printed matter such as curriculum guides but can also be used for the quick and efficient preparation of professional-looking print materials of all sorts — brochures, booklets, flyers, letterheads, address labels, and even small magazines.

Laser printers are among the fastest printers on the market, able to produce from eight to twenty-four *pages* per minute, with crisp text that rivals true typesetting, at a fraction of the cost. Although even the lower-priced laser printers are still beyond the budgets of most school systems, at approximately $3,500, prices are expected to drop sharply with the newer models. Nevertheless, heavy users of locally produced print materials are already finding that the printers soon pay for themselves. Desktop publishing was defined by the Apple Macintosh computer — a graphics-oriented machine in which menu selections are made by choosing icons or "pictures" corresponding to desired operations — used in a system with the LaserWriter, and the burgeoning market is now being assaulted by the other major computer manufacturers.

Pioneering school systems in various parts of the country are already using Macintosh-LaserWriter systems to teach students the skills of graphics design and to provide experience with commercial "pasteup" procedures, through preparing impressive school newsletters and related print materials. And, as appropriate word-processing, graphics, and "page layout" software becomes available for other computer models and as additional laser printers reach the market, more and more schools will be offering students the same professional-level advantages. In education, desktop publishing is clearly a growth industry.

Computer Input Devices — New Ways To Connect

There is a rapidly growing selection of devices designed to circumvent the computer keyboard — often a barrier for young children and handicapped learners, and for many others either awkward or inconvenient. New educational software products provide users with the option of using such devices to register decisions and control action on the screen. In addition to the

(Continued on page 48)

As If You Were There

ONE OF the most persuasive examples of the educational potential of video technology is the new Video Encyclopedia of the Twentieth Century — a seventy-five-hour-long video library that brings to life all the significant people and events of the past century.

Twenty-three years in development and containing 2,217 units of primary source material ranging in length from one minute to nine minutes, this pictorial history allows students to experience the original sights and sounds of the past ninety-three years as recorded by film and television news cameras.

From the return of the Spanish-American War veterans in 1898 to the end of the Vietnam War. From President McKinley to President Reagan . . . and the hopefuls William Jennings Bryan to Walter Mondale. From Lenin, Clemenceau, and Lloyd George to Gorbachev, Mitterrand, and Thatcher. From the suffragettes to Geraldine Ferraro. From marathon dancing to the hula hoop. From the horse-and-buggy to the space shuttle. It is all here.

Students who are following the evolution/creationism debate as it is played out over the question of textbook content will understand that history often repeats itself as they watch William Jennings Bryan confront Clarence Darrow, the defense lawyer in the *Scopes* trial. Students who want to feel the power of an FDR speech can view the film clips of his "Nothing To Fear" address that emboldened a nation. Students who are chronicling the long struggle for civil rights will feel their hearts beat as they watch nine black children attempt to enter a Little Rock school in 1957.

Key to the Video Encyclopedia's usefulness in the classroom is its comprehensive index system and the ease with which any individual unit can be located and accessed. The master index has an alphabetical listing of all people, subjects, and categories, as well as a separate daily index listing the significant events for each day of the year.

The Encyclopedia — which is available on VHS and Beta videocassette format and can also be purchased on videodisc on three-quarter inch tape — comes with printed background material on each of the units, including a scene-by-scene "shot list" identifying each person and place pictured. Up-to-date film segments will be added each year, and a series of teachers' guides are being developed.

For additional information, write CEL Educational Resources, 515 Madison Avenue, New York, NY 10022, or call toll free 1-800-235-3339. — EM

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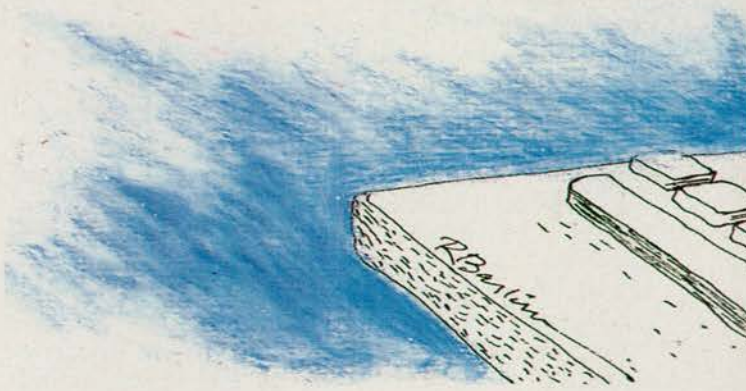

By Teresa Middleton

A DECADE ago we were introduced to what was at the time a radically new technology — the microcomputer. Prior to the development of the microcomputer, large computers — called "mainframes" — had been used to store massive amounts of records, to run statistics, and to provide some instructional programs. To work on these mainframe computers, students used terminals wired directly to the computer, or they accessed the computer via the telephone line. The technology was costly, and instructional programs were few. The new microcomputer gave us much of the power of these large machines but it did so in a compact machine that would fit on a desk — a "stand alone" that had its own memory and its own operating system, yet was small enough to be transportable. The door to using technology in a significant way in education seemed to be opening wide. It was not unrealistic to look to the day when every classroom would contain many micros. It was also not unreasonable to expect that these machines could be programmed to become a source of active learning on the part of students, deliver individualized instruction, provide teachers with feedback on students' performance, and relieve teachers and administrators of much of their paperwork.

Based on these expectations, schools moved quite rapidly. There are now more than a million microcomputers being used for instructional purposes in classrooms and resource centers, libraries, and mobile vans. Approximately half a million teachers are using microcomputers to assist in the instruction of more than 15 million students.

But we are still having trouble making the microcomputer live up to our expectations, particularly as a pedagogical tool that can help students develop advanced cognitive skills. A recent study from Johns Hopkins University indicates that students in kindergarten to grade six are more likely to use computers for drill and practice exercises than for any other purpose; by the time students reach high school, the focus has shifted to programming; and in middle school, it is spread fairly evenly between the two. The use of microcomputers in teaching problem-solving skills is a distant third.

AS WE have learned to use this technology, we have come to recognize that the usefulness of the stand-alone microcomputer as an individual tool in the classroom is severely restricted by its limitations in memory, a lack of availability and affordability of quality software, the expense of individual access to other information sources, and its limitations in representation capabilities.

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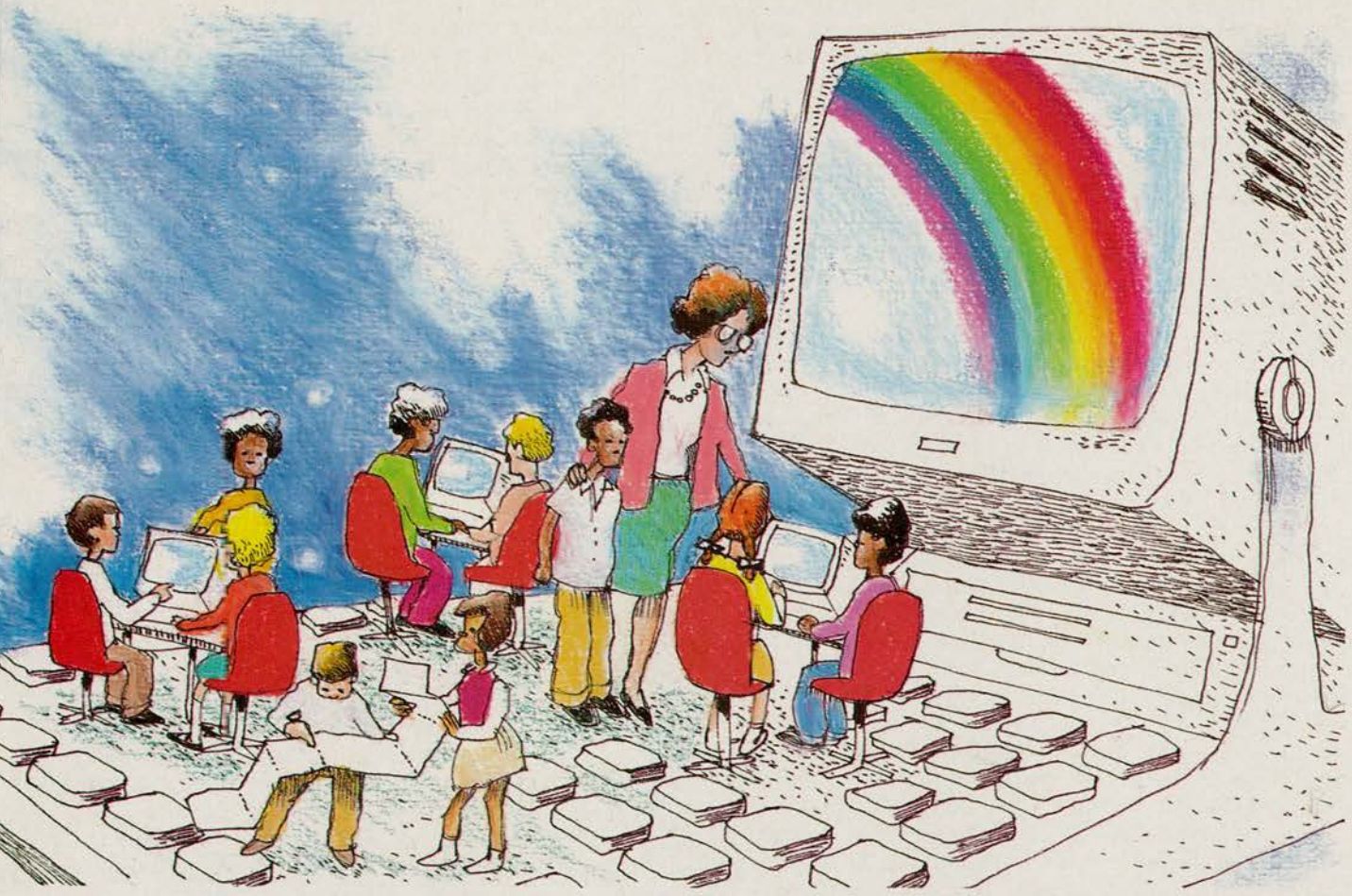


Limitation in Memory: Instructional computer programs are like all other computer programs in that they include the information that needs to be given to the user plus directions to the computer as to how to process and present that information. The more complex a program is, the more room it takes up in a computer's memory. For instance, an instructional program that receives input from the student and then uses that information to modify the instruction will probably end up building files of information that take up a large amount of memory space. Most stand-alone microcomputers now being used in classrooms have a fairly restricted memory, which means they cannot run very complex or large programs. This restricts the amount of individualization that can be built into the software.

Lack of Availability and Affordability of Quality Software: Producing instructional software of high quality is very expensive. To do it well usually requires the work of a team including at least an instructional designer, an education expert, computer programmers, and a graphics expert. It must be pretested in classrooms and adjustments made as necessary; then it must be packaged, marketed, and distributed. All of this comes at a cost, which is one of the reasons that quality software has been slow coming to the education market.

The high cost of production and marketing is also one of the reasons software companies are so concerned about copy protection. They are trying to prevent copying and sharing because, of course, such "piracy" reduces the number of new purchases, thereby increasing the per-unit cost of development. Although many programs being marketed to business and for individual use are now having their copy protection devices removed, most education software producers are still concerned about copying and sharing and at present have no intention of removing protection.

ILLUSTRATED BY ROBERT BARKIN

Publishers' concerns about security of the software lead to another problem for educators: the limited amount of previewing that can be done before selecting a software program. Ideally, a teacher or a school district should be able to fully test out a program before buying or leasing it. Although some companies allow "shareware" — an honor system through which software can be tried out at no cost, usually for thirty days — this practice is still not common in education.

Some education software developers allow users to preview portions of programs, but this is generally inadequate for judging the "fit" of the software in the curriculum. And, while publishers and software houses are investing increasing amounts of time and money in visiting schools to demonstrate their software to teachers and help them integrate it with lesson plans, these vendors are obviously not unbiased in their recommendations. It takes enormous time and effort for a teacher to gain a grasp of just what is available for her particular topic and the needs of her students. It is even harder for her to make a solid assessment of the software's quality prior to actually placing an order. What teachers and administrators need is a large pool of software that they can fully preview and then select from as needed.

The Expense of Individual Access to Other In-

formation Sources: A wealth of information and accumulated knowledge resides in the many databases that have been put together in this country and others around the world. Typical are the Readers' Guide, UPI and other wire services, Dialog, The Source, CompuServe, and Dow Jones News/Retrieval Service. Many teachers are excited at the prospect of their students being able to gather information from these sources because they know it not only adds variety and interest to the subject matter but also because it is a key element in students' learning to conduct their own research. A microcomputer can use telecommunications technology to access databases in the following way: A telephone modem is attached to a stand-alone computer; users "dial" into the computer that stores the database and read the information on their screens. They can also copy information from the database, either printing it out directly or downloading it as a file to their computers. When they are finished, they hang up the telephone and continue to use the computer as usual.

It is expensive to connect with databases in this way for three reasons. First, there is the cost of a modem. Second, the cost of the telephone call, which may be either a local or a long-distance call. Third, and the greatest expense of all, is the cost of "connect time" to the database. Connect time is the length of time users are connected to the computer housing the database as they search out the references or items they need and download the data to their own computer. Connect time costs vary widely, but probably would average $100 an hour during the day. At that rate, it would cost $750 for thirty students to each have individual access to just a single database for a period of fifteen minutes — hardly enough time to perform a search. And this would be just the beginning, since using only one database would not allow students to take advantage of the richness of information that is available.

So it appears that using stand-alone computers to give individual students access to databases is prohibitively expensive. The expense might be justified if a large amount of information could be downloaded from the database for future use by students. However, unless the microcomputer is equipped with extra storage capacity in the form of a hard disk, we are back to the memory limitation problems mentioned previously.

Limitations in Representation Capabilities: Experience has taught us that there is great value in using a variety of media to support teaching: text, graphics, still video, motion video, and audio. Each medium has special strengths for supporting certain types of learning. For example, text and graphics are usually the media we choose when there is a lot of information for students to absorb. We would also select text and graphics to teach some cognitive strategies, such as decision making and planning. However, we would be much more likely to use video and audio for teaching behavioral and communication skills. Stand-alone computers are limited to text and graphics presentations, with some audio capability. For this reason, unless they are attached to another machine or peripheral (like a videodisc player or a voice synthesizer), they are only fully effective when supporting particular types of learning.

Although many classrooms have available to them other equipment and technologies, including videocassette recorders, television sets, audio tape recorders, slide projectors, and more recently, videodisc players, each is a separate item for the teacher to obtain and use. The methods and procedures for using each must be mastered, and teachers are left to find a way to evaluate the instructional materials available for each tool and fit them into both the overall curriculum and the day's lesson plan.

We might find that the integrated system is greater than the sum of its individual parts.

Some of these instructional tools — particularly videotape and videodisc players — can be greatly enhanced when connected to a microcomputer. The combination of computer and video technologies not only supports text, graphics, video, and audio presentations in one program but also gives the student control of that program through the computer and allows him or her to fully interact with it. The result can be self-paced, individualized lessons that support active, engaged learning. But a great deal of the equipment now available to the teacher is not compatible with the microcomputers in the classroom, and the technologies cannot be easily connected or integrated. As a result, our ability to tap the full potential of education technology is severely compromised. If we could find a way to put all the pieces together, not only would we have an impressive selection of pedagogical tools available to us, but we might find that the integrated system is greater than the sum of its individual parts.

MANY OF the limitations of the stand-alone microcomputer could be offset if we could find a way to integrate the technologies that are available to us, provide educational materials that incorporate a wide range of learning approaches and that are available for preview before purchase or lease, and do all of this in a way that is affordable to school districts. A number of efforts are already under way to integrate technologies. One example is the provision of a "turnkey" system that offers computer-driven interactive videodisc technology with built-in instructional programs. Separate efforts are also under way to allow greater preview of educational software and to improve the distribution of computer-based educational materials — generally through the use of telecommunications technology. But probably the most amibitous effort is the telecommunications solution being proposed by the Education Utility*.

*Education Utility is a trademark of the National Information Utilities Corporation.

The Education Utility — called that because Jack Taub, its creator, sees it as a source as basic as the electricity or gas that flows through our other utility lines — is a system that seeks to integrate computer and video technologies as it delivers a wide variety of instructional materials to the teacher in the classroom through telecommunications technology. Put together by Taub's National Information Utilities Corporation (NIU) of Leesburg, Virginia, the Utility has four key components (see Figure 1): (1) a repository of software, databases, and other instructional materials stored in its computer center in Virginia; (2) a distribution system, or network, to send materials through telecommunications carriers to state switching centers or directly to the school site; (3) a computer/controller at the school where the materials are temporarily stored for use by teachers, administrators, and students; and (4) computers and other equipment in the classrooms that can then access materials directly from the school's computer/controller.

The most important aspect of the Education Utility lies in its capacity to house and make instantly available electronically a wide array of instructional and management materials. These materials are held in the Utility's repository until they flow to the school on request. Each student's desktop computer could conceivably run a different program at the same time. The bank of instructional materials stored in the Utility will be constantly updated and expanded as new items become available and as users — particularly teachers and administrators — specify their needs and register their complaints. Users can provide feedback through messages sent via electronic mail; however, a more immediate impact will result from the actual use of the materials. The system will be constantly metering (or counting) the use of each item requested and will be able to run checks on how often an item is requested, at what grade level, etc. If an item goes unused, the software developer will know that something — content, level of difficulty, ease of access — is wrong, and indeed might want to initiate a request to teachers, via electronic mail, asking them to detail the problem and make suggestions for improvement.

In addition, using the Utility's electronic mail system, teachers and others will be able to communicate with each other, with parents, with homebound students, and — as the system expands — with people in other countries, sharing information and ideas.

The resources stored in the repository will take many forms and eventually will include:

- Computerized databases
- Textbooks, journals and magazines, encyclopedias and dictionaries
- A tool for aligning curriculum objectives with available resources
- Standardized tests
- Computer software consisting of:

— Educational programs of all types — e.g., drill and practice, tutorials, simulations, games, and special education packages.

— Software used for administration and instruction — e.g., diagnostic/prescriptive software, spreadsheets, word processors, filing and graphics programs.

— Other administrative programs — e.g., special education IEP management, classroom management, lesson planning, objective and goal setting, testing procedures, test output analysis and reporting, gradebook maintenance, performance reporting, and memo and letter generation programs.

- Video images from videodisc and videotape libraries, film, and slides.

The materials requested are put in a digitized form, enabling them to be sent through a communications carrier. They can then be broadcast by satellite, FM radio, or television, or they can be transmitted via the telephone lines, depending on receiver capabilities. In our illustration, the information is being sent to a satellite from a dish at the Education Utility repository. The school also has a dish and a control center of its own. It pulls the information down from the satellite and stores it in its own control center, thus building its own temporary mini-repository.

I SHOULD emphasize the temporary nature of the storage at the school. Schools will purchase very few materials. They will retrieve what they need from the

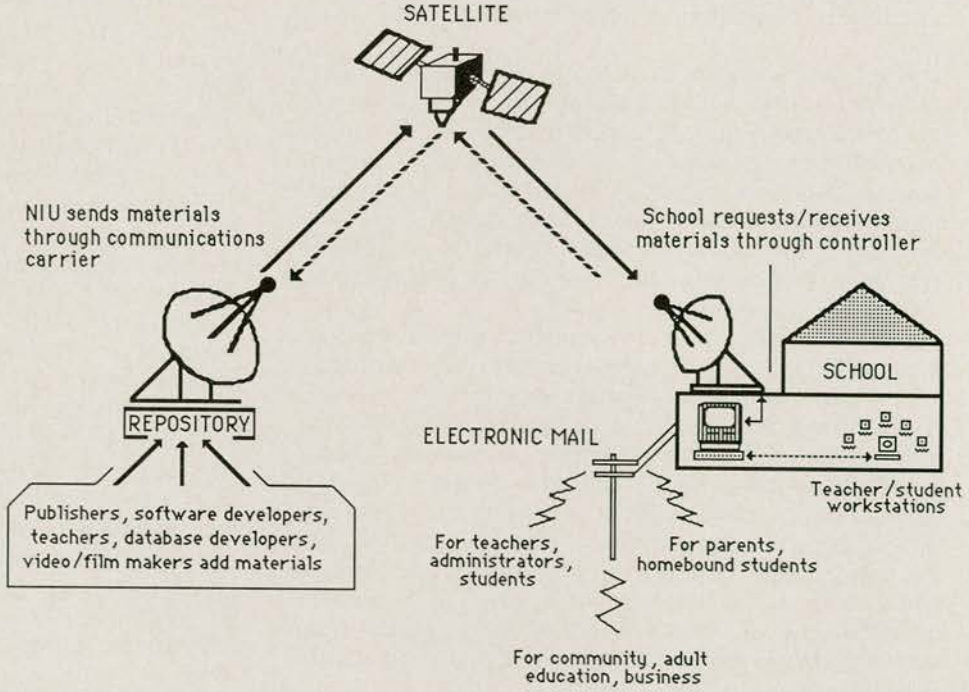


Figure 1: THE EDUCATION UTILITY™

Utility and, as they use the materials, they will pay a user fee. In this sense, the concept of the Education Utility is similar to that of other utilities. When you turn on an electrical appliance, a meter keeps track of the amount of electricity you use, and you get billed later for the actual amount used. We cannot buy our electricity or own it. Similarly, the Education Utility delivers its products — the instructional materials — "on call," and users pay only for what is used.

However, unlike the more traditional utilities in which we are the receivers of a service but have only the most remote influence on its composition and operation, the Education Utility is designed to be an open system. Teachers and administrators, as well as existing developers of education materials, will have input into the Utility. As they make demands on the system for materials to address specific needs, this market demand should, in turn, stimulate product development. In addition, as teachers experiment with new approaches and adaptations, they will become the real experts regarding what works and what doesn't. Thus, many of the new product ideas will flow more directly from the profession and, as such, will be solidly grounded in classroom practice. This feedback loop will be greatly enhanced by the presence of the electronic mail system, through which teachers and other users can easily communicate with each other.

When fully operational, the Utility will overcome most of the limitations of the stand-alone microcomputer. It will solve the memory problem because the student's desk computer will simply draw materials from the school's computer, which *will* have sufficient memory for complex programs and for portions of large databases being used for temporary periods. Since the school's computer will need to hold the materials only for as long as they are actually being used at the school site, it will constantly be clearing room for new materials.

The Utility should also bring about significant reductions in the current high cost of software. Marketing and distribution costs should markedly decrease. The Utility is assuring the trade that it is able to offer copy protection, so piracy losses will be minimized. And as noted above, because of the constant feedback from users and because of the ease with which it will be possible to modify or update programs, not only will software be cheaper, it will be better.

The Utility will also make the rich resources available through databases financially accessible. Instead of facing the prohibitive fees of prime-time use, schools will request the resources they want and have the information downloaded overnight when the costs are at their lowest. In addition, all the databases on the Utility will have a common protocol for accessing their information. This means that expensive time will not be spent figuring out the vagaries of different systems. Money will also be saved because the Utility will be able to transmit data at speeds exponentially greater than achieved by the modem attached to a micro, thus little time is spent on on-line expense.

Finally, and most importantly in terms of its comparative advantage over the stand-alone micro, the Utility brings together the strengths of both computer and video technologies.

PERHAPS AT this point, the best way to demonstrate the potential of the Utility as a versatile and sophisticated pedagogical tool is to sketch out a scenario of how it might be used in a classroom sometime in the future. The scene that follows is based on a passage from a recently published book about the Education Utility written by Dennis Gooler.* Gooler describes how the diverse resources and integrated technologies made available through the Utility might be called into play for a social studies lesson.

THE UTILITY AT WORK

The twenty-eight students in Ms. Jones' seventh-grade class represent a mixture of academic abilities and interests, as well as a range of socioeconomic and ethnic groups. Ms. Jones has found the class as a whole to be willing to work fairly hard at times but also very involved in the social interactions that might be expected of seventh graders.

Ms. Jones has created a unit of instruction that attempts to help students understand the factors that have influenced the development of population centers. She has called the unit "Why do people live where they do?" Ms. Jones first wants students to develop an appreciation of how geography influences settlement patterns. She then plans to explore the social dynamics associated with different types of population groupings.

The classroom is equipped with an Education Utility facility, twenty-nine student work stations, and a teacher's work station. In addition, Ms. Jones' room has a large screen projector, tied into cable television. She also has a VCR available for her use.

About a month before the unit of instruction is scheduled to begin, Ms. Jones prepares a list of instructional objectives, some of which she chooses from the Utility's data bank of learning objectives — based on the school district's curriculum plan — and some of which she formulates herself.

She then commands her microcomputer to search the Utility information base to find electronic material that is suggested for teaching each of the instructional objectives she selected from the objectives bank. The system provides a listing of titles of materials germane to each objective. Ms. Jones requests a preview of some of these titles. She first is given an abstract of the materials (which, in this case, turn out to be educational software) and then an opportunity to preview them. She looks at two pieces of software and decides that one of them will be useful.

In addition, Ms. Jones has her own ideas about materials that might be relevant. She calls up three textbooks from the data bank, checks the table of contents of each, and decides to look in greater detail at a chapter from one of the texts. She likes what she finds and notes that chapter. She also wants to use certain databases of population figures; she locates these and verifies that they contain the kinds of data she wants. Finally, Ms. Jones scans the utility index for maps of various kinds and locates the ones she will want to use.

*_The Education Utility: The Power To Revitalize Education and Society._ Dennis D. Gooler. Educational Technology Publications, Englewood Cliffs, N.J.

Ms. Jones is also concerned about the assessment or testing process she will use to determine who learned what. Using the Utility's curriculum alignment program, she locates test items that match her instructional objectives. She notes, however, that the system does not contain enough testing items; later, she may use the Utility's testing module to create additional items.

Schools will request the resources they want and have the information downloaded overnight when the costs are at their lowest.

With a good sense of both the instructional materials available to her from the Utility and the additional resources she has physically in her classroom, Ms. Jones begins to sketch out how the instructional unit will work. She develops a mix of whole-class, small-group, and individual student activities. The unit will unfold something as follows:

- Ms. Jones begins with a meeting of the whole class to explain what the unit is about. She hands out a list of the objectives, reviews the kinds of projects the students will be engaged in, and describes how the students' learning will be measured.
- The class then views portions of a video broadcast (in this case, excerpts from the Turner Broadcasting series "Portraits of America"). Group discussion of the video focuses on why people seem to have chosen to live where they do.
- Ms. Jones then makes an initial assignment. Each student is to select a city or town in the United States from a list she prepared. Each child then works from his or her terminal, drawing from the Utility's database to locate information that is relevant to the city or town's settlement pattern, such as population statistics at different points in time, immigration figures if available, the dates of major transportation, industrial, and social developments that may have influenced growth, and so forth. Students are asked to enter the relevant data into a "shell" format created by Ms. Jones. Once this work has been done, Ms. Jones is able to develop a summary sheet comparing data about each city. Those summaries are made available to each student. When appropriate, the class will meet as a whole to discuss the implications of the data.
- Ms. Jones then asks students to read material selected from a half-dozen textbooks that are part of the Utility's information bank. As indicated earlier, Ms. Jones has reviewed those texts, and since no single one seems to do justice to the population topic, she has chosen various sections from different texts.
- By this time (possibly a week has been spent on this instructional unit thus far), the class has established a general understanding of what the unit is about and, substantively, the factors that seem to be important in influencing where people live. Ms. Jones decides that there is enough common understanding in the class to permit individualizing instructional programs. Taking into account the learning profiles of her students (stored in the Utility system), she develops a number of individualized programs such as the following:

A. A group of four students is asked to explore the role rivers have played in influencing where people live. Students use a program developed in conjunction with a recent PBS television series on great rivers. Using a videodisc player, these four students engage in an interactive program designed to show how population centers have built up around rivers. The program provides basic information for students to write a report (using a word processing program), which they are able to share with the rest of the class. To prepare the report, students are required to search out the Utility database to find additional information relevant to their topic.

B. One advanced student takes on an assignment that requires her to develop a survey instrument and to send that instrument, via the Utility's electronic mail system, to a sample of two hundred students, living in fifteen different urban centers around the world. The instrument contains twenty questions that the students being polled answer by typing their responses into their own terminals. The results of the survey instrument are transmitted electronically to the student in Ms. Jones' class, who uses a statistical program in the Utility to analyze the data. The student then writes a report for the rest of the class.

C. One of the students in the class has severe reading problems. The teacher uses a program from the Utility that stresses the development of reading skills. The teacher is able to modify the general reading skills program to feature content related to the theme of the instructional unit.

D. Two students work together on a maps project. Using resource materials available in the Utility information bank and with the assistance of the Utility's graphics capabilities, the students construct a number of maps that show — more convincingly than the written word can — how topographical factors influence settlement patterns.

With the knowledge of what kinds of resources are contained in the Utility and with information about the learning characteristics of her students, Ms. Jones is able to create other individualized programs of study. Students work at different speeds, sometimes alone, sometimes with other students or the teacher; they tap a variety of databases, move back and forth among different types of media, and complete a range of projects. Ms. Jones moves among the students while they work, making observations, suggestions, etc.

- As the students complete their independent projects, Ms. Jones brings the entire class back together periodically to examine and learn from each other's work. For example, the student who conducted the international survey has finished her data analysis and has prepared some tables that the teacher thinks will be interesting to the class. The teacher calls up those tables and has them displayed on each student's work station terminal. The student who conducted the survey leads the class in an analysis of the data. Ms. Jones points out critical findings and asks the student who conducted the survey to comment on their meaning.
- At some point, the teacher administers an examination to all the students, based on the material that has been studied in common. The results of the examination are scored and reported by a testing program in the

Utility. The teacher is able to determine those students who seem to have learned the material as planned and those who have not. For those who have not met the instructional objectives, the teacher develops individualized programs designed to address their specific deficiencies. This may require calling upon additional information from the Utility, such as other software programs keyed directly to the instructional objectives not being met by the students. The Utility classroom management programs permit Ms. Jones to continue to monitor and track student progress.

- Ms. Jones' unit on the development of population centers actually was created in collaboration with another teacher in a school district nearly a thousand miles away. The two teachers have been comparing notes and trading ideas back and forth, sometimes on a daily basis, but now it is time for the students in the two classes to communicate. Using the electronic mail capacity of the Utility, students are paired between the two classes and begin to share with each other the concepts they are learning. This kind of electronic communication adds greatly to the richness of the learning experience. The students gain new knowledge about the topic and learn how to communicate more effectively with people they do not personally know. The experience is highly motivating for nearly all the young people, who ask that the exchange be permitted to continue beyond the time limits of the instructional unit.
- Also using the electronic mail capacity of the Utility, several of the students in the class contact a university professor whose specialty is the social dynamics of urban environments. Students send questions to the professor, who responds directly back to them by electronic mail. The professor's informative answers are not the only benefit of this exercise; so, too, is the experience of learning how to use a valuable *human* resource.
- One of the students in the class comes down with a fairly serious illness. She is not allowed to physically return to school for a number of weeks, but is able to keep up with the class, and with her own work, by connecting her computer (borrowed from the school library) with the school computer and working as though she were physically in class. Because of her access to the Utility, she is not behind in her studies when she returns to school.

* * *

THIS SCENARIO is, of course, only one of an infinite number of possible variations. Not only can we not describe most of those variations, we can't even imagine them. We won't fully understand what can be done with the Utility until we do it, that is, until teachers and students come to really *know* this new resource. As with most new tools, our initial tendency with the Utility will probably be to fit it into our existing, traditional patterns of behavior, improving our performance but leaving it unchanged at the core. What is yet unknown is how having full access to technology's tools might begin to change more fundamental patterns, such as classroom and school organization, curriculum content, teacher-student interaction, and school-home relationships.

All of this will take time to work itself out. At present, much of the Utility is in the conceptual and developmental stages. And this is good news for education: Educators, particularly teachers, have never before had the chance to be involved so early in the development stage of the technologies that have found their way into schools and classrooms. With the Utility, there is still time for educators to take this powerful idea and help mold it into the instructional tool it could become.

Schools in three school districts are serving as devel-

We won't fully understand what can be done with the Utility until we do it, that is, until teachers and students come to really* know *this new resource.

opment sites for the Utility — one in suburban Maryland, a second in Southern California, and a third in British Columbia, Canada. With training and technical assistance provided by NIU, teachers and administrators in these districts are learning to use a start-up version of the Utility. These professionals will be reporting their impressions as they experiment and tinker with the new system. The information gathered from these test sites will be used to reduce problems during early implementation of the Utility in other school districts.

THE EDUCATION Utility is a service product; as service providers, NIU will have to support the needs of its users. First on the list of services must be the establishment of a structure to provide preservice and inservice training for teachers, so they can learn to use this potentially powerful classroom tool to enrich their teaching, and — most importantly — in a way that relieves them of burden rather than adding to their existing workload.

Administrators, too, will need training and support to help them use the Utility's administrative programs and learn how to operate the school's controller. District administrators will need extensive help in planning the installation of the Utility in a way that best suits their school and district management needs. They will have to plan strategically for its integration with existing teaching techniques and technologies and will need to consider their present and future staffing and budgets.

NIU's second most critical support activity must be the maintenance of the instructional and management materials: building and replacing databases, ensuring the availability — and usability — of updated versions of software, letting teachers and administrators know about updates, and the like. NIU has been negotiating with numerous publishers, software developers, database developers, and news agency representatives for a number of months now. Working out licensing agreements with all these owners and distributors of source materials will be a difficult and time-consuming task.

Next comes the question of maintaining the equip-

ment. This, too, must be organized and supported by NIU. One interesting concept they have put forth is that school districts might use the Utility as a training tool for their own vocational education programs. Students would be taught how to diagnose problems, maintain, and repair the computers and other equipment. This would give them real-world experience in state-of-the-art technology as they earned credits; and the school, the community, and industry would benefit from an expanding pool of technicians.

Finally, NIU must be responsible for keeping the Utility technologically up to date, incorporating technologies such as computerized simulations of real-world experiences, interactive video, intelligent tutoring systems, and so on. NIU must be especially aware of advances in human interface techniques — to make the complexities of the system virtually invisible to teachers and students as new technologies are introduced.

In considering the support systems that must undergird the Utility, two things are clear: The first is that NIU has undertaken a very large task; the second is that the Utility will not be available as a complete system for quite a while. By a complete system, I mean one that will have a structure in place to supply users with all the services it is designed to provide — training, system maintenance, a large bank of instructional resources, and so on. In another sense, a system like this should never be considered complete, since it must always be evolving and responding to user needs in a changing instructional climate. In this regard, NIU plans to make the Utility a "self-healing" system — one with built-in capabilities of making internal adjustments to correct itself as problems and needs are found and surfaced by users.

THERE ARE a host of other policy issues that are beyond the scope of this article but that will need to be fully explored and debated as educators, parents, and the larger community come to understand how education might be influenced by this new application of integrated technology. Questions such as how the Utility will affect the quest for equity in education, what the Utility will mean with regard to local control over curriculum and instructional materials, and how issues of privacy — such as the confidentiality and security of information about students — will be handled, are terribly important. Lots of people need to be thinking these issues through.

Let me close with a word about funding. The Utility will be expensive. Indeed, although some aspects of the Utility could be put into operation without enormous expenditure, I can't imagine that a school district could implement the entire system without some form of funding outside of its regular budget. The NIU is fully aware of this problem and is proposing a funding approach that would enable schools to help pay for the system by opening it up to the entire community, selling excess capacity to businesses and home users.

Most schools are empty after 5 P.M. and are often vacant on weekends and for much of the summer. The computers accessing the Utility need not stand idle, for the Utility's potential for providing instruction, administrative support, information, and electronic mail is not confined to the K-12 population. Schools could be fully utilized during these down times, providing services to the community that the community would pay for, such as to support adult education classes, to allow undergraduate and graduate students the use of databases and word processors to conduct their research and write their papers, to give businesses the use of classrooms and the Utility for staff training, and to provide owners of small businesses who cannot afford sophisticated computers the use of applications software such as spreadsheets and word processing programs.

Use of the Utility would not be limited to the physical site of the school. Businesses and individuals could tap into the Utility's resources from work or home, at any time day or night, by using a personal computer and a modem and conecting up simply through a local phone call.

Although the idea of school-as-money-making-business is a rather radical notion, it could have some positive effects above and beyond the obvious financial one. The school would become — in a much broader way than it is now — the true education center of the community. It would extend its reach into homes and businesses that now have no direct contact with the public education system. In so doing, it could build strong new partnerships and dramatically increase the number of citizens who feel they have a first-hand stake in the school system's success.

IF THE Education Utility lives up to its potential, it would integrate all instructional media and technologies, providing teachers the materials and resources they need to individualize instruction for their students. It would be a source of active learning for students and would relieve teachers and administrators of much of their present record keeping and paperwork burden. Finally, it would enable the school to play a more central role in the community.

But I am reminded of a story I heard a little while ago. A friend of mine was at a conference where a teacher of the blind was being honored for an instructional device she had constructed that was now being marketed to schools around the country. The device was a "book" made up of swatches of materials of different textures, with buttons and loops attached, and was designed to teach tactile awareness and simple buttoning skills. In her remarks when accepting the award, the teacher made the point that, for her prototype product, she had "just picked up the pieces from the trash." It was not until he was on his way home that day that my friend recognized the importance of that statement. "In fact, all the pieces could go back in the trash," he said. "The importance of the product was what the teacher did with those pieces."

Similarly, the importance of the Education Utility will be in what the teacher does with it in the classroom and how the school and community use this new tool. With its creative use of telecommunications technology, it has the potential of becoming a major force for change in our education system. Its success will rest on the degree to which teachers and administrators are able to use it effectively, the richness of the learning materials that are added to the Utility's repository, and the commitment of local communities and businesses to the concept of a school-based Utility. □

PUTTING RESEARCH TO WORK

AFT Program Delivers Latest Findings to Teachers

BY MARILYN RAUTH

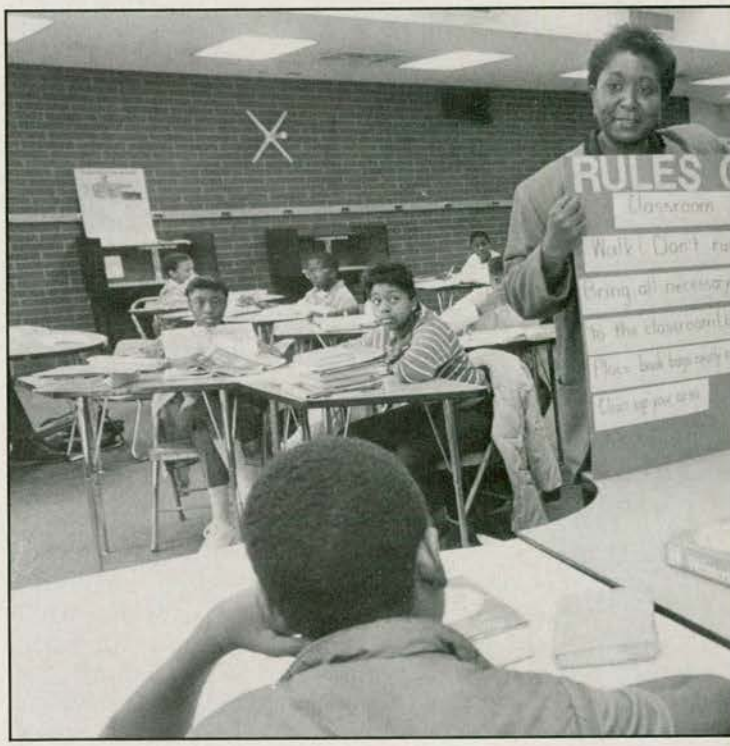
NO OCCUPATION has ever been granted professional status without first having a recognized knowledge base — a definable, codified body of knowledge that separates the professional from the layman.

While it is true that the principles of effective teaching cannot be applied in mechanical fashion but must be filtered through the teacher's knowledge and experience as she surveys a multitude of situational factors, it would be a mistake to conclude from this that teaching is therefore an indefinable art. To describe teaching as idiosyncratic art with no common ground or language erodes the concept of professionalism; it is also just plain wrong.

We all know of very bright people who have come into teaching on emergency certificates and lasted no longer than a few weeks or months because they could not master the skills of teaching beyond knowing subject matter. Effective teachers, on the other hand, accumulate an enormous personal knowledge base that is able to open the doors to student learning. In most cases, because this knowledge is not codified, these skills are retired with the teacher. New teachers begin the process on their own, inheriting little of "the wisdom of best practice" from those who preceded them. Teaching, consequently, continues to fall far short of meeting the criteria of a profession.

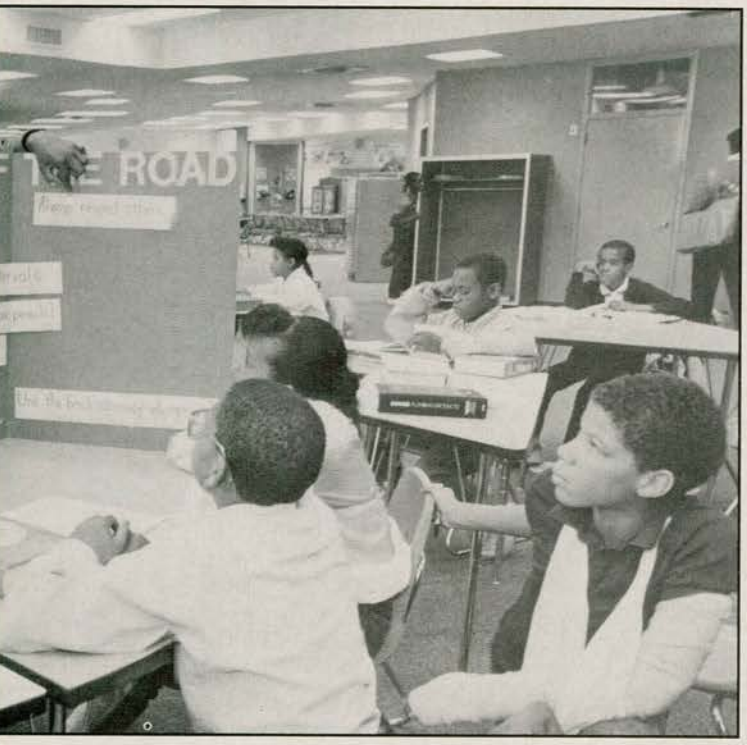
In the early 1970s, AFT president Albert Shanker questioned why a "science" of teaching could not be established to undergird the "art." Certainly, there is no one right way to teach, but there are limits on what will work in given situations. If good teachers are able to identify strategies and approaches more and less likely to succeed in certain instructional situations, the profession as a whole should be able to aggregate this knowledge into a body of effective teaching practices.

At that time, not much was known about the contributions educational research might make to articulation of a knowledge base. To most teachers, research represented impractical ideas of "ivory tower" academicians who had no concept of the real world of schools or classrooms. Researchers, on the other hand, claimed



PHOTOGRAPHED BY MICHAEL CAMPBELL

Marilyn Rauth is assistant to the president of the AFT for educational issues.



Top: Teachers often are surprised by the research findings on teacher praise and feedback, presented here by Lovely Billups, director of the ER&D program.

Above: Frances Robinson, a Washington, D.C., teacher, puts research to work by making sure that students know the "Rules of the Road" from the very first day of school.

Left: The ER&D process counters the isolation of the classroom and allows teachers to use research as a tool to reflect on practice and to share ideas.

significant breakthroughs in methodology, resulting in an emerging knowledge base on teaching and learning. Rather than relying solely on their own remote theoretical constructs, for example, researchers began to define effective teaching by observing what more effective teachers actually did in their classrooms. Theoretical researchers began testing their hypotheses in classrooms and refining them before announcing untested panaceas. However, because storerooms in schools throughout the nation were filled with expensive, dust-covered research products that promised to solve education's ills, these claims were greeted with justified skepticism.

The stakes in the professionalization of teaching were high enough that these assertions warranted some exploration. If the beginnings of a knowledge base did exist, where was it? Teachers and administrators did not have access to it, nor seemingly did teacher educators. Ultimately, reports of the studies in question were found on the shelves of research institutions and libraries and in technical language in journals through which researchers communicate with each other.

THE AFT decided to put this "new" research* to the test, to get it off the shelves and into the classrooms where teachers could determine its validity and usefulness. Curiously, no one else was taking the responsibility to carry the research out into the field. In 1981, the union received a two-year grant from the National Institute of Education to design a research dissemination process for teachers. Known as the Educational Research and Dissemination Program (ER&D), this pilot involved teachers in three urban school systems — New York City, Washington, D.C., and San Francisco. The magnitude of what was accomplished in a short two-year period and the significance of the findings are only now beginning to come to light. From the beginning, bringing teachers and research together quickly demonstrated that a knowledge base with practical implications did exist, that a great deal was known about effective classroom management, and that an evolving knowledge base on effective teaching strategies was emerging. Research served as a tool to help teachers reflect upon practice. The program enabled them to experiment with research concepts in their classrooms on an ongoing basis and to determine the validity of the research findings.

Teachers, who formerly had great disdain for research, now became enthusiasts. For effective teachers, research provided the first real validation of their practice, thereby boosting their morale and self-confidence. It enabled them to explore more deeply a variety of teaching strategies and their consequences. It increased their ability to articulate *why* one approach is preferred over another in a given situation, whereas formerly an argument could be made only on the basis of opinion. Looking through research into other teachers' classrooms allowed teachers to expand and improve their own teaching strategies. Intellectual stimulation permeated the program. As one teacher explained, she had been told what to do for so long, she did not even realize she was now just coasting. The opportunity to use re-

*Actually, the "new" research has been emerging for the last twenty years.

search to weigh the benefits of various approaches to learning and to consider the consequences revitalized her teaching and her commitment. Armed with new ideas, some teachers who had planned to leave teaching because of its frustrations decided to remain in the profession.

THOSE CONSIDERING the restructuring of schools should note that the success of the ER&D process is not based on some magic formula but upon known facts about knowledge utilization and dissemination, how teachers change practice, adult learning theory, education research, and teacher professionalism. Program developers simply took advantage of what was known — a "revolutionary process" infrequently applied in schools.

The ER&D formula might be described as a combination of knowledge, common sense, and a belief in teacher expertise. Researchers report their findings but feel they do not have the background or experience to interpret the implications of these findings. The ER&D Program is grounded in having teachers themselves do syntheses of research studies. They then develop training activities built around examples of how research concepts might be applied in actual instructional situations. These syntheses, called research "translations," are reviewed by the original researchers to assure accurate interpretation of their findings.

Participating local unions are asked to select an outstanding teacher to be trained as the Local Site Coordinator (LSC) for the program. Besides being recognized as an excellent teacher, this person must also be a risk taker and an innovator and must have good interpersonal skills. The LSC receives a week of initial training by AFT staff and experienced LSCs during the summer, attends follow-up training sessions, and receives regular communications from national program staff.

LSCs select teachers with similar qualifications to be trained as Teacher Research Linkers (TRLs) in their own school systems. These groups meet, on the average, for two or more hours after school once every three weeks. They read the research "translations" before coming to these meetings. As part of the training sessions, they determine which concepts they feel will be most valuable in their own classroom contexts and how they plan to implement them. In the time between sessions, they carry out their implementation plans, reporting back at the next meeting on their success or failure and the likely causes. Living up to their title of "research linkers," these teachers are also trained in effective ways to share research with their colleagues, both formally and informally.

Participation in the ER&D program is voluntary. The process that allows teachers from different grade levels and disciplines to interact with one another, exchange ideas, and share experiences is, in itself, a powerful incentive for continued participation. When substantive content — a factor unknown in most school staff development programs — is added, the results are electric. Teachers are invigorated and renewed by the intellectual challenge and stimulation. ER&D helps free teachers from the routine and constraints often instilled by many layers of school bureaucracy. A hobbled thoroughbred, after all, never won a race.

When asked if the program name should be changed to a catchier title, teachers said they were tired of "cute" names being applied to their programs as if *they* were children. Educational Research and Dissemination described the program and sounded professional.

THERE ARE several indicators of the success of this pilot. The first is its phenomenal growth. With AFT assuming the cost of the program when federal funding ended in 1983, the ER&D program has grown from the three initial sites at that time to 130 today. Visiting Practitioners — teachers on leave to work and study at prestigious, university-based educational research centers — continue to produce new "research translations." Among those completed to date are: beginning-of-the-year classroom management, group management, teacher feedback and praise, direct instruction/interactive teaching, time-on-task, cooperative team grouping, communications in the multicultural classroom setting, student learning styles, student coaching, critical thinking, and adult learning theory and dissemination techniques.

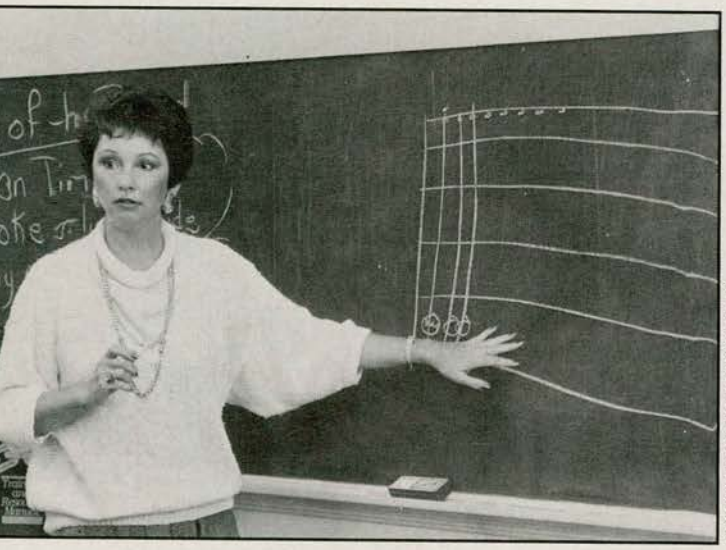
The success of the program can be seen not only in its rapid expansion but also in its retention rate: ER&D program teachers, who, in most cases, spend an average of two hours after school once every three weeks discussing research on effective teaching and its implications, do not drop out of the program but remain in it year after year.

In a documentation study of the effects of the ER&D program in the fourteen initial sites, the Far West Regional Education Laboratory reported in 1986 that the training process produced the following results:

- teachers did indeed change practice as a result of working with research;
- collegiality and morale increased dramatically;
- teachers were propelled into new leadership roles.

These findings show that — when presented in the right way — education research can be of enormous value. Teachers in the ER&D program were able not only to expand effective practice but to use research to change school policy. Interruptions over P.A. systems during classroom time were curtailed because teachers could use time-on-task research to prove the negative impact of disruptions on student learning. Teachers overturned spurious evaluations by using validated research to support instructional strategies being challenged. The rationale behind various mandated programs could be explored, and the appropriateness of program implementation measured against the actual intent of the research on which it was based. Most importantly, teachers were able to use research as a tool to reflect upon practice and determine the most effective approaches to individual students' learning needs.

Who is responsible for creating a mechanism for teachers to assess and explore the emerging knowledge base on teaching? The AFT Educational Issues Department served as a catalyst, but the real credit goes to thousands of teachers at the local level who were willing to give their own time to shape and participate in a process that was intellectually stimulating and that promised to improve or reinforce good practice. These teachers committed themselves not only to learn more for the sake of their own teaching but also to share this



PHOTOGRAPHED BY BRUCE BORICH

Jennielle Blunt, teacher and director of the Lake County, Florida, Effective Teaching Center, illustrates classroom management research for teachers participating in the ER&D process on release time.

research information with teachers at their building sites on an ongoing basis. Teacher Research Linkers make presentations at faculty meetings, hold lunch discussions (some are known as the "Research for Lunch Bunch"), give workshops for new teachers, and share on a one-on-one basis. It is these sharing networks and the willingness of teachers to engage in an activity that promises to improve education that have brought research to life in schools.

SOME LOCAL union presidents and ER&D program Local Site Coordinators, recognizing the value of the ER&D process, decided to take steps to institutionalize the program. By making it part of a district's staff development effort, the program would 1) reach more people and 2) replace traditional staff development — which is all too often irrelevant and trivial — with an intellectually stimulating program that can make a real difference in the classroom.

The ER&D process usually begins by having a Local Site Coordinator train ten to fifteen Teacher Research Linkers. A number of these teachers then train others, so that the number of teachers involved in the program expands over time. How, they asked, can we reach more teachers in less time? While many teachers have been willing to give their own time after school or on Saturdays to explore research, the intensity of the training is wearing when added to teachers' many other responsibilities. If the enthusiasm for this training is great under these conditions, they asked, how much more could we accomplish if it could be given during regular school hours when teachers are fresh?

What is interesting is what people in a number of locations have accomplished in a short period of time by refusing to be put off by obstacles and instead focusing on finding innovative ways of making changes that promise to benefit teachers and students. Some examples make this point.

LAKE COUNTY, FLORIDA

The Lake County Education Association is an AFT affiliate located in a rural school system in central Florida. After operating the traditional ER&D program for one year, the local felt that the results were so positive that there must be a way to give more teachers the opportunity to participate. This could best be done by making the program a normal part of teaching responsibilities. The local president, Gail Burry, and the local ER&D site coordinator, Jennielle Blunt, went to work. They proposed that Blunt be released full time to operate an "Effective Teaching Center." ER&D training would be given to 120 teachers a year, released in small groups for six full days intermittently throughout the school year. Blunt would schedule, plan, and provide the training. This would continue until all teachers were informed about the initial research translations, at which time the process would begin anew with the focus on evolving research studies. The objective would be to familiarize all teachers with state-of-the-art information on effective teaching and learning and to incorporate ongoing teacher exploration of the knowledge base as a professional job expectation.

Once they decided what they wanted to do, they set about finding a way to accomplish it. First, the superintendent's support was obtained. Next, with the assistance of their AFT state and national AFT offices, the local prepared a proposal and a three-year budget to submit to the local school board and a private foundation. After approval by the school board and administration, the proposal was submitted to the Conrad Hilton Foundation and was approved. The school system shared in program costs from the beginning, but these were supplemented by phase-out grants from the foundation. The school system assumes larger portions of the budget each year, and the local union makes a standing contribution. The costs are far below those charged by for-profit consulting firms, while the quality and sense of ownership are far superior.

Lake County's Effective Teaching Center began operating at the beginning of the 1985-86 school year. The following comments, illustrative of those made by all 120 teachers who participated in the ER&D training during the center's first year, reflect a totally new disposition toward research on the part of practitioners:

> "This is the most useful inservice I've had in my twenty-plus years of teaching. Keep it up!"
>
> "Please allow us to meet again next year for at least one day so that we can review what we've learned and be introduced to any *new* research. This was the best use of taxpayers' money. The release time was great because we were fresh and alert. I learned so much."
>
> "The workshops have been excellent. They have provided motivation and a desire to be a more effective teacher. They have given me ideas on how to accomplish that on a level that is transferable to my classroom. Every teacher, administrator, and board member should be encouraged to attend these workshops."
>
> "As a result of this training, I can see a tremendous improvement in both student achievement and behavior just from using ideas learned from the various researchers."

The Visiting Practitioner Program

By Phyllis Franck

A HIGHLY significant outgrowth of the ER&D project is the Visiting Practitioner program, which enables outstanding public school teachers to take a leave in order to work and study in a collaborative relationship with faculty and researchers at prestigious, university-based educational research centers for the major part of a school year.

By the end of the 1985-86 term, eleven teachers — all ER&D participants — had completed the Visiting Practitioner program, joining academic communities at Stanford, Brown, Columbia, and Syracuse Universities, and the State University of New York's Buffalo and Geneseo campuses.

The experience is extremely beneficial to all involved for several reasons:

- The Visiting Practitioner gains insights into how the world of academia functions, learning firsthand about the methodology and terminology of educational research — how to design research and how to read and interpret the findings.
- University researchers and students benefit from interaction with a teacher who, being an ER&D graduate, is conversant in the existing "research translations," has experimented with the applications of findings on effective teaching in the classroom, and continues to be involved in sharing this material with other teachers in her school system. The Visiting Practitioner is also able to help researchers gain access to classrooms for observation and study — generally not an easy process for "outsiders" from the school system.
- Based on their own classroom experiences and feedback from their peers, Visiting Practitioners help researchers determine new areas of research. Continuing contacts between the visiting teacher and the university after each sabbatical provide an ongoing avenue for communication on how research is being received and where additional work is needed.
- As a result of this unique collaboration, Visiting Practitioners have become the people in the ER&D process who create the "translations" and training materials designed to pass on the most important findings from this research to classroom teachers across the country.
- Both teachers and researchers are emerging with a new respect for one another, and an increased appreciation of the AFT and its professional goals is developing in the educational community as a result of its role in creating this program.

THE EDUCATION faculty at Stanford University, impressed with the "Teacher Research Linker" training sessions they had been asked to observe by Lovely Billups, who developed and directs the ER&D program, paved the way for establishment of the Visiting Practitioner program. During the 1983-84 school year, Rudi Faltus, a San Francisco high school reading teacher, became the first ER&D Visiting Practitioner, spending her sabbatical year at Stanford University's School of Education.

A grant from the Hewlett Foundation made it possible for Stanford to assign a quarter-time graduate research assistant to work with Faltus. The university also waived her tuition fees, and the San Francisco Unified School District granted a year's sabbatical leave at 60 percent salary.

Among the many positive outcomes from this first institutionalized effort at teacher-researcher collaboration were two new research translations and accompanying training activities — one on "cooperative team learning" and the other on communication in the "multicultural classroom."

"In a very real sense, this is the backbone of the ER&D program, because without new research and the addition of new translations and training materials, the program would eventually be phased out," said Billups. "But the knowledge base of teaching is constantly being updated. As students change and schools change, it is likely we will find through research that different instructional strategies will be more effective."

Of her experience at Stanford, Faltus says, "Through assigned readings, class discussion, and 'fieldwork' exercises, I learned about the theory and methods of educational research and how to read and evaluate research reports. I am now able to provide teachers with an overview of the research on teaching, which helps us place specific research reports in context. A knowledge of research methodology will allow us to apply this methodology to our own classrooms to solve some of our problems."

IN 1984-85, the second Stanford Visiting Practitioner developed the translation of new research on "student motivation" and worked with the Far West Laboratory for Educational Research in an effort to document the impact of the ER&D training process at the program's fourteen initial sites.

Important collaborative efforts in educational research have also resulted from the Visiting Practitioner program at other participating universities.

While at Syracuse University, the Visiting Practitioner from the Rush-Henrietta AFT affiliate in New York state worked on research analyzing effective dissemination techniques — with the ultimate goal to strengthen that aspect of the national program.

Last year at the Teachers College of Columbia University in New York City, Visiting Practitioners worked with researchers on developing teacher questioning strategies designed to maximize student classroom participation.

A new research translation on "Coaching as a Teaching Technique" is coming out of the Brown University program; on "Student Learning Styles" from SUNY at Buffalo; and on "How To Involve Parents in Children's Education" from SUNY Geneseo.

Universities have been cooperative in waiving tuition and fees, providing a quarter-time graduate research assistant to work with each Visiting Practitioner and assigning a knowledgeable professor as a mentor. Many school systems have willingly provided sabbatical leaves with partial pay. The Hewlett Foundation has continued its support with seed money for new Visiting Practitioner programs.

"I believe that this project can serve as a prototype for larger-scale university-school cooperation," said Dr. Lee Shulman, professor of education at Stanford University and former president of the AERA. "In this prototype, teachers become the active agents of communication, research translation, and planned change."

Shulman, who was a member of the original ER&D advisory board and has served as mentor to three Visiting Practitioners at Stanford, feels that the program "helps to build both trust and understanding between teachers and researchers that is necessary if school improvement is to take place."

Phyllis Franck is a freelance writer specializing in education topics.

PHOTOGRAPHED BY MICHAEL CAMPBELL

Research often confirms that teachers are doing what they should. ER&D Local Site Coordinators Bob Lewandoski and Dale Boatright get a chuckle knowing they were on the right track.

Principals have also have been highly supportive of the program. At the end of the center's first year, the local principals association wrote a letter to the school board praising the program and urging that its funding be continued. Principals are not included in ER&D sessions, because the current "top-down" management orientation of schools, regardless of the school system, jeopardizes the nonthreatening, nonevaluative nature of the program and inhibits teachers' willingness to explore candidly the causes behind both successes and failures. Next year, however, Blunt anticipates offering the research to principals in separate sessions. Collegiality in schools, it is hoped, will increase even more when teachers and principals can refer to a common knowledge base.

Previous participants' hopes that they could continue an examination of evolving research are being addressed in several ways. Often three or four teachers from one building attended the center program. They have selected one teacher as a school coordinator who will hold meetings to continue these discussions two or three times a semester for all those who have been or are currently in the training. In addition, all teachers who have been through the training will be released for one full day in February 1987 to review new research translations.

In this and all other ER&D programs, the word "training" misrepresents the actual process. Training implies that specific steps to effective teaching can be set forth. The research base for teaching is incapable of this. It can establish basic principles and give general guidelines for approaches found successful in varying situations. But environmental factors and the endless variety of individual student needs mitigate against any one clear-cut approach to effective teaching. Research on teaching recognizes the complexity of teaching and acknowledges that, within given parameters, a wide variety of teaching styles and strategies will produce desired outcomes. The ER&D training process enables teachers to use research as a tool, along with their own experience and professional discretion, to reflect upon their practice and to determine how successful different instructional strategies are in meeting their objectives.

Scranton, Pennsylvania

In the summer of 1985, Scranton Federation of Teachers president Bob Cavanaugh sent Mary Alice Kilcullen to be trained as an ER&D Local Site Coordinator. Cavanaugh believed that the most could be gained from this program if it were incorporated as part of the school system's staff development program during the regular school day. He made this proposal to the school superintendent and school board. Working together, they obtained state inservice monies to release Kilcullen each morning and to release twelve teachers a year to be trained as Teacher Research Linkers who eventually would share research with colleagues at the building level on an ongoing basis.

On February 12, 1986, the Scranton ER&D Center — a converted classroom next to Kilcullen's own classroom in the South Scranton Intermediate School — opened its doors. In addition to providing this space, the school system supplied the center with a phone, an AB Dick copier, materials and ER&D manuals. The twelve initial TRLs represented six schools, with two paired from each. (Experience in the ER&D program nationally has shown this support system of two TRLs in a building to be the most successful in eventual dissemination efforts.) The TRLs receive a full day of training approximately once a month throughout the school year. During the 1986-87 school year, twelve additional TRLs are being trained, and this process will continue until all schools have TRLs.

The Scranton school system offers two full state-funded staff development days for all teachers during the year, the first in October, the second in May. Beginning this year, TRLs will be offering a full day of research-based training as one option in this program. Research updates will be provided by releasing experienced TRLs four full days each school year for additional training.

Minneapolis, St. Paul, and Robbinsdale, Minnesota

Louise Sundin, Steve Dress, and Sandra Peterson, AFT local presidents in these respective cities, devised a collaborative approach to implementing the ER&D program. In the summer of 1985, Margaret Johnson, a teacher from Minneapolis, was trained as a Local Site Coordinator by AFT. These three presidents then approached their superintendents and asked that they jointly provide the funds necessary to release Johnson part time to plan after-school training sessions for teachers from these three systems. The superintendents agreed, and during the 1985-86 school year, Johnson used her release time to plan the sessions and then gave her own time to conduct the training for five separate groups — two from Minneapolis, two from St. Paul, and

(Continued on page 45)

The Struggle for Democracy in Chile

An Interview with Osvaldo Verdugo, President of the National Organization of Chilean Teachers

This past June in Chile, the national Civic Assembly — a coalition of students, women, and professional associations, farm worker groups, unions, and teacher organizations — staged a two-day strike to protest the continuing military dictatorship of General Pinochet. The success of the strike, which virtually shut down Chile's capital city, Santiago, and many other major towns around the country, demonstrated the depth of the discontent of the Chilean people with thirteen years of military rule.

In spite of the broad support for the protest, or perhaps because of it, the Pinochet government ordered a massive counterattack against the leaders of the Civic Assembly. Organizational leaders were jailed, troops were used to brutally suppress any further anti-government demonstrations, and a repressive "state of siege" was declared. Dozens of leaders were imprisoned, hundreds of citizens were injured in clashes with troops and, in an especially brutal incident, two young protesters were doused with gasoline and set aflame by government thugs.

The national coordinator of the Civic Assembly at the time of the June protest was Osvaldo Verdugo, who is also the president of the national organization of Chilean teachers, the *Colegio de Profesores,* which has approximately ninety thousand members. He was arrested, along with nearly twenty leaders of the teachers group, for his role in organizing the demonstrations. Following his arrest, the American Federation of Teachers and the International Federation of Free Teachers Unions, to which the AFT is affiliated, launched an international campaign to help secure his release from jail.

Verdugo was released on bail in early September, after six weeks in prison. Following his release, he accepted an invitation from the AFT and the IFFTU to travel to the United States and Europe to meet with teacher organizations in several countries. While in Washington, D.C., he addressed the executive council of the AFT and met with congressional leaders and representatives of the press. During his stay, he was interviewed for the *American Educator* by David Dorn, director of the AFT international affairs department. The interview was conducted in Spanish and translated for publication into English.

Dorn: *Could you begin by telling us something about the* Colegio de Profesores, *the Chilean teachers organization that you represent?*

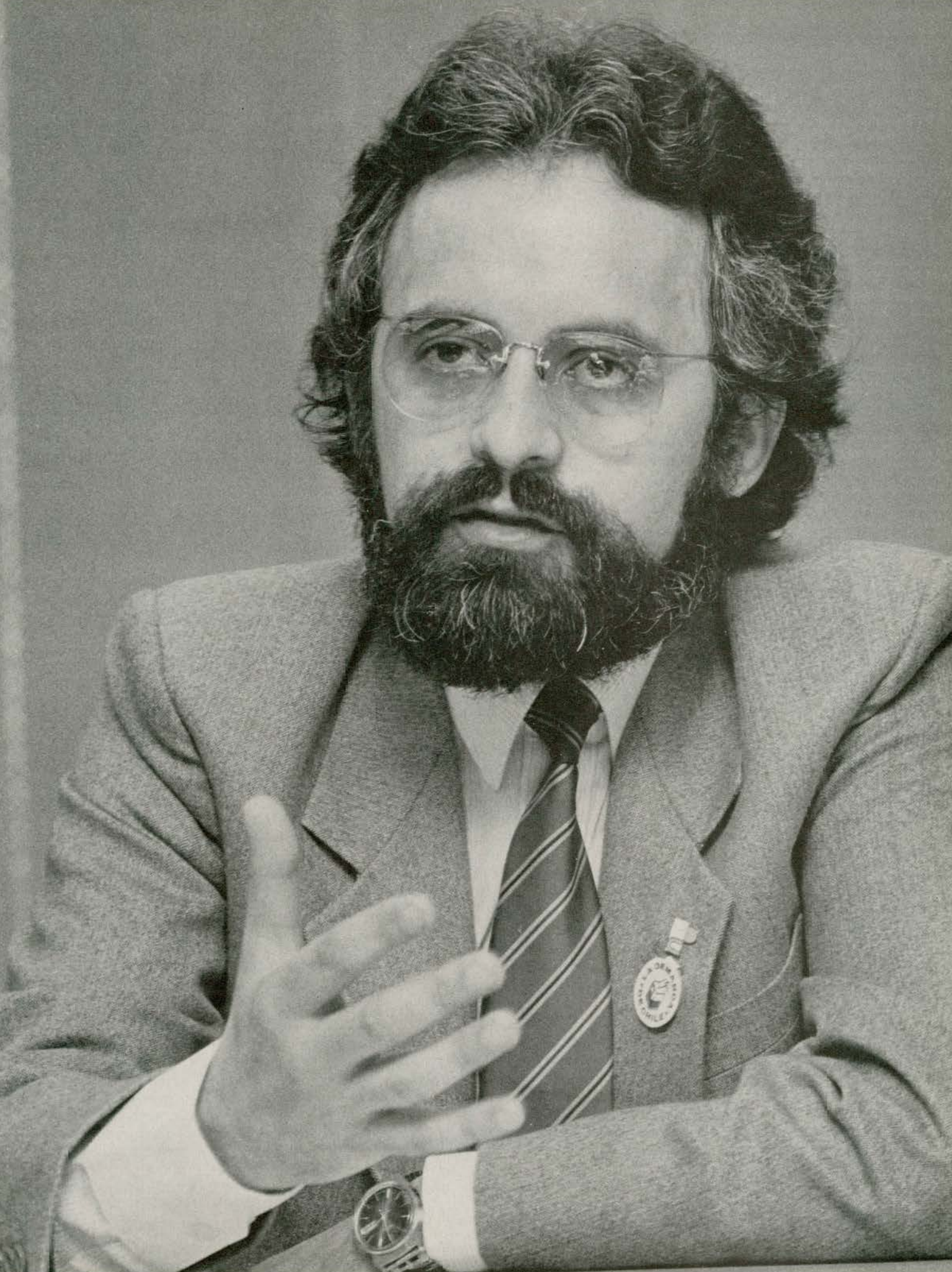
Verdugo: The history of the *Colegio de Profesores de Chile* dates back to 1974. Following the *coup d'etat* of General Pinochet in 1973, the existing democratically based unions and professional organizations in Chile were forced to disband. In their place, new national organizations were created that were controlled by the military regime. The *Colegio* was one of these organizations. So for twelve years, the teachers organization worked not in the interest of teachers but in the service of the government. Teachers tried several times to take over the *Colegio,* but the government used repression and censorship to keep its representatives in control.

In the early 1980s, we formed a group called the "Movement for the Democratization of the *Colegio de Profesores*" to try again to bring democracy to the teachers movement. After a few years of work and a couple of false starts, the government finally agreed to hold national elections for the leadership of the *Colegio* in December 1985.

Dorn: *After twelve years of government control, why would the authorities permit such a democratic election to be held?*

Verdugo: There are several reasons. In the first place, the government had been under constant pressure from teachers to allow such elections. In addition, the authorities themselves were not entirely satisfied with the management of the *Colegio,* even though the management had been installed by the government. Between the teachers' pressure and the questions about the existing management, I think the government saw the *Colegio* as a burden. So, for the government it was preferable to hold an election, even a relatively democratic one, to give the impression that social organizations such as the *Colegio* could function freely. In the second

PHOTOGRAPHED BY EARL DOTTER



place, the *Colegio* was one of the last of a number of Chilean organizations that had been allowed to reorganize and become independent over the past few years. Workers, lawyers, engineers, doctors, and other categories of working people had already regained independent control of their unions and professional associations.

The *Colegio* election was held in December 1985. There were four slates of candidates for executive board at the national level. Two of the slates were composed of candidates who were "pro-government." One of these slates received active support from the government. That group had all the necessary financial resources and all the support and means of communication and benefited from state intervention in the electoral process, especially at the local level outside the larger population centers. A third group of candidates was supported by the traditional leftists, primarily composed of the Communist Party of Chile. The fourth slate represented, in our judgment, the largest and widest spectrum of political tendencies in Chile. It was composed of candidates from the "democratic alliance."

Dorn: *What do you mean when you refer to the "democratic alliance"?*

Verdugo: The democratic alliance is a conglomerate of political parties that opposes the military government in Chile and that supports a nonviolent struggle against the dictatorship. It was founded by the Christian Democratic Party and includes the Social Democratic, the Radical, and the Socialist parties.

Our means of struggle is peaceful mobilization, but the government responded, as always, with violence.

The 1985 *Colegio* election was especially significant because it was viewed as a mini-plebiscite. After twelve years of dictatorship in Chile, this was the first large-scale, open election in which all political tendencies were represented. Observers noted that the election was going to give a profile, a diagnosis of what Chile was thinking about the government.

Dorn: *How many teachers voted?*

Verdugo: Over 60,000 voted. These represent the Chile of today, the common Chilean middle class. The results of this election were a triumph for the democratic sector. Our slate won approximately 60 percent of the votes. Out of five possible national positions, we won three. Our fourth candidate lost by only 80 votes, and we believe that his defeat was due to irregularities in the electoral process. The election was a historic event for teachers and for Chile because it demonstrated the broad support for the democratic parties.

When the new leaders officially assumed office in March, we had two overall objectives for the *Colegio de Profesores.* The first was to restore what we call "dignity" to the teaching profession. This includes all the problems facing the teaching sector . . . that is to say, all the demands that have been accumulating during the last twelve years. But, in addition to our responsibility to the immediate needs of our members and the education system in general, we feel that teachers have to make a contribution to the democratic reconstruction of Chile. During these very difficult moments, we have to make this effort.

We think the school is the place to rethink and recreate democracy and freedom. As teachers, we have a historic compact with the country to work together with other levels of Chilean society to find a way out of our current situation.

Dorn: *Is that why the* Colegio, *and you personally, became so deeply involved in the Civic Assembly?*

Verdugo: In Chile, different social movements, such as the teachers movement, have walked a road, an extremely difficult road, to regain rights that were abolished by the dictatorship. However, we now understand that the problems peculiar to each individual organization will not be solved if there is no change in the military regime. That is why, with a great amount of effort, we were able to constitute the Civic Assembly, the largest organization of Chilean citizens in thirteen years. In the past, individual organizations have paid a price for their struggles. Often they have been isolated. Through the Civic Assembly, we have achieved an institutional solidarity to handle the problems of the doctors, the problems of the women, the youth, and educational issues . . . problems of the whole Chilean society . . . through peaceful mobilization. The *Colegio* is an especially important element of this movement because of its size and because it has branches in all the regions of the country and in all the provinces.

Our means of struggle is peaceful mobilization, but the government responded, as always, with violence. Troops attacked Chilean citizens in the streets, and they jailed the leaders of the Civic Assembly. We were accused of trying to bring down the government. We were accused of being responsible for all the deaths that occurred during the year. The government pretends that through our jailing it has put an end to social confrontation. But, those who are responsible for the deaths are in the government of Chile, whether they wear uniforms or not. We in the *Colegio* are in solidarity with the victims of this violence, such as Rodrigo Rojas, who was burned and died in the streets of Chile, and Carmen Gloria Quintana Arancibia, who was a student of the Technical University of the State and is now recovering in Canada from burns she incurred in the demonstrations last June. [These two individuals were doused with gasoline and set afire by government police.]

Dorn: *You were in jail for over six weeks following the national demonstrations in June. As you are aware, the International Federation of Free Teachers Unions initiated a campaign of protest to demand your release. In response, the AFT and other unions around the world sent dozens of letters to Chilean government authorities on your behalf. Do you feel that this type of international pressure has any impact?*

Verdugo: In those difficult moments, the protests were very important. You have to understand

that, in jailing the legitimate leaders of Chile, Pinochet wanted to make us feel that we were isolated . . . that we were alone . . . that we had no social support inside the country or internationally. But just the opposite occurred: Through the solidarity we received nationally and internationally, jail made us realize that the great majority of Chileans and many others are supporting us.

Dorn: *You were released from prison in August. Could you tell us under what conditions you were released?*

Verdugo: The government accused the strike leaders of trying to bring down the government and of trying to paralyze the country. They wanted to make us responsible for the violence that occurred and also for the deaths that happened after the strike. The Minister of Justice needed to make these formal charges in order to hold us. After a period, our lawyers — who helped us out without charging for their services in the spirit of solidarity — were able to gain our release on bail. But, we are still considered criminals and this process will continue.

"Because he was arrested for representing us, we fight for his freedom," reads the poster printed to defend Chilean teacher leader Osvaldo Verdugo.

Jail in Chile is really part of the life of the democratically elected leaders of Chile. The time that we were jailed is only a small contribution to the long years that our people have suffered under this dictatorship. Jail has always meant to us the realization that there is an immense value to freedom, that liberty is a value that never should be renounced.

Dorn: *Could you comment on the assassination attempt on Pinochet and the question of the strategy of violence to overthrow the dictatorship?*

Verdugo: The political situation is quite changed after the recent threat on Pinochet's life. In declaring the "state of siege," Pinochet is deliberately exaggerating the situation. He is trying to convince the armed forces that Chile is subject to constant and permanent external aggression and that the danger of communism is a problem that has not been resolved in Chile. In a way, this shows the failure of this government because in 1973 the main goal [of Pinochet's junta] was to get rid of communism.

Political violence in Chile is a natural ally of the dictatorship. Pinochet pretends that Chile is completely polarized by two warring groups. Those who support war by supporting the militarization of politics in Chile are minorities from the right and from the left; they do not represent the vast majority of the people. And Pinochet knows perfectly well that in that war he will be the winner. That is why we do not choose the strategy of violence. We repudiate the government's use of violence to keep itself in power, and we also repudiate political violence as a way to free ourselves from the dictatorship because the cost of this dirty war is paid by the people. In Chile we are tired of violence. We are tired of deaths. The Chilean people would like to elect and not to die. This is why we, as civilians, will take no part in this war scenario. We believe that a nonviolent struggle and mobilization is the only mechanism that can give confidence to the majority of the Chilean people in order to isolate those extreme sectors of Chilean society.

Dorn: *You are currently visiting the United States and will go on to Europe at the invitation of the AFT and the European teachers unions. What is the purpose of this trip? What do you want to achieve?*

Verdugo: For us this invitation is very, very important. The *Colegio de Profesores* accepted the invitation because, after having been under government control for twelve years, it is important to explain how the organization has changed. When the *Colegio* was under government control, it was not recognized by any international teacher organization. It is now important to let other teacher groups know that the *Colegio* is now a democratic organization and that it is a protagonist in the fight for change in Chile. Our first goal in this speaking tour is to publicize the situation of Chilean teachers and to establish relationships with international and national teacher organizations. At the same time, we are interested in the work and problems of teachers in other countries. We need to become aware of the

way in which other teacher movements are structured and how they approach problems.

Dorn: *Osvaldo, you have discussed the process of democratization in the* Colegio *and how teachers have been involved in a movement to return Chile to democracy. Now, I would like to ask you about the education sector itself. You mentioned earlier that there is a need to redevelop the teaching sector in Chile. Could you give us an idea of what some of the more serious problems facing Chilean teachers are?*

Verdugo: In the first place, I would say that all policies imposed by the military regime in the educational field are measures that have not been appropriate, have been arbitrary and authoritarian. They have not taken into consideration or consulted the teachers themselves.

Teachers have been systematically censured or fired by the authorities without any explanations or without any possibility of a just defense.

Education is in a state of disequilibrium because the employer [the state or private school administrations] can fire a teacher by only giving thirty days' notice. This is by law. As you can understand, the instability this causes has profound consequences not only for the teacher but also for education itself. A teacher who lives under this anguish — without any security — certainly cannot function in a tranquil manner or fulfill his educational duties. Teachers have been systematically censured or fired by the authorities without any explanations or without any possibility of a just defense. This is why we are demanding special legislation for the educational system that would guarantee the stability of the teaching profession, that would guarantee a dignified remuneration for teachers and conditions and tenure and mobility within our system. It should also provide for retirement and social security. Look at the current retirement law, for example. Now in Chile, we are retired by age and not by years of service. The teachers believe that this is unfair because men retire at sixty-five and women retire at fifty.

The teachers in Chile are in a very precarious economic situation. Education in Chile is now subject to the whims of the market. Salaries for teachers in the public sector are hurt by the bad economic situation of the country. Also, private schools are not required to pay salaries equal to those in the public sector, and today in Chile a large percentage of education is in private control.

Dorn: *Before the Pinochet dictatorship, Chile had a strong tradition of support for public education and a relatively high literacy rate. Has there been a deterioration of the education system during the past thirteen years?*

Verdugo: Yes, our studies show that the education system has deteriorated during this period even though the demand for education has remained strong. The current government sees education more as a service to the "marketplace" . . . that is to say, it views education as existing to meet the needs of private business rather than as a means of human development and as a contribution to the broader public interest.

We believe that education is a right. And this is why we demand that every single Chilean citizen should have the opportunity of receiving a good education. Even though this is guaranteed in the constitution of 1980, the government does not follow this in practice. There is a very unequal distribution of scarce educational resources. One has to have the financial resources to have access to a quality education. This policy will have deep consequences for the future of Chilean society. In Chile today, education is the locus of many social injustices and social confrontation instead of being a bastion for social justice.

Dorn: *I have a final question. The Pinochet government has declared that there will be some form of elections or national plebiscite in 1989, but the current state of siege seems to throw a cloud over that possibility. In any case, there was always some doubt whether Pinochet would allow the country to return to democracy. What are your hopes about this? Are you optimistic or pessimistic?*

Verdugo: Well, we are convinced that the constitution of 1980 is a constitution that was created to maintain the Pinochet dictatorship. This is why we believe it is illegitimate . . . illegal from its origin because of its antidemocratic content. According to the constitution, in 1989 there will be a plebiscite "to freely elect the president of the republic." We have to see what the meaning of this plebiscite is. Without a doubt, I think it was designed to allow Pinochet to keep himself in power for the next eight years.

However, even though we are going through a very dramatic moment in our country . . . a state of siege that gives General Pinochet all the power, we still have hope that we will have the opportunity to decide our destiny. Our objective is to obtain free elections.

Dorn: *Thank you. We wish you all the best and we hope that we can continue with this relationship between our teachers union and the* Colegio de Profesores of Chile.

Verdugo: We believe that the teachers of the world, with respect for our autonomy and our cultural characteristics, share many things in common . . . most importantly, the desire to educate for freedom and for social justice. This common value pertains to all teachers and is felt more poignantly now than at any other time in Chile because, under the dictatorship we endure, the values of truth, justice, and life have been systematically violated.

And this is why we want to be in solidarity with all the teachers of the world, so that that common message is heard everywhere. Wherever authoritarian regimes or dictatorships that want to destroy the conscience of the free man exist, we as free teachers will raise our voice and carry out our responsibility of making our contribution as teachers and as human beings to a society that is just and free. □

IN THE SOVIET UNION HEBREW TEACHERS ARE THE ONES WHO ARE TAUGHT A LESSON.

YULI EDELSHTEIN—
Hebrew teacher, charged with 'illegal possession of drugs' sentenced to 3 years.

ROALD ZELICHONOK—
Hebrew teacher, charged with 'defamation of the Soviet State' sentenced to 3 years.

IOSIF BEGUN—
Hebrew teacher, charged with 'anti-Soviet agitation and propaganda' sentenced to 12 years.

LEONID VOLVOVSKY—
Hebrew teacher, charged with 'defamation of the Soviet State' sentenced to 3 years.

Hebrew is a dangerous subject to teach in the Soviet Union.

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But it's time the Soviets were taught a lesson. March for Soviet Jewry on Solidarity Sunday, May 3, 1987 and focus the attention of the world on what the Soviet Union is doing to Soviet Jews.

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Relearning To Teach: Peer Observation as a Means of Professional Development

By Elizabeth Rorschach and Robert Whitney

In graduate school, and afterward in the college or university, a great deal of emphasis is placed on developing ourselves as scholars and very little on developing ourselves as teachers. There are probably many reasons for this, but one of them surely is the fact that the products of scholarship are tangible while the products of teaching are not. Two years ago, we were both preceptors in the Expository Writing Program at New York University, where we were Ph.D. candidates in English Education, a combination designed to encourage our interests in teaching. Among English Education students in this program, the conversation about teaching, learning, linguistics, and discourse theory and their application in the classroom tends to be quite intense. Yet even in such an intellectually rich and supportive environment the discussion of teaching has its limits: the talk was good as far as it went, but it didn't entirely satisfy our need to look closely at what was happening in our writing courses.

We were both, at that point, experienced teachers, having taught freshman writing in various colleges for ten years between us — experienced enough to know that the translation process from good idea to effective lesson is often unpredictable. We both enjoyed the talk, but we knew that something was missing: the phenomena themselves — the actual events of the classroom — remained sequestered behind closed doors. It is one thing to talk about what happens in our classes or to share ideas and lesson plans; it is quite another thing to be the one who is there when class is in session, trying to put those ideas into practice and meeting with the unexpected reactions of students. For example, many writing teachers have tried peer groups on the recommendation of colleagues only to be disappointed by the results. Why does this happen? Despite prodi-

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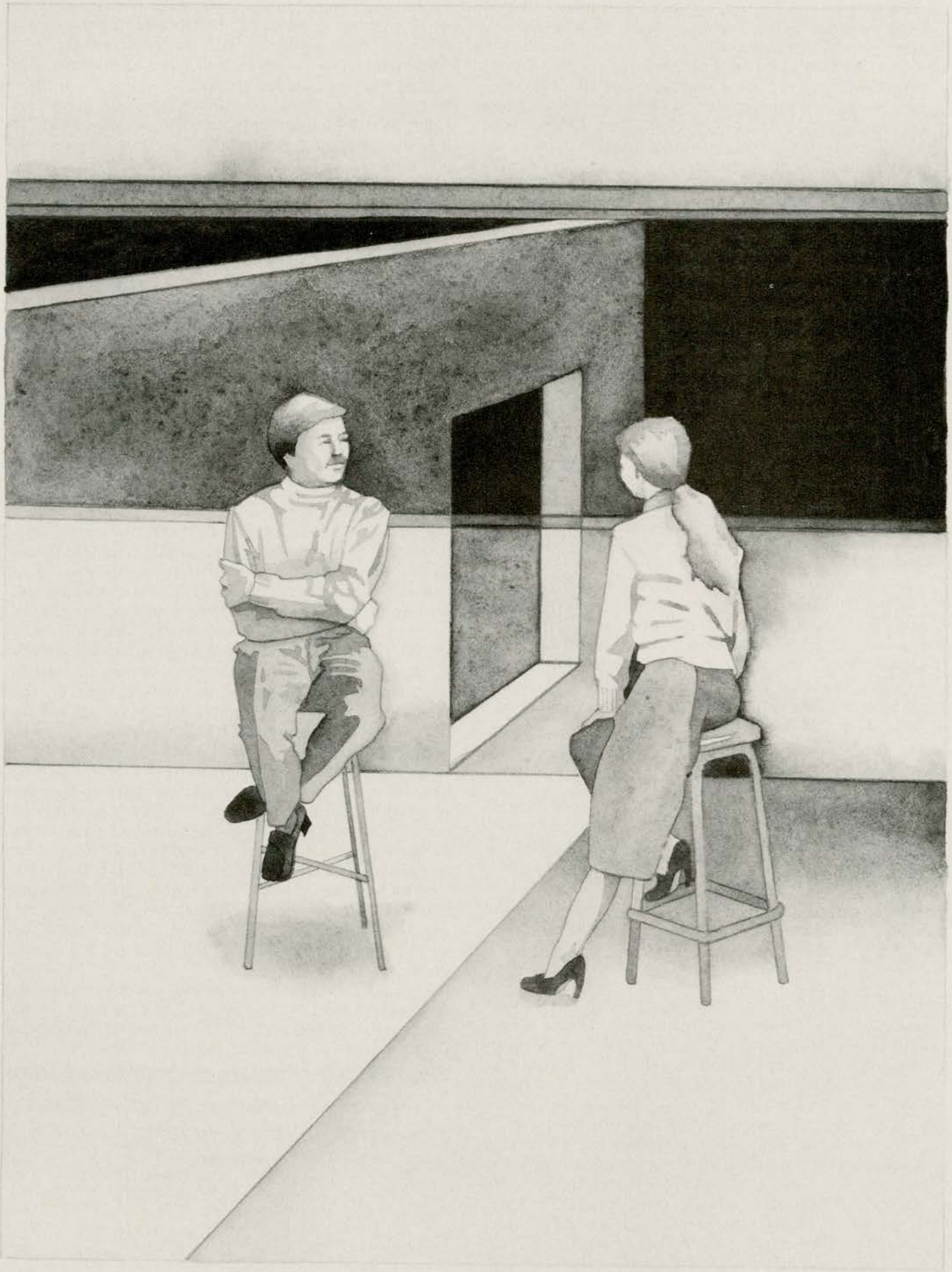
ILLUSTRATED BY BOBBI CLAYCOMB



gious amounts of talking, we often remained baffled about why certain things worked and why other things didn't or why our classroom successes and failures so frequently contradicted the predictions of theory. Even when the talking did help us "understand" these events, our new understandings were seldom of use in getting something different to happen the next time. We needed a way to carry these discussions further; a way of connecting them more directly to the classroom experience itself. After considering a number of approaches, we decided to attend each other's freshman writing classes in the role of students — a version of the participant-observer method used in ethnographic research.

We expected that there would be two advantages to this approach. First, the project would be intensive and holistic. That is, we would not be just *observing* each other's teaching once or twice during the semester, getting bits and pieces of the courses, but *participating* in the courses as if we were members of the community, taking part in discussions and group work and even writing some of the assigned papers. This meant that we would be able to see each course as a whole, from the inside — to view each class meeting within a context that would gradually build throughout the semester. It also meant, we hoped, that we would get to experience what it was like to be a student in our courses — something we were aware that we really didn't know much about.

Second, having another pedagogically aware person to report on what happened in our classes brought us closer to a method that ethnographers call "triangulation" — analyzing events from multiple viewpoints. In practical terms, this meant that the other teacher would provide a check or test of our interpretations of events, giving us a means to build a more inclusive understanding of what had happened.

Initial Methodology

Our project's design turned out to be quite simple: For fifteen weeks, we attended each other's freshman writing course, which met twice a week for a total of three hours. The teacher in each class taught as she normally would, while the observer took the role of a student, participating in class discussions, writing drafts for most of the assignments, and sharing his writing in peer groups with the other students. We each kept a notebook on the experience, and we met once a week for about an hour to discuss what had been happening. In our earliest plans, we thought we might not tell the students, but we abandoned that idea as too risky, thinking that the students might find out and have genuine cause to feel betrayed. On the first day of classes the teacher simply introduced the observer, said something about what we were doing, and asked the students to treat the observer as they would any other student.

We were quite nervous about revealing our teaching to each other, but at our first weekly meeting we focused on the things we liked about each other's teaching, and the nervousness began to disappear. The care we took at the beginning to be supportive was probably crucial. Had we initially made comparisons — which could have had negative implications — the resulting increase in anxiety might have crippled our ability to work together in the open and trusting way that made this collaborative inquiry such a rich experience.

After a couple of weeks, and quite fortunately as it turned out, we decided that we could go no further without comparisons. This proved to be an important aspect of our method and led to some of our richest insights. We think what made the comparisons so powerful was the diversity of points of view, something that doesn't happen with solo teaching or even with team teaching of a single course when both teachers constantly share the leadership. Although we were never, of course, really in the roles of students either (among other things, we weren't being graded), our viewpoints were different enough to allow us to form divergent perceptions of the same events and then to compare those divergent perceptions with our perceptions of events in the other class, seen from reversed perspectives. It was this duality of viewpoints by the same observers reversing roles in parallel cultures that led us to the most important new learnings and insights and that allowed us, in the third week, to make a discovery that shaped our work for the rest of the semester.

Initial Findings

From the beginning we had noticed two things. On a philosophical level, we were in almost complete agreement. Ideas of active learning, promoting the autonomy of students, forming a community in the classroom, and writing as the making of meaning, based on the works of Berthoff, Britton, Elbow, and Freire, among others, shaped most of our planning and provided a framework in which we interpreted classroom events. Central to this framework is the notion that writing is among the most authoritative and autonomous acts that human beings do. If this is true, and if becoming a writer means growing in one's ability to act on one's own authority, to think for oneself, then it seemed to us that in a writing class there needed to be a transfer of authority from the teacher to the students. The students needed to come to see themselves as making choices that shaped meaning for themselves and each other, instead of waiting for the teacher to make these choices for them by telling them exactly what to do. This, in turn, required a transition from a situation of singular authority vested in the discourse of the teacher to a situation of distributed authority — a community in which discourse is a shared creation.

On an experiential level, however, our classes proved to be very different. This was a surprise, but we initially avoided paying much attention to it. The difference had to do with what might be called an "atmosphere" of

We were quite nervous about revealing our teaching to each other.

participation. This is not easy to describe in a way that conveys how striking it was to experience. We both felt markedly more comfortable in Betsy's class, and the students seemed to participate more. In Betsy's class, the students spoke a lot, actively and freely participating in the discussions she initiated. There were silences, but they had a thoughtful quality to them and did not make us feel anxious. It seemed to both of us that the students in her class had begun to recognize their own ability to carry on a discussion without the explicit leadership of the teacher. That is, students didn't wait to be called on by the teacher before speaking, they addressed each other as well as the teacher, and they asked a lot of their own questions rather than just answering the teacher's. In Bob's class, however, the students were uncomfortably quiet unless addressed directly by Bob. It was as if Bob remained much more in control over what was happening in the class, resulting in a conversation that revolved around him and stifled the students.

In our third weekly meeting we could no longer ignore this difference. Actually, the difference was so great it was hard to ignore, but when our avoidance of comparisons proved unsatisfactory we simply explained away this difference by attributing it to differences in our students. The fact was, our students *were* different. Betsy was teaching an out-of-sequence section of the first semester composition course, and over half of her students were upperclassmen. Bob was teaching all freshmen in a "natural science" section of the second semester course, where all the reading and writing topics were drawn from the natural sciences. These natural science sections had a reputation for attracting students least interested in writing. Those in Betsy's class were older (average age of about twenty-five) than those in Bob's class (average age of about eighteen), and some of the students in Betsy's class had returned to university after interrupting their schooling in order to begin careers or families. Bob's class had a higher percentage of premedical or predental students (whose concern for grades and aversion for the uncertainties of writing are well known at NYU). It was thus easy for us to account for the differences between our two classes by pointing to the types of students we had.

We felt there was a problem, however, with such an approach: If we blamed the students, however deserving they might be, we weren't going to learn anything much about teaching. So we decided to adopt what seemed to us at the time to be a personally risky hypothesis: that the differences in our classrooms resulted from differences in our behaviors as teachers rather than from differences in our students. Although threatening, such a hypothesis proved to be a lot more valuable.

Changes in Methodology

At this point, having identified a problem to solve — something we wanted to know more about — we decided to add several tools to our method of inquiry.

First, we began tape recording our classes so that we could look more closely at our classroom behavior. Although we shared a sense that we were probably behaving differently in our roles as teacher, it was not immediately apparent how, since neither of us really sought to create an authoritarian classroom and both of us went to great lengths to encourage participation, arranging the chairs in a circle and conducting our classes mostly as conversations of one kind or another. It would have, of course, been better to have recorded the initial classes, but we "reasoned" that whatever we had done in the early classes to set things up, we were probably still repeating in some form or other.

Second, we decided to look at our lesson plans for those first three weeks to see if any differences in the progression of each course would help us explain the experienced differences in the communities we had produced. Clearly the essential difference in our courses didn't lie in our goals. Consequently, we needed to look elsewhere, and the sketches of our lesson plans revealed some startling contrasts.

If we blamed the students, however deserving they might be, we weren't going to learn anything much about teaching.

At first glance, our lesson plans didn't seem essentially different. Both involve whole-class discussions, small-group discussion, peer response to drafts, student-generated writing topics, reading and freewriting* in class. To us, as we went through the first three weeks with the students, the progression of events seemed merely like different arrangements of largely similar elements. However, when we compared these events on paper in the third week and began to talk about why we had arranged them in the ways we had, we saw one crucial difference. This was not a difference of philosophy or of classroom method or execution, but of what might be called "strategy."

During the first three weeks, Betsy's strategy was focused on creating different classroom interactions to put into practice new rules and procedures for a course in which authority is shared. Betsy went to considerable lengths to demonstrate these new role expectations and set up her assignments with the intention of giving the class opportunities to think about them (for example, in the first week students freewrote about a previous writing class; in the second week they freewrote about and discussed the roles of the teachers and students in a writing class). She also had more small-group activities than Bob. Although it does not show up in the syllabus outline, she even went so far as to dramatize repeatedly the nonauthoritarian "culture" that she was developing. For example, at one point during a discussion, she left her seat and moved to a chair at the back of the room, outside the discussion circle. After listening for a while (and purposely neither speaking nor making eye contact with the students as they spoke) she interrupted to ask why everyone was craning his neck around to speak

*Freewriting is writing quickly for five or ten minutes whatever is in the author's mind without judging or editing it.

to the back of the room. She used this "drama" as a way of initiating a discussion of classroom roles and acknowledging each other's authority.

Bob's strategy during the first three weeks was focused on creating a different understanding for the activity of writing itself, having the students do a number of short, generative writing assignments to help them gain a sense of writing as a generative activity. Students wrote in class each day, discussing as a large group what had happened as they wrote. Throughout these discussions, Bob was the recognized leader, setting the tasks and asking the questions, and since the attention was on writing and its processes, the classroom roles remained largely unaffected.

Findings about the Role of the Teacher

As time went on, it was this issue of the role of the teacher in affecting the distribution of authority that became the central focus of our inquiry. The difference between the progression of events in our two classes was important, yet subtle. Betsy was no less a leader than Bob during those first three weeks, or for that matter during the rest of the semester. She also set the tasks for the students and was the primary agenda setter for the course as a whole, as was Bob. Nevertheless, her leadership had a different intention and purpose: to help the students discover their own autonomy and authority in and through the classroom conversation. Her idea was that once they began to experience this new relationship to themselves, each other, their teacher, and the educational process, it would transfer to their writing as well since their writing was part of the same conversation. Bob's idea was to have the students discover their autonomy and authority, their "voices" as writers in the experience and study of the writing process itself, without giving much attention to the classroom and its dynamics.

This difference had significant effects on the ways we employed the various elements of instruction. For example, the students in Betsy's class began working with each other in small groups at the second class session; those in Bob's class met in groups for the first time at the fourth class session. We felt that this delay, in combination with more frequent in-class writing assignments, allowed the students in Bob's class to maintain their conventional understandings of the classroom as composed mainly of one-way conversations with the teacher. While both of us had set out to build a community of writers, Betsy used the spoken conversation as the vehicle for the distribution of authority. Bob used the relationship of each writer to his writing as the vehicle, giving little attention to the form of the spoken conversation. Ironically, he ended up emphasizing writing as a solitary activity, despite his intentions to the contrary.

It is important to think of how all this affected the student's perceptions, a phenomenon we could at least speculate on from our positions as participant-observers. Take, for example, their perception of how the writing assignments were given. Both of us believed that the students should come up with their own topics as much as possible since choosing what to generate must be an integral part of any generative act. Both of us, in fact, offered this freedom, but we believe that only in Betsy's class did most of the students understand it and begin to make real use of it, choosing from their journals topics that they were personally interested in. In Bob's class, the students remained in an uncomfortable no-man's land between choosing their own topics and choosing what they thought Bob wanted them to choose. In spite of Bob's repeated entreaties to choose for themselves, this discomfort with autonomous choice remained throughout the semester. For the students, perceiving that Bob's actions belied his words, continued to act as though the real authority remained in his hands, and thus most of them never came to experience themselves as the authors of their own choices.

In our analysis of the transcripts of the tape recordings of our classes, we were especially interested in the beginnings, the ways discussions were initiated and conducted, and the ways our actions facilitated or interfered with autonomous activity by the students. In Betsy's class, the students were talking a great deal more than the teacher, and there was much more talk addressed by students to other students. Although it wasn't apparent on the audiotape, we also noted that Betsy made a point of not looking at the students when they were speaking, thus forcing them to look around the room at their other listeners. Perhaps the most important finding in the transcripts for Betsy's class was the pauses. Betsy would begin a discussion by asking a question and then would remain silent, waiting for a student to respond. Unlike Bob, who would usually say something himself if nobody responded, Betsy would wait until somebody spoke, even if the silence seemed interminable. We timed the silences in one discussion.

Betsy would wait until somebody spoke, even if the silence seemed interminable.

Most of them were about five to seven seconds long, but one was fifteen seconds long, and another was twenty-three seconds long. We concluded that Besy's behavior and conscious actions had somehow set up the kind of classroom culture that encourages autonomous behavior within a community of writers. But we had to wonder to what extent Betsy's students had made it easy for her to build the culture she wanted. Could the same community feeling be attained with a different group of students?

Testing the Findings

Prior to our study, Bob had always been dissatisfied with the quality of classroom discussions in his courses, but since nothing he had done in his attempt to improve these discussions had made much difference, he had begun to wonder if he was wishing for something unattainable — maybe he was hoping for a quality of participation beyond the capabilities of college fresh-

men. Now he had reason to believe otherwise. What we needed was a way to test our hypothesis that the behavioral and strategic differences we had identified were indeed sufficient to create a different culture in Bob's classes.

Fortuitously, such an opportunity was available almost immediately because Bob was also teaching at a community college whose spring semester started four weeks later than NYU's. The students at the community college were very different from NYU's typical affluent students from suburban high schools. The students at the community college were among the least well prepared of college freshmen Bob had taught, mostly coming either from the inner city or from other countries. We felt, however, that in some ways this provided a better test than would a group of more similar students because such students generally have even greater expectations that teachers are supposed to act in authoritarian ways.

Bob revised his course outline in the light of what he and Betsy thought they had learned and included early freewritings and discussions on previous experiences in writing courses and teacher/student interaction, as well as several classroom dramas of the type Betsy had used, leaving the emphasis on writing and writing process to develop as the course progressed. He also worked consciously at changing his presence in the classroom. Together he and Betsy worked out ways that he could force himself to tolerate more silence and remove himself from the center of the discussion. One such plan was to make a point of sitting in some nonfocal position in the room. Another was to take notes during the discussion. This note taking served several purposes simultaneously — it kept him from talking, made it possible for him to endure the silences, and allowed him to break eye contact with the student who was speaking, forcing her to look elsewhere for someone to talk to.

Often Bob found that the change in his "normal" patterns of classroom behavior was so upsetting that he was unable to concentrate well enough even to take notes, so he just scribbled, freewrote, or drew lines on the page, but even this proved sufficient to break the cultural pattern and allow a new one to emerge. In fact, he was astonished by the effect these relatively superficial changes had on his behavior. In his new classes at the community college, and for the first time in his teaching career, he had discussions in the classroom that he enjoyed participating in and that didn't make him feel as though he were pulling them out of the students line by line. The students spoke back and forth as if they cared about what they were saying, and after a while he could join the discussions without taking them over.

Implications for Professional Development

Does all this mean that as teachers we are now to take Betsy's approach as the final word on freshman composition? We don't believe so. The kind of experiential knowledge we generated in the course of our study is probably largely tacit and thus not generalizable beyond our own classrooms. It was not our intention to generate knowledge with wider application — all we wanted was to learn something about our own teaching and to construct a vehicle for carrying our development as teachers further. What can be shared, we feel, is our approach to method: collaboratively designed classroom research projects as a means of professional development for teachers and as a method of faculty development for institutions that train teachers or want to support the improvement of teaching. There are many ways such informal research could be done — peer observation is only one of them — but the need must arise from the teachers themselves so that they can work with peers on developing "research" methods appropriate to the kinds of pedagogical problems they want to investigate. We eventually found that the method we used was more elaborate than necessary — but then we started out not knowing what we were seeking so we needed to use a large net. For instance, if we were to do this again, it would probably be possible to make the necessary observations in only two or three weeks of participation, that is, if we knew ahead of time what we were looking for. We also feel that classroom visits are only one of several methods that are possible to gain more information about what is going on in our classrooms. Loren S. Barrett, an anthropologist at the University of Michigan, often advises teachers to find out more about what is going on in their classrooms by asking the students, a method that is notably absent from this study. Certainly, were we to study our teaching again we would spend more time conversing directly with our students about their various realities of the experience of the classroom.

We set out to learn some things that would be useful in our own teaching, and we feel that we succeeded.

Currently there is much talk — in writing projects, at conferences, and among colleagues — of classroom research. For some, the term "research" carries with it all the connotations of statistical methodology and experimental design that most teachers probably believe are beyond their abilities. When the goal of such "research" is to produce knowledge that has wider applicability — reliable knowledge for the larger community as a whole — carefully constructed methodology is necessary, and if we wanted to repeat our study for such purposes, we would have to set up the procedures and controls appropriate to the generation of such knowledge.

However, generalizable knowledge does not always have to be intended by an investigator. We set out to learn some things that would be useful in our own teaching, and we feel that we succeeded. For that, a casual and exploratory methodology was much more appropriate, perhaps even necessary. Indeed, a great deal of what we learned is not in this paper, nor even as yet consciously conceptualized in our own minds — it

exists in the realm of what Michael Polanyi calls "tacit knowledge" and informs our decisions in the classroom without our even being aware of what it is.

One of the richest aspects of this project was the direct experience of another teacher's classroom over a period of time and a chance to think and talk about that experience with another teacher who was present. This is holistic learning of a kind that perhaps can never be fully understood in the abstract.

Such experience seems to wake up a kind of capacity for cultural awareness that we didn't know we had, and once awakened, that awareness applies even to participation in the familiar cultures in which we usually live and work. In fact, that was the primary benefit that Betsy felt she got from the study — a heightened awareness of what she was doing in her own classroom and an expanded ability to step back from and analyze her own behavior as a teacher. Prior to the study she had felt satisfied with her teaching, but she didn't know why, because she hadn't made concrete the connection between her conceptual system and what she actually did in the classroom. Our work afforded her that and enriched her experience of her own classroom as well.

The situation that we found ourselves in is not uncommon. Most teachers experience a yawning gap between the abstractions about education presented to them by university researchers and the pressing decisions about what to do in their classrooms tomorrow morning. Perhaps the fault for this gap lies neither with the researchers nor with the teachers but with the situation: the isolation of the one-teacher classroom, rigid scheduling patterns, limited or nonexistent opportunities for ongoing collaborative inquiry, and the lack of sufficient precedent and support for carrying out such inquiry even when the opportunities for it could be made. The great bulk of useful human knowledge, after all, is probably generated outside of laboratories and libraries by groups of people working to solve common problems, talking, and thinking together as they go. Through such collaborative inquiry, we teachers can become researchers in our classrooms and turn our valuable classroom experience into useful knowledge for ourselves and for one another. □

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one from Robbinsdale.

This school year, Johnson is teaching full time, and each local union, having trained TRLs, is running its own ER&D Program. In Minneapolis, for example, the response from teachers was so positive that the union could accept only half of the applicants — thirty out of sixty. One piece of research, Beginning-of-the-Year Classroom Management, was shared with all new teachers during a preschool orientation session. Innovative applications of the program are being considered, such as offering training at building sites through instruction and discussion led by the building TRL and assisted by the Local Site Coordinator and/or other TRLs through interactive cable TV. ER&D is also likely to be a component of mentor training in a collaborative intern recruitment program.

In St. Paul, two groups of TRLs (twenty-four teachers) were trained by Margaret Johnson during the 1985-86 school year. To expand the program, St. Paul Federation of Teachers president Steve Dress sent four additional teachers to be trained by AFT as Local Site Coordinators in the summer of 1986. Working with the superintendent, Dress obtained $20,000 in school district staff development funds to release forty teachers for ER&D training. When applications were sought for the second round of ER&D training, teachers did not know that release time would be provided. Despite this, ninety-seven applications were received.

Kristine Stolz, the new Local Site Coordinator, will be released one day a month to schedule and plan the training sessions. Providing the training and working closely with Stolz will be Pat Carson, Robin Abel, Pat Peterson, and Glo Tonkskemper. Training will be provided to the forty participants over seven full days spread throughout the school year. Originally, the school system wanted to reserve one of these seven days for its own inservice on discipline. After observing an ER&D training session, however, the day was given back because of the quality and importance of the ER&D information and process.

PROVIDENCE, RHODE ISLAND

The Providence Teachers Union and its president, Marcia Reback, have had a long involvement with educational issues. The local first sent Phyllis Daly to be trained by AFT as a Local Site Coordinator in the summer of 1984. The following summer it sent Marsha Berger to this training to develop a statewide ER&D training network. Both programs were highly successful. Teachers praised the program but expressed concern to Reback about the difficulties of managing the requirements of the ER&D process in addition to their many other responsibilities. To assure that the program would not be lost to these pressures, Reback went in search of a solution.

Reback served on a number of local Chamber of Commerce committees that produced several school/business partnership initiatives, among them Adopt-a-School and Jobs for Youth. Because the Chamber had demonstrated substantial interest in public schools, she approached this body for help in institutionalizing the ER&D process. She received immediate support: The Chamber agreed to provide a meeting hall and refreshments for participants and to purchase the necessary ER&D manuals.

Reback then obtained a commitment from the school system superintendent for release time for people to be trained and to train others. Familiar with the program, the superintendent wanted it to reach as many teachers as possible, so both went to the state Commissioner of Education and obtained state monies to release Phyllis Daly, for two-fifths time, to be the Local Site Coordinator.

The unique arrangement Providence established for its training underscores an important element in the success of the ER&D Program: While basic principles of the research and the training process must be maintained to assure quality, a great deal of flexibility is left in the structural design to fit local needs. Reformers should take note that adaptation is key to successful implementation.

During 1985-86, twelve TRLs were trained in Providence during after-school hours. This year, twenty-three new TRLs will be trained. The first three research units and the concepts of adult learning theory will be covered in an initial weekend conference paid for by the local union. Following this, the participants will have two and a half weeks to implement the research concepts in their classrooms. They then will be released for three consecutive days to assess the results and implications of their work.

In addition, TRLs from the preceding year will be released two full days to receive training in additional research findings. In eighteen schools between January and June, for a total of six days, teaching faculties will be released for half-day periods to attend the ER&D training process on a voluntary basis. Building level TRLs will provide the training and be assisted by Daly in the planning.

WHAT CAN be learned from these experiences? First, a knowledge base worthy of a profession is clearly emerging. Second, teachers are eager to bring this knowledge base to life in their classrooms. In 130 ER&D sites across the country, thousands of teachers — most of them working on their own time — have demonstrated that they care enough to exert whatever effort is necessary to strengthen their teaching practice. In doing this, they are also adding to the collective knowledge base. Third, teacher activists recognize the importance of this effort and are taking steps to restructure and revitalize professional growth opportunities for all teachers in their school systems. Incorporating the teacher-run ER&D process into the regular school staff development program is a great accomplishment. It fulfills an important professional expectation of teachers to continue to learn and to explore and shape the knowledge base of effective teaching. In so doing, teaching takes another step closer to becoming a full profession.

The vision of the ER&D program is perhaps best summed up by a slogan on a Lake County poster: "The Lake County Effective Teaching Center brings teachers out of solitary confinement and into a world of possibilities." □

When Technology Enhances Teaching

(Continued from page 13)

tial and linear. Ideas are popping out of the blue. As a teacher, you have to decide: Do you encourage students to pursue these ideas? Do you discourage them? Where do you place the emphasis? Do you tell the students, 'OK, we're going to wait two months and then talk about it,' or do you say, 'We're going to talk about it now'?"[3] Unable to rely on the textbook or curricular sequence, teachers must be secure enough in their subject matter to negotiate its terrain in diverse and flexible ways. This unpredictability is uncomfortable for some teachers and liberating for others. Their role shifts from lectures and whole-class explanations to more spontaneous work with individual students or small groups. Posing problems that are appropriate for student ability is the first task; next, teachers must guide students as they learn how to proceed and what to look for in making conjectures, collecting data, and either proving their examples or finding counter examples.

According to Houde, the *Supposer* promotes another situation that occurs much too rarely in most classrooms: It enables students to watch their teacher being a mathematician. For teachers in the habit of asking all the questions — and only questions to which they already know the answers — this change involves more unfamiliar risks. Carefully planned lessons can fall flat. But again, reports Houde, the change can be liberating. He sees students become looser, too: They're less likely to groan or panic when they see a novel problem. Relieved by the software from the drudgery of measurement, computation, and formal notation, many students have less trepidation about exploring the unfamiliar.

Exploration, of course, can mean anything from helter-skelter, hasty trial and error to patient, disciplined, and systematic inquiry. Enthusiastic but inexperienced students usually start out closer to the former and need coaching to move toward the latter. They need not only conceptual guidance but methodological guidance as well. When the ETC Programming Group studied the behavior of novice programmers, they found that students who charged ahead without a clear plan sometimes had no more success than those who got stuck and gave up. The group also discovered knowledge that they described as "fragile" in several ways: Students knew something about a command but had minor gaps in understanding that kept the knowledge from being useful; they had the relevant knowledge but failed to use it when needed; they used their knowledge inappropriately; or they failed to spot incorrect solutions.

Convinced that such students need not more drill and practice but instruction about strategies, and prompting to invoke the strategies they already know, the programming group set about devising a series of lessons to provide just that. The result is a "metacourse" designed to fit into the structure of first semester programming courses. The lessons focus on the patterns of thinking that programming requires, helping students to develop a mental model of the computer and to ask themselves a series of strategic questions about the programs they are writing. Once again, teachers pose problems, then prompt and model solutions, gradually withdrawing their assistance as students become better able to guide and monitor their own performance.

Sometimes, of course, nothing fits the pedagogical moment better than direct instruction. In the Geometry Group, one teacher saw students become frustrated as they tried to construct definitions using the *Supposer*. Deciding the time could be better spent, she taught the definitions directly and then posed problems to give students practice in using them. The Programming Group sometimes uses the same ploy: Teach a strategy directly then let students explore its applications.

BECAUSE THEY make available uniquely powerful technologies, microcomputers can be a particularly potent support for the educational philosophies and approaches they are used to serve. They can bolster any existing approach, becoming an automated workbook at one extreme or a cognitive sandbox at the other. This can happen in a rather unthinking way,

as decisions about where to place the machines, what software to use, and so on, fall easily into line with a school's ongoing general approach. ETC believes that a more exciting and almost certainly more productive alternative is to use the introduction of microcomputers as an occasion to rethink traditional conceptions of disciplinary subject matter and pedagogical orientations.

At a recent conference to train the teachers in ETC's laboratory sites, Thompson referred to technology-based innovations as empowering for both teachers and students. In a question that expresses volumes about the way schools are organized and the way they often feel to their inhabitants, a teacher in the audience wondered how this was possible — how could students have more power without threatening teachers' control, and how could teachers have more power without alienating administrators? Her question had to do with the politics of schools; Thompson had referred more to intellectual power. But the two are related. Traditional directed instruction tends subtly to pit teachers and students against one another: Teachers have the knowledge and students vie to obtain it. Open education can be vaguely wary of teachers, fearful they will squelch students' natural inclinations. Many teachers are understandably dissatisfied with both. Guided exploration, as ETC is coming to understand it, makes teachers the crucial link between the characteristics of students, the demands of the curriculum, and the power of the technology. Given a supportive school context, it can place teachers and students on the same side and give them rich and powerful tools with which to become co-discoverers of knowledge. □

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MODEMS AND MORE

(Continued from page 17)

joysticks, paddles, and trackballs used commonly to operate action games, some educational software is designed to be controlled by touching the screen by hand or with a small beam of light from a "light pen" attached to the machine. But the most successful input device by far is the mouse — a small, box-like unit that moves a cursor around the screen as the box is moved around on a tabletop. Menu selections and instructional decisions are made easily by "clicking" a special button on the surface of the mouse. First made popular by the Apple Macintosh computer, the mouse now comes as standard equipment on the Commodore Amiga, the Atari 520 ST, and the new Apple IIGS, and mouse input devices are available for virtually every computer model used in education.

In addition to the hand-held input devices, another group of devices includes "touch tablets" and "alternate keyboards." An example of the former is the popular Koala Pad, used primarily to translate sketches made on the tablet with a plastic stylus or fingertip to full-color drawings on the monitor screen (the sketches can be saved on a disk and also inserted into teacher- or student-made computer programs). An example of the latter is the Muppet Learning Keys, an alternate keyboard that enables young children to operate software by pressing giant letter, color, and numeral keys on a large lapboard attached to the computer. As is true for other successful input devices, a growing number of educational products are being developed that are designed to be controlled by both the Koala Pad and the Muppet Learning Keys.

A particularly unique input device is the Cauzin Reader, a computer attachment the size of a waxpaper box that is able to read special data strips printed in magazines and translate the markings into computer programs that are loaded into the computer's memory — including color, sound, graphics, and animation. These programs can be used and saved as can conventional software. Potentially this system offers a highly economical way for software to be distributed (the strips can even be photocopied), and, if software developers decide to support the system widely, it will also become possible to use the under-$200 device to preview samples of new software by reading data strips received through mailings or magazine ads.

There are myriad other computer peripherals under development and reaching the market continuously, including information mass-storage devices such as "hard disks" that provide computers with the space of dozens of ordinary disks, speech input/output devices that both respond to spoken words and that produce speech electronically, scanners that translate "photographed" scenes into computer graphics that can be manipulated, and enough robot devices to establish a separate industry. Many of these technologies are converging, and in a few cases, such as in computer-videodisc systems, it is no longer clear which component is really peripheral to the other. As with all rapidly developing technologies, the precise shape of the future is unknown; about the only thing we can predict with certainty is that there will be more. □

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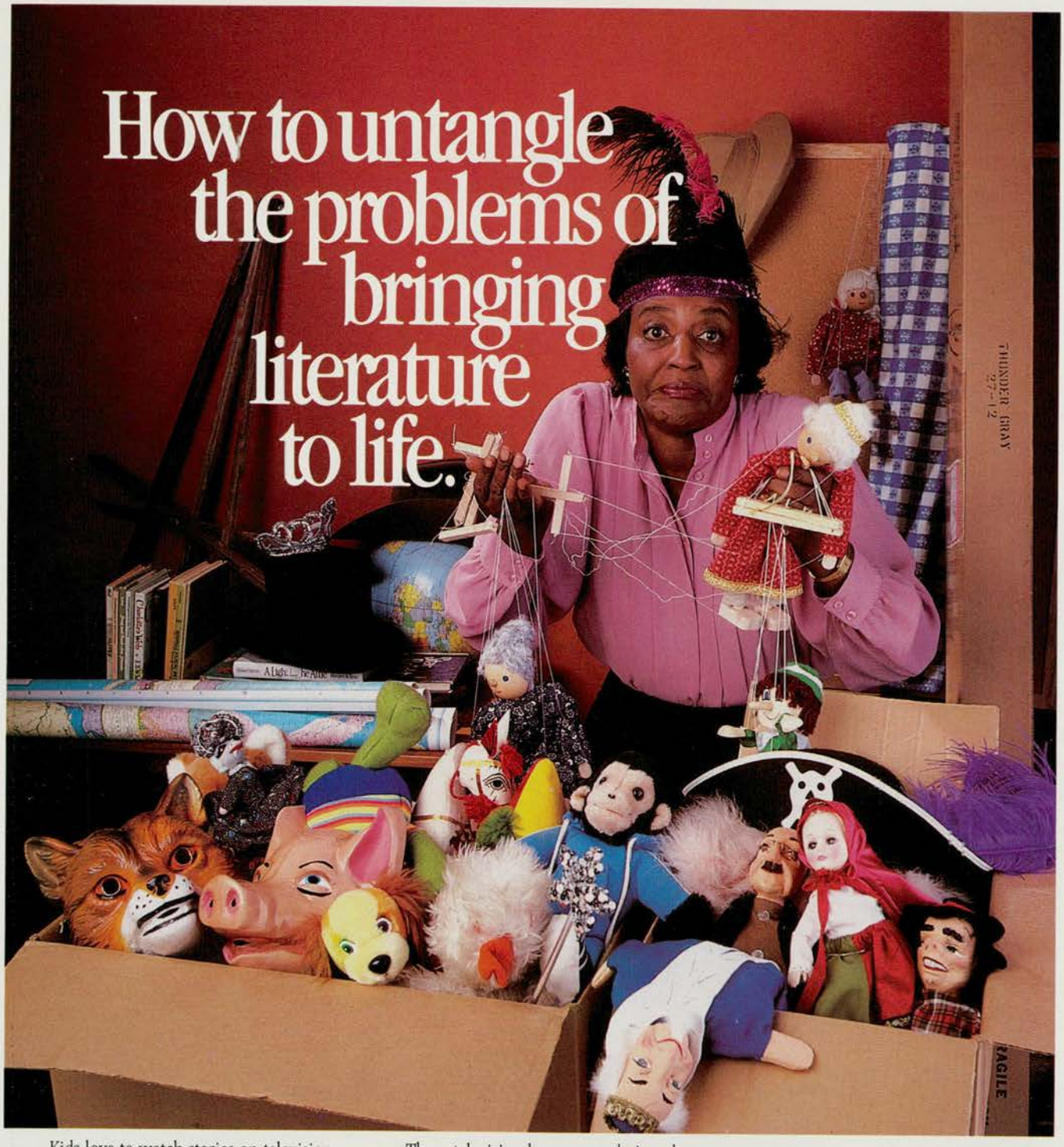

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