We Teach with Technology

New Visions for Education

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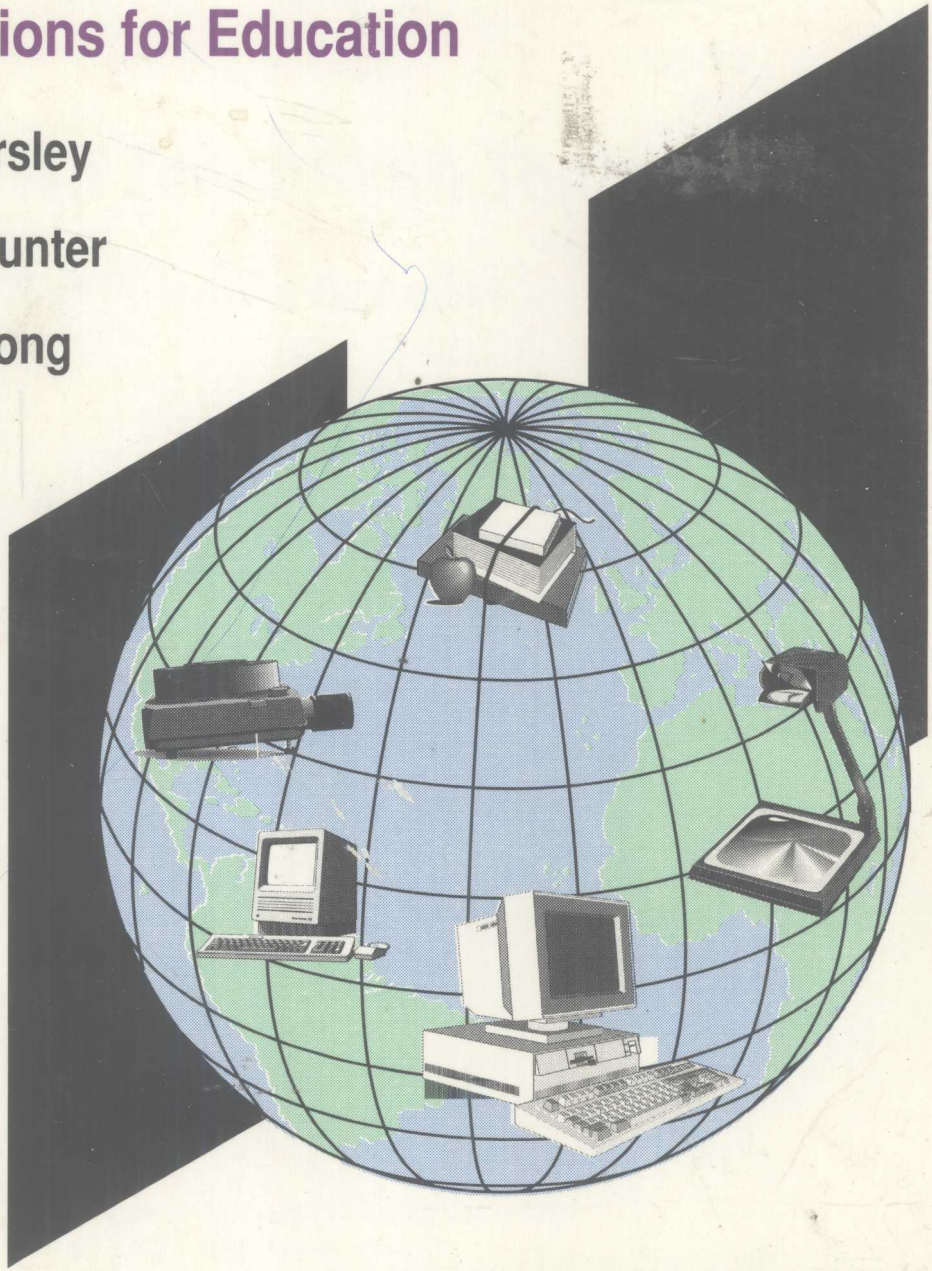

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Dedication

This book is dedicated to our students . . .
who have taught us so much.

Publisher: James F. Leisy, Jr.
Manuscript Editor: Sheryl Rose
Cover and Interior Design: Lisa Cannon
Photography: Mark Hooper
Manufacturing: Malloy Lithography

Library of Congress Cataloging-in-Publication Data

Kearsley, Greg,
We teach with technology : new visions for education / Greg Kearsley, Beverly Hunter, Mary Furlong.
p. cm.
Includes bibliographical references and index.
ISBN 0-938661-37-X
1. Computer -assisted instruction--United States. I. Hunter, Beverly. II. Furlong, Mary S. III. Title.
LB1028.5.K37 1992
371.3 34--dc20 91-44315
CIP

Preface

Computers and other instructional technology have long been heralded as change agents in our educational system. However, no form of technology since the chalkboard has really created a fundamental change in schools. Despite many impressive demonstrations over the years, technology has not lived up to its potential to improve learning for most students.

But something dramatic is beginning to happen in classrooms around the world. More and more teachers are using computers as tools to support their own work and their vision of what education is about. Teachers are discovering that computers can serve as electronic chalkboards, administrative aids, writing and publishing vehicles, information resources, communication pathways, data collection instruments, laboratory workbenches, and creative media. Once teachers begin to use computers routinely as personal and teaching tools, we see a more profound impact of technology in schools. The computer is no longer some sort of "learning aid" but an integral part of classroom activities.

This book tries to document the remarkable new direction of educational computing as seen through the eyes of teachers themselves. We studied exemplary computer-using teachers and how they use computers in their schools. We have tried to capture their insights, strategies, and feelings about the use of computers in the classroom.

We would like to acknowledge the enthusiastic cooperation received from all of the teachers whose stories make this book what it is. We would also like to thank the many individuals who reviewed drafts and made contributions, including Helayne Waldman, Lenny Schwartz and Janet Graeber. Finally, we would like to express our appreciation to Jim Leisy of Franklin, Beedle & Associates for his vision in publishing this book.

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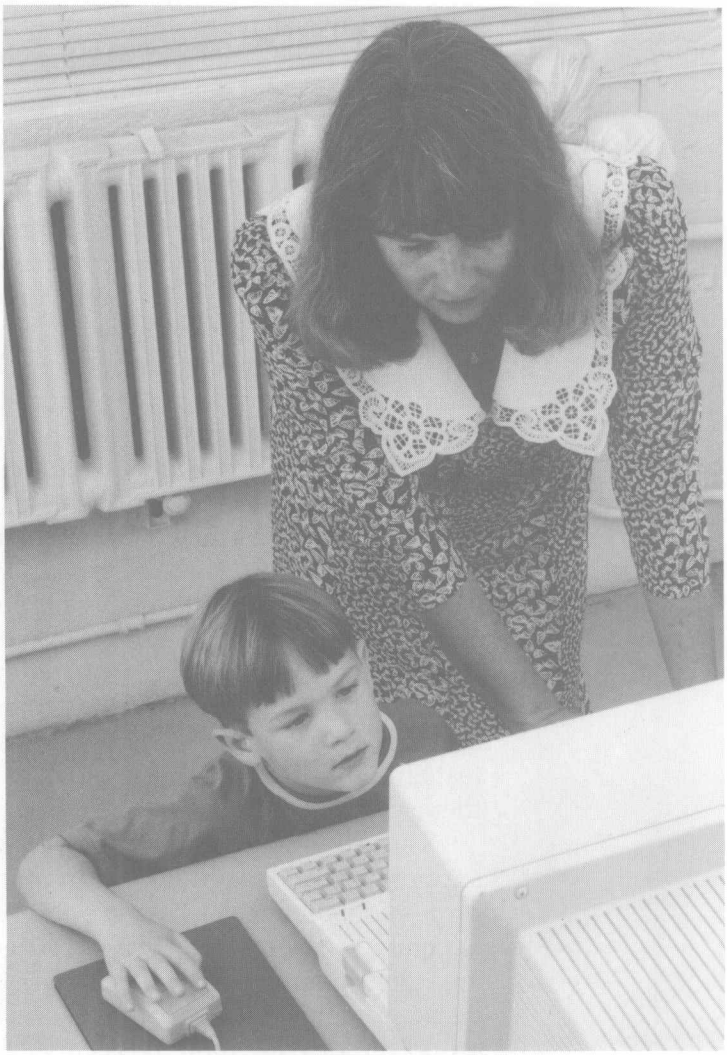
Chapter 1
Information Age Teachers

Teachers are playing key roles in helping the U.S. educational system make the transition from the Industrial Age to the Information Age. The teachers who contributed to this book represent a sampling of the thousands who are on the leading edge of this transition.

These teachers have developed or are in the process of developing their own vision of the direction schooling must take to meet the needs of the children of the Information Age, and they have a sense of mission about their roles in making the needed changes.

Since the territory they are exploring is in many respects uncharted, these teachers realize that they, like their students, are learners. They no longer believe they must play the role of authority and dispenser of knowledge at all times in their classrooms.

Because they are initiating changes in their schools, they are spending more and more of their time collaborating with other teachers, researchers, community leaders, and parents. The cross-disciplinary and project-oriented curriculum evolving for the Information Age requires more team teaching and coordination than the Industrial Age school demanded. These teachers seek real audiences for their students' work, which means closer connections with the world outside the school.



Information Age teachers are experimenting with innovative approaches to teaching. In the process, many of these teachers are reexamining their ideas about what learning is. They are seeing their students as actively constructing knowledge rather than as passive receivers of knowledge. Because they realize their students must become lifelong learners, they are expecting their students to take more responsibility for managing their own learning.

Some of the teachers in this book are discovering more ways to meet the needs of students from diverse cultural backgrounds. They are finding ways to help children build on their own out-of-school interests, experiences, and knowledge.

Teachers are developing new ways to manage their classes. Many are moving toward more small-group activities, and some are focusing on improving their skills in managing cooperative learning groups. They give fewer lectures and spend more time working with small groups and individual students.

These teachers are providing a wide range of materials, media, tools, and information sources for their students. Some are focusing on providing their students with access to information or expertise outside the classroom or school. They are less inclined to have their students fill out worksheets or answer textbook questions, and more likely to make assignments involving original investigations or writing for real audiences.

As their ideas about the nature of learning changes, they are developing alternative ways of assessing their students' learning progress. They are depending less on student performance on paper and pencil tests, and more on the quality and substance of students' oral and written communications.

The teachers contributing to this book are at different stages in their professional development and in their mastery of the computer-based tools of the Information Age. Some are just beginning to apply computer-based tools to their own work, and are introducing their students to computer applications that fit into the existing curriculum. Others tried many different technologies before they discovered how to match the tools with their own vision of learning and teaching. Many are taking leadership roles in their schools, districts, states, and professional societies. All are finding the teaching profession more rewarding as they become more active learners themselves.

These teachers are drawing on a wide range of resources and sources of support, from colleagues, the community, their administration, industry, or professional societies. They are learning how to overcome myriad obstacles to change—policies, curricula, tests, schedules, budgets, politics. In some areas, teachers and principals are being given increased responsibility for decision making. They are using technology as a means of restructuring schools to provide more relevant and effective instruction.

A New Philosophy for Educational Computing

Computers have been used for educational applications since the early 1960s. However, for the first three decades of educational computing, the major focus was programming and computer-assisted instruction—the use of the computer to provide curriculum materials in the form of drills, tutorials, games, and simulations.

With the emergence of personal computers and various types of application software in the 1980s, the primary use of computers in the classroom shifted from a content delivery device to a learning tool. Teachers and students began using word processing, desktop publishing, database, spreadsheet, telecommunications, graphing, and graphics programs. They also began experimenting with a new generation of educational software that encouraged critical thinking, problem solving, decision making, and exploration.

As teachers developed more experience with computers as learning and thinking tools, they realized that the computer could be a vehicle for restructuring curriculum and classroom practice. Instead of passive learning activities such as reading or following along on the chalkboard, students became active participants in computer-based projects, usually working in pairs or small groups.

Another important development in the 1980s was the realization that the computer could be a *teaching* tool as well as a learning tool. Teachers discovered they could assign problems to small groups of students sharing a computer. With the advent of inexpensive LCD panels, teachers began to use computers as electronic chalkboards to demonstrate ideas to the entire class. They also found that the use of telecommunications networks for electronic mail, bulletin boards, and to access online databases extended their range beyond the walls of the classroom. As teachers developed experience and confidence with a range of computer applications, they were better able to personalize the use of technology to support their own goals and style.

This book shows the great diversity in the ways teachers are employing computers and related technologies. This diversity mirrors the wide range of technology applications in the "real world"—from word processing and desktop publishing to large screen presentation aids, to scientific visualization tools, to computer-aided design, and to accessing databases via telecommunications networks.

Indeed, it is the desire to "recontextualize" learning that is driving many of the innovations in computer use in schools. Teachers are seeking ways of setting up learning environments that are more realistic than traditional classrooms. There are many reasons for this emphasis, including the

obvious need to help students become better problem solvers. Computers and related technology can be used to help create realistic problem-solving situations, as well as providing tools to help pose and solve problems. For example, specially designed video stories are used to create realistic contexts in which students can pose as well as solve mathematical problems much more effectively than they can from text-based story problems (see Chapter 7). Similarly, students collaborating with distant peers via telecommunications are often working on real problems, such as the problem of how to improve local recycling efforts or control pollution (see Chapter 5).

Using computers as a teaching tool is a new and profound development in educational computing. We believe that this new perspective will ultimately unleash the full potential of computers in education. We also believe that it will allow many teachers to be much more productive, creative, and successful in their classrooms.

About This Book

This book differs from other books about educational computing in a number of ways. First, it is written from the point of view of teachers instead of the "expert" or "technologist" perspective. Rather than surveying all possible ways of using technology in school, the book presents teachers who are adopting and adapting technology to support their own goals and visions for the reform of teaching and learning in the Information Age. The book addresses the concerns of teachers, concerns such as:

- How can I make my classes more interesting to my students?
- How can I help my students become better problem solvers?
- How can I get my students to take more responsibility for their own learning?
- How can I get my students to work more cooperatively together?
- How can I help my students see the connection between school and their experiences outside school?
- How can I help students make connections among the skills and ideas they learn in various school subjects, rather than treating these skills and ideas as disconnected pieces of knowledge?
- How can I spend less time on "administrivia" and more time helping my students?

Unlike other books on educational computing, this book is organized according to curriculum domains. Each chapter focuses on a specific subject or computing activity, such as writing or telecommunications. Chapters begin with an overview of the topic that explains basic concepts and summarizes the current state of the art. Following the overview are a number

of case studies or profiles of actual teachers organized around major topics or themes. Throughout the chapter you will find sections that describe specific programs or examples of applications mentioned in the overview or case studies.

There are many connections between the chapters in terms of concepts and applications. For example, a recurring theme is teachers' desire to provide real audiences for their students' work. Multimedia (e.g., videodisc or CD-ROM) is often used. Technology can break down the artificial barriers between subject areas, leading many teachers to adopt a cross-curriculum approach. These connections are mentioned as they occur and direct you to the related information in other chapters.

Who Is This Book For?

This book is written for teachers and prospective teachers who are seeking to change or improve their own classroom practice and to help our educational system make the transition to the Information Age. The focus of the book is on teaching in K-12 settings, although the book should also be useful to instructors at the college level, especially education faculty.

We believe this book will make a good text for elementary and secondary methods courses, as well as courses about educational technology. The book illustrates the connection between technology and current reforms in educational practice, such as cooperative and collaborative learning, contextualized learning, interdisciplinary learning, problem solving, higher-order thinking skills, information-handling skills, and alternative assessment. The book addresses a wide range of technology applications in schools and presents topics from a teacher's perspective. Each chapter includes activities that can be used as class assignments or for self-assessment.

This book assumes a modest degree of "computer literacy" and is intended for readers who already have some experience using computers. The focus is on the use of computers in teaching, not providing an introduction to computers. Although we provide explanations of many basic concepts in educational computing, it is not the purpose of this book to be either a primer or comprehensive textbook. There are many good books that do this already (see Chapter 14). Our goal is to present a different perspective on the field and provide a sourcebook of ideas that teachers can build on in their own classrooms.

About the Teachers in This Book

The teachers you will meet in this book represent a broad spectrum of backgrounds and personal views. They teach different subjects, different grade levels, at different kinds of schools (or nonschools), and in different

places in the U.S. and other countries. The one thing they have in common is that they are using computers and related technology to support the kinds of change they see as needed for the Information Age.

The teachers included in this book were nominated by other educators as being exemplary computer-using teachers. Many have won awards and received national recognition for their exemplary teaching or for their innovative applications of technology.

Here is a sampling of what they have to say about the impact of computing in their lives:

As a high school English teacher and "technophobe," I decided to learn to use the dreaded computer. My hard-won ability to do so gave me such a thrill that I designed a computer-based writing course for "at risk" high school students. Their thrill of success was my impetus to integrate computers as the core of a brand-new creative writing magnet program.

—Michelle Starrett, Miami, Florida

Using the computer builds the self-concept of students in a variety of ways. The very idea that they are using a machine usually reserved for upper level students gives them something to be proud of and to brag about to their peers.

—Sharon Hurwitz, Norfolk, Virginia

I have initiated and implemented a comprehensive program that introduced computer skills to an elementary parochial school. As the children progressed through the program, they developed basic skills in keyboarding, word processing, and databases. Students at all levels were provided with software to encourage higher level thinking skills beyond drill and practice.

—Toni Votava, South Bend, Indiana

I had a dramatic career change because of computers. I was so excited that I quit my job and opened a computer learning center in order to create the type of learning environment that I felt computers permitted. I used the independent aspect of computer learning to mix ages and levels and to encourage a focus on students' own efforts.

—Jean Dames, Highland Park, Illinois

During the past two years I have been using a computer with home- and hospital-bound students. The computer is invaluable as a motivational and therapeutic tool when instructing confined children and youth. Students are able to see computer applications across the curriculum—integrated learning.

—Linda Copper, Baltimore, Maryland

Read on to find out what these and other teachers have to say about using computers in their classrooms!

Why Read This Book?

For anyone who cares about reform of education or the role of technology in Information Age schooling, this book should be interesting and enjoyable. Reading this book will give you an appreciation of the creativity of teachers. You will see some of the ways that teachers can take control of technology to make it support their own vision of learning and teaching. The book illustrates how technology can be used to make teaching more interesting and effective.

We hope that in the process of reading this book you will come to understand how computers can unlock your full potential as a teacher. If you become inspired, you will likely pass this inspiration on to your students and colleagues. Not only will you get more satisfaction from your own teaching but the quality of education in your school can be improved. Just think what a difference this could make to our overall school system.

Further Information

Most education computing textbooks do a good job describing past research in the field from a learning or student perspective (see the references in Chapter 14). However, there are relatively few sources that examine technology from a teacher perspective. Here are some recent studies:

Dwyer, D., Ringstaff, C. & Sandholtz, J. (April 1990). *The Evolution of Teachers' Instructional Beliefs and Practices in High Access to Technology Classrooms.* AERA Conference Proceedings, Boston, MA. [An Apple Computer ACOT Project Report]

Educational Technology 29, 3 (March 1989). Special issue on teacher training for technology.

Sheingold, K., & Hadley, M. (1990). *Accomplished Teachers: Integrating Computers into Classroom Practice.* Center for Technology in Education, Bank Street College of Education, New York, NY.

Wiske, M., et al. (March 1988). *How Technology Affects Teaching.* Technical Report 87-10. Educational Technology Center, Harvard Graduate School of Education, Cambridge, MA.

There is a large literature that describes what teachers do in the classroom. We consider this work to be fundamental to understanding how teachers can

use technology in schools. Here are some key readings:

Jackson, P. W. (1968). *Life in Classrooms.* New York: Holt, Rinehart & Winston.

Johnson, S.M. (1990). *Teachers at Work.* New York: Basic Books.

Kidder, T. (1989). *Among Schoolchildren.* Boston: Houghton Mifflin.

Kohl, H. (1984). *Growing Minds: On Becoming a Teacher.* New York: Harper & Row.

Lortie, D. C. (1975). *Schoolteacher: A Sociological Study.* Chicago: University of Chicago Press.

Books that discuss the history of educational technology contain important lessons and insights for teachers and administrators to consider. Here are three excellent ones:

Cuban, L. (1986). *Teachers and Machines: The Classroom Use of Technology Since 1970.* New York: Teachers College Press.

Gagne, R. (1986). *Instructional Technology: Foundations.* Hillsdale, NJ: Erlbaum Assoc.

Saettler, P. (1990). *The Evolution of American Educational Technology.* Littleton, CO: Libraries Unlimited.

Activities

- Informally survey 5-10 teachers at a school. Ask them why they use/don't use computers in their teaching. What are the factors that seem to determine whether or not computers are used?
- Ask students of different age groups what they think about using computers in school. What view of technology do their answers reflect?
- The history of technology in U.S. schools is not a very successful one (see the books by Cuban or Saettler listed above). Is there any reason to believe the new philosophy outlined in this chapter will lead to better results?
- Do you think the use of technology in the classroom has changed the traditional roles and activities of teachers? Will it change these roles and activities in the future?
- Make a timeline chart for the evolution of educational computing starting in 1960. You will have to decide which events are critical enough to include on your chart.