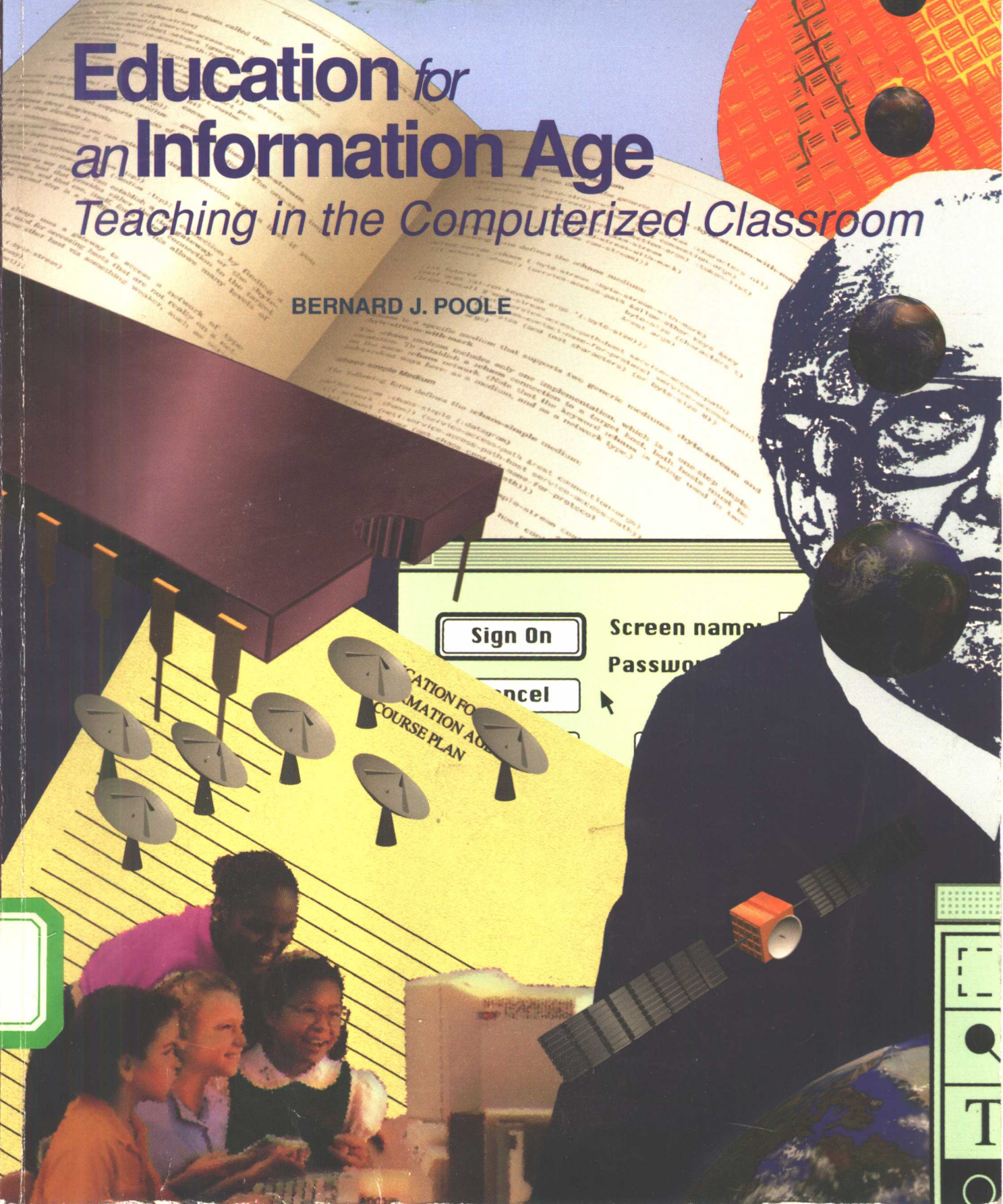
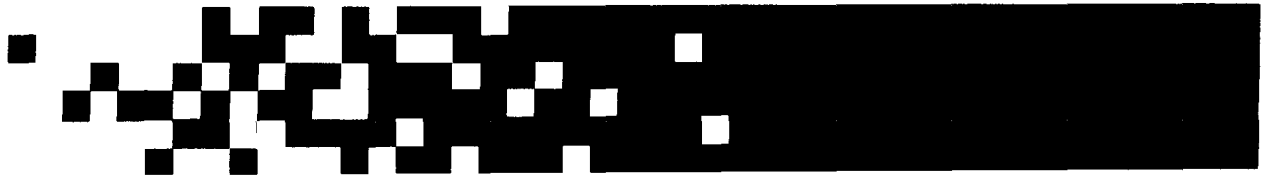


# Education *for* an Information Age

## Teaching in the Computerized Classroom

BERNARD J. POOLE





# **Education for an Information Age**

*Teaching in the Computerized Classroom*

■ **Bernard J. Poole**

*University of Pittsburgh at Johnstown*

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Cover and interior designs by Lansdon Design.

Cover illustration by Telemation, Inc.

Line art generated by Bernard J. Poole unless noted otherwise.

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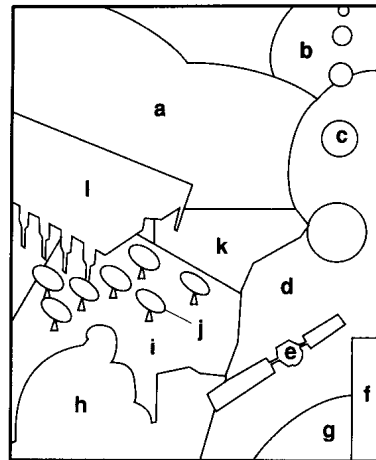
Library of Congress Catalog Card Number: 93-74427

ISBN 0-697-15403-3

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Printed in the United States of America by Wm. C. Brown Communications, Inc.,  
2460 Kerper Boulevard, Dubuque, IA 52001

10 9 8 7 6 5 4 3 2 1



## On the Cover

- a. Book
- b. Silicon disk
- c. Globe
- d. John Vincent Atanasoff—inventor of electronic digital computer
- e. Satellite
- f. Desktop computer tools
- g. Earth
- h. Students and teacher at computer
- i. Course plan
- j. Satellite dish
- k. Desktop computer on-screen display
- l. Computer chip

### About the Author

Bernard John Poole has broad experience in education. He understands the needs of teachers who may not be naturally inclined to get excited about the latest technology. He has 25 years of experience teaching at all scholastic levels in Europe, the Middle East, Africa, and North America. For 15 of his 27 years in the classroom, he has taught in nontechnical subject areas in elementary and secondary, private and public schools. His undergraduate degrees are in English, history, French, and data processing; he has postgraduate degrees in education and in information science. His teaching responsibilities have also included work with special-needs children.

### About This Text

**Purpose of the text.** This text has been written for preservice and in-service teachers who want to learn about computers and their use in the classroom. In-service teachers need help making the transition to computer-based teaching and learning, and preservice teachers need to be prepared for a profession in which the computer will become an increasingly indispensable tool. *Education for an Information Age* addresses all aspects of this need from the basic level of computer literacy to the more cutting-edge issues related to the integration of computer-based technology into the curriculum.

The approach has, therefore, been to make the text as accessible as possible to K–12 teachers, many

of whom work under conditions that are far from ideal as far as technology-based education is concerned. The text presents the potential powerful effects of learning in the technology-rich classroom while acknowledging unequivocally that teachers can create and sustain such a learning environment only if they have strong moral and financial support from the community of parents, school boards, and administrators, at all levels.

Because of the breathtaking rate of progress in the computer field, it is impossible to publish a textbook that is as current as monthly publications such as journals and magazines. *Education for an Information Age* makes no pretense of trying to compete with these publications. The focus here is on concepts rather than keystrokes. For this reason, there is no extensive coverage of specific hardware or software systems. Such systems are profiled only where such treatment is useful to amplify conceptual material.

Professionals in the field of education are no different from professionals in any other job. They must commit to an ongoing upgrading of skills and knowledge in order to remain current in their field. Thus, there is an appendix that lists recommended reading for teachers who use technology in the classroom. There is also an appendix that lists some of the sources of funding for technology projects.

**Organization of the text.** The book has been organized into four distinct parts in order to facilitate flexible use in the context of a course for preservice or in-service teachers. Each part can be studied independently and in any sequence. *The impact of the*



text is not necessarily cumulative. In the next section, *Content of the Text*, the rationale for the organization of the book as published is given, but it is appreciated that no two courses are identical and different emphases will always require alternative approaches to the subject matter. Users of the text should feel free to select parts and chapters in a sequence that suits their needs.

**Content of the text. Part I** of *Education for an Information Age* presents an overview of computer use in schools and society at large.

**Chapter 1** presents the outcomes of research based on studies of computer use in schools. Teachers should be familiar with this research as a prerequisite to, and justification of, their efforts to incorporate the computer into the curriculum.

**Chapter 2** examines the history of computer use in schools, and **chapter 3** examines their impact on society in general. Students are children of the Information Age. They are in tune with the reality of instant access to data; they are conscious of how tiny the world has become; they are intuitively aware of the global impact of even their most insignificant actions. Teachers need to develop the same awareness in themselves, if only so that they can get some sense of their students' frame of reference.

In **chapters 4 and 5**, we will examine ethical and legal issues arising out of computer use in the classroom and in society in general. It is, perhaps, unusual to include chapters on these matters so early in a text on computer literacy. The majority of such texts relegate this material to the latter half of the book, which often results in its being presented, if at all, as a hurried afterthought at the end of a semester. But teachers have a special responsibility to contribute to the preparation of children for life in today's world. A text for teachers should, therefore, recognize this responsibility, and give it the priority it deserves.

**Part II** introduces computer hardware and software.

**Chapter 6** examines the basic hardware components of desktop computers, along with those specialized devices of which multimedia systems are comprised.

**Chapter 7** will review the different kinds of software necessary to drive the computer at what are called the **systems** and **applications** levels of general computer use. Computing machinery is useless without the software that controls its operations. The more one understands about the software systems (called operating systems) that control the operations of the computer, the more comfortable one will feel at the machine.

**PART III** examines how best to incorporate the computer into the curriculum.

In **chapter 8**, we will look at the different ways in which computers are set up in typical school environments. We will also discuss some innovative ideas for organizing computing resources, whether in the classroom or in the purpose-built laboratory setting.

**Chapters 9 and 10** examine the wide spectrum of software for computer-managed instruction (CMI) and computer-assisted instruction (CAI). These chapters will inform the teacher's experience, explaining the different types of educational software and providing sets of criteria for making sound judgments about the quality of that software.

**Chapter 11** examines computers and communications (C&C) as it applies to classroom management and learning. The demands of the corporate world have brought communications technology—the technology that links computer systems over local and wide area networks—to the point where it has powerful applications in the classroom—and in the community served by the school—for collaborative, intercultural, and distance learning. This is important reading for the teacher who will work in the classrooms of tomorrow.

**Chapter 12** looks at specialized technologies that are giving a new meaning to the term *multimedia* and that are slowly finding their way into the schools. Teachers will more than likely be called on to make decisions about the use of multimedia hardware and software in their classrooms. They will, therefore, benefit from as broad an experience as possible with the technologies involved. Ideally, readers will have access to some or all of the different types of educational software and hardware discussed in **chapters 8 through 12**.

**Part IV** answers the question: “How can I get this technology for my classroom when my school district can barely afford to maintain the equipment already in place?”

**Chapter 13** examines the process of applications development along with the various ways, from traditional programming to modern authoring systems, in which teachers and students can get involved. This chapter will be of interest to those preservice or in-service teachers who want to try their hand at creating their own software, or who are interested in what would be involved in getting their students to do the same.

**Chapter 14** deals with the subject of grant writing. Needless to say, for the most part, teachers can reasonably expect that their school districts will provide the hardware and software they need. However, money—always in short supply—is generally allocated according to priorities that reflect the educational philosophy—or lack thereof—of those in control of the budget. So, teachers and administrators may have to take matters into their own hands.

In the last chapter of part IV, **chapter 15**, you will have the opportunity to sit back and reflect on what you have learned through the book. You will review teaching philosophy as it applies to computer-based learning. Methodologies will be examined and a case made for an ongoing commitment to the needs of individual students in the computerized classroom. This debate will best be appreciated if you have had the opportunity to experience, either firsthand or in discussion, all aspects of computer-based learning—hence, the positioning of this chapter at the end of the text. This is not to imply that it is less important than the other chapters. Indeed, it is the most important chapter of all. A convincing rationale both informs and stimulates motivation.

### **About the Pedagogy**

The following learning aids have been designed into *Education for an Information Age*:

- The main body of each chapter begins with a summary of anticipated learning outcomes and closes with a review of material covered.

- Chapters conclude with case studies based on the experience of teachers using computer-based learning in the K–12 classroom. Each case study is accompanied by a set of topics for discussion.
- At the end of every chapter is a set of suggestions for projects related to the subject matter of each chapter.
- Also at the end of every chapter is a references section, which can act as a resource for recommended reading beyond the text.
- Chapters are clearly divided into “mind-size” sections and subsections to aid reading and understanding. Where applicable, listed items are indented and “bulleted” for easier assimilation.
- Illustrations are used throughout the text to increase interest, promote understanding, and provide rest for the reader’s eyes as they progress through the material covered.
- In general, the writing style is immediate, friendly, and engaging. The reader often is addressed in the first or second person (“we” and “you”) in order to foster commitment and sustain interest.
- There is a glossary of terms which may be unfamiliar to the reader.
- There is also an extensive index to aid the reader who wants to browse selected sections of the text.
- Supplementary materials include an optional set of Microsoft *Works* tutorials, a test item file, test items on disk, an instructor’s manual, including transparency masters and a set of lecture outlines for instructor and/or student use.

### **Acknowledgments**

My thanks to the many teachers, past and present, whose skill and dedication have fueled my own enthusiasm for this rewarding profession. In particular, I owe a huge debt of gratitude to the Brothers of the Christian Schools, whose exemplary commitment to teaching inspires me to this day.

I am grateful to Patty Riddle, assistant director of the University of Pittsburgh at Johnstown (UPJ) Regional Computer Resource Center (RCRC), who

recognized the contribution I could make and who was instrumental in getting me involved with the Pennsylvania Information Technology Education for the Commonwealth (ITEC) program. That involvement led directly to the creation of this textbook. Rob Eckenrod, Director of the UPJ RCRC, has been a valuable resource. Dr. David Dunlop at UPJ and Dr. Ken Mechling at Clarion University, Pennsylvania, also deserve special mention in this context because of their efforts formulating and supporting the ITEC program, both at UPJ and statewide, since its inception in 1984.

I must thank the following reviewers of various drafts of the manuscript:

Norman Sterchele  
Saginaw Valley State University

John Achrazoglou  
The University of Iowa

Charles Mlynarczyk  
S.U.N.Y. College at Potsdam

Albert P. Nous  
University of Pittsburgh

J. Steven Soulier  
Utah State University

Debra A. Mathinos  
Bucknell University

Neal Strudler  
University of Nevada-Las Vegas

Marilyn Shelton  
California State University-Fresno

Their encouragement motivated me to stay the course, and their criticism has led, I hope, to significant improvements in this final draft.

A special note of thanks must go to Toni Good, copy editor, whose close criticism, corrections, and suggestions have also significantly improved the quality of the manuscript.

Next, I am grateful to my sister-in-law, Susan, who spent many hours reviewing the text, assembling artwork, and helping with the development of supplementary materials.

Finally, I thank my wife, Marilyn, who ranks among the most dedicated and best teachers I have known and whose example and companionship have sustained me on the journey that has led to the completion of this book.

## **Preface xv**

Introduction 1

---

## **Part I Computers in Schools and Society 11**

- 1 A Review of the Research 13
- 2 The History of Computers in Schools 39
- 3 Educational Computing and Society 61
- 4 Ethics and Computers: Invasion of Privacy and Computing Inequities 89
- 5 Computer Crime: Software Piracy and Hacking 117

---

## **Part II Computing Fundamentals 137**

- 6 Computer Hardware for Education Environments 139
- 7 Software Systems for Microcomputers 169

---

## **Part III Computers in the Classroom 193**

- 8 Educational Computing Environments 195
- 9 Computer-Managed Instruction (CMI) 229
- 10 Computer-Assisted Instruction (CAI) 257
- 11 Computers, Communications, and Distance Learning 295
- 12 Educational Multimedia 323

---

## **Part IV No Problems, Only Solutions 357**

- 13 Creating Computer Applications for Education Environments 359
- 14 Funding Technology Projects 377
- 15 Reflections on Education for an Information Age 401

## **Appendix A: ASCII Codes 427**

## **Appendix B: Resources and Recommended Reading 429**

## **Appendix C: Sources of Funding and Other Resources 435**

## **Glossary 439**

## **Credits 445**

## **Name Index 447**

## **Subject Index 451**



## Preface xv

## Introduction 1

- I.1 The Challenge of Change 2
  - I.1.1 The Need for Change 2
  - I.1.2 Teachers Can Make a Difference 3
- I.2 Objectives of the Text 3
- I.3 Computers in the Classroom 5
  - I.3.1 Computers Can Be Used to Support Learning 5
  - I.3.2 Computers Can Be Used to Support Children's Socialization 5
  - I.3.3 The Computer Is an Effective Tool to Support Classroom Instruction and Administration 5
  - I.3.4 Software That Is Well-Designed to Support Learning Enables a Teacher to Duplicate Excellence 8

---

## Part I **Computers in Schools and Society 11**

### Chapter 1

#### **A Review of the Research 13**

- Learning Outcomes 14
- 1.1 Introduction 14
- 1.2 Sources for Research Findings 15
- 1.3 Computers, the Three R's, Science, and Social Studies 16
  - 1.3.1 Reading 17
  - 1.3.2 Writing 20
  - 1.3.3 Arithmetic and Problem-Solving 25
  - 1.3.4 Science 26
  - 1.3.5 Social Studies 28
- 1.4 The Challenge of Change 31

**Case Study 1:** *Just Because a Person Can't Speak, It Doesn't Mean He Has Nothing to Say* by Jeff Lavin 34

### Chapter 2

#### **The History of Computers in Schools 39**

- 2.1 Early Uses of Computers in Schools 40
    - 2.1.1 Sowing the Seed 40
  - 2.2 The Microcomputer in Schools 44
    - 2.2.1 The Apple II Family of Personal Computers 44
    - 2.2.2 The IBM PC Family of Personal Computers 46
    - 2.2.3 Focus on the Commodore Amiga 47
    - 2.2.4 Compatible Computers on the IBM PC Bandwagon 48
    - 2.2.5 Focus on the Apple Macintosh 49
    - 2.2.6 The Apple IIGS 51
    - 2.2.7 The Apple Macintosh LC 52
  - 2.3 Educational Computing in the 1990s and Beyond 53
    - 2.3.1 Future Horizons in Personal Computing 54
- Case Study 2:** *A Day in the Life of a Computer Coordinator* by Denise Ryan 56

## Chapter 3

### Educational Computing and Society 61

- 3.1 The Social Impact of Advances in Computer Science 62
  - 3.1.1 Extending the Capability of the Mind 63
  - 3.1.2 Extending the Capability of the Body 67
  - 3.1.3 Extending the Boundaries of the Feasibly Finite 70
  - 3.1.4 The World of Work 72
  - 3.1.5 The Global Village 73
  - 3.1.6 "High Tech, High Touch" 74
- 3.2 The Computer Revolution 75
  - 3.2.1 "Revolution" Is a Relative Term 75
  - 3.2.2 The Revolution Has Not Yet Run Its Course 76
  - 3.2.3 Information Overload 77
- 3.3 Education and the Information Society 78
  - 3.3.1 Information and Wealth 78
  - 3.3.2 Computers, Control, and Systems of Education 79

**Case Study 3:** *ACCESS Pennsylvania: A Statewide Network* by Lisa Dallape Matson 84

## Chapter 4

### Ethics and Computers: Invasion of Privacy and Computing Inequities 89

- 4.1 Why Should Teachers Discuss Ethical and Legal Issues? 91
  - 4.1.1 Teachers Have a Role in Preparing Students for the Computerized Society 91
  - 4.1.2 Education Should Empower Students 93
  - 4.1.3 Issues of Computer-Related Liability May Affect Our Students' Lives 93
- 4.2 The Invasion of Privacy and the Illusion of Truth 93
  - 4.2.1 Privacy and Big Brother 94
  - 4.2.2 Privacy Invasion: Is It All for a Good Cause? 95
  - 4.2.3 Data Are a Source of Wealth in the Information Age 96
  - 4.2.4 Is It Possible to Control Invasion of One's Privacy? 97
  - 4.2.5 Privacy, Faulty Files, and the Right of Public Access 98
  - 4.2.6 Disinformation and *Doublethink* 100
- 4.3 Computing Inequities 102

- 4.3.1 Haves and Have-Nots: Rich versus Poor 102
- 4.3.2 Haves and Have-Nots: Girls versus Boys 104
- 4.3.3 Haves and Have-Nots: Whites versus Minorities 107
- 4.3.4 Haves and Have-Nots: The Lack of Equal Access to Information 109
- 4.3.5 The Problems of the Haves and Have-Nots Is Founded on More Than Just Financial Inequities 109

**Case Study 4:** *Girls and Technology* by Jo Sanders 112

## Chapter 5

### Computer Crime: Software Piracy and Hacking 117

- 5.1 Software Piracy 118
  - 5.1.1 Theft of Programs 119
  - 5.1.2 Copyright Law as Applied to Software 120
  - 5.1.3 Public Domain Software versus Shareware versus Licensed Software 121
  - 5.1.4 Software Protection 123
  - 5.1.5 Steps Schools Should Take to Discourage Software Piracy 127
- 5.2 Security: Hacking and Cracking 127
  - 5.2.1 Computer Viruses and Vaccines 130
  - 5.2.2 Trespass of Computer Systems 131
  - 5.2.3 Money Theft (Embezzlement) 132
  - 5.2.4 Computer System Security 132

**Case Study 5:** *School Piracy: A Case Study* by Christopher B. Hopkins 134

---

## Part II Computing Fundamentals 137

## Chapter 6

### Computer Hardware for Education Environments 139

- 6.1 Electronic Computers Were Invented to Meet Educational Needs 140
- 6.2 The Components of a Basic Computer System 143
  - 6.2.1 The Monitor 144
  - 6.2.2 The System Unit 145
  - 6.2.3 The Keyboard 148
  - 6.2.4 The Disk Drive(s) 149
  - 6.2.5 The Printer 152
  - 6.2.6 The Mouse 154

6.3 The Components of a Multimedia Educational Computing System 155

6.3.1 The Optical Disc Drives 155

6.3.2 Display Devices 157

6.3.3 Scanners 157

6.4 Maintaining Your Computer System 157

6.4.1 General Dos and Don'ts 158

6.4.2 Taking Care of Disks 158

6.4.3 Printers 164

**Case Study 6:** *Interactive Multimedia in the Media Center*  
by Susan Bond 166

**Chapter 7**

**Software Systems for Microcomputers 169**

7.1 Layers of Software 170

7.1.1 Software That Is Part of the Computer's Hardware 172

7.2 The Operating System 173

7.2.1 What Is an Operating System? 173

7.2.2 Operating Systems Most Commonly Found in Schools 174

7.2.3 Utilities 175

7.2.4 Functions Common to Operating Systems for Popular Educational Computing Systems 177

7.2.5 Useful User-Controlled Operating System Functions 183

7.3 The Graphical User Interface (GUI) 183

7.3.1 The Problem of Nonstandard User Interfaces 183

7.3.2 Standardization through Integrated Software 184

7.3.3 Standardization through Graphical User Interfaces 185

7.3.4 GUIs and Educational Psychology 187

7.4 Applications Software 188

**Case Study 7:** *Simulated Corporate Success* by Carolyn Cornish 190

---

**Part III Computers in the Classroom 193**

**Chapter 8**

**Educational Computing Environments 195**

8.1 Introduction 197

8.2 First Things First: Training for Teachers 198

8.2.1 ISTE Foundational Skills and Concepts 199

8.3 Safety First: Computers and Health 204

8.3.1 Extremely Low Frequency (ELF) Electronic Emissions 204

8.3.2 Carpal Tunnel Syndrome (CTS) 205

8.3.3 Other Ergonomics-Related Recommendations 208

8.3.4 Summary of Safety and Ergonomics Recommendations 213

8.4 Considerations for Computer Setup 215

8.4.1 Computers in the Classroom 215

8.4.2 The Planning, Design, and Management of the Computer Lab or Multiple-Computer Classroom 219

8.4.3 Recommendations for Lab Management 222

**Case Study 8:** *Planning the Computer Lab at Cornell Middle School* by Jodi Tims 225

**Chapter 9**

**Computer-Managed Instruction (CMI) 229**

9.1 Introduction 231

9.1.1 People, Not Computers, Increase Productivity 231

9.1.2 Success with Computers Has Not Come Easily 231

9.2 Teachers and Productivity Software 232

9.2.1 The Word Processor 233

9.2.2 The Database 234

9.2.3 The Spreadsheet 235

9.2.4 Drawing Software 235

9.2.5 Communications Software 236

9.2.6 Useful Utilities 237

9.3 Other CMI Applications 238

9.3.1 Using Electronic Templates 238

9.3.2 Preparing and Maintaining Curricula and Syllabi 240

9.3.3 Planning Lessons 241

9.3.4 Preparing Learning Materials 242

9.3.5 Generating and Evaluating Tests 243

9.3.6 Computerizing Audiovisual Support 248

9.3.7 Managing, Assessing, and Guiding Students 250

9.3.8 Communicating between Home and School 251

**Case Study 9:** *Computer Mediated Communications Can Increase Teacher Productivity* by David Popp 254

## Chapter 10

### Computer-Assisted Instruction (CAI) 257

- 10.1 Introduction 258
    - 10.1.1 Children Want to Learn 259
  - 10.2 Students and Productivity Software 259
    - 10.2.1 Productivity Software Is a Platform for CAI 259
    - 10.2.2 Word Processing 261
    - 10.2.3 Database Management 264
    - 10.2.4 Spreadsheets 265
    - 10.2.5 Charting and Drawing 266
    - 10.2.6 Communications 269
  - 10.3 Classifications of CAI 269
    - 10.3.1 Software for Drill and Practice 269
    - 10.3.2 Software for Tutorials 271
    - 10.3.3 Software for Simulations 272
    - 10.3.4 Microcomputer-Based Laboratories 274
    - 10.3.5 Programming and Problem Solving 276
    - 10.3.6 Integrated Learning Systems 276
  - 10.4 Software Evaluation 280
    - 10.4.1 Characteristics of Quality CAI software 281
    - 10.4.2 The design of Effective Software-Evaluation Instruments 281
    - 10.4.3 The Process of CAI System Evaluation and Purchase 290
- Case Study 10:** *Microcomputer-Based Laboratories: Sound Ideas for Science* by James Stringfield and Donna Verdini 292

## Chapter 11

### Computers, Communications, and Distance Learning 295

- 11.1 Computers and Communications 296
  - 11.1.1 Background 298
  - 11.1.2 Technology Transfer 298
  - 11.1.3 Explosion in End-User Computing 299
  - 11.1.4 The Expansion of C&C in Schools 300
  - 11.1.5 A Vision for the Future 300
- 11.2 Computer Networks 301
  - 11.2.1 The Components of Computer Networks 301
  - 11.2.2 Different Kinds of Computer Networks 302
  - 11.2.3 Applications of Computer Networks 304
  - 11.2.4 The Case for Computer Networks 305

- 11.2.5 Implementing Computer Networks 306
  - 11.2.6 The Impact of Computer Networks in Education 308
  - 11.2.7 Recommendations for Successful Introduction of Computer Networks in Schools 308
  - 11.3 Home-School Communications 309
    - 11.3.1 Teachers Need Parents 309
    - 11.3.2 The Importance of the Student-Parent-Teacher Gestalt 310
    - 11.3.3 The *TransParent School* Model 311
    - 11.3.4 Outcomes of the *TransParent School* Model 311
  - 11.4 Distance Learning 312
    - 11.4.1 National and International Education Networks 312
    - 11.4.2 On-Line Database Retrieval Services 314
    - 11.4.3 Teaching and Learning from Remote Sites 315
    - 11.4.4 Collaborative Learning 316
- Case Study 11:** *On Line with Horton: A Telecommunications Unit* by Kay Rewerts 319

## Chapter 12

### Educational Multimedia 323

- 12.1 Introduction 324
  - 12.1.1 The Importance of the Senses in Learning 325
  - 12.1.2 Audiovisual Aids 326
- 12.2 The Concept of Computer-Based Multimedia 328
  - 12.2.1 Multimedia Has Added a New Dimension to the Process of Teaching and Learning 329
  - 12.2.2 Multimedia Authoring Tools 329
  - 12.2.3 The Need for Standards 330
- 12.3 Physical Components of Multimedia Systems 330
  - 12.3.1 Data Capture Devices 331
  - 12.3.2 Using Copyrighted Materials 338
  - 12.3.3 Data Storage Technology 338
  - 12.3.4 Data Output Devices 339
- 12.4 Hypermedia Systems: Bringing It All Together 342
  - 12.4.1 Hypertext 342
  - 12.4.2 Hypermedia 342
  - 12.4.3 The Power of Hypermedia 345
- 12.5 Model Schools 346
  - 12.5.1 Room 405 Brookhaven Elementary School, Placentia, California 346

12.5.2 Spring Mills Elementary School, Waterford, Michigan 347

12.5.3 New American Schools Development Corporation 348

12.5.4 Are Model Schools a Good Idea? 349

**Case Study 12:** *The Magic of Multimedia* by Sandi Agle 352

---

## Part IV No Problems, Only Solutions 357

### Chapter 13

#### Creating Computer Applications for Education Environments 359

13.1 Introduction: Programming Is Hard 360

13.2 Why Should Teachers Learn About Software Development? 361

13.2.1 Historical Background 362

13.2.2 Why Should Teachers Know About Programming? 362

13.3 Characteristics of Quality Educational Software 363

13.4 Authoring Programs: How Teachers Can Get Involved 365

13.4.1 Authoring Systems 366

13.4.2 *HyperCard* 367

13.4.3 *Linkway Live!* 369

**Case Study 13:** *HyperCard Enlivens The Fundamental Particles Chart* by Barbara Gasdick 372

### Chapter 14

#### Funding Technology Projects 377

14.1 Introduction 379

14.1.1 Everything Points to an Increase in the Cost of Education 379

14.2 The Goals of Education for an Information Age 380

14.2.1 The Five Competencies of Effective Workers 381

14.2.2 The Foundation Skills Required of Effective Workers 381

14.3 Sources of Funding and Support 382

14.4 Preparing Grant Proposals 384

14.4.1 Steps in the Preparation of a Grant Proposal 384

14.4.2 Strategies for Successful Applications 385

14.4.3 The Qualities of a Grantsperson 386

14.5 Making the Most of Grants: The Seven Pillars of Success 388

14.5.1 Active Support Must Come from the Top 388

14.5.2 A Nondictatorial Approach Is Always Best 389

14.5.3 Every School Should Have a Core of Teacher-Computerists 389

14.5.4 Teachers Must Come First 390

14.5.5 Parents and Students Must Be Involved in the Evolutionary Process 390

14.5.6 An Ongoing Program in Technology Training Must Be in Place 391

14.5.7 Teachers Must Be Given Time and Freedom to Restructure Their Curriculum around the Technology 392

14.6 Evaluating the Technology Program 392

14.6.1 The Purpose of Evaluation 392

14.6.2 When Should a Program Be Evaluated? 393

14.6.3 The Components of the Evaluation Process 394

**Case Study 14:** *Technology Education at David Prouty High School* by Brian Scarbeau 396

### Chapter 15

#### Reflections on Education for an Information Age 401

15.1 Introduction 402

15.2 Computers, Learning Theory, and Cognitive Development 403

15.2.1 Computers and Learning 403

15.2.2 Learning Theory 404

15.2.3 Cognitive Development 404

15.2.4 Constructivism 405

15.3 The Importance of Individualized Education 406

15.3.1 It's Not How Smart the Child Is, but How the Child Is Smart 406

15.3.2 Data versus Information 406

15.3.3 The Transfer of Data to Information Is a Unique Individual Experience 408

15.4 When Should the Computer Be Used in the Classroom? 409

15.4.1 Computer-Based Learning Enables the Teacher to Tailor the Learning Situation to Suit Individual Student Needs 409

15.4.2 Computer-Based Learning Suits Children's Desire to Control Their Own Learning	410
15.4.3 The Computer Is an Invaluable Tool for Classroom Management	413
15.4.4 The Computer Is the Best Writing Implement Yet Invented	413
15.5 When the Computer <i>Should Not Be</i> Used in the Classroom	414
15.5.1 Computers Should Not Be Used for Purely Passive Learning	414
15.5.2 A Computer Does Not Take the Craft Out of Writing	414
15.5.3 Spelling Checkers Do Not Have All the Answers	414
15.5.4 Computers Cannot Replace the Teacher's Skill and Experience	415
15.5.5 Computers Should Not Be Allowed to Take Away from the Teacher's Responsibility for Careful Class Preparation	415

15.5.6 The Computer Can Be an Excellent Child Minder, but That Is Not How It Should Be Used	416
15.5.7 Computers Should Not Be Used Purely as Electronic Page Turners	416
15.6 Taking Care of the Teachers	417
15.6.1 Teachers Must Have Time	417
15.6.2 Teachers Must Have Ongoing Training	418
15.6.3 Teachers Must Have Logistical and Technical Support	419
<b>Case Study 15:</b> <i>Computer Cadre: A Brief History</i> by Kay Rewerts	422

**Appendix A: ASCII Codes 427**

**Appendix B: Resources and Recommended Reading 429**

**Appendix C: Sources of Funding and Other Resources 435**

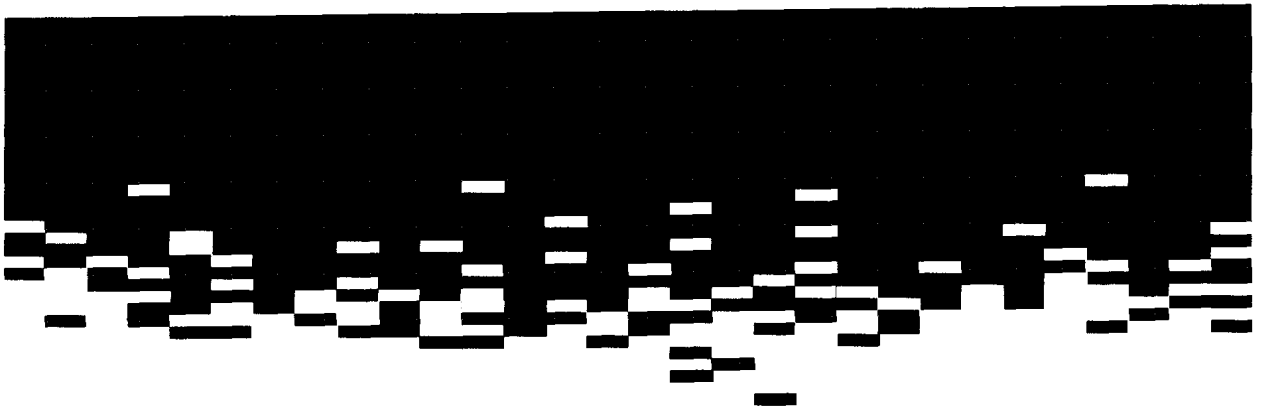
**Glossary 439**

**Credits 445**

**Name Index 447**

**Subject Index 451**





## Introduction

**T**hus education forms the common mind;  
Just as the twig is bent, the tree's inclined.

*Alexander Pope (1688–1744)*

**I** have hope that society may be reformed,  
when I see how much education may be reformed.

*Gottfried Wilhelm von Leibnitz (1646–1716)*

## ■ 1.1 The Challenge of Change

The audience for *Education for an Information Age* is the pre-service/in-service K–12 teacher. The primary goal of the text is to help you incorporate the computer into the curriculum. A secondary goal is to support your endeavors toward being the most effective educator you can be.

To this latter extent the book cannot be taken in isolation. The ideas and skills presented form part of the continuum of learning and experience related to your profession that began when you were yourself on the receiving end as a K–12 student, continues during your college studies as an education major, and ultimately bears fruit in your role as a teacher in the classroom. The computer, along with the expanding range of associated technology, is just one of many tools and techniques that can improve the learning environment that you provide for your students.

### 1.1.1 The Need for Change

There has been a great deal of hype about the computer as a tool for teaching. Perhaps it is in the nature of the profession, but teachers are more skeptical than most about the advent of yet another fad, yet another experimental methodology, yet another pedagogical imposter destined to come and go like so many others.

Change, in and of itself, is not usually welcomed with open arms. As Machiavelli observed:

It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage, than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institutions and merely lukewarm defenders in those who would gain by the new ones.<sup>1</sup>

People in general are resistant to change even when it is for the better. A certain inertia is built into time-tested ways of doing things. “If it ain’t broke, don’t fix it,” as they say, and the fact is that time-tested methodologies—chalk and talk, competition, rote learning, regimentation—have been successful until relatively recently in achieving the goal of turning out at least an educated elite from our schools.

With the collapse of agriculture, and then of industry, as the primary provider of people’s bread and butter, today’s increasingly service-oriented, information-based societies are waking up to the fact that an educated elite will put food on only a small number of plates on a nation’s table. Today we have to ensure that *everyone* has a realistic opportunity to develop the intellectual skills required to prosper in an information age.

To this end education needs help. We continue to be *A Nation At Risk* (National Committee on Excellence in Education, 1984). A growing number of young people graduating from our schools are ill-prepared to find gainful employment in tomorrow’s workplace, where the majority of jobs require higher-order intellectual skills—strong communication skills, information gathering and analysis skills, interpersonal skills, learning skills, and creative skills.

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<sup>1</sup>Niccolo di Bernardo Machiavelli, 1469–1527.

This is not to deny the progress that American education has made over the years. In fact there is cause for great optimism as pointed out in the report *Workplace Competencies: The Need to Improve Literacy and Employment Readiness* (Information Services Office, 1990). A century ago one was considered literate if one could sign one's name. Today almost all young adults can do that. Fifty years ago the criterion for literacy was the ability to read at a fourth-grade level. Today 95% of young adults meet this criterion. Twenty-five years ago one was deemed literate by the War on Poverty standards if one could read at the eighth-grade level. Today 80% of young adults read at that level. These are indeed grounds for optimism.

But young-adult preparedness for a productive and prosperous life requires more than merely the ability to read at an eighth-grade level. To quote from the above-mentioned *Workplace Competencies* report:

The requirements [for America's work force] are likely upward, at least in many important sectors of the economy and in particular employers' needs. The present technological environment has enlarged some workers' responsibilities. The lines between workers and supervisors and managers blur as "work teams" or "quality circles" are used to raise creativity and productivity. The team members put their heads together and solve problems. The members can do each other's jobs. They must be flexible. And they have to deal with print, often in more complex forms than before. In short, the requirements are rising in some areas that are highly visible to employers and to observers of the economy in general, and it is against these growing demands and expectations that the adequacy of preparation for the entering work force must be viewed.

### **1.1.2 Teachers Can Make a Difference**

The challenge is enormous, but we must hold on to the conviction that each one of us, in making our contribution, can make a difference. There indeed *is* the source of joy in teaching—the act, day by day, of "putting a spark" in young minds. As Anatole France observed, "If there is some good inflammable stuff, it will catch fire."

In the pages that follow, you will have the opportunity to learn about computing in general and about computer-based education in particular. The computer is obviously not the whole solution to the challenge of broadening and deepening the base of educational opportunity, but it may be part of the solution. This text examines all aspects of computer-based technology as one among the set of tools in a teacher's methodological toolbox.

The reader should bear in mind that it is beyond the scope of this book to profile in more than cursory fashion specific courseware or other applications for teaching and learning. Here we are concerned with concepts, rather than keystrokes. Keystrokes are essentially ephemeral; concepts endure. The ideal accompaniment to the study of the material here would, however, be hands-on experience with, and review of, a wide range of applications for education. It is hoped that the reader will have this opportunity.

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## **■ 1.2 Objectives of the Text**

### **1. To encourage the use of computers in the classroom by removing the mystery that surrounds the technology**

Many teachers resist using computers in their classrooms because they are intimidated by the technology. For this reason, another objective of *Education for an*