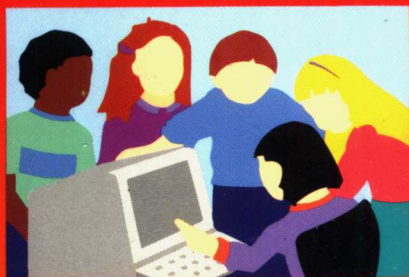


# Computers, Curriculum, and Whole-Class Instruction

Issues and Ideas



APPLE® II family disk enclosed

Betty Collis



COMPUTERS,  
CURRICULUM,  
AND  
WHOLE-CLASS  
INSTRUCTION

ISSUES AND IDEAS

BETTY COLLIS  
UNIVERSITY OF VICTORIA

WADSWORTH PUBLISHING COMPANY  
Belmont, California  
A Division of Wadsworth, Inc.

Computer Science Editor: Frank Ruggirello  
Editorial Associate: Reita Kinsman  
Production Editor: Vicki Friedberg  
Managing Designer: Donna Davis  
Print Buyer: Karen Hunt  
Designer: Vargas/Williams/Design  
Copy Editor: Mary Roybal  
Compositor: G & S Typesetters, Inc.  
Cover: Vargas/Williams/Design  
Signing Representative: Valerie Hunter

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Printed in the United States of America 14  
2 3 4 5 6 7 8 9 10—92 91 90 89 88

#### **Library of Congress Cataloging-in-Publication Data**

Collis, Betty.

Computers, curriculum, and whole-class instruction : issues and ideas / Betty Collis.

p. cm.—(Wadsworth series in computer education)

Includes bibliographical references and indexes.

ISBN 0-534-08460-5

I. Computer-assisted instruction. II. Title. III. Series.

LB1028.5.C527 1988

371.3'9445—dc19

87-27917

CIP

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SOCIAL STUDIES LESSONS	GRADE LEVEL													
	K	1	2	3	4	5	6	7	8	9	10	11	12	
1: Me! (p. 25)		■												
2: Home Sweet Home (p. 27)			■											
3: Going Places (p. 29)				■										
4: Let Your Fingers Do the Walking (p. 33)						■								
5: Hail to the Chief (p. 34)						■								
6: My World (p. 35)							■							
7: The Melting Pot (p. 41)							■							
8: You Can Bank on It (p. 42)									■					
9: Pictures Speak Louder Than Words (p. 44)										■				
10: Hot off the Press (p. 47)											■			
11: Working Women (p. 49)													■	
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2: Being Agreeable (p. 79)					■	■	■	■	■	■			
3: Division Problems (p. 80)								■	■	■			
4: First Things First (p. 83)					■	■	■	■	■	■			
5: A Better Way to Go (p. 84)							■	■	■	■			
6: A Rose by Any Other Name? (p. 85)								■	■	■			
7: No Place for a Lady (p. 86)								■	■	■			
8: Smooth It Out (p. 87)								■	■	■			
9: Bits and Pieces (p. 88)								■	■	■			
10: The Less Said the Better (p. 89)									■	■	■		
11: The Book Bin (p. 97)						■	■	■					
12: For Your Reference (p. 101)												■	■
13: There's a Word for Everything (p. 103)									■	■	■		
14: Making Connections (p. 105)								■	■	■			
15: A Likely Story! (p. 106)									■	■	■		

LANGUAGE ARTS LESSONS	GRADE LEVEL												
	K	1	2	3	4	5	6	7	8	9	10	11	12
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17: Odd Man Out (p. 108)						■	■	■	■				
18: Add-Libs (p. 109)							■	■	■				
19: Conversational Gems (p. 110)								■	■	■			
20: Dear Sir: (p. 111)									■	■	■	■	■
21: Word Count Statistics (p. 113)									■	■	■		
22: Hot off the Press (p. 117)							■	■	■				
23: Poster Prose (p. 118)						■	■	■	■	■	■		
24: A Real Bargain (p. 119)								■	■	■	■		
25: This Is Your Life (p. 120)												■	■
26: Picture This (p. 125)			■	■	■								
27: Time Capsule (p. 126)						■	■	■					
28: What's in a Name (p. 127)						■	■	■	■	■			
29: I Don't Know What to Write (p. 128)						■	■	■	■				
30: Just Thickening (p. 129)									■	■	■		
31: Find the Letters (p. 131)	■	■	■	■									
32: Shifty Business (p. 134)			■	■									
33: Poem Play (p. 139)								■	■	■	■		

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5: Insulin (p. 159)									■				
6: In the Spotlight (p. 161)											■	■	
7: Decathlon, Anyone? (p. 165)												■	
8: Strike It Rich (p. 169)								■					
9: To Bee or Not to Bee (p. 170)							■						
10: Green Thumb (p. 171)						■							
11: Is the Weather Forecaster Ever Right? (p. 172)									■				
12: Pest Plagues (p. 173)										■			
13: Pollution Problems (p. 174)													■
14: Rocky One-Two-Three (p. 187)				■									
15: You Are What You Eat (p. 189)										■			
16: Hot Tubs (p. 191)						■							
17: Energy Eaters (p. 193)						■							
18: Interplanetary Express (p. 195)					■								

SCIENCE LESSONS	GRADE LEVEL												
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20: Sounding Off! (p. 202)									■				
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3: What's Next? (p. 225)					■								
4: Following Faye (p. 227)			■										
5: A Rose by Any Other Name . . . (p. 231)			■										
6: Bingo! (p. 235)					■								
7: Popeye (p. 237)							■						
8: Parallelograms Plus (p. 243)									■				
9: Powerful Stuff (p. 245)								■					
10: Measuring Up (p. 249)								■					
11: Figuring Figures (p. 250)									■				
12: Poly Turtle (p. 252)										■			
13: Ups and Downs (p. 257)										■			
14: Going in Circles (p. 258)												■	
15: Zeroing In—#1 (p. 259)												■	
16: Zeroing In—#2 (p. 261)												■	
17: It's Your Money (p. 263)									■				
18: My Word (p. 271)						■							
19: Take It or Leave It (p. 273)								■					
20: Making a List, Checking It Twice (p. 274)									■				
21: Turtle Tracks (p. 277)					■					■			
22: Fore! (p. 281)						■							
23: F Is for Fun (p. 283)			■										
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26: Dear Abby (p. 289)										■			
27: It Seems That . . . (p. 291)											■		
28: The Coin Game (p. 292)										■			
29: The Cereal Box Problem (p. 293)									■				
30: Monte Carlo Area (p. 294)												■	
31: Go Pig! (p. 297)										■			

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## PREFACE

This book is for educators interested in the following questions:

- How can a computer help me teach mathematics, science, social studies, or language arts and English more effectively than I do already?
- How can I do anything of significance with computers if I only have occasional use of a single computer in my classroom, little money for software, and no extra time to teach something new in my busy day?
- What has research shown about the impact of computer use on teaching and learning? How can I make use of research findings about computers in education?
- What are some of the problems teachers and students encounter when they use computers in the classroom? What can I do to prevent these problems from developing?
- Is the computer a passing fad in education, a “solution in search of a problem,” or are there some computer applications that truly have the potential to make an important impact in the classroom?

Educators who are interested in questions such as these represent many different professional perspectives. Some are classroom teachers, others are teachers responsible for some kind of computer-related leadership in their schools or districts, still others are educators involved in teacher support and in-service with regard to the use of computers in the instructional setting. And there are other important groups: teacher trainers and researchers at faculties of education; senior and graduate students attending computers-in-education courses at these faculties; school and district administrators and policy makers; and individuals involved at senior levels in computer resource centers, institutes, and software development projects. I work with people representing all these groups; I know the different perspectives each group brings to its consideration of the impact of computers in education, but I also know that all of the groups are interested in key questions such as those at the beginning of this preface. This text attempts to provide something of value for anyone involved with computers in education.

## ORGANIZATION OF THE BOOK

This book is unusual in that it synthesizes practical ideas, ready for use in the classroom, with research findings and theoretical perspectives. Throughout the book, lesson ideas appear; each lesson plan relates to specific curricular objectives and can be utilized in a whole-class setting when only one computer is

available, but each lesson plan is also discussed in a larger context—one of disciplined inquiry about issues. The book assumes the computer is a tool for the teacher and student, not an object of study in itself. The book also assumes teachers and students will not willingly use this or any tool unless it fits the needs and characteristics of the situation. One of these characteristics is that teachers generally organize instruction around specific curricular areas; this book therefore reflects this type of organization. In particular, the book contains ten chapters and two appendixes.

- *Chapter 1* includes a rationale for the use of a classroom computer as a curricular tool and defends the use of applications software as instructional media.
- *Chapter 2* focuses on the development of information-handling skills in social studies—skills involving the organization, display, and interpretation of people-related data—through the use of data base management software, graphing programs, and telecommunications.
- *Chapter 3* looks at the development of language skills from a “product” orientation, where discrete language skills are of particular interest, and demonstrates how a classroom computer with word processing software can relate to this orientation.
- *Chapter 4* deals with the writing process and with social aspects of writing and communication. Word processing software is the major tool described in this chapter.
- *Chapter 5* examines the hypothesis-testing approach to science instruction and explores eight categories of computer simulations as tools for hypothesis testing, prediction, and modeling in the science classroom.
- *Chapter 6* looks at the role of the experiment in the science classroom and investigates the use of the computer as a tool for data capture and display in this environment.
- *Chapter 7* considers the development of basic mathematics skills and examines the role of computer drill and practice and of computer games as tools for skill development and strengthening.
- *Chapter 8* investigates problem areas in the secondary mathematics curriculum and describes the use of a classroom computer—often with a graphing program or spreadsheet software—as an agent for concept development in secondary mathematics.
- *Chapter 9* explores special areas of mathematics—problem solving, geometry, probability, and statistics—that are typically underdeveloped in the mathematics classroom and suggests ways that classroom computer activities can make these topics accessible and attractive to students.
- *Chapter 10* examines the various issues that concern anyone involved with coordinating or setting policy for computer use in a school or district. These issues, especially that relate to equitable computer use in schools, are also of importance to the individual teacher.
- *Appendix A* describes the collection of programs supplied on the disk that accompanies this book. The programs amplify teaching suggestions in some of the lesson plans and have been used extensively with students in the classroom and teachers in in-service sessions.
- *Appendix B* includes two detailed lesson plans to help those unfamiliar with the logistics of using a data base management program or a



word processing program as an integral part of a lesson. Appendix B also contains two complete unit plans—one on coordinate graphing and the other on energy conservation—that provide the teacher with day-by-day lesson plans and resource materials for instructional sequences that use a classroom computer as a valuable tool.

## ACKNOWLEDGMENTS

From one perspective, this book is a very personal effort. It represents my response to the questions indicated at the beginning of this preface. From another perspective, this book is built on the interactions I have had with hundreds of teachers, students (school age and university level), administrators, educational computing professionals, and decision makers. I have learned from all of them; I care for their problems, and I am delighted in their successes with and enthusiasms about the computer in the classroom. In particular, I would like to acknowledge three former students—Kathy Owen, Judith Terry, and Donna Juelphs—whose programs, written as class assignments, have been modified by me and included on the diskette that accompanies this text. Also, I would like to thank the following reviewers of the manuscript for their thoughtful comments and suggestions: Les Blackwell, Western Washington University; Ann Hernandez, ABCComputers; Thomas D. Johnsten, Oklahoma State University; Gaylen B. Kelley, Boston University; Albert P. Nous, University of Pittsburgh; John Wedman; and Robert B. Wiedermann, Corpus Christi State University. As current president of the International Council for Computers in Education (ICCE), I am fortunate that I can build on the experiences of computer educators throughout the world and see that the important issues in North America regarding computers in education are important issues in other countries as well. I acknowledge with gratitude the support and confidence of my friends and the forbearance of my family for my never-ending interest in the potential of computers in education.

Betty Collis  
Victoria, British Columbia

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## INTRODUCTION

One day in February 1980, I had an experience that has subsequently changed my professional life. I was teaching mathematics half-time at the Grade 8, 9, and 10 levels and half-time in a faculty of education. Although I had taken some computer courses when I earned my undergraduate degree in mathematics and had worked with computers during my graduate studies, I had never had any real interest in computing. Then, on that day in 1980, the principal of the school where I taught asked me to attend a one-day meeting about computers in education, because she thought that our school “ought to know something about this.” I went, saw my first microcomputer, looked at three programs—*Algebra* (graphing equations), *Hurkle*, and *Lemonade*—and in a matter of a few minutes’ time was convinced that this tool had powerful applications in education.

I returned home and the next day purchased an Apple computer. I carried it to and from both of my workplaces each day and set it up in various places in my home each evening. Other than three disks of MECC programs, no software was available to me, so I worked my way through “The Applesoft Tutorial” and started to write my own simple programs.

I was very anxious to apply the computer to my teaching and to share my enthusiasm with my students, both in the school and at the university. Because of my own orientation toward a whole-class mode of classroom organization, I immediately became interested in how I could use my one computer in a whole-class setting. Since it was already the middle of the teaching year, I had no time to introduce any particular “computer unit” into my overcrowded course outlines. Instead, I looked for ways to use the computer in the context of what I was already teaching. Thus began my development of ideas for whole-class use of a computer within the context of curriculum, as well as my concern for the logistics of making profitable use of only one computer with whole groups of students, one busy teacher, and few or no resources.

I was fortunate in having two jobs at that time. Working in a classroom gave me firsthand experience with real students and with the problems and potential of a classroom computer. Working at a faculty of education gave me the opportunity to think and work with teachers and to consider computer use in a broader perspective. I was soon actively involved in in-service teacher training and the development of lesson materials and associated software to use in my in-service work.

In the intervening eight years, I have been involved in virtually all aspects of educational computing. I have learned firsthand the time, energy, excitement, and frustration that accompany the use of computers as an integral part of lesson delivery. Although I now often teach in computer labs, I still deal regularly with the problems involved in moving a mobile computer into my teaching area or workshop. I am still continually frustrated by the problems of providing good visibility of the computer output in a whole-class setting.

Also, as I work in schools with teachers and principals, in districts with district administrators, at the university level with curriculum specialists and computer software development teams, and with parents in and out of the school setting, I am still asked many of the same questions as when I first began carrying my computer from class to class in 1980: "What can we do with a classroom computer?" "How can we manage it?" "Is it worth it?" "Is it possible to do anything useful with a single classroom computer?" "How can we get started?" "What do we do after we buy the computers?" This book is a summary of my responses to these questions.

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