Chapter 1

The Promise

> It seems that the message the parents are buying, along with their home computers, is pretty clear: one way or another – both in school and at home – computers can help American education pull itself up by its bootstraps. (Komoski, 1984, p. 245)

Home computing became a reality in the late 1970s after Steven Jobs and Stephan Wozniak, working in a garage, created their stand-alone *micro*computer, the Apple.[1] In their book *Silicon Valley Fever,* Rogers and Larsen (1984, p. 11) describe the Apple's inauspicious "birth" and the poor impression it made on computer figures like Nolan Bushnell:

> Jobs and Wozniak . . . went to their bosses at Atari and Hewlett-Packard with it. Jobs tried to convince Nolan Bushnell, founder of Atari and creator of Pong, the first video game, that microcomputers had a bright future. But computers were not in Atari's product line, and Bushnell laughed at Jobs.

Nearly ten years later, however, Bushnell ruefully recalled: "We all knew that profits were in mainframes and minicomputers. That was in 1975. . . . I never said we were perfect." By 1982, when *Time* named the personal computer its "Man of the Year," sales of microcomputers had topped $5.4 billion (Rogers and Larsen, 1984, pp. 11–12).

Rogers and Larsen (1984, p. 17) also point out that the promise of the personal computer could not have been fulfilled without the "thousands of software programmers around the country" who had ideas about how the Apple could be used for education and for other purposes:

> When the hobbyist market for microcomputers dried up in 1978, dozens of little computer firms collapsed. But not Apple, thanks to its cadre of free-lance programmers who had designed accounting, word processing, spelling, teaching, graphics, and a host of other programs. By 1983 over 15,000 programs were available for the Apple computer.

The development of the personal computer and software, as important as they were, might have had little or no educational impact had it not been for the growing disenchantment with public schools and the publication of several reports in the 1980s critical of public schooling. These included *A Nation at Risk* (1983), *A Nation Prepared: Teachers for the 21st Century* (1986), and *Making the Grade* (1983). Taken together, these reports revealed just how ineffective reformers, educators, and parental groups believed the public schools to be.[2]

THE EDUCATIONAL PROMISE

Many reformers saw the newly created personal computer and the growth of educational software as fundamental to the improvement of public education. With the computer-aided instruction of the 1970s in mind, some software creators, educators, and parents formed alliances to put computers into the schools, thereby hoping to make them more efficient and effective places for children to learn. Equally important, they urged parents to buy computers so that children could use them at home in cooperation with the school.

Other reformers, having given up on school improvement, argued that education could be changed dramatically if computers were brought into the home because they would enable parents to help their children learn in ways *independent* of the schools. Some even said that this move could revolutionize the way education took place in America.

The vast literature on educational computing reflects two somewhat divergent views of its educational promise for families: (1) that children's use of home computers would increase

their learning or academic achievement at school, and (2) that home computers would empower parents to educate their children independently of the school.[3]

It was hoped that the computer would be used at home as – in Taylor's (1980) terminology – a tutor, a tool, or a tutee. With the appropriate software, it would tutor children in their learning of subjects (e.g., math and science) and skills (e.g., reading and writing). It would also help children develop thinking or problem-solving skills. As a tool at home, the computer would help children accomplish such tasks and activities as writing and editing, manipulating data, drawing, composing music, and telecommunicating. As a tutee, it could be programmed by children to accomplish various educational tasks.[4]

REASONS FOR THE OPTIMISM

In the past, technologies such as radio and television were expected to transform education, but none has reached its potential as a learning tool (Cuban, 1986).[5] No tool before, however, seemed to hold out the educational promise of the computer. Rogers and Larsen (1984) attribute the hope that was pinned on the computer to its interactive potential: "What is different and special about computers is that they are interactive. It is this interactive nature of computers, and of related communication technologies based on computers, that marks a cultural turning point from the passivity of viewing television" (p. 260).

Wakefield (1983, p. 1), too, was optimistic about the computer's interactivity and its potential for encouraging children to learn at home:

> With its powerful interactive potential, the computer used for education emphasizes learning rather than teaching, the student rather than the teacher. This permits the students to work with a greater degree of independence from the school and teacher, and shifts the locus of learning from the school to the home as more homes than schools get computers.

Speculating about how this technology would revolutionize learning, Komoski, quoted in Wakefield (1983, p. 1), went even further:

> It is not being overly pessimistic to view the microcomputer as the vehicle that may drive a technological and instructional wedge between the home and school. . . . On the other hand, it is not overly optimistic to think that educational computing could become the basis for cooperative, community-wide educational experience for all families.

In short, the 1980s saw the spread of a technology that many came to believe had great promise for solving some of American society's urgent educational problems. Not only might computers become integrated into classrooms, but they might also provide parents with a tool that could enhance their children's achievement at school or help them educate their children on their own. The time of the home computer in the field of education *seemingly* had come.[6]

THE MEANING OF EDUCATIONAL COMPUTING

The term "educational computing" has been used in a variety of ways. Some have maintained that *all* computing is educational in one way or another. For instance, computer games, even those not labeled educational, can help players develop eye–hand coordination, spatial skills, and higher-order thinking skills.

With a more specific definition of educational computing in mind, schools began introducing children to computer literacy and elementary computer programming about a decade ago. They also began using academic drill and practice software with some students.

In this book we use "educational computing" to refer to any educational endeavor in which the computer is used. Such endeavors include fostering computer literacy, programming, word processing, and educational telecommunicating, as well

as academic teaching. We use the term "academic computing" to mean the use of computers for developing skills and knowledge and for understanding subjects such as reading, math, science, and social studies.

OUR RESEARCH FOCUS

As we noted earlier, schools have been under attack for some time because they are perceived as being unable to teach basic skills and academics or to motivate children to learn. When personal computers came on the market, they were sold to schools as a promising educational technology for teaching the three R's and other academic subjects and skills efficiently and effectively. Parents were also told that it was essential to have computers in the home if they wanted their children to learn well, achieve better grades in school, and be successful as adults.

Although a great deal of theorizing and research was devoted to school computing in the early 1980s, very little attention was given to home educational computing. Therefore, little was known about the ways in which parents were allowing and urging their children to use computers at home. How was this use being affected, if at all, by their school use, especially with regard to the learning of academic skills and subjects? Were parents helping their children use home computers to improve their performance in school or to learn independently of school? In other words, to what degree were the two versions of the educational promise being fulfilled?

This book attempts to answer these questions.[7] It is the product of a three-year, qualitative field investigation entitled Studies of Interactive Technology in Education (SITE) involving seventy families. The research began in February 1984 and ended in late 1986.

Although we focused on academic forms of educational computing, our qualitative approach allowed us to observe the extent to which children were using their computers for other purposes such as word processing, programming, telecom-

municating, and game playing. The study therefore provided contextual information about the presence or absence of recreational and other educational uses of computers at home.

OUR BASIC FINDINGS AND THEIR IMPLICATIONS

Our in-depth study of seventy families revealed a near absence of children's academic computing, only a modest amount of other forms of educational computing (including programming and word processing), and almost no telecommunicating. Game playing took up most of the children's computer efforts in these families.

Children did not use their home computers for academic learning mainly because of social reasons: parents neither encouraged nor aided such computer efforts; schools emphasized other forms of use; and peers and siblings were not supportive of this kind of use. Other social factors that explained why children did not get involved in academic or other kinds of educational computing included parent reluctance – especially of mothers – to use computers; parents' lack of knowledge about or positive evaluation of relevant educational software; and poor communication about educational computing between the home and the school and between the creators of hardware and software and families.

Our research pointed to three overarching lessons about the use of computers at home, lessons that are relevant for other educational technologies as well. Advocates need to (1) more clearly define the social envelope – especially the roles parents and children need to play in order to use computers for academic and other educational purposes at home; (2) pay greater attention to the conditions necessary for the successful diffusion, adoption, and implementation of academic computing and software; and (3) reexamine the adequacy of schools as linking agents to foster educational computing in the home. Unless these lessons are heeded, home academic computing is unlikely to grow very much.

In recent years, researchers and reformers in computers and education have begun to emphasize the potential of computers for learning higher-order thinking skills; for managing and manipulating information; and for creating text, graphics, and music. Many now consider it important for people to use computers as tools, as extensions of the mind, and not solely for the transfer of knowledge. Moreover, computer hardware and software are becoming so sophisticated and powerful that computers are now being hooked up with other technologies to form promising new interactive multimedia for learning. If reformers, developers, educators, and families do not take seriously the lessons learned about simple academic computing at home, however, the interactive multimedia or any other new technology are likely to have little more success in meeting their potential. Here, too, it is necessary to plan for and implement social change. We believe this book has important implications for the effective use of any new educational technology at home or, for that matter, in school.

WHAT THIS BOOK IS NOT ABOUT

There are at least three important issues concerning educational computing in the home and at school that this book can only deal with tangentially at best. One is whether or to what extent computers *should* be used for educational purposes.[8] A second concerns computer equity.[9] The third is related to the effects of computer use on learning.[10]

Whether computers should be used in education remains a controversial question (e.g., compare Weizenbaum, 1976, and Papert, 1980). We recognize how easy it is to misuse or overemphasize computers, but we also believe that with forethought and planning, computers and other technologies can be extremely valuable educational tools.

The point we wish to make is that the use of computers needs to be evaluated with a critical, but not negative, eye. Obviously, technology is here to stay; it has always been a major component of societies, big and small, ancient and modern. All technologies

have their "upside" and "downside." What we caution against is the mindless or unexamined use of technology just because it is there. We also warn against the knee-jerk refusal to try a technology just because it is a technology. In short, while we think the contribution of home and school computers to the education of children has not yet been fully demonstrated, we believe that this technology deserves a fair test.

The matter of computer equity with respect to such factors as gender, social class, and race has sociological and political dimensions that go beyond the focus of our research, especially since the data were collected from a relatively homogeneous group of mostly middle-class, white families. We do, nevertheless, speculate about social class differences at several relevant points. We also devote a whole chapter to gender differences surrounding the use of computers.

The proper study of outcomes would have required a different orientation and research design, one that emphasized larger numbers of children and a quantitative approach to data analysis. In addition, had we chosen to do an effects study, we probably would not have been able to get close enough to the families to examine how and why computers were being used educationally at home. Most important, we believe that effects studies are premature when the facts of actual implementation or use have not been established. As Gross, Giacquinta, and Bernstein (1971, p. 216) put it:

> Many promising educational innovations have been rejected on the basis of experimental designs that failed to take into account that the innovations may have been inadequately implemented. Clearly, when a new program or practice has not had a "fair" trial, judgment about its educational utility must be held in abeyance.

AN OVERVIEW OF THE BOOK

In Chapter 2, we provide a brief review of the research conducted on families with computers up to the time of our investigation. We discuss the advantages of doing in-depth

qualitative work to understand better the actual educational computing efforts of families. We also describe our research procedures, the kinds of families studied, and the extent to which they represented families with children and home computers throughout the United States – then and now. In Chapter 3, we describe the reality of home computing as we found it, especially the nature of children's academic forms of computing. We also propose a general model for why children do or do not engage in home academic computing. This chapter sets the stage for the next five chapters, which provide further details on the various conditions behind the lack of academic computing at home and discuss possible changes since the end of our study. In Chapter 4, we deal with various aspects of educational software, particularly its availability and quality in SITE homes as well as in the marketplace. In Chapter 5, we discuss the extent to which parents offered encouragement and assistance in order to foster their children's academic and other educational computing efforts. We delve into the reasons why some parents were involved, while most were not. In Chapter 6, we take up the special matter of mothers' reactions to home computers and the reasons why so many feared or avoided them. In Chapter 7, we examine the forms of computing that schools emphasized and the effects of school use on home computing. In Chapter 8, we consider why so many children used their home computers for playing games rather than for educational computing.

Chapters 9 through 11 discuss the three major lessons learned from our study. In Chapter 9, we explore the concept that technological change requires a proper "social envelope" if the technology is to achieve desired outcomes such as the learning of academic subjects. In Chapter 10, we view technological change as a social process depending on a variety of conditions that need to be fostered if a technological change effort is to succeed. In Chapter 11, we discuss the need for an effective linking agent for the diffusion, adoption, and implementation of home educational computing and the role that the school can play in this regard. In Chapter 12, we recap the promise and the reality based on our findings. We discuss one

new educational technology – interactive multimedia – and explain why creators and advocates may repeat the mistakes with this and other promising technologies if they fail to heed the lessons learned in our study about academic computing at home. The chapter concludes with suggestions for future research on educational computing.

NOTES

1. In this book, we use the term "computer" to refer to the machine called a "microcomputer" in the late 1970s to middle 1980s: a self-contained machine that (1) is based on the microprocessor, (2) has a video display, (3) can have information read into it by means of disk drives and diskettes, and (4) can be hooked up to a printer and a modem. The term "microcomputer" was used to distinguish this machine from the larger mainframe computer, which dominated business and industry at the time. We shall use "computer," "personal computer," and "home computer" interchangeably to refer to this kind of machine. When we talk about a home computer, we mean it literally: a stand-alone (personal) computer that is located at home. We do not use the term in its earlier sense of a very small stand-alone that was suitable for the home but not work.
2. For a critical appraisal of these and other reports at the time, see Berman's "The Improbability of Meaningful Educational Reform" (1985, pp. 99–112). The disenchantment with public schools did not begin with these reports. It may be that this disenchantment began in the 1960s with the publication of James B. Conant's *The Education of American Teachers* (1963). His critique and those of others such as James Coleman in *Equality of Educational Opportunity* (1966) helped form the basis of the federal government's Great Society initiatives of the 1960s and 1970s, including those for compensatory education. Some critics complain that schools continue to produce a work force that is not skilled enough to support America's large industrial-based and information-based society (Besser, in press). Others have emphasized the seeming failure of public schools to bring about social equity at a faster pace and greater social achievement within its multicultural population. Still others worry about America's flagging efforts to maintain its place