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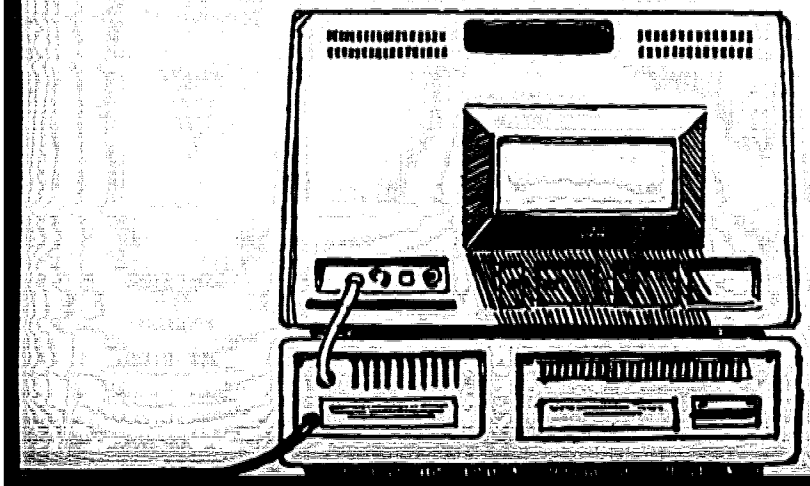
ABSTRACT

Computers have not revolutionized social studies curricula because so few teachers use them. But research does indicate that computers are flexible instructional tools that can assist in the development of attitudes, intellectual motivation, and inquiry skills. Social studies educators need to consider expanded computer use in their classrooms because computers assist in the preparation of students for effective participation in society. Teachers must understand how technology affects instruction, learning, and classroom environments, along with the types of effective instructional strategies that can be used to achieve specific goals. Educators should acquire the knowledge and experience needed to use computers by reviewing research relating to computer use in teaching and to instructional strategies. Information on research concerning the impact of computers on students, how computers change the way teachers' work, computers' effect on the training process, and computers' influence on the social studies curriculum is included. Necessary teacher competencies and appropriate instructional uses are explored through an analysis of teacher utility programs, databases, data analysis programs, and simulations. A 76-item bibliography concludes the document. (JHP)

Computer-Based Education in the Social Studies

Lee H. Ehman
Allen D. Glenn



COMPUTER-BASED EDUCATION IN THE SOCIAL STUDIES

by

Lee H. Ehman
and
Allen D. Glenn

Social Studies Development Center
ERIC Clearinghouse for Social Studies/Social Science Education
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CONTENTS

ABOUT THE AUTHORS

Lee H. Ehman is a professor of education and director, Educational Technology Services, at the Indiana University School of Education. In 1978, Dr. Ehman received an award from the National Council for the Social Studies for excellence in research. His articles have appeared in such journals as *Social Education, The High School Journal,* and the *American Educational Research Journal*. He is co-author of *Toward Effective Instruction in Secondary Social Studies* and *Review of Research in Social Studies Education, 1970-1975*. Dr. Ehman has conducted workshops in Europe and the United States on instructional uses of computers in the social studies, and he has led the effort at Indiana University's School of Education to incorporate instructional computing in the undergraduate and graduate programs.

Allen D. Glenn is a professor of education and associate dean of the College of Education at the University of Minnesota. Dr. Glenn has been a consultant and instructional developer in several projects on computer-based education, including *Computer Literacy Instructional Modules* for the National Science Foundation and *Solutions Unlimited* for the Agency for Instructional Technology. He is co-author of *Computing in the Social Studies Classroom, Social Studies Microcomputer Courseware Evaluation Guidelines,* and *The Young Voter*. His articles have appeared in such journals as *Social Education, The Social Studies, Teaching Political Science, The Educational Forum, Electronic Learning, The High School Journal*. Dr. Glenn has served as a consultant and workshop leader throughout the United States and in Europe and Asia.

FOREWORD

During the 1980s, computers have entered elementary and secondary school classrooms throughout the United States. During the 1990s, it is likely that they will become standard equipment for teachers and students in all subjects. This development will require big adjustments in curriculum development, lesson planning, and teaching, especially in the social studies. It will also open grand opportunities to enliven and enrich learning experiences. Computers in the classroom may be the long sought key to effective instruction in elementary and secondary social studies.

In this publication, Lee H. Ehman and Allen D. Glenn present a valuable view of computers in the social studies. They review research on uses of computers in the social studies classroom and raise critical issues about how and why to teach with computers and about the likely effects of instructional technology on teaching and learning in the social studies. Ehman and Glenn are optimistic about the instructional potential of computers, but they also raise problems that will continue to challenge social studies educators.

John J. Patrick
Director, ERIC Clearinghouse for Social
Studies/Social Science Education and
Director, Social Studies Development
Center at Indiana University

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CHAPTER I

COMPUTERS AND SOCIAL STUDIES EDUCATION

It wasn't too long ago that a group of educators interested in technology were forecasting a computer revolution that would bring sweeping changes to all of education. Proponents of the new technology suggested that it would not only change the content of social studies but also the manner in which it was taught. Advocates suggested that with this new technology social studies students would have opportunities to learn new skills and that the social studies teacher's role would change from a dispenser of knowledge to facilitator of learning. Finally, social studies teachers would be able to focus their instruction on higher level thinking and to the creative use of knowledge to solve problems.

Recent reports about schools, such as *A Place Called School* (Goodlad 1985), suggest that the social studies classroom is pretty much like it was ten years ago. Most classes still have a teacher leading thirty students through a lesson in which the teacher does most of the talking. Where is the technology? Where is it being used to facilitate learning and to assist students in acquiring higher-level skills?

Some computer educators suggest that the technology revolution has stalled (Dronka 1985) and point to three specific problem areas that are contributing to the lack of movement in technology. First, even though there are almost two million computers in schools across the nation, there is still a shortage of computers for teachers to use. Second, there is a lack of high quality software. True, there are many more titles available for purchasing; however, critics suggest that there is a sameness to the materials and a lack of courseware that goes much beyond drill and practice. Consequently, many schools and teachers are not purchasing as much courseware as before. Third, even though computers have been used in the schools for almost a decade, there is little research available to suggest that the social studies teacher who uses the computer will affect student achievement.

Two other problems should be added to Dronka's list. Teacher knowledge about using the computer in the classroom is low, and efforts to change this situation are slow and costly. Also, the computer software that is available is often not well integrated into the curriculum, making the computer an expensive and perhaps unwelcome addition to an already crowded school day. As a consequence, many people are taking a hard look at technology and its place in the school.

Many other educators are much more optimistic, as one might expect. Gilbert Valdez (1986) believes that computer education is at a turning point in which educational technology has moved from a curiosity to a useful tool that will help schools provide better curric-

ulum and instruction. Valdez goes on to suggest that the extreme claims by computer zealots that computers will replace teachers will be tempered by a more balanced understanding of what technology can and cannot do. The "computer revolution" has not stalled, according to Valdez; it has matured.

Valdez's views are supported by Robert Taylor in a recent interview with Diane Kendall and Howard Budin. Taylor contends that schools are witnessing an "intellectual regeneration" because of the ways computers are used. Word processing, database building and use, graphical representation of all kinds, and telecommunicating are all creating new environments in which "student attention and interest can be intensely focused on intellectual activity for long periods of time" (Kendall and Budin 1987, 34).

So, what is the status of computers in social studies education? Is social studies education moving forward in the use of technology in the classroom; or is the use of technology in social studies at a standstill? Exploring the answers to these and other questions is the purpose of this monograph. After presenting a brief status report on computer use in social studies, Chapter II reviews the research literature related to the use of technology in instruction with a special emphasis on social studies. Four questions focus the discussion and serve to provide a snapshot of what we know about using computers in social studies classrooms in the summer of 1987.

Chapter III uses the generalizations from Chapter II to discuss selected instructional strategies for using computer technology in the classroom. The chapter utilizes what we know about effective teaching and using technology to provide the social studies educator with some practical guidelines for classroom use.

The monograph concludes with a discussion of the issues related to computer use in the future. While it is always dangerous to speculate about the future, it is even more dangerous to look into the future of technology. Change in equipment occurs so rapidly that most projections are out-of-date almost immediately. Nonetheless, we conclude the monograph with some speculations based on current data, projections for the future, and some hunches.

Our fundamental purpose is to provide a series of pictures of computer usage in social studies education. We will focus on what is happening now, what we know about the impact of technology, how we might use technology more effectively, and what we might expect in the future. We begin by examining what is happening now.

In order to have a perspective on the research on computers in social studies and potential instructional uses, two broad areas need to be explored. The first, computer software, will provide a base for thinking about the research that has been done. The second, computer usage in social studies, will also provide a better perspective on the amount of research that has been conducted in social studies class-

rooms. We begin by looking at the types of computer materials available for classroom use.

Computer Software for Instruction

Computer materials currently on the market may be divided into four general areas: (1) stand alone materials that can be inserted into the curriculum at a specific point, (2) supplementary materials designed to be used with specific textbooks, (3) generic or utility programs that are not content specific but allow the user to generate materials or data, and (4) integrated packages that are designed to teach skills and content and to keep records of student progress. Each offers different possibilities for the teacher to consider.

Stand Alone Materials

During the early years of computer courseware development the most popular programs were drills, educational games, simulations, and some tutorials. These materials were designed to fit into the curriculum at some point. In social studies a variety of drill programs appeared to help students learn the names and locations of the states and their capitals. Often the drills had characteristics of the popular video games in which students tried to score points. A few simulations appeared, headed by the very popular Oregon Trail, developed by the Minnesota Educational Computing Corporation (MECC). These stand alone programs were related to general content areas and it was up to the teacher to decide where to place them in the curriculum. Stand alone materials are still being produced by many companies.

A recent development in stand alone programs is the generic database. A database for social studies contains a data set—such as world population figures or information about the presidents of the United States—and allows access to these data by the user. Again, many are general purpose databases that are not limited to just one content area. Many advocates of technology see the database as the most important piece of computer software to come along for social studies education. We examine databases in greater detail in Chapter III. It is, however, too early to determine the impact of the computer database on social studies instruction.

Supplements to Textbooks

During the 1980s major textbook publishers began to supplement their textbooks with computer discs and supportive materials. Responding to this trend other software publishers coordinated their materials with chapters in various popular textbooks. The publishers' goal was to make the text more appealing to social studies educators who were advocating computer literacy among students, and to make it easier to decide when and how to use the computer. Although

growing in number, these materials are still in the minority of new programs being introduced.

Generic or Utility Programs

Related to stand alone computer materials is a rapidly growing set of programs that are quite flexible, allow the user to custom make materials, and are relatively easy to use. These popular utility programs either provide almost all the information and the user simply selects from options, or they provide a general framework and the user makes most of the key decisions. Examples of the easier programs are *Print Shop*, *Newsroom*, and *Certificate Maker* (Springboard) that allow the user to make signs, posters, cards, transparencies, worksheets, newspapers, and certificates. Each program is easy to use because it contains a variety of options from which the user may select. The user can produce a document that contains different fonts and graphics by typing in just a few simple commands from a menu. These programs are popular with teachers because they may be used inside and outside of class to produce products that can enhance traditional instructional activities.

The second type of utility program provides a general framework for the user but takes more time and effort to understand and use. Word processing programs fall into this category. Once mastered word processing programs can be used to create an almost endless list of materials for instruction. Other utility programs such as spreadsheets, computer gradebooks, and programs that create labels, lists, and letters are also popular among educators.

Utility programs are the growth area for many software companies. Computer-assisted tools have become more important for both the social studies teacher and the student. Considerable effort has been made and will continue to be made to make these tools an important part of the instructional process.

Integrated Packages

During the early years of computing when programs were run on mainframe computers and time was shared with other users, Computer-assisted Instruction (CAI) or Computer-managed Instruction (CMI) was thought to be the wave of the future. Educators were told that soon students would be instructed by the computer and that the computer would manage instruction, keep all records, and determine whether or not the student had learned the materials. The early claims for CAI did not materialize. Equipment was expensive, materials limited, and microcomputers diverted attention from time share systems.

During the past several years the storage capacity for microcomputers has increased dramatically. New microcomputers now have the capacity to run more powerful computer-assisted learning packages. At the same time, new technology, such as the videodisc and

compact disc, is enhancing the power of the computer and encouraging developers to once again create total learning packages that will help students develop basic skills. For example, a number of developers have on the market computer learning packages that are designed to teach basic reading and writing skills. These systems, linked with a minicomputer, provide instructions to teach the student, assess progress, prescribe remediation, and test for minimal performance. The Minnesota Education Computing Corporation (MECC) has an integrated microcomputer and videodisc system designed to teach an introductory economics course to secondary students. The system also manages instruction and maintains student records. Although such sophisticated systems are not currently available on a widespread basis, some educational specialists see these as the next big area of growth for instructional computing. These systems will teach basic skills, provide a mechanism for the teacher to access the information about student achievement, and allow the teacher to concentrate on higher-level learning. But those systems remain in the future for most schools.

If these are the common types of computer materials currently available in education, to what extent are they being used in social studies classrooms? Let us explore the research on usage.

Extent of Computer Use in Social Studies

Before discussing how much the computer is used in social studies, we need to see how much computers are used across all subjects and levels in schools. By examining a baseline of data, we will have a standard of comparison and interpretation. The findings reveal the distance that we still must go in order to make technology available to all students.

In 1985 there were about 1.3 million computers in precollege schools. This means about one computer for every 51 students (TALMIS Report 1986; Quality Education Data 1986). Henry Becker (1986) who conducts a series of surveys in the United States found in his most recent sample of 2,361 schools in 1985 that the average computer-to-student ratio was 1 to 42 (Becker 1986, Issue 1, 2). His data, however, were based only on those schools actually using computers and therefore the findings are high compared to all schools. Given these figures, access to computers in any school is still going to be difficult. And, with limited access, what can be done with them is also going to be limited.

On a more positive note the number of computers in schools continues to grow. Becker found in 1985, for example, that the number of computers quadrupled between the spring of 1983 and the spring of 1985. He estimated that during 1984-1985 approximately 15 million students and 500,000 teachers used computers as part of their schools'

instructional programs. He also suggested that almost all secondary schools and five-sixths of the elementary schools in the United States have begun to use computers with students, and that in 1987 there were about 1.8 million computers in schools.

Another way to look at overall computer use is by the function the computer serves in the school. Becker reported that at the elementary grades between 50 and 60% of the teachers surveyed said they use the computer for enrichment. At the secondary level only 25-30% of the teachers said they use the computer for enrichment. In contrast, computer use for regular instructional purposes increased from 20% in the elementary grades to 60% in the secondary grades. A third function, remediation, is more often used in elementary classrooms (20-35%) than in secondary classrooms (10-20%) (Becker 1986, Issue 2, 2).

An earlier study done in 1983 reported similar figures for enrichment, but found that regular instructional uses were higher for elementary grades than secondary grades. Remediation was used much less in 1985 than in 1983 (Office of Educational Research and Improvement Bulletin 1986).

Given that the number of computers is limited it is not surprising to find that overall computer use in schools is modest. Becker (1986) estimated that only one out of seven students used the computer during a normal school week and that only about 12% of the teachers in all subject areas in a typical high school used the computer with students.

With these findings as a backdrop we can turn to the use of computers by social studies teachers. Becker found that only 1% of the total use at grades kindergarten through three was in social studies; 4% at grades four through eight; and 1% at grades nine through twelve. Computers were most often used in mathematics and computer science, science, English, and business education. The computer was limited to "simple simulation games in middle school social studies course" (Becker 1986, Issue 2, 8). Why such limited use?

First, few teachers see computers fitting into the social studies curriculum. When asked by Becker in his study to list the positive outcomes from using the computer with students, very few teachers suggested anything that related to the social studies curriculum (Becker 1986, Issue 3, 8). The question seems to be, "What would you do with it in social studies?"

Second, social studies teachers do not understand how to use the computer. In a survey of 132 social studies teachers in 1985, it was found that relatively few understood or used computers. This was especially true for experienced teachers and teachers at the secondary level (White 1986). This finding is supported by Sabir's (1986) study which found low knowledge levels among social studies teachers. These conclusions are similar to those found in the United King-

dom (Ashley 1983) in which computer-assisted instruction was used mainly in geography rather than history or economics.

If one remembers that there is a scarcity of computers in schools and then combines that with a lack of understanding of how to use the computer and where it might fit into a social studies curriculum, it is not surprising that social studies teachers are not using the computer. If you do not know how to use one, and cannot get access to one easily, it is simpler to keep doing what you are doing without a computer.

There are variations of use among the states, but the percentages remain fairly low. Idaho researchers, for example, estimated that 2.5% of its computer use was for social studies instruction (Tucker 1982). Louisiana officials reported about 17% for social studies (Louisiana State Department of Instruction 1985) and in Indiana 5% of the social studies departments in the high school reported student use of social studies drills, tutorials, problem-solving, and simulation programs (Green 1983). In 1982 Texas reported about 4%; Oklahoma none, and 1983 figures for Massachusetts showed 22% of its social studies departments using computers (Robbat 1984). While the figures give us little insight into why usage was low, they do confirm Becker's conclusion that social studies teachers as a group tend not to use computers in the classroom.

Although very limited in size and area of its sample, a survey of Oregon and Massachusetts history teachers adds some detail to our understanding of the extent of and reasons for computer non-use in the social studies (Robbat 1984). Of 53 history teachers and department chairs, 50% had used computers themselves outside of the classroom, but only one had employed a computer in history teaching—a drill and practice program. Robbat asked the teachers why they did not use the computer in the classroom and those with previous experience cited limited access, lack of expectations for use by the school, and lack of adequate software. The teachers who had not used the computer cited lack of knowledge as the primary factor. Interestingly enough, all the teachers agreed that several recommended computer programs would be valuable in teaching history. These programs included databases, computer simulations, and models to analyze simulations. As we previously noted, lack of knowledge and access were the two major problems.

What can we conclude from these limited findings? First, there is very little reported use of the computer in social studies classrooms. Given the lack of equipment, software, teacher training, and experience, the low level of use is not surprising. Also, other subjects such as mathematics, computer science, and science traditionally command more resources in schools so there is a double impediment to integrating computers into the social studies curriculum.

Second, although Becker's data do not reveal that computer-as-tool is a dominant role, he did find that more and more emphasis is being placed on that type of use (Becker 1986, Issue 3, 10). In social studies the use of computers as intellectual tools has considerable promise. Chapters II and III explore these new tools.

Finally, computer-using teachers noted that "computers have improved the climate for learning by increasing student motivation..." (Becker 1986, Issue 3, 14). Computers may foster intellectual gains, but most teachers saw them as motivational. There is an important message for social studies in this finding. In social studies, where student disinterest in and devaluation of the content is high relative to other subjects, the motivational aspect of computer use might become an important lever in influencing teachers to integrate computers into instruction.

It is our contention that social studies educators must continue to study the use of the computer in social studies because the computer relates to our fundamental purpose, the preparation of students for effective participation in their nation, state, and world. In order to do this an effective social studies teacher must understand how technology affects instruction, learning, and the classroom environment, and the types of effective instructional strategies that may be used to achieve specific goals.

Conclusion

We began our examination of computers and social studies with the realization that computer software continues to evolve as does the hardware, and that computers have yet to earn a prominent place in the social studies classroom. While it might be easy to become discouraged at this point, we are not. The task for social studies educators is to acquire the knowledge and experience needed to use computers. Two possible methods for achieving part of the goal are to understand what research says about computer use in instruction and to think about instructional strategies for using the computer. These are the topics of Chapter II and Chapter III.

CHAPTER II

WHAT DO RESEARCHERS SAY ABOUT USING COMPUTERS IN THE SOCIAL STUDIES CLASSROOM?

In order to interpret trends and promising computer-related practices, and to project what the future might hold for the social studies curriculum, we need a snapshot of what we know at present about using computers in social studies classes. What we "know" has to be constructed each time that question is asked. We have to invent a set of questions and categories, summarize the research literature available at that point in time, and then try to make sense of it—interpret the research so that it means something as a whole. That is what this chapter is about.

Four questions ought to be answered by researchers if we are going to be well-informed about computers and social studies:

1. What impact do computers have on students?
2. How does using computers change the way teachers work?
3. Do computers affect the instructional process?
4. Do computers influence the social studies curriculum?

Most of the research evidence bears on the first question, having to do with impact on students; however, there has been relatively little research conducted on that question. Because of the general lack of findings, we have to include studies and reports that might not be legitimate parts of other reviews; they are included here only as impressionistic reporting and opinion. However, given the paucity of rigorous studies on these questions, and because most often these opinions are very well-grounded in the experience of the writers, they are important to include. We will point out when we are basing our discussion and conclusions on strong or weak evidence.

As we proceed through the questions, we will also identify whether elementary or secondary school settings are being discussed. At the end of the chapter we will summarize our tentative answers to the four key questions, and then suggest lines of research that ought to be followed in order to add knowledge about the impact of computers on the social studies curriculum.

What Impact Do Computers Have on Students?

In examining research on the impact of computers on students in social studies classes, we are going to look at computers in two ways: as teachers' assistants and as students' learning tools. As teach-

ers' assistants, computers can help promote students' basic knowledge and skills. Computers can be used to run drill and practice software, including some games, tutoring programs, and computer-managed instruction programs, which increase students' learning of facts, concepts, and thinking skills.

As students' learning tools, computers can help foster critical thinking and problem-solving skills. This is done through the use of simulation programs, spreadsheets, database programs, and access to local or remote databases that contain social studies information used in figuring out answers to questions. Another possible use in this category is word processing; however, this area is so new that little research could be found.

Using Computers as Teachers' Assistants

Drills and Tutorials—Findings from All Content Areas. Drill and practice programs dominate the social studies computer software market, but surprisingly little research has been done to examine its effects on student learning and attitudes. A research review of the effectiveness of computer-based teaching in grades six through twelve in all subjects was conducted by Kulik, Bangert, and Williams (1983). They found drill and tutorial programs to have small but positive results on achievement, attitudes toward subject matter and use of computers, and efficiency of time use. Unfortunately for the present review, most of the studies reviewed by Kulik and his associates were in mathematics and science, with only 10 in their non-specific "other" category. Furthermore, few studies included in their review used microcomputers. Nonetheless, their synthesis of the research in this area is promising for computer-assisted instruction.

Subsequent reviews, including all subject areas and incorporating more studies, have confirmed this picture. Niemiec and Walberg (1985; 1987) conclude that computer-based instruction (not necessarily reflecting microcomputers, however) is moderately effective for achievement outcomes over all the grades, and is most effective at the elementary school level.

As with many research reviewers today, Niemiec and Walberg use an indicator of average effectiveness called the "effect size." This index shows how much an experimental group outperformed the control group in a comparison study. It is based on the standard deviation unit, so that effect sizes can be compared across studies, and average effect sizes can be computed for groups of studies and for particular treatments and outcomes. Niemiec and Walberg found that the overall average effect size of computer-assisted instruction was .42 across all the reviews of research upon which they base their conclusions. This .42 effect size means that on the average, 66% of the students with computer-assisted instruction would outperform the average students not receiving the computer-assisted instruction.

This is considered to be a small to moderate effect of computer instruction on students' learning.

For the elementary school studies only, Niemiec and Walberg (1985) found that drill and practice programs are most effective (effect size of .47) while tutorials are less effective (effect size of .34) and computer-managed instruction, of which there are few examples in the studies, show no apparent effectiveness at all. The kindergarten through third-grade students benefit much more than students at the higher elementary grades (effect sizes of .81 compared to .27 for fourth through sixth grades). Computer-assisted instruction helps boys more than girls (effect sizes of .45 and .22). Of considerable interest is the apparent high effectiveness for handicapped students at the elementary school level. The average effect size for mentally retarded students is 1.07; for visually impaired it is 1.43; and it is .83 for emotionally disturbed children. These are unusually large effect sizes for any educational intervention. While there are virtually no social studies research reports represented in any of these findings, the overall picture provides a backdrop for examining recent research in social studies.

Before moving on to specific investigations of social studies computer-assisted instruction applications, it is important to address the question: How cost-effective is this instruction? Answering this requires comparing it, on the same outcomes, with other possible instructional interventions. Levin (1984) did this. What he found was that peer and adult tutoring were more cost-effective than computer-assisted instruction. Furthermore, reducing class size and increasing instructional time were each even less effective than computer-assisted instruction. To make these comparisons, he estimated cost-effectiveness ratios that are the average achievement gains for each $100 spent on any of the four approaches. The peer tutoring ratio was .34, compared to .15 for computer-assisted instruction. The ratio for reducing class size from 35 to 20 students was only .09. Therefore, peer tutoring was more than twice as cost effective as computer-assisted instruction, and nearly four times that of reducing class size.

While not conclusive, these findings provide an important context for interpreting the general findings relating to effectiveness of computer-assisted instruction introduced above, as well as for the social studies research reports presented below. Computer-assisted instruction might well be an important instructional approach, but alternatives such as peer tutoring might be more cost-effective.

Drills and Tutorials—Findings in Social Studies. A few teachers and doctoral students have developed their own programs and then field-tested them in their own or others' classrooms. One such effort took a teacher four years to program a two-day tutorial unit for seventh graders on the battles of Baltimore and Washington during the War of 1812. He tested the unit in a randomized group experimental de-

sign, and found that there was a positive effect on the computer-based group for factual learning, but not for higher-level thinking skills or map reading. There were no gender differences. The researcher observed that the teacher-created computer programs took so much time and effort as not to be practical or cost-effective (Marsh 1984; 1986).

In another study, Bradley showed that high school students studying U.S. history with computer-assisted instruction had better achievement than control students not receiving the computer-assisted instruction, but attitudes of the two groups were not different after instruction (Bradley 1983).

Kansas City eighth- and ninth-grade students, however, had positive attitudes toward computer-assisted instruction, and believed that they had increased their skills after studying three social studies topics with computers. The topics were reading maps, reading and interpreting graphs, and using reference information. Eighth-grade students showed gains in basics skills on the Visual Materials Test of the Iowa Test of Basic Skills, where the test measured skill in getting and using information from maps, graphs, and tables. But the ninth graders did not show corresponding gains on the Sources of Information subtest of the Test of Academic Proficiency. Unfortunately, the latter finding is clouded by the fact that not all of the ninth graders actually completed the experimental computer-assisted lessons (Way 1984).

Computer-assisted instruction was used by Feldhausen (1986) to assist students in preparing for a test in secondary United States history. In a well-controlled experiment, he found that his "computer review assistance module," or CRAM, as he called it, had no greater impact on students' test performance than a traditional study guide, even though the students liked the computer module and thought it prepared them for the test.

Another study, aimed at geography content, reported use of a computer adventure game by fourth and fifth graders (Forsyth 1986a; 1986b). Other research has shown that such adventure games can improve skills in note-taking, observation, map use, and general problem-solving (Hayes, Lancy, and Evans 1984). Students in the Forsyth study played 40 minutes with a game based on *Winnie the Pooh in the Hundred Acre Wood*, with some of the students having maps, and others with no maps, as they played. (Within the map treatment, labels and drawings were also added separately and together in the experiment, so that there were actually four treatment groups). Attitudinal outcomes were very positive. Learning the locations of places in the adventure game, the cognitive outcome in the study, was found to be facilitated by the use of maps. This was confirmed by a two-week retention test. The researcher reported no gender differences, contrary to his expectations. Forsyth concludes that using computer-

based adventure games, with maps to teach place location, was effective and enjoyable for the students.

Social studies content is sometimes used as the vehicle in which to move toward more generic learning goals. Such was the case in the language-oriented research project in Texas where Beltran and deJuarez (1982) taught social studies concepts. They used computer-assisted instruction which had one or two concepts from either United States history (eighth grade) or Texas history (seventh g in each lesson. The lessons consisted of twelve frames, with four concept frames, and eight quiz question frames. What was most interesting about the materials is that they were bilingual, with both English and Spanish displayed on the screen. Students studied the lessons in groups of two to four, and over a year's time 26 lessons were included in the program. The researchers were interested in language and vocabulary outcomes, and found that general language achievement did not improve more than in a control group, but vocabulary increased by six months more than in the control group. Attitudes toward the computer-assisted instruction program were reported as very positive by parents, students, and teachers.

Some uses of computers in social studies involve generation and administration of test items. A Virginia-based researcher studied the outcomes of teaching students with regular tests from a computer test file over a ten-week period. The results of this controlled experiment showed that students receiving the computerized tests learned more specific knowledge, but not more general knowledge, after the experiment (Pedersen 1977). This study suggests that computers can assist the teacher in ways other than delivering instruction directly to students.

Tutorial computer programs are often dismissed by critics as "expensive page-turning" devices. But two research studies show that by adding an interactive video component to didactic instruction, the computer can assist students in learning concepts as well as factual knowledge, and can promote application of the knowledge and concepts in problem-solving activities.

Glenn, Kozen, and Pollak (1984) reported field test results from students using the first unit in a multi-unit computer-based senior high economics course. One distinguishing feature of this course was the extensive use of videodisc materials integrated with the computer instruction. The introductory unit included tutorial sequences within 13 lessons which taught the concepts of resources, wants and goods, scarcity, allocation, values, goals, and decision making. Using pre- and post-tests of knowledge, as well as student reaction questionnaires and teacher interviews, the researchers studied the unit's use in five Minnesota schools with a total of 44 students, mostly in the twelfth grade. They found that students learned the economic concepts, and reported that the computer-based lessons were not too

difficult. Further, the students found the lessons interesting, and their teachers reported that the students were motivated as they studied the lessons. Unfortunately, there was no comparison group in this case study.

In a much more tightly controlled experimental study, Dalton and Hannafin (1987) reported very interesting results. They adapted an existing 30-minute videotape lesson on "opportunity costs of buying on credit" to create two alternative lessons. The first, called the "context" lesson, was an interactive case study of poor budget management, in which concepts were exemplified and application questions were asked, with looping for reteaching and requestioning as necessary. The second, called the "knowledge" lesson, was a "talking heads" tutorial approach, with interactive recall questions following the tutorial. This lesson focused on definitions rather than the examples used from the case study in the context lesson. The outcome measure was a 20-item achievement test, with 10 recall and 10 application items.

Three randomly assigned groups of 32 ninth graders used either the original linear video lesson with no questions (control), the context lesson, or the knowledge lesson. As expected, the knowledge and context groups outperformed the control group on the recall subtest, probably because of the questions added to the former lessons. For the application subtest, however, the context group outscored the other two groups. Therefore, while the factual information was communicated equally well by the context and knowledge lessons, application performance was better for the context group. What made the context lesson group different was the emphasis on examples rather than definitions. Examples taken from video sequences are apparently effective in fostering both recall and application learning, suggesting the potential of interactive video instruction in social studies subjects.

The findings are scattered and mixed concerning use of drill and practice programs in social studies. Several researchers assert that students' attitudes toward computer-assisted instruction and the subject matter were more positive after such instruction. Achievement outcomes were more mixed. Lower-level knowledge seems to be promoted more consistently than higher-level knowledge, but in some studies no discernible differences were found on any cognitive outcome. On balance, while based on few studies, the review suggests a modest impact of computer-assisted instruction on affective and lower-level cognitive outcomes of junior and senior high students.

For tutorial computer instruction, the two interactive video studies suggest that computer-based instruction using videotape or videodisc images and audio can teach facts and concepts and can promote application of that knowledge. More research is needed in this promising area.

We now turn to the second major application area in which computers are used as teachers' assistants—that of simulations.

Computer-Based Simulations. Classroom simulations have been used in social studies classrooms, without computers, for many years. While their use does not improve content and skill learning more than conventional instruction, they do appear to have benefits in student motivation, attitudes, and active participation in the learning process. They also involve students in decision-making processes more effectively than other teaching approaches, and incorporate complex representations of reality better than usual print materials, or than is possible in lecture or discussion teaching (Schug and Kepner 1984).

One unique benefit of computer-based simulations is that they relieve the teacher and students from many of the time-consuming managerial tasks otherwise necessary with classroom simulations. For example, a simulation can be stopped at the end of a classroom period and then restarted the next day, with the computer keeping track of the situation where it ended, and restarting the process where it was interrupted. Record keeping, reporting the status of quantitative factors and decisions regularly, manipulating computations, and making projections, are other examples of routine tasks performed easily by the computer. Such activities improve instructional efficiency. This means that the teacher and students can pursue the intended learning outcomes rather than troublesome and unproductive managerial tasks.

In the Kulik, Bangert, and Williams (1983) research review mentioned earlier, the authors grouped together five of their 51 research studies in a "simulation" category, and these had the largest average effect on student learning of all the studies they reviewed. However, in a subsequent review of some of the same studies, plus newer ones completed after the earlier review, Bangert-Drowns, J. Kulik, and C Kulik (1985) contradicted this rosy picture. In the five simulation studies reviewed, they found, on the average, no effect whatever of the simulation treatments. While none of these five studies were from the social studies content area, this more recent finding is much less promising than the earlier one. Given the higher standards for including studies in the 1985 review, we must accept the findings that simulations have no average effectiveness in the five non-social studies research reports.

Turning from the general picture about simulations, we now take up research based in social studies classrooms. A well-structured example of such a computer-based simulation, called *Life Decisions*, was studied by Hetzner (1972). This simulation aims to promote thinking and deciding about educational and career development issues. Using a controlled field study with junior and senior high school students, Hetzner found through structured interviews that the simulation promoted interest and goal-directed behavior, and provided students an opportunity to apply principles in a social context.

Attitude outcomes from the use of computer-based simulations can include a sense of personal control over external events. In a sixth-grade classroom, a world resources simulation was used in a four-week pre-post case study, and the group showed an increase in sense of personal control (Roberts 1976). In another study, teachers and students showed more positive attitudes toward computer-based instruction after having engaged in a simulation exercise on microcomputers (Bolton and Mosow 1981). Similarly, impressionistic reports from an informal study suggest that after engaging in a simulation called *The Great Depression* high school students' responses were very positive toward this mode of learning, students' involvement was intense and enthusiastic, and they displayed little apprehension with respect to the microcomputing equipment, even though they had little or no prior experience with computers (Weible and McMahon 1983).

An interesting case study of simulation use was carried out in a sixth-grade classroom in Massachusetts. Vincent (1986) describes the use of a simulation called *Foreign Policy: The Burdens of World Power* from the *Decisions, Decisions* series by Tom Snyder Productions. Computer and non-computer approaches were mixed in this application, so that oral history from parents, reference book and videotape use, map location activities, class discussion, and writing a news magazine were all used in addition to the actual computer-based simulation. Vincent reports impressionistically on results from the study. Increases in motivation and intellectual curiosity were noted, with persistent questioning and data-seeking activities as indicators of positive impact on students' intellectual work. Students also appeared to be less chaotic and more rational as they discussed the topic after three plays of the simulation. Vincent concluded by asserting that students' decision-making skills were improved by the unit.

It is important to recognize that the Vincent case study was carried out with students who had previously worked with LOGO, BASIC, computer-assisted instruction, and other simulations. She points out that with a previously used simulation, *The Other Side*, also of Tom Snyder Productions, the class members had difficulty with collaborating among themselves, with frequent changes in leadership, and low participation by less active students. Experience with this simulation, plus the systematic use of *Decisions, Decisions* in the present study, allowed students to become more skillful in collaboration. This suggests that expecting students to benefit fully from one attempt at a simulation, or any computer-based activity, is asking too much. There needs to be regular practice and application of skills over a period of time before gains are likely to materialize.

In any case, this example of integration of the computer simulation into an otherwise rich social studies curriculum unit is worth viewing as a model for such applications, and the reported student

outcomes are very positive. These findings are important even though they are based on an informal case study.

Some in social studies advocate that students ought to be involved in the creation of computer-based simulations rather than merely using those invented by someone else. While this is a time-consuming and complex process, it teaches students things they would not otherwise understand in detail. For example, they are forced to make explicit the social models and processes underlying the simulation in order to design it. They must work through decision patterns and specify the consequences of each decision. Teamwork skills are also potential outcomes of student simulation development.

Roessler (1987) reported on his efforts to involve his middle school class in developing a simulation based on the Great Depression. His informal evaluation showed very positive reactions by the students, who, although they found the activity difficult work, reported high interest, enjoyment, and understanding as a result. Some complained about inequitable sharing of tasks in small groups, and a few found the topic boring. Nevertheless, the overall reaction was enthusiastic and positive. Roessler argues that the motivational impact alone makes this kind of learning worth the time and effort, and is a good example of how use of computers can stimulate students to learn social studies content.

Computer-assisted cooperative learning has been argued to be generally superior to competitive and individualistic learning (Johnson and Johnson 1985). Moreover, this general assertion has been validated in a study of social studies computer-based simulation instruction. In a very well-designed and controlled field experiment, Johnson, Johnson, and Stanne (1985) used a modification of Tom Snyder Production's *Geography Search* computer simulation. The simulation requires that a ship be navigated from Europe to America and back in order to accumulate gold. Three randomly assigned groups of about 24 students used the simulation in groups of four—either cooperatively, competitively, or individually—for ten days.

The researchers found that the cooperative students outperformed the competitive and individual students on achievement, including factual recognition, application, and problem solving. Furthermore, the cooperatives generated more observed on-task statements and behavior, and less off-task socializing and talking to the teacher during their computer work. They were also more goal-oriented and cooperative.

Another important pattern emerged when the researchers analyzed male and female students separately. Females did much better in the cooperative and individual modes, while males flourished in the competitive situation. Also, females showed more persistence than males in the cooperative groups, while females liked computers

less and had less confidence in using computers than males when they were in the competitive groups.

This important work should remind us in social studies that our many opportunities for cooperative group learning should be used to best advantage. While the shortage of computers relative to the large number of students we teach is a problem, the Vincent, Roessler, and Johnson, Johnson, and Stanne studies show that grouping students to work cooperatively while working on computers can have a variety of beneficial outcomes.

The general picture that emerges from this review of social studies simulations is that their use stimulates affective outcomes such as interest, enjoyment, sense of control, and willingness to persevere in learning tasks. Also, cooperative learning with simulations promotes lower- and higher-level learning, and especially benefits female students. Most of these claims are made casually, however, without the benefit of rigorous evidence or analysis. In only three of the studies reviewed, moreover, is there any assertion made that there are positive intellectual outcomes, and two of these—Vincent's claim about intellectual curiosity, collaboration, and more rational discussion behavior, and Roessler's claim of increased understanding—are highly impressionistic and not based on public evidence.

We should not reject the use of computer-based simulations simply because of the lack of scientific evidence about their efficacy, however. The results of these studies, if credible, suggest an important teachers' tool which can influence students' motivation and attitudes for the better. In social studies, where student motivation and attitudes are relatively troublesome in the first place, the computer simulation might be a productive device for addressing those problems.

Using Computers as Student Tools

While the computer can function as a welcome teachers' assistant, some educators claim that the real power of the machine in schools is as a tool in the hands of the learner. One commentator puts it this way:

> The key to the future use of the computer in education—at least in the intermediate term—lies not in its history in schools as an instructional delivery system but in its evolving use in the society at large, and in higher education, as a tool to get work done—not as an extension of the teacher but as an intellectual companion for the student (Tucker 1986, 22).

The computer database has been heralded as a focal point of development in the social studies curriculum. Student use of databases implies a number of inquiry learning outcomes long held as important in the education of responsible citizens. Hunter (1983) sug-

gests that databases can be used at several levels of complexity, ranging from students' use of already-prepared databases to students' creation and use of their own databases.

In an example of the use of ready-made databases, White (1985) studied the impact on student learning of a two-week unit in U.S. history involving analysis of computerized databases, accompanied by other structured activities. Using a carefully controlled experimental design he found that, on a test of information processing skills, those students using computers to retrieve data outperformed other students carrying out the same structured curriculum without the computer data retrieval.

Rawitsch (1987) conducted a study involving 340 eighth-grade students in 16 different suburban classes in Minnesota. Using mostly geography data, the students located and sorted data and tested hypotheses in one of three situations. These included a paper and pencil mode, a computer database mode (both with geography data), and a computer database mode with car purchasing data for comparison purposes. Rawitsch found that using the computer took longer but produced better accuracy than using paper and pencil methods, and students preferred using the computer. He also examined the differential effects of computer use on learners preferring a structured learning style as compared to those preferring an exploratory style. He found that the structured learners achieved better accuracy than exploratory learners when using the computer.

In contrast, a pair of researchers attempted to develop a database system for student recording of information in a sixth-grade social studies classroom oriented toward critical inquiry (Hawkins and Sheingold 1986). They worked for two months in one classroom, trying to employ the computer system as an adjunct to the topic-oriented research projects underway by students. They found that the computer software did not integrate well with the curriculum as a whole. A major technical problem was that the database creation program was designed to store information within the same categories over multiple cases. In fact, the information that the students had to save would not fit into the predefined categories for all cases. Therefore, it did not turn out to be very useful in their projects. While it was not effective as an intellectual tool to support problem-solving and critical inquiry, the researchers were hopeful that, with the invention of more flexible and powerful technology, especially access to large databases through telecommunications, facts will be less important, and skills in understanding and retrieving structured data will be more important in the social studies curriculum (Hawkins and Sheingold 1986, 47).

Another study with basically negative results was carried out in 1985 with 36 high school college preparatory seniors in a Pennsylvania high school. Cornelius (1985) randomly assigned the students from intact world cultures classes into three groups which received one

day of instruction on the organization and use of a text (not quantitative) database and computer retrieval strategies. The content of the database were cases, law review summaries, and journal and magazine article abstracts relating to the 26th amendment to the U.S. Constitution, involving the 18-year-old vote.

Following the instruction, one group used keywords in a computer retrieval process, another used a computer linear text searching process, while a third searched the printed text of the database by hand. Each group had one day of database work. A retention test and attitude instrument, administered five days afterward, showed that all groups gained knowledge, but there were no differences among the three groups on either knowledge or attitudes.

Two problems in this research probably prohibited any positive findings. First, the length of treatment was so short—one class period—that little difference among groups could reasonably have been expected. Second, the text database was so small, consisting of about 40 short paragraphs in all, that scanning titles and contents manually or with a linear computer search would be about the same as using the very simple keyword search system constituting the "complex" treatment. In any case, the research adds little to our knowledge about effects of database use on student learning, except that Cornelius did show some learning by all groups, and that the control group, the one using a manual search of the printed database, needed the least amount of time to complete the necessary operations.

British researchers have aimed at improving discrete information-using skills of students. In a study apparently conducted at the upper elementary level, students were taught to use binary classification trees for entering their data with a program called *Factfile*, and then add to the data, or interrogate it, with a second program, called *Seek*. In the learning games that followed their entry of the data, students made decisions about the nature of the information available. "In coming to understand that the structure of the file governs what we may ask, they [students] may acquire a sophisticated and valuable skill" (Underwood 1985, 27). The study involved a three-week experiment that found increases in classification skills, particularly in what the researcher described as asking more constraint-seeking questions rather than specific questions. However, there were no increases in recall of factual information as a result of using the computer database programs.

Another interesting British study was conducted in a secondary school, in which 19th century trade directories, census records, and other historical information from the school's village were used as the data which was entered in seven databases by the teacher. The same data were also available to students in printed form. The teacher aimed at developing inquiry skills in asking questions such as these: What questions are important? What questions are answerable and

not answerable? How can answers be obtained from the available data? What sense can be made of the answers? The researcher reported only descriptions of his work, not formal experimental findings. But he did note the interesting observation that there were differences in the use of printed records compared to the computer-based databases. Students found the printed records good for answering questions about small data sets, but the computer was better for larger arrays of information (Ennals 1985). In terms of efficiency, Cornelius found the same thing—students using a manual search of a small text database took less time than with a computer. This would seem to be an important point to be kept in mind for teachers and curriculum developers contemplating the use of computers and databases.

In some settings student use of databases can be combined with use of other intellectual tools such as spreadsheets, graphics software, and word processors. One project stemming from Harvard University's Educational Technology Center created a curriculum package called *The Irish Immigrant*. This package involved students in using a database with information about immigrants coming to the United States during the Irish potato famine, and about their life in Boston during 1840-1860. Students extracted information from the database, entered other planning information into a spreadsheet, and wrote reports of their observations. An account of the pilot tests of the program reported very positive student responses, and noted that the integration of the traditional curriculum and computer-based intellectual tools for students was very promising (Mendrinos and Morrison 1986; Morrison and Walters 1986a, 1986b).

Most database applications in social studies classrooms involve use of commercially-developed database managers such as *Appleworks* or *PFS:file*. However, Traberman (1983, 1984) describes her use of the APL programming language with which her eighth-grade students actually programmed tables, matrices, and other databases, and also programmed the display of the data when they retrieved them. In a sense, this is analogous to having students create their own simulations, as Roessler (1987) does. Using geography and global studies content, Traberman taught such concepts as area, population density, agricultural yield, and population pyramids. She reported that students learned facts as well as concepts, and showed deeper understanding of concepts, generalizations, and relationships because they actually manipulated the raw data and resulting displays themselves by having programmed the computer. While her report does not constitute a formal study, and is purely impressionistic, her rigorous approach to the subject matter and explanations of teaching strategies are convincing.

Similarly, a New York teacher used a simple and seemingly powerful homemade application program to allow high school students

to study the process of political revolution (Rothman 1982). A student-written program was used to accept student-researched measures of revolutionary factors such as violence level and economic stability, year by year. The program graphed the data separately for each revolution being studied, allowing comparisons and analysis across the different examples. Students working in groups used detailed monographs on revolutions in order to glean the necessary data. Rothman reported, impressionistically, several positive outcomes of this activity. Student motivation and persistence was high, and cooperation within groups was promoted. Class discussion was stimulated, and students were able to understand complex historical processes in some depth. Students of differing ability levels derived success from working with the program, developing the computer database, and visualizing the interplay of factors in a revolution. Rothman points out another important point. Use of the computer program combined important thinking skills and content with the use of the machine. It was not a disjointed, added-on activity, but an integrated part of his European Studies and History courses.

Actually having students program the needed data storage and retrieval themselves, rather than using a database management program, would not be what many social studies teachers could or perhaps should do. But given the knowledge and resources, it could prove to be a very powerful instructional approach.

The general conclusion from research on use of the computer as a student tool in social studies is that it can affect intellectual skills such as information processing, data classification, and question asking. It also might influence attitudes positively, but the evidence for this is very sketchy. Most impressive among the research reports was the richness and diversity of teachers' instructional strategies, and the creativity of students and teachers that is expressed. Another important idea to be gleaned from the research is that computer-based inquiry processes are alive in some social studies classrooms. Computers by themselves cannot be made to "teach" inquiry, of course, but as long as there are teachers and students adapting computer tools such as database systems to answer social questions, inquiry goals are being pursued. Furthermore, the little evidence that we do have suggests that this computer application does contribute to development of inquiry skills.

How Do Computers Change the Way Teachers Work?

We know very little about the answer to this important question. Although a few of the studies described above include comments about teacher enthusiasm for computer use in social studies classrooms, only one study has aimed specifically at teacher outcomes. In this single study, Germundsen and Glenn (1984) found that the six

junior high teachers in their research reported using computer gradebook programs was more useful than paper and pencil gradekeeping. Four of the six thought that students tried harder in class because of the weekly posting of computer-generated grade reports. Each of the six teachers received positive remarks from parents as the result of computer progress reports sent home. Parents overwhelmingly liked the computer-generated grade reports they received, and about 90% of the students reported that they found the system helpful. The researchers noted, however, that the system did not save teachers time compared to hand tabulations of the grades. But the reports used regularly in the classroom and parents' reports were probably a bonus to the teachers' productivity, as they were computer-generated and couldn't have been produced as economically by the teacher using the hand recording system.

A particularly important teacher outcome is the influence of computers on how the teacher does the job of preparing for, delivering, and evaluating instruction. Do computers make teachers' work easier or harder? Do they add to the quality of the teachers' work? Does their use increase or decrease teachers' sense of professionalism and satisfaction? These are a few from the range of teacher outcome questions that should be, but have not yet been, addressed by researchers.

Nevertheless, a handful of other studies bear mention. In the most comprehensive of these, Cline and his associates (1986) studied the outcomes of an extensive 1983-84 IBM-sponsored research project involving 89 high schools. These schools wer provided computer classrooms, extensive software libraries, telecommunications equipment permitting electronic mail among students, teachers, and administrators, and inservice training support. One would expect some impact on teachers' work activities. From their report, however, only a few hints about this impact could be found. One was that "In subject-matter areas such as the liberal arts and the social and physical sciences, computers were most commonly employed for word processing" (Cline et al., 81). Unfortunately, the researchers did not elaborate on the word processing finding, and whether it had a positive or negative effect on teachers' work.

They also found relatively little computer use in content instruction, either as teachers' assistants or students' intellectual tools. Lack of content-specific software, and lack of teachers' time necessary to create materials and integrate them into instruction, were cited as principal impediments (Cline et al., 72). Finally, the telecommunications capabilities were not much used. While teachers had access to *The Source*, for example, they didn't see how it could fit effectively into their subject matter teaching. Electronic mail was used mainly by administrators, not teachers or students. This large case study of what happens when a large infusion of computer resources is made

in schools suggests that with respect to teachers and their work, little meaningful change occurs.

A second interesting, and somewhat more optimistic, teacher effects case study was conducted in Minnesota by Pollak and Breault (1985). The project under scrutiny was a state-wide program in which social studies teachers were given on-line access to lesson plans and supporting newspaper materials on contemporary issues. The intent was to complement the teachers' own plans with lessons written by master teachers. Teachers could access the lessons on a 24-hour basis, screen them for possible use, and download the ones selected to their own computer at home or school. Pollak and Breault found several positive influences on teachers' work. As was intended, the teachers used the lessons extensively and in many ways, adapting them to their own needs and situations. Teachers were enthusiastic about this resource tool, finding it convenient and adding to their range of teaching approaches. Teachers from other subject areas became very interested, and expressed their need to have similar capabilities added for them. One concern—costs of maintaining the system through lesson development, hardware, software, and phone charges—was also expressed. While this was just a pilot study, with no formal data reported, the feasibility of the idea was demonstrated successfully, and there seemed to be a positive impact on social studies teachers.

A third study examined a far narrower question—whether social studies teachers can learn to program in the BASIC language well enough to construct acceptable drill and practice software. Ferguson (1986) taught 31 teachers, both elementary and secondary, for 30 hours in five weeks, and concluded that their post-test knowledge of BASIC demonstrated that they had learned the language. Further, expert ratings of their class-end drill and practice programs showed a relatively high level of accomplishment. Ferguson concluded that social studies teachers can learn to program adequately in less than a semester's time.

So few studies bear on the question of computer impact on social studies teachers that it would be presumptuous to conclude anything except that much work in this important area is needed. Most helpful will be naturalistic studies which use in-depth observations and open-ended interview techniques to explore teachers' interactions with and outcomes of working with computers.

Is There an Effect on the Instructional Process?

If computers are used extensively as teachers' assistants or students' intellectual tools, is there any impact on the overall classroom learning environment? This question has to do with effects on a classroom system rather than on either students or teachers alone. One study examined the social consequences of computer use in upper

elementary classrooms in four schools (Diem 1986). The researcher observed the classrooms weekly over a nine-month period. He reported several interesting findings. First, teachers used technology as part of their positive and negative reward structure, which seems to confirm findings in other studies. A possible implication of this finding for social studies teachers is that students will associate being able to use or not use computers with rewards and punishments. This affective association, in turn, might interact with students' learning as they use computers. Those for whom computers are positively associated might learn more, while those who have computers withheld as part of punishments might respond negatively, and have their learning inhibited as a result.

Another finding was that while using computers in groups, students tended to take on differentiated roles, including experts, experimenters, and observers. Further, males dominated in such groups, and teachers made little or no effort to change this pattern. If this situation is widespread and continues throughout the school grades, sex differentials in computer use reported elsewhere (Becker 1986, Issue 2, 9-11) will be reinforced and hardened. Surely this is a negative social outcome of school computer use to be resisted actively by social studies teachers, as well as their colleagues in other subject areas.

Diem also noted that teachers grouped students according to their prior computer knowledge. This also can have important social implications for classroom learning. By combining the most experienced students in one group, and the least experienced students in another, the computer knowledge and expertise gap will tend to be widened, disadvantaging those less fortunate who need extra help the most. Socioeconomic disparities are linked to computer knowledge, of course, because of home computer purchases by more affluent families. Unless counteracted in school, this kind of difference will widen over time. Giacquinta (1984) found some teacher resistance to student use of computers at home because they believed it gave those students an unfair advantage over those not having computers at home. What Diem finds, however, is that teachers tend to reinforce existing differentials, rather than reducing them, by their grouping practices in classrooms.

A descriptive study of twelve secondary school geography classrooms used videotaped observations of the employment of computer-assisted learning to determine how teachers and students used six different programs. These tutorial-oriented programs ranged in topics from demography and economics to consumer behavior and transportation connectivity. Three modes of computer use were described. First, they were used in whole class teaching with large TV monitors. Second, when enough microcomputers were available, group work was employed, and often competition was used as a motivating device. Third, some teachers used a "cafeteria classroom" approach, in

which several simultaneous tasks, at least one involving the computer, engage different individuals or groups of students. The researchers found that the teachers kept a very high level of control and directiveness when using the software in their classes. They acted as gatekeepers, where they "owned" the computers, and strictly controlled student access and use. Students, of course, were reduced to little more than rote button-pushers, rather than being active learners (Weigand 1985).

Unfortunately, there is simply no pattern to the studies in this category. What we need is much more research on how use of computers changes classroom teaching and learning processes.

Do Computers Influence the Social Studies Curriculum?

We will use this last question in the review to make some general interpretations and observations about using computers in the social studies curriculum and what sort of influence this seems to have. As pointed out repeatedly, the evidence that we stand on is thin indeed. We have bent over backward in order to include reports of "action research" that otherwise would not be included in research reviews because of the impressionistic nature of these reports. Nevertheless, there is a basis for drawing the overall picture that we seek, no matter how scattered, or smattered, the evidence seems to be.

The first general point has to do with the increases in student interest and motivation that accompany computer use, whether it be in the form of drill and practice, simulations, or databases. From a researcher's point of view, this might be little more than evidence that there is a Hawthorne effect at work. But social studies educators can see the effect in a much more positive way. Whether it is caused by special attention, or by true intrinsic motivation, is not the most important question. Rather, we must ask, how can we use the improved attitudes and intellectual motivation to teach social studies more effectively? Because the positive affective results from computer use are the most pervasive findings across the research, we must find ways to capitalize on them.

A second point stemming from the research is that by using computers as intellectual tools, we have added to the inventory of techniques social studies teachers have to foster students' thinking skills. Possibilities are there that were not there ten years ago. Simulations and data search activities have been used for many years, but surely the computer-based versions of these approaches equip the teacher and student to do much more, and with better quality, than without them. The simple mechanics of managing a simulation, or of retrieving and displaying social science data, make these techniques, if done by hand with large data sets, cumbersome and time-consuming. But the computer can free both teachers and students

from these routine tasks, leaving the time and effort for the important efforts—thinking, asking, creating, solving. The research evidence hints that, at least with regard to using computer-supported databases, students gain in inquiry skills as they use the tool. Because this represents a brand new intellectual and instructional resource for social studies teachers, we are obliged to make productive use of it.

Third, the fact that students benefit cognitively and affectively from computer-assisted instruction—drill and practice, and tutorial programs—means that there is another opportunity to modify instruction advantageously. This partly means individualization of instruction, when that is appropriate. For low-level knowledge outcomes, to which computer-assisted instruction seems to contribute, computer individualization might be appropriate, if the required computers and software will support the application. However, this is probably not a wide-scale answer to teaching basic knowledge and skills in social studies. And we must remember that for higher-order outcomes cooperative computer-based learning in groups might be more effective, especially when using simulations.

When choices have to be made it might be more appropriate to use computers in some of the more creative ways suggested above, and aim them at promotion of higher-level knowledge and thinking skills. The cost-effectiveness data of Levin remind us that computer-assisted instruction might not be a good bargain, compared to other approaches, when trying to raise low-level achievement.

Fourth, computers might turn out to be as important as teacher productivity tools than as adjuncts to the instructional process. Unfortunately, almost no data exist to support this idea. Little research, for example, aims at how the quality or quantity of teachers' job performance is affected by use of word processors, grade book and other record-keeping programs, or spreadsheets and file managers. The three intriquing studies that do bear on this question, Germundsen and Glenn with their electronic gradebook study, Cline et al. reporting on the large IBM project, and the Pollak and Breault report on the Minnesota contemporary issues electronic distribution of lesson plans, present a mixed picture. But as computers make their way to the teachers' workrooms and lounges, home offices, and classroom desks, their use has the potential for making the routine work easier, and the creative work more powerful. Teaching is partly the translation of knowledge patterns in the head of a teacher into forms that students can learn. Computers are tools that can assist in this process, and social studies teachers, as well as their students, can benefit from them.

In summary, we might ask a very general question: Have computers revolutionized the social studies curriculum? Certainly not, nor is there any prospect that will happen. Has there been any positive impact at all? Frankly, there seems to have been very little. The data

on incidence of use presented in Chapter I show clearly that so little use is made of computers across the states and the nation (and in the United Kingdom, for that matter) that the impact has to be slight. And yet there are hints of a larger potential. Attitudes, intellectual motivation, inquiry skills—these can be influenced by computer use. We have, in the form of the computer and its varied software, a flexible instructional tool that is effective for some goals. We need much more exploration into ways of making creative, sensible, and effective use of this tool. The next chapter addresses a range of such promising practices in computer use.

CHAPTER III

INSTRUCTIONAL ISSUES

The conclusions from Chapter II suggest that there is a limited body of research findings directly related to computers in social studies; however, the knowledge that we do have suggests that the computer and related technology have a place in the social studies curriculum. If these are valid conclusions, the next issue becomes how social studies teachers can begin to incorporate technology more effectively into their lessons. In deciding what to do with technology a variety of questions must be answered. In this chapter we will discuss some of the key questions a social studies teacher needs to consider when deciding on whether or not to use the computer, and describe some promising practices that may help the teacher use technology more effectively in the classroom.

Questions About Using Computers

Decisions about whether or not to use the computer can be divided into two broad categories: issues related to personal competence and questions about appropriate instructional uses. Although our focus is on the second category, appropriate instructional uses, a brief comment about personal competence is appropriate as a background to instructional uses.

Questions About Personal Competence

The most dominant role for the social studies teacher is instructional leader of the classroom—leading the class from the front, providing most of the information, and doing most of the talking. To alter this mode, teachers must change the classroom norms and shift some responsibility for learning to students. Furthermore, if technology is to be an important part of the instructional sequence, the teacher must consider four key questions.

1. *Do I have the technical skills to "run" the computer?* No teacher really wants to look inept in front of the class. It is okay not to be an expert, but being inept is another matter. Also, no matter what dealers say about user friendly computers, there are still important steps that must be followed in order to use the computer. These steps involve basic technical skills and the knowledge to know what to do if something does not work. A teacher needs to have a positive feeling about personal technical competence.

2. *How much time will it take to get ready to use the technology?* Social studies teachers are always pressed for time. Lessons must be prepared and student work evaluated. Learning to use the computer and related software takes time. If it is necessary to allot a considerable

amount of time to preparation for using a piece of computer software, a decision must be made. Research findings by Germundsen and Glenn (1984) on use of gradebooks, for example, indicated that although time was saved in one area, additional time was needed to prepare and enter data into the computer. Charles White (1987) reviewed instructional activities using the computer and concluded that teachers spend a lot of preparation and class time in data manipulation steps. Is the time worth it? Is it available?

3. *How much trouble will it be to obtain the technology for use in the classroom?* Every teacher has a horror story about ordering a film and having it show up two weeks early or late. Some also have stories about trying to negotiate with the person in charge of the computers in order to get access to a computer for class use. Trouble like time influences the decision-making process.

4. *What kind of management problems will occur if I use the technology?* Maintaining classroom discipline is an important consideration. What are the ramifications of using a particular piece of computer software? If only one or two students can use the computer at a time, it means that related activities must be created for students who are not using the computer. Having to take students to a computer lab introduces the possibility of management problems.

The answers to the questions are important early determinants of whether or not a teacher will choose to use the computer or some other method of instruction.

Questions About Teaching Content and Intellectual Skills

Although instruction is broken down into small segments, most teachers think about instructional units. The length of these units may be several days or several weeks. The challenge to the social studies teacher is to create the larger unit conceptually and then break it into smaller sets of activities. Effective instruction means that all the pieces are put together so that when the unit is completed the student has a working knowledge of the goals of the unit. In creating a unit, many instructional decisions are made about what should be done and in what sequence. The teacher makes judgments about student knowledge, the learning tasks, the materials available, and the time frame in which the unit must be taught. In making these decisions a variety of questions are posed. Questions related to the use of technology in teaching content and intellectual skills pertain to (a) presenting the content, (b) assisting students to learn and practice, (c) helping students apply what they have learned, and (d) assessing student learning. How can computers contribute to the instructional process?

Presentation of Content. The social studies curriculum is based on important facts, concepts, and generalizations. One of the major tasks for the social studies teacher is to teach a specific body of content and

skills to students. The first step in teaching this content is often the presentation of materials to students.

In most social studies classrooms the teacher serves as the focal point of instruction. A significant proportion of each class period is spent presenting information to students. The most common methods are the lecture, the use of a standard textbook, supplementary readings, and an occasional videotape or film. Where does computer technology fit into the presentation of content to students? To what extent can computers assist us in teaching content effectively?

In Chapter II we found that few computer tutorials exist that are designed to teach the basic content of social studies. Data from a small pilot study by Glenn, Kosen, and Pollak (1984) indicate that it is possible to teach the basic concepts of economics to students via an integrated package containing computer programs, videodisc materials, and a written manual; however, the findings are far from conclusive. Their findings are supported by the conclusions of research conducted on more integrated learning packages such as IBM's *Writing to Read* (District of Columbia 1985; Deboe et al. 1984). Data from such studies suggest that sophisticated computer-managed instructional programs can present and teach basic skills to students. At this time, however, few tutorial programs are available to present social studies content to students.

Computer technology can assist the teacher with more traditional presentations. Teacher utility programs, data analysis packages, databases, and simulations may be used. Data analysis packages, databases, and simulations can also be used for other instructional purposes, and we will discuss them later in the chapter. Let's turn our attention to how these computer materials can be used during traditional classroom presentations.

Using Utility Programs to Present Content. Almost all classrooms contain an overhead projector. It is a tool that is flexible, controlled by the teacher, and easy to use. Almost all social studies teachers use the overhead projector during whole-class presentations. The quality of the transparencies, however, is often less than perfect. Handwritten or typewritten transparencies are often difficult to read and there is a sameness to most transparencies that often lulls students to sleep. A variety of utility programs exist that allow the teacher to generate materials for use as transparencies. Different types and sizes of font are available. Graphics packages allow the teacher to create special illustrations. Most packages are simple and straightforward to use and provide a different look to the traditional transparency. Figure 1 is an illustration. (See page 32.)

For the teacher who has a computer with a large screen monitor available, computer packages such as *Frameup* from Beagle Brothers allows the teacher to prepare slides (transparencies) using different fonts and graphics, store them on a computer disc, and then call them

QUESTIONS FOR YOU TO THINK ABOUT

WHO FIRED THE FIRST SHOT?

WHO WAS CRISPUS ATTUCKS?

WHAT WAS THE IMMEDIATE OUT-COME OF THIS EVENT?

up one-at-a-time to be shown on the monitor. Another piece of new technology allows the teacher to plug the computer into an attachment to the overhead projector and the materials shown on the computer screen are projected through the overhead transparency onto the wall screen, thereby deleting the need for a large screen monitor.

Computer-generated transparencies are more attention getting and easier for students to read. Teachers can prepare them before class, and they are still as flexible as the old versions. If used with the traditional overhead projector, teachers can also write on them during presentations to make or elaborate a specific point.

The same utility programs that allow the social studies teacher to create better transparencies can also be used to generate lecture outlines and study guides to assist students during presentations. Figure 2 shows examples of a lecture guide developed by a utility program. (See pages 34-35.)

Two emerging technologies, the videodisc and the video chalkboard, will also permit the social studies teacher of tomorrow's classroom to enhance presentations. The videodisc combines the power of the movie projector, slide projector, and stereo into a compact, quickly accessed system.[1] The typical videodisc holds 54,000 slides, or 30 minutes of motion, on one side of the disc. Random access to the slides takes a few seconds, and the quality of the picture is much better than the traditional videotape. The videodisc materials can be used in a variety of ways or during an instructional presentation. For example, the teacher can preselect slides and access them quickly during a lecture, or the videodisc can be linked to the microcomputer which allows the teacher to pose key questions on the computer and then show illustrative slides.

The video chalkboard is another emerging technology that may be useful in tomorrow's classroom. A new product by Xerox called the *Xerox Conference Copier* allows the presenter to write up to four boards of information and then push a button and the materials will be reproduced on a piece of paper. Up to 99 copies of each board can be made. While still impractical because of costs, the "electronic chalkboard" is another indicator of new technologies changing the manner in which the teacher can present and store information.

These illustrations demonstrate that common utility programs can be used by the social studies teacher to enhance traditional modes of presenting materials to students. Will they be effective? At this time, as we have found, little research exists to answer the question. However, we did find in Chapter II that using technology in the classroom does increase student interest and motivation. The use of the utility programs to bring a new twist to an old technique might well increase student awareness. But utility programs are only one way to help the social studies teacher present materials.

Lecture Guide #1 Mr Jones

Citizenship in Groups

GENERAL INFORMATION. This guide will help you understand key points in the lecture. Listen for the answers to the questions listed below.

What is CIVICS? _____

What is PATRIOTISM? _____

What is MAJORITY RULE? _____

What is REPRESENTATIVE DEMOCRACY? _____

Answer these questions based on the lecture and what you read in your text.

1. If our school was a representative democracy, what would be three key features of the manner in which it was governed? _____

2. Give an example of patriotism and state the reasons for choosing that example. _____

Question: How does someone become a citizen of the United States?

Citizenship by birth

* Born in one of the 50 states
* Born in one of the following areas
  - District of Columbia
  - Puerto Rico
  - Guam or the Virgin Islands

Citizenship by naturalization

* File a declaration of intent
* 5 yrs of residence (3 if married to a U.S. citizen
* file a petition
* have 2 citizens testify about your moral character, residency, and belief in the Constitution
* take an examination
* pledge an oath of allegiance to the Constitution and the laws
* sign a certificate of naturalization

It is in the area of developing skills, analyzing data, and simulating environments that the computer can provide significant assistance to the teacher. It is in these areas that the computer can provide the calculating power and model building that the teacher cannot do without considerable effort. Computer materials are now available to allow the teacher to work with large groups, small groups, or individual students. Three examples illustrate the power of the computer to assist in the area of intellectual skills and problem solving processes.

Using Data Analysis Programs to Present Content and Develop Intellectual Skills. In many social studies classrooms the analysis of data plays an important role. For example, in civics and government classes students learn about polls and surveys and their role in politics. Analyzing survey data and presenting it in an appropriate manner is a difficult task because of the calculations that are needed and the necessity to manipulate the data in order to examine key relationships and to draw conclusions.

There are a variety of simple data analysis programs available for use in the social studies classroom. A well-known program developed by the Minnesota Educational Computing Corporation (MECC), *Polls and Politics,* is an example. The instructional package presents background information on how to conduct a survey, describes the role of surveys in political history, and provides a computer program that allows the teacher or student to enter and analyze data collected by survey research techniques. Frequency distributions for each variable can be calculated, and crosstabulations can be displayed for selected variable pairs.

The teacher has several instructional options with the program. First, the program can be used as part of an introductory skill-building lesson on hypothesis testing using survey data. By using data gathered from a questionnaire developed either by the students or the teacher, the teacher can lead students through the basic steps of hypothesizing—speculating about relationships, developing hypotheses, testing the hypotheses, and then drawing conclusions. The data, stored on a disc prior to class, would be used to test the hypotheses. One computer and a large screen monitor would be needed. The teacher controls the pace of the lesson and may stop to work on areas of needed skill improvement.

A second option is to use the program in an expanded skill-building lesson that covers several days of instruction. For example, Mr. Fred Kunze of Mounds View Senior High School in St. Paul, Minnesota uses the MECC program as part of a civics unit on voting. Prior to using the computer materials he teaches the students the basic skills related to survey research and data analysis. The students then create a set of hypotheses, construct a survey, select a sample, gather data, enter the data on the computer, test the hypotheses,

draw conclusions, and write a report using a word processing program. Groups of students are given sections of the questionnaire and then work cooperatively with other students in developing a summary report. The lesson provides an opportunity for students to develop, practice, and apply basic social studies skills.[2]

Using Databases to Present Content and Skills. One of the most powerful computer tools available for social studies instruction is the database. Databases enable the individual to store, update, retrieve, organize, sort, format, and perform computations (Hunter 1987). In some cases the data are already stored in the computer program and are ready to be used for a variety of purposes. Another type of database allows the user to enter specific data gathered from other sources and then access the data. Both applications assist students in organizing and using information and to develop or reinforce problem-solving and social participation skills.

In the last year a variety of packaged databases have appeared on the market. To help the teacher understand the differences, Fay Wheeler (1987) suggests three categories: stand alone, add-on, and hybrid. Stand alone databases contain a set package of information, include the mechanism (series of prompts or questions) for requesting information, and can be used in one application. Add-on databases are those that must be used with commercially available database managers such as *PFS:file* or *Bank Street School Filer*. Add-ons are primarily data discs containing specific information which can be accessed. Hybrid databases present the user with a set of data but allow new information to be added to the data set.

Databases may be used in the same manner that data analysis programs were used in the above example involving Mr. Kunze's class. The teacher can use the database to illustrate a particular point during a large group presentation, to teach students skills in handling information, or as a part of several days of instruction in which the primary responsibility is placed on the students.

Wheeler (1987, 28) recommends asking five basic questions when deciding whether or not to use a database as part of instruction. The following questions are presented as guidelines for teachers.

1. After looking at the database. Do you agree with the information? If not, can you change it?
2. Are the sources for the data up-to-date? Do the data extend what you already have available?
3. Are the activities pertinent to your curriculum? Has the information been presented in such a way as to encourage exploration?
4. What type of sorting, searching, and reporting features will you want? For example, is it necessary to print the tables in order to use the data?

5. How good are the print materials that accompany the database? For example, do they provide background information or list generalizations?

It is important for the teacher to remember that most databases are not designed to teach the students the skills needed to use them. Databases are not tutorials. Unless students have had prior experience, instruction and practice will be necessary.

Using Simulations to Present Content. The review of research on the impact of simulations on students indicated that they have a positive impact on student motivation to study the topic and students' attitudes about learning and the class. These conclusions are not surprising because similar findings have been found for noncomputerized simulations.

Another reason for using computer-based simulations is, as Becker argues, that the ordinary school use of computers contrasts with regular classroom instruction, in that computer-based instruction usually involves one student at a time, whereas other classroom activities are group-based. Simulations offer a middle ground, where groups of students can work together with a computer, rather than each student having to work individually. He calls for instructional developers to produce materials that will "involve students challenging one another with problems for which the computer is official scorer or judge (regarding issues of 'fairness' as well as 'right and wrong'); interactive games in which the computer is the playing board; and simulations in which students take on different roles or work together to solve group problems." (Becker 1982, 384).

These are innovations that have long been the hallmark of social studies curriculum, and they can be implemented with computers in the social studies classroom as effectively, or more effectively, than in other subject areas. As Johnson, Johnson, and Stanne (1985) demonstrated, cooperative learning in simulation activities can indeed bring about very positive outcomes in the social studies classroom.

The social studies teacher should be aware that instructional simulations can have negative outcomes too. Real-life phenomena have to be simplified, and too simplistic a version of some social situation or process can lead to incorrect understanding. They also involve more teacher preparation time, and sometimes consume so much classroom time that they are inefficient instructional tools (Schug and Kepner 1984). Simulations depend on role involvement of students, and sometimes this assumption is not realized in practice—students simply refuse or are unable to take necessary roles. Student boredom caused by repeated plays of the same simulation, or of different, but highly similar, simulations, is also a difficulty (Roberts 1976).

By placing a simulation in a computer-based format, some of these problems can be overcome. The more sophisticated social proc-

esses can be more completely modelled with the computer, given its ability to incorporate many variables simultaneously. It can also inject randomness into the process, which is often a factor not easily incorporated into a non-computer-based simulation (Schug and Kepner 1984).

The random factor can also make repeated runs through a simulation both interesting and educational for students who would otherwise be bored by repetition (Roberts 1976). Similarly, computerized simulations can lead to an emphasis upon strategy and structure, rather than personal roles, so that students play more against the inherent intellectual problems in the simulations rather than in competition against other students, which might be counterproductive for learning (Roberts 1976).

Early versions of simulations often required more management than playing time due to the various pieces of material and the calculations needed to determine the outcomes. Many teachers, as a consequence, believed simulations to be more trouble than they were worth. Computer applications to simulations have allowed more complex models to be used, lessened some of the management problems, and solved the need to calculate scores. Computer simulations have opened new opportunities for teachers to use them as a part of instruction. Popular social studies simulations such as *The Other Side* (Tom Synder Productions, Inc.), *President Elect* (Strategic Simulations), *Geography Search* (McGraw-Hill Book Co.), *Oregon Trail* (MECC), and *President's Choice* (Spinnaker Software) are being used by teachers as part of instructional units.

Some simulations such as the McGraw-Hill *Search Series* are designed to help the teacher manage classroom groups and to adjust to flexible time slots. The computer simulation handles up to six groups of five students which means that one computer can serve the whole class. In addition the data from the group's decisions are stored on the disc so that the simulation can be stopped at any time and continued later. For teachers who have limited access to computers and who must operate within definite time limits, such features are important. When deciding whether or not to use a simulation the teacher should check to see if more than one group can use the computer at a time, whether or not the simulation can be interrupted and started again without starting over, and if groups are used, whether or not the members of the group are used effectively.[3] Answers to these decisions determine the management problems that might exist when using the computer simulation as part of the instructional unit.

Most commercial simulations are not designed to present content to students. Their major functions are to introduce concepts, focus interest, apply decision-making skills, and facilitate a broader view of a particular topic by placing the student in a particular situation.

As a part of an instructional unit, they can be effective means of focusing attention on key issues and motivating students.

Can Computers Assist in Helping Students Learn and Practice? The social studies teacher is constantly confronted with the problem of attempting to meet the learning needs of a diverse group of students while at the same time covering the content that is appropriate for the course. Computer drills can be of assistance. Two types of drill programs exist. The first is the prepackaged program that is designed to drill students on specific areas—capitals, states, countries, facts about the Constitution or the history of Rome. The second is the utility program that allows the teacher to develop a specific set of questions to be used in a particular unit of study. Both types have a great deal of utility for the teacher and can be used with a variety of groupings. The following example shows how a teacher uses a drill program at two different levels.

> Ms. Pitaro has just completed a fifth-grade social studies unit on the states and capitals. Students have completed a variety of map activities and have studied the states in the midwestern section of the United States. Reports had been made and several films were shown highlighting the difference among the states. Important goals were to have the students learn the names of the state capitals and the location of each state. Several learning games had been used to allow students practice naming and locating the state capitals.
>
> Today, Ms. Pitaro is using a simple drill program that has two programs—one asking the students to name the capital of a selected state and the second in which students are shown a state on the map and asked to type in the name. She has divided the class into three teams and selected score keepers for each side using the computer program which randomly selects the questions, Ms. Pitaro leads the class through a "drill game" on the name of the capitals. The game is fun for the students and provides insights for Ms. Pitaro into their learning. If the students have trouble with a particular area, she stops to review what students need to know. Ms. Pitaro leads the instruction; however, the computer selects the questions—thereby keeping her from selecting certain questions for certain students. The computer chooses and plays no favorites. A day later Ms. Pitaro gives a test to the class over the states and capitals in the Midwest. After correcting the tests she finds that six students have not met minimum standards—they still can't recall all the names capitals. She decides to assign four of the students to a learning station activity to work on the drill program several more times. Students like working on the computer because it is fun and makes practicing the names easier. After several practice rounds Ms. Pitaro tests them again. She assigns one student to work on the drill program again and works individually with another student during study time.

Ms. Pitaro has used a common drill program in two different ways. She used it as a whole class experience to provide an early evaluation of student learning in a competitive situation. It was fun for the students but also informative for the teacher. At another level she used the drill program for additional practice for two groups of students. At the same time she could continue with new content and new activities. In a perfect teaching situation she would have the

opportunity to stop and work with each student individually, but she does not teach in an ideal situation. Finding enough time to work with individual students is difficult.

While prepackaged programs can be very useful, utility programs which allow teachers to create their own tailored programs are even more flexible. Similar instructional strategies could be followed as those used by Ms. Pitaro, but the content would be very content specific for the unit being studied. Programs such as MECC's *Study Guide* allow the teacher to develop a bank of questions for use with students, permit students to access the database, answer a set of questions, and receive feedback on their responses. In addition, scores for individual students can be kept, allowing the teacher to check on individual student progress. These programs are more powerful because the content can be determined by the individual teacher. Time must be allocated to develop the database of questions and a teacher must have minimal technical knowledge about using the computer program.

Instructionally it is necessary to remember several important facts about using of drill programs to help students learn materials. First, drill programs are not designed to teach new content to students. Many social studies teachers were disappointed with early computer programs because they were primarily drill programs with a game orientation. Some of the disappointment was justified because some of the programs were of poor quality. However, some of the criticism was unfair because teachers expected the drill program to do more than provide practice; they expected it to teach. Such expectations are unfair. Computer drills assume that the teacher has taught the students the content prior to using the program. In fact, Ms. Pitaro, in our example, had used several activities prior to using the computer program with the class. She used the computer drill with only a selected number of students.

It is also important to remember that after several practice sessions the student might well reach a plateau in which more time using the program will not increase the student knowledge of the materials. For example, two students who used the states/capitals program did not pass the test. Ms. Pitaro then asked one to do one more practice session and chose to meet individually with the second. As effective teachers know, not all instructional strategies work for all students. The same holds true for computer programs.

Can the Computer Help Students Apply What They Have Learned? While practice is an important component of the learning process, application of learning prior to actual testing is also a critical part of the learning cycle. Students need to use materials that they have learned in order to make sense out of new situations. Computer courseware can provide such application opportunities. For example, a simulation can be used to determine whether or not students have

learned the basic principles of a unit of study. Another classroom example illustrates this point.

> Mr. Starry has just completed a unit on basic economics focusing on factors of competition. To evaluate whether or not students can apply their new knowledge, he selects a computer simulation. Students then play the simulation. By observing the students, analyzing the results of their work, and listening to the debriefing responses, Mr. Starry is able to determine how much knowledge students were able to apply to the economic decisions they had to make.

Like Ms. Pitaro's use of the drill program, the use of the simulation provided important feedback to Mr. Starry. If, for example, the students could not apply the knowledge they had learned prior to the simulation, Mr. Starry might then have to re-teach.

Simulations are only one type of computer-related material that can be used to see if students can apply what they have learned. Databases and data analysis programs can also be used as application lessons. The research findings reported in Chapter II indicated that these programs can be used to enhance students' information processing, data classification, and question asking. Mr. Kunze's use of the data analysis program by the students to develop, collect, and analyze information is an excellent example of the application of skills learned during earlier instructional activities. Having students develop their own simulation to reflect the key variables of a particular period of history is another way of having students apply their knowledge.[4]

Instructionally it is important to remember that the purpose of the application lesson is to determine whether or not students are able to apply what they have learned to a new situation. This means that the teacher observes carefully during the experience, asks specific questions about what students are doing, and evaluates the learning experience to determine whether or not additional instruction is needed before moving on to the next topic. Application lessons are not tests.

Can Computers be Used to Assess Student Learning? Tests are an important part of the social studies world. More and more emphasis is being placed on evaluation and the learner's demonstration of basic skills and recall of factual knowledge. Computer programs can assist the teacher in developing tests, administering them, and keeping records of student progress.

Two types of programs exist that allow the teacher to develop tests. Word processing programs are the most flexible because they permit the teacher to create his/her own tests, format the test, and print a variety of versions. Other more specific programs allow the teacher to create and insert questions into a formatted sequence. Many of these programs also permit the teacher to print a copy of the test or to use the test as part of a drill review process. Both types of test makers are useful tools that give the teacher flexibility.

For record keeping, computer gradebooks have become popular. They allow the teacher to enter a variety of scores, permit extra credit, sum scores, and permit the printing of special comments. Although it takes time to set up the gradebook and learn the techniques of entering information, the advantages are numerous. The study reported in Chapter II by Germundsen and Glenn (1985) found that students like being able to check their progress, that parents liked receiving information about their student's work, and that the teacher saw important benefits in using a computer gradebook. While gradebooks are not used to assess student progress, they are an integral part of the evaluation process.

Finally, although systems have yet to be developed for use directly with social studies education, networked systems are now being used at the elementary school level that manage student learning and keep track of student progress. WICAT and IBM have learning systems that are designed to teach students basic skills. These systems, run by a minicomputer and linked through a connecting network, introduce the materials, present guided teaching activities, remediation, and testing. Scores are kept on the machine and the teacher can access the scores to determine student progress.

Questions About Implementing Computers in the Classroom

Once a decision has about how to use the computer, there are additional questions for the social studies teacher to consider. These questions pertain to implementation of computer technology in the classroom: (a) Is the technology available? (b) Is the quality of the software acceptable? (c) Will students need to be taught new skills? (d) Will management issues interfere with the learning?

Is The Computer Available?

In all probability some computers are available for instructional use in the school. As we noted in Chapter I, the number of computers in schools is increasing. School districts continue to provide funds for both software and hardware. More and more computers are being brought into the classroom at all levels. While these facts are accurate, there are still major problems in getting hardware for use in the classroom. Many schools have computer coordinators who are responsible for scheduling, and are available for technical assistance. If such a person is available in the school, this is the best place to start. Advice to the wise is to start this discussion as early as possible because in all probability the computers will be heavily used. The social studies teacher should also be ready to present a case for why the computer should be used in social studies. Remember, national surveys indicate that we are not one of the big users of the technology; therefore, the social studies teacher will have to break down old stereotypes and barriers.

Is The Quality of the Software Acceptable?

A common cry for many years has been that there is no good software available in the social studies. Teachers and other professional educators have lamented that too much software is drill and practice and of poor quality. While some of these criticisms are accurate, citing poor software often has been an excuse for not using the computer. For example, most teachers would find any new textbook not totally acceptable to them. Modifications would be needed in order to use the text book effectively in the classroom—worksheets, supplementary readings, and other primary data are examples. So, a good teacher is always able to work around weaknesses in any materials if the materials can help a teacher accomplish the goal. The same holds true in the world of computer software.

While social studies has not been the prime market for most software developers, during the past several years more and more software has been produced for the classroom. General utility programs and databases have been the two most popular. Prices range from less than twenty dollars to several hundred and price does not always mean that the materials will be of high quality. How can a social studies teacher find out about the quality of computer materials that are available for the classroom? Before answering that question, a couple of comments are necessary.

First, evaluating software is hard work. To carefully go through a piece of software will take several hours of work. A variety of forms are available to assist the person doing the evaluating. MicroSoft Clearinghouse, *The Evaluator's Guide for Microcomputer-Based Instructional Packages*, contains both a "Courseware Description" form and a "Courseware Evaluation" form.[5] The first asks for a description of the software in terms of program format, instructional purpose and techniques, type of package, available documentation, and hardware needed for operation. The second requires the reviewer to examine the content, instructional quality, and technical quality of the program.

Another instrument that has received widespread use is the one developed by EPIE (Educational Products Information Exchange) at Stony Brook, New York. Many state departments of education have also developed evaluation guides for examining software materials. An interested teacher should contact the social studies consultant for the state.

A specific evaluation form has been developed by the National Council for the Social Studies (Rose et al. 1984). This form is designed to be used with any of the evaluation forms listed above. The NCSS guidelines focus on issues directly related to the social studies. The following questions illustrate the topics covered in the form.

1. What is the knowledge base represented by the computer software materials?
   a. What about validity, accuracy, and bias?
   b. What content is emphasized? Is there a an emphasis on enduring issues, and basic concepts?
2. What skills are taught by the computer software materials?
   a. What intellectual skills such as inquiry, critical thinking, divergent thinking, and concept formation are taught?
   b. What decisionmaking skills are utilized? How does the software deal with alternatives, consequences, and uncertainty?
   c. What participation skills are facilitated?
3. What values are introduced by the software materials?
   a. What is the social orientation of the materials?
   b. Do the materials involve the students in the valuing process?

It is evident that the questions posed by NCSS are different from the typical questions asked of computer software materials. The purpose of these guidelines is to bring a different perspective to the evaluation of software—a social studies orientation. But for the classroom teacher the evaluation of computer software is a major problem. Few classroom teachers have time to sit down and evaluate materials for use in the classroom. Many teachers are too busy to take one or two hours to evaluate a particular piece of software. The types of questions that a classroom teacher often needs answered are not the ones necessarily on the typical evaluation form; therefore, a teacher needs to look for other sources of information. Where can information be found about programs?

One of the easiest ways to find up-to-date information on new computer software is by reading the educational journals that are available. *Electronic Learning*, *Classroom Computer Learning*, and *The Computing Teacher* are three popular journals that provide reviews of materials in social studies education. The *Social Studies* and *Social Education*, the two mainline social studies journals, also from time to time contain reviews of computer software (these journals also have articles of a more general nature about computers in social studies).[6]

In addition to these popular journals, a variety of other databases and publications are available. A major new listing of computer software has been developed by the California State Department of Education. Entitled *Technology in the Curriculum Resource Materials*, the materials cover four general areas, one of which is history/social science. Two hundred and twenty-one software programs are reviewed

and 83 programs are recommended for use in the social studies curriculum.

Other excellent sources are *TESS: The Educational Software Directory* from the EPIE Institute, *The 1986 Educational Software Preview Guide* from the International Council for Computers in Education, and *Database Software for Social Studies* from the Northwest Regional Educational Laboratory. Each of these sources reviews various software materials and uses some type of a rating system to judge the quality of the materials. Two computer-based sources that may be accessed are *RICE* (Resources in Computer Education) and *Microcomputer Index*. The *RICE and Microcomputer Index* can be searched by ERIC/ChESS User Services.

A final source, the most popular one with most teachers, is simply through word-of-mouth among colleagues. There is always at least one teacher in the school who is interested in computer applications. These individuals are continually discovering new utility programs that are available for the teacher and finding materials that can be used in the classroom. In many school districts training efforts are made to ensure that teachers are knowledgeable about new materials.

Will Students Need to be Taught New Skills?

Beverly Hunter offers some important advice to social studies teachers. While enthusiastically supporting the potential of databases as extremely useful tools for the social studies classroom, she says, "We cannot expect the tools to teach the skills, any more that we expect a pencil to teach a child how to write" (1987, 39). Using the computer in the classroom means careful consideration about the student skills needed to use the computer and specific pieces of software. While more and more students are computer literate—they know to turn on the computer, run programs, and maybe have had other classroom experiences—it does not mean that they have the skills needed to understand a particular piece of computer software.

Hunter again provides important advice to the social studies teacher. She says, "Learning activities using a data file need to be structured and sequenced to provide mastery of prerequisite skills...before taking on tasks requiring more complex skills" (1987, 39). Acquiring the skills needed to develop key questions or hypotheses, to locate appropriate data to test hypotheses, and to draw conclusions cannot occur without careful instruction. The computer database, analysis package, or simulation may indeed make the learning activity easier; however, to take advantage of the instructional power of these technologies the social studies teacher will have to teach the students to use them.

Assuming that students have had sufficient experience using the computer, the following questions might be useful to ask.

1. What are the basic skills needed to use the program?

2. Have students developed these skills in prior lessons? If so, how much practice should be needed to re-introduce the skills?
3. How much time will be needed to teach or practice the skills?
4. How structured is the computer program? Is the computer program written in such a way as to guide the students through the exercise so that skills need not be a major factor?
5. What support materials are available to assist both the teacher and student in using the computer program?

These and other questions need to be asked before trying to use a particular piece of computer software. Too often some teachers assume that students may already have the needed skills to understand the task, or they assume that the software will teach those skills. When these assumptions are made and they prove to be incorrect, a lot of class time and effort are devoted to explaining what to do, or teaching new skills. Most often this leads to all kinds of instructional and management problems. It also usually means that the teacher is not willing to try again. The key is to ask the questions before using computers with students, provide the needed skill development, and then structure the first learning experience so that students can achieve the learning goals.

Are There Potential Management Problems?

No social studies teacher wants to have management problems detract from the learning experience. It is often difficult to keep student attention during traditional instructional activities. Adding a new piece of technology contributes another variable to the mix and increases the potential for management problems. When thinking about using the computer, several important factors must be considered: (1) class size, (2) time constraints, (3) technical equipment, and (4) student interest.

Class size: Most classes have 20 to 25 students. The students represent a mix of abilities and interests. Instructional activities must accommodate these numbers.

Time constraints: At the secondary level most classes last between 45 and 60 minutes. At the elementary level time is not as structured; however, time alloted to social studies instruction is usually limited. Additional pressures are placed on time by the need to cover a specific amount of content each year. School district curriculum guides outline the goals for the year, and textbooks provide the basic structure. The challenge for many secondary American history teachers is to get to the 1970s by the end of the spring quarter.

Technical equipment: As we noted in Chapter II, social studies teachers have not been the most active users of computer technology.

An important part of the problem is the lack of equipment available for use in social studies. Another issue is the lack of appropriate software.

Student interest: While it is always good to have students interested in the subject or topic, student interest can also lead to management problems. We know, for example, that students like to use computers. If a teacher wants to use a computer in the classroom and only a few students can use it at a time, what do you do with the others? Nonusers will be counting the minutes until they can "get on the machine."

In order to avoid some of these problems two important areas need to be considered. First, the teacher needs to examine carefully the computer software with an eye toward management issues. For example, does the computer program require the student or group of students to complete the program before another group can begin? If so, several computers will be needed in order to have all the students using the program, or alternative activities will be needed to keep students on-task while waiting to use the computer. Furthermore, does the computer program have any built-in management features? As noted earlier a simulation like *Geography Search* (McGraw-Hill Co.) has a built-in feature that manages student groups. It can also be stopped and started at any time. Such built-in features allow the program to be used within a given time frame, can get most of the students onto the computer within a short time, and needs only one computer. Such features decrease potential management problems.

Another area to check is whether or not support materials are available for students. While students will wait for their turn on the computer, they will wait only so long. The best possible alternative for those who have to wait is to complete an activity that directly relates to what is being studied. Such an activity has meaning and may help the student understand the topic. If such materials do not accompany the computer materials, it is wise to create them and then use them when discussing the total learning experience.

Management problems can be lessened by careful previewing of the materials, teaching the needed knowledge and skills needed to use the materials, and organizing the total learning experience.

Analyzing Lessons Using the Computer

A reflective teacher always wants to know what was effective in the lesson and what areas need to be improved. Only by analyzing a lesson is it possible to improve it.

Two key areas for analysis of lessons using computers are: (1) overall instructional techniques and (2) computer-related activities. Within each area there are several important issues to be examined.[7]

We list them here as questions for the teacher to answer. The areas overlap, but are presented separately to sharpen differences.

Overall Instructional Techniques

During the last several years research on teaching has provided significant insights into what contributes to effective instruction. Important components of a good lesson include (1) gaining and maintaining student attention, (2) informing the learner of the goals and objectives, (3) stimulating recall of prior knowledge and skills, (4) clearly presenting the content, (5) providing for guided practice, and (6) providing for application. In evaluating a lesson or series of lessons that use the computer, it is important to remember that those activities preceding and following the computer experience are equally important; therefore, the total learning sequence must be examined. Based on these elements, the following key questions can be asked about the lesson.

1. Did the lesson focus student attention?
2. Did students know what was expected of them?
3. Did the students use knowledge or skills that they had learned earlier?
4. Did the lesson present the materials in a logical sequence?
5. Were the directions clear?
6. Did the lesson have students apply the knowledge and skills they learned?

Answers to the six questions posed above can provide insights into the instructional strategies used in this sequence. However, additional questions about the computer-related activities also need to be asked.

Computer-Related Activities

Four areas can be examined: (1) the instructional effectiveness of the computer programs, (2) classroom management issues, 3) the software, and (4) the hardware. Within each area there are several key questions that should be asked.

Instructional Effectiveness. Four key questions can be asked in this area.

1. Did the computer materials help the students achieve the lesson's objectives?
2. Did the computer materials accommodate a range of student abilities?
3. Did the computer materials keep the students' interest?
4. Did the computer materials contribute to the lesson's effectiveness?

Classroom Management. As we discussed earlier in the chapter, classroom management issues can be the major determinant of the successful lesson. Troubles with management issues often overshadow other successful aspects of a lesson. In addition to the earlier stated questions that a teacher needs to consider prior to using a computer program, the following questions will help one reflect on management issues.

1. Did the grouping arrangement work?
2. Did the strategy used to monitor student progress work effectively?
3. Was there sufficient time for the students to complete the computer activities?
4. Were the students able to work together effectively?

Software. After reviewing the software prior to instruction, a few questions are still needed to check to see if the software contributed to the overall success of the lesson.

1. Did the software run without any problems?
2. Was there enough software to meet the instructional needs for the number of students in the class?
3. Did the software use the power of the computer, or could the same goals have been accomplished without the computer?

Hardware. Finally, one should think about hardware issues by asking the following questions.

1. Were there enough computers?
2. What technical problems occurred that should be corrected the next time computers are used?
3. What additional hardware might make the lesson more successful?

Evaluating the effectiveness of an instructional sequence using the computer, like evaluating software, is a difficult task. Many variables enter into the analysis and it takes time to sit down and go through the lesson. The time may well be worth the effort, however, if the whole process goes smoother next time the computer and the software are used for instruction. The questions posed throughout this chapter have been designed to help you reflect on the whole process of incorporating the computer into social studies lessons.

Concluding Remarks

In Chapter I we found that computers are being used sparingly in social studies. Although we were not overwhelmed with the re-

search findings at this point in time, they were at least mildly encouraging. In this chapter we have attempted to provide some additional insights into how the computer might be used more effectively in the instructional process. Examples have been provided to show ways in which you might be able to use the computer. In addition, we have raised a variety of questions for you to ask prior to and after using the computer in your lessons. We believe that the computer is a powerful tool for both the teacher and the student. Some of the disappointing research results might be due to the fact that both teacher and student are still learning how to use the technology effectively. Next to the textbook, the computer is the most powerful tool to be used in the classroom. Learning to use it is like learning to team teach effectively with another colleague. It takes time, practice, and the courage to continue the effort. Why? Because in the next decade the technology will continue to increase in its power and flexibility. This in turn will introduce more challenges to teachers and students. The future technologies are the subject of our final chapter.

CHAPTER IV

NEW TECHNOLOGIES AND SOCIAL STUDIES EDUCATION

Change comes very slowly to large institutions. In a decade of rapid change, the school, for the most part, has remained an island of stability. The school of yesterday looks like the school of today. Looks, however, are often deceiving, and so it is with the school. The numbers of school age children are changing; the demographics of those students are also changing; the age of the teaching staff is changing; and the curriculum of the school is changing. Many factors are contributing to these changes, and prominent among the change agents is technology.

As we have noted earlier, there are almost two million computers in schools, and the numbers continue to grow each year. Almost every elementary and secondary school in American has at least one computer and over 500,000 teachers have used computers in some capacity related to their professional role. Between March 1985 and March 1986 the editors of *Electronic Learning* counted over 1,100 new software programs (*Electronic Learning* 1986, 2). And the price of software has remained at a reasonable level of about $50 per copy, which has encouraged schools to continue to purchase software for educational uses.[1] Computer technology and educational uses of computer software are firmly entrenched in the school. While the critics may indicate that the movement has stalled, it is evident that the push of computers into the mainstream of schooling is still occurring. So, what does it mean for social studies educators? Let's examine two areas: the social studies classroom and needed research related to technology and social studies.

Changing Technology and the Social Studies Classroom

Our research has found that computers are not used a great deal in most social studies classrooms. Social studies teachers for a variety of reasons are not using computers as part of instruction, but this does not mean that the curriculum and the students who are enrolled in social studies are unaffected by computers and related technologies. For example, elementary school students are now taught the basics of keyboarding so that they can use the computer effectively. Word processing is the most popular tool used by adults and young people. English teachers are using word processing strategies to assist students in the writing process, and more and more secondary students are using computers to write papers for school classes. Although limited in scope of use, more families have computers at home. While the world of social studies education includes limited computer ex-

periences, students are gaining in their skills, and these skills are related to social studies in a variety of ways. Consider the following six trends.

Trend One: Word Processors in the Classroom

Word processors are changing the way students write papers in school. Student reports can now be written using a word processing program that allows for easier editing, contains a spell check, and counts the number of words written. Options to change the margin, the size of the print, and even the font are available at the touch of a key. Printers produce reports that may include high quality graphics and even color. An assignment to write a report no longer than five pages and with no spelling errors takes on new meaning when placed in the hands of a skilled word processor.

Trend Two: Accessability of DataReports

The task of gathering information for reports will be altered by emerging technology. For example, two years ago Grolier put all nine million words of its 20-volume *Academic American Encyclopedia* onto one-fifth of the surface of a compact disc (CD) (Elmer-DeWitt 1987).[2] By linking the CD disc with a word processing program via a computer, an individual will be able to access any portion of the encyclopedia, load it into a word processing file, revise it, and then print it off! A forthcoming new CD will make the *World Almanac* easily accessible, make it possible to crosscheck a variety of figures, and test a variety of hypotheses.

Trend Three: Telecommunication Services

Through telecommunication services students will be able to access hundreds of commercial databases. In fact, in 1987 40 percent of high schools, 18 percent of junior high schools, and 10 percent of elementary schools had at least two modems—the instrument needed to connect a computer to a telephone line (Office of Technology Assessment 1987, 120). Through *NEXIS*, for example, students can gain access to the fully indexed contents of news stories from the *New York Times* and other newspapers. Two interesting social studies on-line databases have been announced recently. *SCAN* (System for Communication and Networking) is a developing base of global and international education materials sponsored by Global Perspectives in Education. It will give annotated bibliographic support to social studies teachers as they develop lessons and materials for teaching global education. Also, the ABC-CLIO publishing company plans to bring on-line their *Kaleidoscope* database for remote student and teacher use. This database contains detailed statistical information on every country in the world, plus current news events, as well as political and historical background information for each country. On-line access to

these teacher and student intellectual resources will extend the reach of computer-based education in the social studies classroom.

Trend Four: Teleconferencing in Schools

Teleconferencing, live, two-way video communication will begin to link classrooms from other locations. The East Central Minnesota Educational Cable Cooperative project, for example, is linking seven rural districts with two-way interactive television. Each classroom is able to see the teacher and the other on-line classrooms. One teacher is now teaching up to four classes in four districts at a time in subjects that were previously unavailable. As satellite and terrestrial communications become cheaper, these linkages will become more powerful and offer more opportunities for creative instructional uses.

Trend Five: Interactive Video and Computer Systems

Interactive video and computer systems are allowing materials to be presented in such a way as to link superior motion or stills with the power of the computer. The MECC videodisc economics course discussed in Chapters II and III is just one example. More and more such courses will be forthcoming during the next several years.

Trend Six: Utility Programs for Teachers

Utility programs are allowing teachers to develop and store massive amounts of material for class and information about student progress. Access to and the manipulation of these data are easier than in the past.

Implications of Technological Trends

What do these and other technological trends mean for the social studies teacher? The changes will affect three general areas, student/teacher interactions, the curriculum, and the manner in which the teacher teaches.

Student/Teacher Interactions

Technological innovations mean that the students who enter social studies classrooms will have increasing knowledge about the computer and its uses. Whether or not social studies teachers use the computer in their classes, students will begin to use them. Granted, it will be some time before more than just a few students will have easy access to a computer, but each year the numbers grow. These changing skills will directly affect the work that students do. For example, a staple of most social studies classes is the written report on some topic. Word processing, data discs, databases, and on-line communication are all changing the access to information and how that information may be treated. Whereas not so long ago getting the

information and physically writing the report took the majority of a student's effort, now the physical act, as well as the manner in which information may be gathered, has changed. The encyclopedia and the library magazine are taking on new forms.

It will also mean that students will have changed expectations about using the computer in social studies classrooms. If the computer can be used in English, art, and business education, why can't it be used more often in social studies? Students who have been introduced to the computer in the elementary school will want to continue that use in the junior and senior high school.

Finally, with the increase in technology that allows students to access information will come a change in the relationship between the teacher and the student. If the studies by Goodlad and others are accurate reflections of the teaching at the secondary school level, teachers tend to dispense information to students who in turn write it down for recall on examinations. Teachers are the providers of information. In the advancing technologies of compact discs, how can a teacher compete with a small 4.5 inch disc that contains all the information from an encyclopedia, world almanac, and history book? Roles and relationships will change. It will take time, but they will change. These changes will also affect the curriculum.

The Social Studies Curriculum

Changing student skills and expectations and access to information cannot help but change what is taught in the formal curriculum of the school. In our discussions of the research findings and uses of databases, we indicated that students will need to develop and continue to enhance problem-solving skills and their abilities to handle information. Although these skills have a long history of being part of the social studies curriculum, in the next decade the technology will foster the movement of these skills and abilities to a more important place in the curriculum. Facts, concepts, and generalizations will continue to be essential, but their acquisition will be achieved through different methods.

The emphasis on intellectual skills will mean greater attention to scope and sequence in the curriculum. Technology may be of assistance in providing the framework for assisting the learner in the development of these skills. It is entirely possible that in the next decade powerful learning environments may be created in which computers and related technology teach the student basic skills at a particular grade level. A permanent record of each student's attainment will be stored on the computer, and as the student progresses through the school his or her updated file will be accessed by the teacher. A tenth-grade social studies teacher, therefore, would be able to find out the skill development level of a particular student and design or access

instructional activities appropriate for that student. This will mean that the teacher's role will also be changing.

Teacher's Role

Technology throughout time has slowly but surely altered the teacher's role in the classroom. The textbook opened new avenues of teaching and learning. The film, the television, the overhead projector, and the videotape all have changed the manner in which the teacher has approached instruction. Granted, much of today's classroom activity is still teacher talk, but changes are emerging. Consider these examples: (1) a teacher working with seven different classrooms in Minnesota at the same time; (2) a teacher assisting a group of students who are analyzing data collected from a large neighborhood survey; (3) a teacher working with several students learning economics via a videodisc system; (4) a teacher sending home progress reports by using a computer gradebook system that allows for individual comments; (5) a teacher preparing and storing questions to be used on the final examination; (6) and finally, a teacher using a utility program to create worksheets and overhead transparencies for a unit on South Africa. These and hundreds of other examples exist in social studies classrooms all across the United States. In each case, the computer has changed the manner in which the teacher approaches instruction and his or her role.

For some situations the change is minimal—using the computer to generate a worksheet. In others the change is significant—developing the skills needed to help students analyze survey research data. And in others it is even more dramatic—carefully planning instruction so that it can be beamed to six other classrooms and scores of students. In each of these situations, the teacher's concept of instruction has been influenced and altered. As newer and more powerful technology becomes available in the schools, the teacher's role will continue to evolve.

Needed Research Related To Social Studies and Technology

Based on the review of research conducted in Chapter II, there are four main areas of work needed in order to provide a solid basis for developing technology applications in the social studies curriculum. These area are productivity, motivation, curriculum integration, and cost-effectiveness.

Needed Research on Productivity

We need much more knowledge about how students' learning is influenced by technology in the classroom. Particularly important is to examine lower- and higher-order thinking outcomes, to determine if there are particularly apt uses of technology, and whether

they can be matched with certain student learning needs. For example, does using databases over extensive periods of time contribute to metacognitive capabilities of students? That is, does this work lead to their learning how to think about problems within an overarching mental framework that helps solve those problems? Another interesting line of research is the effect of images, manipulated interactively by the learner during instruction, on learning concepts and application skills. The little work that has been done in this area is suggestive, and we need to know much more about the interplay between written and spoken instruction, and pictures delivered as an integral, interactive, part of teaching.

Affective outcomes should not be ignored in our research. The citizenship development that is at the heart of the social studies curriculum is an important area for investigation. Do students feel more or less competent as future citizens as a result of having used new technology in the classroom? If telecommunications link students to others in other cities, states, or even other countries, does this have an effect on their attitudes toward others, toward themselves, toward the emerging global society? Do they feel better integrated socially, or more alienated, from their use of technology? Another important aspect of productivity research should be related to the social studies teacher. Does the use of word processors, grade books, classroom management systems, and other computer-based tools mean that teachers will spend more or less time doing routine tasks? Will use of these tools increase or decrease teachers' productivity? We need the answers to these urgent questions before knowing whether and how to deploy the technology we have at our disposal.

Needed Research on Motivation

Once again, we need research on both teachers and students in this area. For teachers, we need a picture of what are the incentives and disincentives for learning about and using technology in their teaching. Are there certain types or styles of teachers who will never use technology facilely? What factors lead teachers to adopt ideas like computer-based instruction or the use of productivity tools such as word processors and grade sheets? What means and levels of support do teachers need to persevere in learning and using computers and other technology?

As for students, we need to know if the often-reported positive attitudes and motivation toward using computers to learn are stable and long-lasting, or whether they tend to wear off through time. If the latter is true, what seems to contribute to the decline in motivation? Are there materials design principles, such as personalization, which can serve to support positive motivation? What kinds of computer-based lessons do students tire of, and are there certain subjects or objectives that should be avoided for this reason?

Needed Research on Curriculum Integration

The third general area of needed research has to do with the integration of technology-based research in the social studies curriculum. One problem cited over and over by critics of computer-based instruction is that most present software can only be "stuck in" the curriculum on a hit and miss basis, and there is little reliable connection between what students learn from using such software and the rest of their social studies learning. What we must study is the range of skills that can be promoted by computer use, and the nature of subject matter which is particularly amenable to teaching by the new technologies. Then we must take that knowledge and begin to piece together thoughtful ways of using technology in social studies where and when it is most appropriate. This will depend upon the goals and objectives, grade level, and specific subject matter issues in the curriculum. But if we find that using interactive video instruction teaches economic or geographic concepts better to high school sophomores than any alternative method, then we have to figure out how to capitalize on that knowledge. It will be a big task, but one which will ultimately pay handsome dividends in student learning.

Needed Research on Cost-Effectiveness

Finally, in order to keep a reasonable perspective on the use of technology in the classroom, we should conduct cost-effectiveness studies. We mean that researchers should compare the effectiveness of alternative means of conducting the same instruction, given the cost of resources devoted to each method. In other words, we should be able to tell whether it is worth spending extra money and time to obtain the level of desired outcome that we finally achieve. For example, if we teach about institutions in a high school sociology course, we should be able to determine cost-effectiveness ratios for each of the methods we use, by dividing the average gains made by students taught by each method by the costs associated with teaching by the respective method. We might find that using interactive video materials are prohibitively expensive for this particular application, whereas they might be most cost-effective when teaching the concept of opportunity cost to junior high school students. With this kind of information, we will be able to make well-informed decisions about where and when to apply technology in teaching, and the the situations where it makes no economic sense to do so. Only then can we make effective use of the scarce resources at our command.

As we acquire the answers to these, and many more, important questions, we can help build an effective and integrated curriculum for social studies. There is a small base of research upon which to work, and it is imperative that we do so. While not all instructional decisions, perhaps not even most, are made in light of research knowledge, there is an urgent need for answers to the questions posed here.

Without that kind of knowledge, we are consigned to wander about in a desert of technological mirages.

Conclusion

As we look to the immediate future of computers and education, what do we see? Here are some hunches.

The number of computers in schools will continue to increase. School districts will continue to allocate funds for the purchase of second generation computers and make funds available for software.

School districts and software developers will work to develop bulk buying agreements so that schools may reproduce software as it is needed.

Software companies will continue to produce multipurpose tools as a means of sustaining income. At the same time, more integrated software packages will be developed to teach basic skills and maintain student records.

Administrators will develop a stronger interest in computers as more powerful administrative packages become available. This increase in interest should also pay off in the classroom as administrators see the power and potential of the computer.

Training of teachers will remain the number one issue. Although considerable funds have been allocated for training, most teachers still want additional training on how to use the computer as a part of effective instruction.

Hardware will continue to get smaller, faster, more powerful, and integrated. Compact discs, videodiscs, 32-bit machines, desktop publishing, and networking will all be emerging during the next several years.

Computer companies will continue to battle for the school market, which will remain a major source of revenue. Apple, IBM, and Tandy will be major forces in the school market; however, other companies will gear up to challenge the leaders.

Research and development in computer-based teaching will focus more on interactive video instruction, on higher order learning outcomes, on the computer as an intellectual tool for teachers and students, and on telecommunication applications which link classrooms to remote databases, libraries and universities, and other classrooms.

Computer-based education in the social studies classroom promises to be an exciting, challenging, and perhaps frustrating arena for future work. We are likely to be pressed hard to implement computer instruction by our students as they learn about and use computers in their other classes and in their homes. Parents will look to us to develop and integrate computer software into the curriculum. School administrators will expect that our professional self-development efforts will include learning more about computers and their applica-

tions for effective classroom teaching. All of these challenges are reasonable, and if we meet them, we will improve social studies and become more effective educators.

Improving computer-based education in the social studies will be a difficult job. If we can remember that computers are simply tools, like all of the others we have at our disposal in schools, then we are likely not to miss the opportunities these tools offer. We must figure out their appropriate uses and abuses, when they are effective and when not, and how expensive they are, in terms of dollars and our own valuable time, relative to alternative tools. Research will add to our ability to make these judgments. But practical experience communicated among teachers will be most important. Above all, we must maintain a positive, yet skeptical, attitude toward learning about and using computers in teaching. They can save us time and effort, and make us more productive as teachers. And most important, they can help students know and think, surely an overarching goal of education in the social studies.

NOTES

Chapter III

1. For a discussion of the use of the videodisc see Glenn (1983).

2. For an interesting discussion of other instructional activities using the computer for data analysis see White (1987) and Hunter (1987).

3. For a discussion of how to select a computer simulation see Glenn and Rakow (1985).

4. For a detailed discussion of this process see Roessler (1987).

5. This form can be obtained through the Northwest Regional Educational Laboratory, 300 SW 6th Ave., Portland, OR 97204.

6. See the May 1983 and January 1987 issues of *Social Education*, and the January 1987 issue of *The Social Studies*, for special sections on computers and technology.

7. The discussion presented in this section is from Sales, Carrier, and Glenn (1986).

Chapter IV

1. While this price is good for the schools it is not good for the developer. Development costs may run up to $1 million for a complex piece of computer software. At $50 per copy it is difficult to recoup such development costs. The impact of the low sale price has a direct influence on the development of a particular type of software.

2. A single 4.72-inch disc can store up to 250,000 pages of text!

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