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Susan Florio-Ruane
Major professor

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NEW ROLES AND ROUTINES FOR ELEMENTARY TEACHERS AND STUDENTS: A STAFF DEVELOPMENT PROJECT USING COMPUTERS TO TEACH THE REVISION OF WRITING

By

Glenn Lawrence DeVoogd

A DISSERTATION

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ABSTRACT

NEW ROLES AND ROUTINES FOR ELEMENTARY TEACHERS AND STUDENTS: A STAFF DEVELOPMENT PROJECT USING COMPUTERS TO TEACH THE REVISION OF WRITING

By

Glenn Lawrence DeVoogd

Traditional teacher and student roles and routines for constructing and revising knowledge have persisted in the classroom since the rise in popularity of the common school in the middle 1800s. Technology has dramatically changed much of our society outside of education. The arrival of the computers in schools offers opportunities to *reform* education as well. This study, drawing on ethnographic theory and method, examines some of the ways four elementary classrooms changed in a staff development project where computers were relatively new. Over the course of the study, teachers and the staff developer co-constructed several methods for using the computer that were fundamentally different from traditional classroom roles and procedures. Students began to take a more active role constructing and revising knowledge in the context of pairs and small groups. Whereas traditional sources of knowledge in the classroom included the teacher and the textbook, in these classrooms student experts, personal knowledge, student voice, and other sources were common. The use of technology offered a different context and medium that changed the participant structure of the classroom. These participant structures can accommodate students of increasingly diverse styles

of learning and cultures. I include principles for using technology that make it an excellent tool for revising writing. I finish by posing two future scenarios of what schools could look like as they use technology in the schools. Future studies might spend more energy to document long-term outcomes of classrooms where the character of interaction and participant structures has changed as a result of the use of computer and a vision of student empowerment.

Dedicated to Lawrence Robert and Ursula Edith DeVoogd

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editing comments and big ideas, I am grateful to Doug Campbell. For uncommon wisdom and fun at every step of the process, I am indebted to Chris Clark. Most importantly, I thank my director Susan Florio-Ruane who took a personal and intense intellectual interest in the process and and the content of my study. She guided me throughout the writing of this text by highlighting ideas, helping me to rethink problems, and pushing my thinking in so many ways.

This book would not be possible had it not been for the interest of the teachers, Patti, Maria, Katie, and Kari, who worked hard to learn about writing revision with technology. I thank Tom Stark for his encouragement and prayer. In appreciation for transcribing and editing I thank Karla Bellingar and Sandra Gross.

Most importantly I thank God from whom all blessings flow. Part of the call to growing in our knowledge of God is having the skills and strategies that allow us to wonder, articulate, and clarify His will for our lives. God grant that this work will be an inspiration to do all those things for myself and for those who read this work.

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CHAPTER 1: TO REFORM OR TO REFLECT...

An Overview of the Study

Educational reformers note that with few exceptions, schools have not changed much over the past century. Traditionally, teachers and textbooks have formed the primary sources of knowledge for education. The principal activity in schools centers around the telling and accrual of knowledge that is considered unchanging and appropriate for all students. Much of the computer software reflects those traditional school-type activities.

Many with different educational philosophies have sought to use the computer as a tool to benefit student's learning. In some schools, teachers with constructivist views of learning helped students learn to program computers using LOGO to construct and revise microworlds. Other teachers used the computer as a tutor or to manage student learning for them. Many competing software developers designed attractive programs for use in the schools. Teachers were inundated with choices about different software to use, but in fact teachers are not sure what software to use or *how* to use it in the classroom.

The school districts in this study decided to use technology to help

students use the computer as a tool to construct and manage ideas in school. It was their goal to empower students to control the computer instead of merely responding to the computer prompts. Students could access information from the growing sources of knowledge and then revise the information according to their needs.

As a teacher who was interested in writing instruction and in particular student revision of writing, I saw the potential for using the computer as a tool for revising writing. I also realized that revision of ideas was a much larger concept related to revision of writing. Certainly, those who found it easy to revise their ideas about any topic would also find it easy to revise their writing. Revision of writing, when it takes place at the idea level beyond superficial changes in text, involves the revision of ideas. In this text, I think of the ability to revise knowledge in general to be an important part of revising writing and sometimes the two terms are used interchangeably.

I saw the potential for revising writing with the computer, but many obstacles still existed. Studies of writing revision have discovered that it is rare for students to revise in schools. Others who study computers note that the existence of the computer does not impact the schools. It is, rather, the teachers and the context in which the computer is used that allows computer use to act as a change agent. As I studied these goals and the general directions computer use was taking in the schools, I became intrigued by the tremendous amount of work it would take to transform classrooms to use the

computer as an instrument for revision of knowledge in general and the revision in writing in particular. Although there is potential for computer to be used to reform education, there exists the likelihood that in many classrooms the use of the computer will merely reflect traditional practices of schooling.

So many questions remained. How could the computer be used as a tool for constructing and revising knowledge? How can we educate teachers about these practices? After teachers and staff developers learn to use the computers to revise knowledge, what will the classroom look like?

To answer these questions, I worked in two first-grade and two fourth-grade classrooms in two distinct educational settings. In those classes, I worked with teachers as a staff developer and co-teacher to enact a curriculum revising knowledge using the computer as a tool. These settings as well as the methodology of the study are described in Chapter 2. An overview of the site including characteristics of teachers and students is located on Table 4.

This study describes the use of technology in the classroom over the course of 10 months. Our first task was to think about principles of study using the computer consistent with emerging curriculum guidelines on technology and other curricular areas (see appendices A and B). What I found was that over the course of the study, as the teachers and I changed the routines and procedures of the classroom to explore the uses of the computers, the roles of the students and the teachers began to change.

Different methods were used to teach revision in the classroom. One of

the most common methods was to encourage students to revise a content area

passage written by the teacher. The processes teachers employ to revise

writing at the keyboard and on paper away from the keyboard are described.

Chapter 3, which describes the new routines and procedures that teachers and

I developed as co-workers, is a significant part of the study for a couple of

reasons. Below, Figure 1 illustrates a semantic map of the major concepts

reported in Chapter 3. New classroom routines and procedures emerged from

discussions with teachers about how to integrate the use of computers in

classroom lessons. Teachers provided opportunities for students to revise in

two different ways: (a) an emphasis on students *revising writing on paper and

keyboard*, and (b) students editing writing and graphics the teacher had created

as a *template*. The units the teachers and I planned and I have reported on in

this study are listed around those two broad areas.
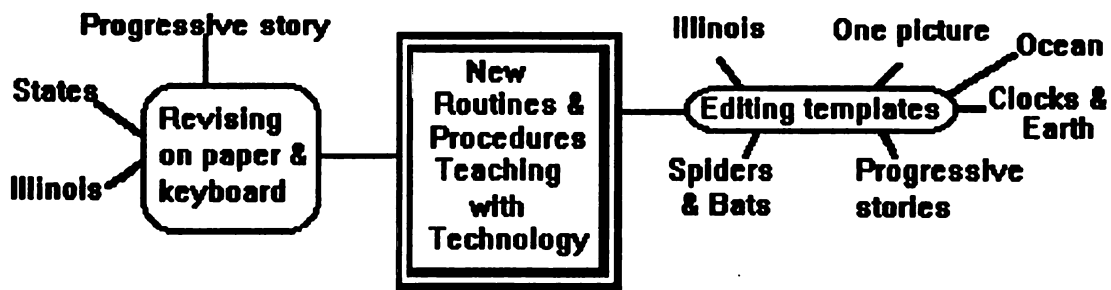
Figure 1. New routines and procedures.

Chapter 3 gives the readers a fuller sense of the context of the classroom situation where we were attempting to use technology to revise knowledge. Teachers and staff developers may find this section interesting as an example to critique in their own search for using the computer as a tool for constructing and revising knowledge in the classroom. This chapter also reveals portions of the process that emerged as we pursued these goals. Many studies describe staff development projects in which the desired outcome was defined in terms of specific methods that had been proven worthy by researchers. This project, in contrast, describes endpoints in a journey of discovering new routines and procedures in which the desired outcome was defined only in terms of principles such as construction and revision.

Most importantly, this chapter leads to a fuller understanding of how participants discover new roles themselves as teachers and learners. That discussion takes place in Chapter 4 on Emerging Participant Structures. Participant structures refer to relationships students and teachers have with each other and what their rights and obligations are in the different roles they play.

In a sense, these changes in routines and procedures provided a context that enabled all classroom participants to relate to each other in ways that changed the character and the tone of learning. The computer as a form of media and staff development acted as catalysts and provided an opportunity for this important transformation of goals.

In Chapter 4, this shift of roles in the classroom and an emerging

participant structure that differs from traditional classrooms is examined. As

teachers use the computer in the classroom as a tool for constructing and

revising knowledge the classroom, the participant structures in the classroom

change, resulting in smaller groups, more student talk, and more student control

of the learning process. Group work allows students to regulate their own

information; students become less dependent on the teacher.

The classroom changes in the emerging participant structures are detailed

in three groups (Figure 2). In the first group, the role of the expert computer

person is examined. Expert computer persons take on the roles of secondary
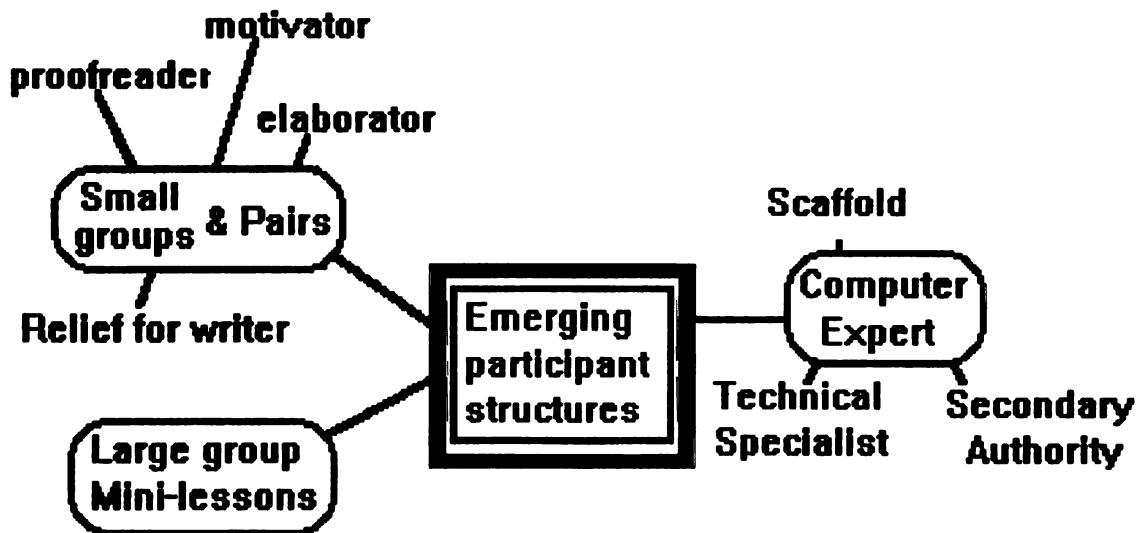
Figure 2. Emerging participant structures.

authority, scaffold (help fellow students understand the content of the lesson), and technical specialist (roles previously reserved for teachers). The partners in small groups and in pairs take on the roles of proofreader, elaborator, motivator, and relief for the person who is writing. Mini-lessons are a tool teachers use to teach large group students to revise writing, graphics, and knowledge of technical skills in a whole group setting.

Educational historians and reformers have described how classrooms are structured to value teacher and textbook knowledge. Students become increasingly passive as their ideas go unexplored in favor of static school sanctioned knowledge.

In Chapter 5, the shifting role that revision in writing plays to help include some of the student's prior knowledge and preferences in the teaching of

Integrating
personal knowledge

Shifting roles for writing

Personal preferences in the appearance of writing

Integrating personal voice
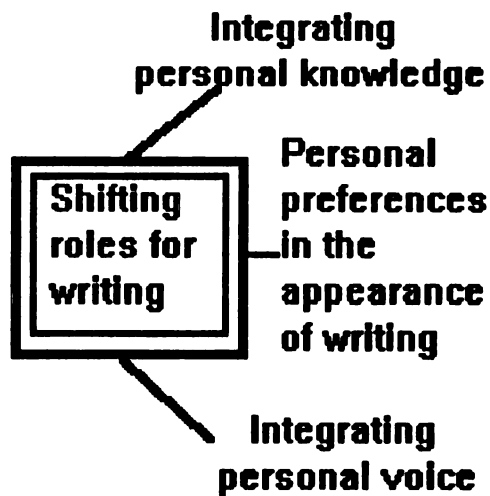
Figure 3. Shifting roles in writing.

different subject areas is described (Figure 3). The nature of student revisions using the computer as a tool reveals that students revise in ways that reflect personal choices. Students revised their writing by integrating their *personal knowledge* with other sources of knowledge. The written product that results from such an experience can reveal the child's prior knowledge and personal experiences.

The shift in the role of writing in the classroom became more evident when, instead of duplicating the teacher's or textbook's schema, students expressed their personal choices and emotions concerning different topics. The students' expression of choice and emotion are less interesting in literacy classes where student voice is more common. I am more encouraged by the expression of choice and voice in social studies and science classes where student voice and choice have not been so common. Students continued to participate in the revision of knowledge by expressing themselves, revising graphics and text to suit their personal interests. The role of revision in writing in the classroom can be more than just another tool to accumulate facts. Chapter 5 provides examples of ways in which revision of writing with the computer can supply a context that allows students to participate more in the construction of a more personal knowledge.

The common thread that ties all of these chapters together is their focus on shifting roles and routines in student revision of writing (Figure 4). As teachers and I established new classroom routines and procedures, a

participant structure began to emerge that was fundamentally different from the type of teaching and learning that had taken place in the classroom previously. The teacher and students related to each other differently. The role of writing became a role of personal expression. Students integrated their voice and personal knowledge with content area knowledge. Figure 4 illustrates the principle shifts in roles and routines in student revision of writing.

It is inappropriate in a study of a few classes to propose that what is
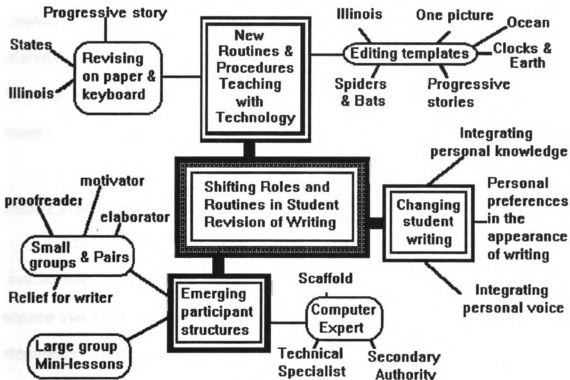
Figure 4. Shifting roles and routines in student revision of writing.

described in those classrooms can be generalized across contexts to all classrooms. Instead, this study provides examples of shifting roles and routines in the revision of student writing that may appear interesting to researchers and practitioners. The study provides a rough view of means by which teachers provided a more engaged personal experience for students revising their writing with technology.

The rest of Chapter 1 explores in detail some of the ideas researchers have expressed in the areas of writing revision and the direction of the use of technology in the classroom. It also briefly explores traditional concepts of knowledge with an eye towards looking at writing using the computer in a different way. Questions and ideas as to how to pursue these different ideas in the classroom form the basis for the research questions at the end of the chapter.

Whose Information?

Literacy Instruction as a Set of Power Relationships

Traditional classrooms in the past and now are places where students have learned from the teacher and the classroom textbooks. Students listen to lectures that teachers give in the classroom and read the book for other information. These two sources have formed the primary basis of content students were compelled to use.

The physical structure of the classroom has been shaped to reflect the importance of teacher and textbook knowledge. Classrooms have been shaped

with desks separated and facing the front to minimize student conversation and maximize attention to the teacher (Cuban, 1984) and to books. Teachers have felt it necessary to structure the classroom so that students can gain the most advantage of the information available. That information was received in books and from the teacher. Children reading books and listening to the teacher lecture have long been recognized as getting an excellent education. The students' purpose was to soak up as much information as possible from the teacher and the text. However, this type of education has been referred to by reformers as dull and passive (Cohen 1988; Freire, 1970; Goodlad, 1984). In John Goodlad's (1984) book entitled A Place Called School, researchers saw students passively listening, reading textbooks, completing assignments, and rarely initiating anything despite stated school goals that stressed curiosity and involvement.

Other researchers similarly report that telling and accruing information dominates the classroom (Cohen, 1988; McDiarmid, Ball, & Anderson, 1989). This traditional approach incorrectly views the concept of "knowledge" as something that is static and unchanging. By treating knowledge as a static, unchanging entity, teachers are really misrepresenting its true character. Knowledge is actually revisionary and pluralistic in nature (Schwab, 1978). In order to give their students a more realistic concept of knowledge, teachers should acquire a flexible understanding of the subject matter they teach. A flexible understanding of knowledge means the ability to (a) understand

relationships within and across disciplines and experiences, (b) do what specialists in the field do, (c) discover how knowledge in the field is created, and (d) seek different application for knowledge (McDiarmid, Ball & Anderson 1989). A flexible understanding of knowledge is very difficult to explain to students in a "telling" style of teaching. To gain a flexible understanding of knowledge one has to work with the knowledge, create it, and relate it to other types of knowledge.

Reformers emphasize the need for the treatment of knowledge and truth as an entity that is not static, but rather flexible (Cohen, 1988; Lampert, 1985; McDiarmid, Ball, & Anderson, 1989; Roehler, 1989; Schwab, 1978). The most fundamental commonly accepted evidence of teaching is that of the telling and accrual of knowledge (Ball, McDiarmid, & Anderson, 1989). A typical student/teacher exchange consists of the *teacher* telling and the *text* informing the students of some kind of content. The students are then tested to see if they listened to the teacher and understood the text. In these instances, knowledge is strictly controlled by the teacher and the text she used. This concept of the job teachers perform is deeply embedded in thoughts and actions of both teachers and the community.

This relationship of teacher and textbook monopoly over knowledge and power in schools has persisted throughout this century. For example, Cuban (1984) discusses how stable teacher-centered practices were in his book detailing the stability of classroom practice from 1890 to 1980. He described a

professor who studied rural schools in Texas in 1922 and found that in 88% of the classes the textbook and teacher were the primary sources of information. Typical dialogues between teacher and student consistently followed a similar pattern: teacher question, student answer, and teacher evaluation (Cazden, 1985; Mehan, 1988). Although Cuban finds that for short periods of time educational movements shifted educational practices away from teacher-centered instruction, his conclusion is that there has been no significant change in teaching practice this century. In other words, the measure of the students' goodness is the amount of facts they know, even though standardized tests are criticized for only being able to demonstrate *what* a student knows and not *how* he/she knows it.

Controlling knowledge in a school is also a way of mediating the relationship of power by the teacher over the student. For some educators, the purpose of schooling is to teach a particular collection of knowledge, as claimed in Hirsch's (1987) book Cultural Literacy (1987) and Bloom's (1986) book The Closing of the American Mind. Many times these particular compilations of knowledge imply value systems that are not shared by all cultural groups. These sets of knowledge are culture-bound and particular cultural groups have an advantage in schools where the content of the knowledge the parents teach matches that of the school (Heath, 1983).

Since norms and procedures of teaching and learning are almost always strictly regulated by the teacher, the cultural knowledge taught by the teacher

does not always fit the student of a minority culture. In other words, the method of learning in certain school practices is not congruent with the method of learning in the home environment (Delgado-Gaitan, 1987 for Mexican-Americans; Heath, 1983, for rural European-Americans and African-Americans; Phillips, 1972, for Native Americans). These proponents of cultural congruence between classrooms and the community claim that students can best succeed in mainstream society when they feel comfortable in their classrooms. This comfort is created when classrooms are congruent with community from which the students come (Singer, 1988).

If educators insist students learn only using certain traditional classroom norms and knowledge that conflict with knowledge and norms of learning from the home environment, the child may become more easily disenchanted with school. Students may not develop in knowledge or social norms that are important for growth in their own community. In the short term, the result may be that students experience limited growth and affection for school. In the long term, for a society that depends on lifelong learning, the results may be more profound.

Of course this does not not imply that all knowledge or norms at school should become congruent with home knowledge (Zeuli & Floden, 1987). The home community can consists of ideas and norms teachers do not want to promote. However, it is important that the child feel welcome include ideas and norms from his/her home for discussion at school.

In schools, so often we, as teachers, demand students accept our version of the truth or we impose a textbook version of the truth to the exclusion of the child's personal knowledge and personal voice, and to the exclusion of other voices that are not mainstream enough to qualify for inclusion into textbooks. We have wanted children to accept the power the printed word has over them (Scollon, 1988). Children often get the impression that what is written in the textbook is more authoritative and relevant than that which they have heard spoken by their friends or relatives. Because of the authoritative style in which we present and test students on textbook and teacher knowledge, the sanctioned school knowledge has supremacy over student knowledge.

In schools we expect students to accept a position of submission in respect to content and style of learning in classrooms, but this forced relationship does not have to exist. Constructivists have a vision of schooling where inspired students use personal knowledge in the classroom and express their voice as an equal scholar in the classroom (Cognition and Technology Group at Vanderbilt, 1992; Dwyer, Ringstaff, & Sandholtz, 1991; Newman,1990; Papert, 1993). They claim that teachers should not just transmit information that students receive. These theorists emphasize student construction and coordination of effective problem representations (Daiute, 1985). Students need repeated opportunities to engage in in-depth exploration, assessment, and revision of their ideas over extended periods of time.

With constructive approaches, students who engage in generative rather than passive learning activities recall that information more readily because the information is created and used. In contrast, teachers who simply transmit knowledge to students will find that their ideas are inert and not as easily recalled. In a classroom where construction is important, information from various sources *are constructed as they integrate with student voice and personal student knowledge.*

In search for this vision of schooling, three issues are central. First, when teacher and textbook information are used to the exclusion of student knowledge, a richness of knowledge that reflects personal knowledge and diversity that otherwise would not be present is missed. This point is the important aspect of multicultural education that was discussed above.

Second, duplicating teacher and textbook knowledge is a *passive process* that only teaches students to be docile and obedient to authority. As a method of learning, this passive process trains our young people to be dependent learners who need the direction of the teacher to progress. This type of thinking keeps students from constructing personal divergent thoughts that are important to a liberal education.

Passive learning is also unexciting (Goodlad, 1984) and does not provide the sense of personal freedom and creativity that is vital to foster a feeling of ownership with the learner. That sense of ownership involves the learner to give them the critical element of motivation necessary to learn complex

strategic processes (Paris & Oka, 1986). When students are active learners and learn skills when they need those very skills to complete the task, they are motivated. But first, students must gain the will to do the skill.

Third, when students accept teacher and textbook knowledge they often merely duplicate the teacher's schema while holding onto their own schema. Some call this duplication of the teacher's schema as replication, as opposed to an integration of personal and school knowledge, called restructuring (Roehler, 1989). Students accommodate the school schemas to help them survive the educational rites of passage and then revert back to their own schemas when they leave school. Knowledge in a child's life becomes unnecessarily compartmentalized and students find it difficult to access their prior knowledge dependent upon the context they are in. School knowledge is used at school; church knowledge at church; knowledge about friends with friends; practical knowledge is used in other places. School knowledge does not become integrated into personal experience coming from other contexts. Hence, copying school schemas leads to only temporary and not truly educative experiences.

Contemporary educational reformers believe that students should not *passively* accept information from the teachers and textbooks. Instead they should constantly monitor that information against their own existing knowledge and integrate the synthesis of those two into their own schemas (Garner, 1988). Some reformers look for teachers to provide adventuresome teaching (Cohen,

1988) or perhaps adventuresome learning that allows for students to initiate projects, drawing on many sources and constructing new information from what students and their classmates experience (Gardner, 1993; Harste, 1993; Smagorinsky, 1993). As students and teachers learn to use the computer to construct knowledge this way they provide avenues for educational reform (Papert, 1993).

The next sections describe specific concepts of revision that are particularly well suited for work on computers in the classroom. These sections expand in practical ways on the concepts of constructivism discussed above.

Constructing and Revising Knowledge

Empowerment Through Revision of Knowledge

Revising knowledge is one of the foundational concepts for lifelong growth and learning. Revision in writing instruction has been somewhat of a struggle for teachers. In a review of research on revision in written composition, Scardamalia and Bereiter (1986) cited many studies that found small proofreading changes, but few changes at the idea or paragraph level. Similar conclusions were found when students used the computer (Murray, 1986; Owston, 1992; Reilly, 1992). In fact in some cases the computer was used to type in final drafts of papers with no editing similar to using a typewriter (Murray, 1986). This paucity of revision has been a source of frustration for many teachers who hoped the ease of changing and moving text would persuade their students to revise.

In the content areas revision or reconceptualization is vital so that students do not merely replicate the teachers knowledge for the sake of evaluation but rather restructure their own understandings to reconceptualize or include the new information presented. Using the conceptual change model of teaching science, students are asked to expose their conceptions which are occasionally misconceptions about science. Success or failure of the learning is dependent upon the teacher's ability to persuade students to revise their incorrect understandings of these concepts (Anderson & Smith, 1987; Roth, 1989).

Accommodating Diversity of Personal Knowledge

Another part of revision concerns the diversity of perspectives that people have. This diversity is expressed by (a) the differences in background experience, (b) our thoughts and options expressed as "voice," and (c) linguistic differences.

More recently, educators have come to recognize the importance of the prior knowledge the student and the classroom community bring to the learning situation. In A Nation of Readers (Anderson, Heibert, Scott, & Wilkinson, 1985) the authors argue the point that reading is a constructive process requiring prior knowledge. No text is completely explicit but requires readers to draw on what they know. Prior knowledge of any topic has a profound effect on how people interpret information they are given (Anderson, 1977). Science educators discovered that when students' understandings of the world conflicted with the

information presented in class, the student would learn the information briefly for purposes of surviving in school and then would revert to a more personal understanding that the student started with (Anderson & Smith, 1987). Science educators propose that teachers start with exploring the students' prior knowledge. In language instruction and the literature concerning literacy development, researchers also concern themselves with the role of prior experiences, linguistic experience, and knowledge of social norms in students (Au & Kawakami, 1986; Wixson, & Peters 1984; Wilson, & Anderson, 1986; Heath, 1983; Smith, 1983). These researchers described school settings where the students' prior knowledge about the use of language differed with teacher's ideas about appropriate language and caused a conflict in the classroom.

The fact that we construct and revise knowledge in social groups accounts for the fact that different groups have different perspectives, according to McCarthey & Raphael (in press). Part of prior knowledge comes from the cultural group in which students learned language. Instead of building on the strengths of students with language differences, the teachers treated the students' prior knowledge as a deficit. In order to accommodate this diversity and make a personal meaningful connection with students, educators have to do a better job building on the literacy that students bring to school (Auerbach, 1989). Just because computers make revision less complicated does not mean that teachers will teach revision. What is needed is a pedagogy in which revision is taught and valued in authentic writing situations.

Student voice and self-expression are concepts that allow the student to maintain a sense of identity and uniqueness while they are learning specific content. The student voice affords students a sense that they can connect school content with their goals and purposes in life. Dewey (1938) emphasized the role of individual knowledge and experience. Most knowledge in schools is imposed from outside the experience of students in a static, matter of fact way. What Dewey calls the "traditional approach" does not invite the student to challenge, edit, or modify information presented.

In this section, some of the reasons why it is important to revise knowledge in the schools instead of simply asking students to accumulate facts were discussed. Different computer programs and the teacher's use of the programs, in part, can determine whether students revise knowledge or simply learn to duplicate school-sanctioned knowledge. The next section provide an overview of the uses and lack of use of technology in the classroom.

Reform and Technology

Technology now permeates every segment of our society. From grocery stores to auto shops to the music studio, technology has changed the way we live. Yet schools have not changed. In fact, schools have been perhaps the last profession that teaches literacy that is not computer literate (Papert, 1993). According to Power On (U.S. Congress, Office of Technological Assessment, 1988) a government study, despite the presence of computers in 98% of the schools in the United States, only half of the nation's teachers report having

ever used computers. The number of teachers who use computers regularly is much less. The study reported that computers are hardly ever used for subjects such as reading, math, or science (also Glenn & Carrier, 1989), but are used almost exclusively for learning about computers themselves.

Unlike many machines, the computer does not make our life more comfortable, transport us, do any physical labor, or prepare our food. The computer is a machine that allows people to record, store, communicate, display, and manipulate thoughts and ideas. The computer allows teachers and students to use personal knowledge and add it to school knowledge. One would think that in schools, where the life-blood of activity centers around thoughts and ideas, there would be quite a bit of interest and use of computers. And yet this is not the case. In the next few sections I discuss some of the reasons why computers have not been used or integrated into the regular curriculum.

Problems Integrating Technology into Education

Lack of Access or Understanding?

It is hard to get a good sense of how many computers are available in classrooms because the numbers are changing as schools buy computers or as computers rapidly fall into disuse. By most reports, only a few computers are seen in classrooms (Yeaman, 1993). By 1988, 98% of the schools had at least a couple of computers, and overall the ratio of children to computers was 18:1. Even if computers were evenly distributed among all schools, which we

know they are not, the average might be only one computer per class. At the same time, statistics from the U.S. Department of Commerce, Census Bureau report that only 52% of all children grades 1-8 and 39% of high school students use computers. Children of color are reported to use computers at a rate 18%-23% less than white students in grades 1-8. So we can conclude that there are computers in practically every school, but only between 39% and 52% of all students have used computers. Certainly lack of access is a problem, but lack of use when computers are available appears to be an added problem. Some reports make the case that although there are computers in schools, lack of teacher training about how to use the computer has kept the computers from being well used in schools (Brennan, 1991; Bulkeley, 1988; Schlug, 1988; Yeaman, 1993). This issue of teacher training will be a focal point in this study.

Confused About the Role of Computers in Education

One of the reasons technology has not made speedy progress has been that educators have not always been clear about the role computers play in education. There is a general sense that computers equal to progress and progress is good. But schools have done little to articulate goals or roles for the computer in any more detail than that. Many agree with the former Education Secretary, Lamar Alexander, that "Computers and technology are intrinsic in the administration's aim to 'reinvent the American school.'" But neither he nor researchers admit to having specific plans to guide the effort to integrate computers into the curriculum (Kondrake, 1992). In a study of 14

schools making plans for school restructuring, only seven schools even mentioned computers in the plan (Ray, 1991). Of those seven, the role of the computer was mentioned in such vague terms that it was hard to ascertain if the computer was to have any effect at all. There is no shortage of such a vague, general sense that more computers equals to more progress. What is lacking is a more profound exploration of the curriculum and the computer's place within it. From such a study, specific methods and purposes for computer and staff development could evolve.

A Wandering Curriculum: Programming as Construction

When schools first started purchasing computers, a strong movement focused efforts on giving the student as much control of the computer as possible. Some in the educational community feared the computer would become an electronic workbook or a video game where students would lose creative control and the machine would take control. At the time, drill and practice (i.e. math facts) and video game software, in which students only had limited choices, were popular. Programming activities started competing with drill-and-practice activities on the computer to get the attention of educators. A group of constructivists including Semour Papert (1993) delved into a simplified version of programming called LOGO. Using LOGO students would give the computer a set of commands to draw with lines. Students had to use programming language such as REPEAT 4[FORWARD 80 RIGHT 90] to create a square. With the same intent the computer classes of the secondary school

focused on Basic programming. By the mid-80s, the most common application of computers was programming (Mehan, 1985). Of course, the focus on programming limited the ability of the schools to integrate the use of computers into the schools (Schlug, 1988).

Programming seemed to be on tangentially related school subjects. The focus on programming also limited access on the computers to those who knew programming commands and how to integrate their use with math. Also, educators equated the entire use of computers with the knowledge of programming. There was a sense that if you knew how to program, you could use the machine. Otherwise, you should not bother. Integration of computers in traditional school subjects was confined to a very limited amount of reading and certain types of math. Instructions were difficult to follow and inservices were much less than adequate. Even though programming was common among teachers who used computers, most teachers opted not to use them at all (Bulkeley, 1988).

The emphasis on programming, while providing intense use of computers in the classroom for some, has not been appealing to most educators throughout most of the 80s. In effect, the fact that computers were used for programming deferred any kind of changes in education because teachers were not interested in programming. As a result, computers were only used by a small group of educators who enjoyed this technical side of computers. The end effect was to pigeonhole or side line the use of the computer to a small

group of educators. Others, prompted by the narrow scope of the computer curriculum, encouraged educators to focus on applications to other parts of the curriculum and enhancements of instructional practices when thinking about goals for computer use as opposed to making computer goals a separate curriculum for itself (Newman, 1990; Kulik & Kulik, 1989).

In contrast to its past technical reputation, fitting somewhere between aerospace design and air conditioning repair, the computer is capable of exciting people, like teachers, who are interested in ideas. A number of studies have been done with computers that indicate that they can be used as tools that can make the activity and look of classrooms fundamentally different than we have ever imagined.

Current Options for Computer Use

Of the many different types of educational computer programs available for the schools today (simulations, drill-and-practice applications, computer managed instruction, and word processing), word processing provides for the greatest opportunity for revision of knowledge because the writer constructs whole ideas and integrates school and personal knowledge on the computer. Students also control and manage the learning process which allows them to be more flexible, creative, and initiating. Although the constructive style is more evident during writing instruction, there is also a need for students to initiate and revise learning in other areas of school work (Anderson, Heibert, Scott, and Wilkinson, 1985; Wixson & Peters, 1984). Constructive software like word

processing gives the students opportunities to become self-regulated learners. The uses of word processing will be an important focus of this study.

Computer managed instruction refers to the type of software in which the computer asks the student for limited answers, assesses the student's answer against its criteria for the correct answer, and prescribes a future set of questions. In this way, the student does not have control of the learning process. Instead the computer regulates the student's learning process. Drill and practice are sometimes a part of computer managed instruction but are more narrowly defined to cover content to be learned as rote. There is a narrow range of responses possible, fixed by the teacher, and presented to the student in small steps.

Computer-managed software instruction often breaks down tasks into atomistic units and offers automated tasks, in which the computer defines acceptable performance. Michael Apple (1992) points out that these characteristics of instruction as they are used on the computer allude to the types of work that do not empower students or teachers to be great learners and earners in their future. When using this type of software there is little time for reflection and deliberation. The type of passivity and lack of opportunity to regulate and manage learning using this type of software reflects a type of schooling which reproduces a society of low-wage workers (Freire, 1970; Newman, 1990; Oakes, 1985; Willis, 1977). Unfortunately, this type of software is very common among ethnic, minority, and low income populations while other

students use more constructive type software (Borta cited in Mehan, 1985). Computer-managed software is allowed to regulate and control students' learning and reflects the type of relationship many low-income parents have with their employers. Teachers also tend to prefer this type of software because students do not require the teacher's time to plan or manage (Bahr, Kenny, & Hannaford, 1993).

Computer managed instruction limits learning for students at the lowest and least empowering level and the same is true for teachers. In the 1970s and 1980s one of the largest and most subtle educational reform movements took place as the publishing industry published teacher-proof curriculums. Today software from Joostens and IBM (called Edu-quest) has the same effect on classrooms in the information age. Out of practice and deskilled, the teacher becomes a technical manager. In an approach described by Erlwanger and called Individualized Programmed Instruction, students learn by doing worksheets and taking tests. When the student completes the worksheets and passes the test he/she can go onto the next higher level after a conference with the teacher. In interviews with Benny, Erlwanger discovered that although Benny had been getting most of his math correct, the boy's strategies and rationale were incorrect and could cause Benny many problems in his future work in math. This example calls our attention to the need to address the teachers' professional knowledge base in any reform. Since computer managed instruction contains the same elements as the teacher-proof

curriculum of the past, it is unlikely that Benny would fare any better in the 1990s. It appears that the use of computers in the classroom could easily become a vehicle for continuing the traditional education described earlier.

Student empowerment, as a type of educational reform, occurs in part when students have the opportunity to revise whole thoughts and regulate their learning. Another critical element in such a reform movement includes the ability to revise knowledge to reflect students' different backgrounds, perspectives, and development.

The next sections explain some ideas about what reform is necessary and how computers can be a tool to facilitate those reform goals. In particular, the focus is on the computer as a tool to foster construction of knowledge, to provide the opportunities for revision and manipulation of ideas, to allow the student to add voice to writing, to provide for more resources, and to add graphics to text.

Opportunities to Reform Education with the Use of the Computer

Information Management

Most of the opportunities for reform dealing with the computer pertain to the computer as a machine to express, communicate, store, and manipulate ideas. The computer becomes a type of idea manager. Schools deal with knowledge as a central goal. It is knowledge that educators treasure, and the computer is a machine that allows learners to create, store and manipulate that knowledge. Some scholars report that our next period of history will be labelled

the information age. David Thornburg (1994) has recently declared that the information age is already passed and that now we are in the communication age. If either of these are true, computers and technology as a whole will play an integral role in the society managing that knowledge. Students will think of information not as something to possess completely since there is much more information in the world than any person could possibly learn. Instead people will think about information as an entity to manage. Students will realize that information helps them manage their own lives instead of being controlled by others.

Revision of Knowledge Using Multiple Sources of Data

Now with the advent of use of the modem, CDs, networking, telephones, and reference software, there is a great deal more potential for information available to the classroom. The burden of access to a wide variety of information with technology is greatly simplified. Students can see information from various perspectives and in different forms. This allows them to evaluate differences in information from different viewpoints. With easy access to a greater variety of information, teachers will no longer have to spend great amounts of time telling and providing information to students, which is presently the most common activity in classrooms (McDiarmid, Ball, & Anderson, 1989). Teachers will have more time to be able to teach students *about* knowledge. Educational researchers have long sought classrooms where the flexibility and revisionary qualities of knowledge are considered. Teachers can also spend

more time guiding the learner to be more strategic in their use of information to *revise* their own knowledge.

The real power of accessing more information with the computer lies not in the ability of the student to memorize more information, but rather to use the greater fund of information to revise using more personal information. Personal information is the type that is meaningful to the individual in his or her unique context. Since there is more information, the student can sort out which information is most important to him/herself and create a production that fits his/her needs. The student may want to consider the audience or purpose for writing.

Revising Graphics

Graphics provide information and context to the document students are revising. In classrooms pictures can be digitized into the computer with video cameras, scanners, and graphics libraries. Especially for students who are not artistically talented, these graphics can add meaning and give a personal touch to text in a way that was not previously available. Students can scan in pictures of their family with a text dealing with their family. Pictures of historical scenes and science experiments can add invaluable information and a professional look that has never been available to students before.

For students learning English, the context that a picture provides is very beneficial. The picture helps give away the meaning of the words in the text. As children look at the picture they can more easily predict what the words on

the page say. Even for native speakers, pictures with text increase student recall (Whitmer, 1991).

The Social Context for Revising With Computers

A number of researchers have considered how the use of the computer facilitates collaboration between students. Collaboration is when at least two people contribute information as a team to solve a common problem. Collaboration is particularly helpful when people are trying to solve complex problems (Polin, 1991). The mechanical procedures for editing and saving can be complex for beginning users with computer, and therefore foster collaboration and coaching. Even more importantly, a collaborator can provide the dialogue that would empower students to write with perspective and voice.

Certainly collaboration can be practiced in many subjects and many parts of the school day. However, the computer facilitates collaboration because of the public display of the monitor (Daiute, 1985). It is more difficult for two students to work together on pencil and paper because only one of the group can read the text at one time. Flower and Hayes (1980) found that for students whose mechanical ability to write was not automatic, there was a great cognitive burden on the child to just form the letters and spell the words. Since so many of the child's cognitive capacities were devoted to mechanical tasks, it was difficult for the child to focus on *how* he/she was presenting the content. Students who were unable to juggle those thoughts usually ignored the rhetorical question. During writing time using the computer, since one student

is consumed typing in information, the other can read the text and deal with the rhetorical questions.

One of the obstacles teachers and students face in education is that often people carry out strategies mentally without explicitly explaining how they are being strategic. The act of collaboration, i.e., sharing information, forces students to verbalize their intentions, therefore making invisible strategies public (Reilly, 1992). In some classes student computer experts emerge to help other students (Michaels, 1990; Murray, 1986).

These types of collaborations fundamentally change the nature of schooling. As teachers allow students to share knowledge about language, computer, and content with each other, they recognize the importance of the knowledge that rests in all people. Traditional forms of teaching such as lecture-recitation-seatwork (Ringstaff, Sandholtz, & Dwyer, 1993) in which the teacher has the answers and student try to access them, appear less attractive. In collaboration there is a sharing of power and control that empowers the learners to initiate goals and actively pursue them. These factors are particularly important considering the needs of individuals with backgrounds unlike that of the teacher or the majority culture.

Of course none of the reforms mentioned here will be realized by simply installing technology in the classroom (Reilly, 1992). The presence of the machinery itself will not affect the routine behavior that students, teachers, and parents have all become used to over the past 100 years. In fact, technology

can be a force for deterioration in the schools as well. Mindless repetitive programs that do nothing more than satisfy a child's interest for action can substitute for rigorous study. It appears that technology will give educators the tools to reform education, but will education be reformed? As usual the greatest potential for reform depends on the teacher, hence the importance of staff development. In the next sections, I will outline some of the recent thought about staff development for computers especially when the goals are revising knowledge.

Learning to Use the Computer as a Tool for Revision

Many studies emphasize the primary importance of the teacher's role and the social structure of the classroom on how computers are used in the classroom (Mehan, 1989; Michaels, 1990; Pisapia, 1992; Reilly, 1992). In and of itself, the computer makes no impact unless the social structure and the teacher in the classroom inspire or at least accommodate a change. In a study of two teachers who had computers in their classroom, Sarah Michaels (1990) found that teachers used the computer in different ways consistent with the type of social structure they maintained. In answer to the question, "Do computers make a difference?" one would have to answer, "No, teachers make a difference." Computers in and of themselves do not have an impact on the classroom. The existence of computers in a classroom is a "dependent variable" (Michaels, 1990) reliant on teachers and the social structure to form patterns of use and goals.

Teachers would normally use the computer differently depending on their goals and the social structure of their classrooms. Some teachers, in the Vygotskian tradition, give models of how to use the computer and gradually give up control of the computer (Keran, 1993). Others report having tried models and metacognitive guidance (Salomon, 1989). Teachers who try to integrate their computer time with the writing process need to deliberate a great deal about how process writing fits together with computer use. These patterns of use require the teacher to think carefully about goals and progress and how those fit with computer lessons. Certainly, this is difficult in a world where teacher time is limited.

In contrast, some teachers have minimal interaction with students who work on the computer (Murray, 1986). Teachers who use computer-managed instruction may only need to schedule student access to computers. This is an attractive option for teachers already very busy doing other projects or in need of individual time to teach students with special needs. Perhaps for this reason, teachers prefer that students do computer work independent of their regular classwork (Bahr, Kenny, & Hannaford, 1993). In essence, teachers give up the option to control curriculum when they choose this method because the computer-managed instruction software is not always flexible enough to accommodate differences in curriculum. We see the different goals and outcomes of classrooms where teachers use computer-managed instruction as well as those who use the computer for revising knowledge.

An important decision teachers make concerns the question of student access to computers. Researchers report that computer use at all is fairly uncommon (Bahr et. al, 1993; Bulkeley, 1988; Brennan, 1991; Yeaman, 1993). On the average, Bahr found that the computer was used 15 minutes per day. How the teacher allows students to access the computer determines how much and what purposes the computer is used for in the class.

Lack of teacher knowledge about computers often signaled lack of student success on the computer (Brennan, 1991). In fact teachers recommended more training (Schlug, 1988). Charney, Reden, & Kusbit (1990) report better scores for students when the teacher provided guidance than when they followed a tutorial or just explored on their own. The next section investigates methods of teacher training that may result in teacher growth learning to use the computer in the classroom.

Developing Technical and Professional Knowledge

Teacher knowledge about technology can be divided into technical and professional knowledge. Technical knowledge is knowledge which can be reduced to procedural lists are usually done repetitively such as accessing and saving files. It is necessary that teachers become *technically* competent on software and hardware to feel comfortable enough with the computer as a tool to teach with. Technical knowledge becomes the teachers' tools that allow them to make *professional* decisions.

Professional knowledge is information that allows teachers to make

decisions about applying the best uses of technology based on the teacher's knowledge of the unique context of the situation. This unique context consists of the teacher's own knowledge, the students' knowledge, the curriculum, and the context (Schwab, 1978). With these four types of knowledge, the teacher as a professional decides on methods to use with the computer as a tool for constructing knowledge. As this study will illustrate, the fact that the context and the curriculum have changed dramatically with the introduction of computer, influences the teacher's traditional ideas about how to prepare for teaching. It is this change in thinking that may be the source of the computer's potential to reform practice.

Teachers appear to have persistent difficulty integrating the computer as a tool into classroom instruction. Much of the literature on technology teacher inservice describes traditional style lecture (Charney, Reder, & Kusbit, 1990). In these types of inservices, teachers go to a lab where a room full of computers is set up in rows and a teacher at the front of the room gives instructions about how to run different types of software. Most often computers, setup, and software differ from the computers teachers have in their classrooms. Since the machines teachers learn on in the lab do not work exactly the same as others in the classroom, teachers often become frustrated when they try to use what they learned in their inservice in their own classroom.

Another group of research that merits consideration for this study examines staff development *situated in the classroom*. Feiman-Nemser and

Rosaen (1992) discuss "Guided Learning." Different perspectives range from Schon's (1987) "reflective practitioner" to Shower's (1985) structured teacher "coaching." Significant elements of guided learning include (a) the importance of the collegial nature of the relationship between teacher and mentor (Hargreaves & Dawe, 1990) and (b) integrating and practicing the goals of the teacher education program in authentic settings (Brown, Collins & Duguid, 1989).

Those serving as coaches or guides to teachers attempting to integrate technology into their practice should share trust, support, and a good sense of self-worth as a professional. Such norms of collegiality can break teacher isolationism and create an atmosphere where change and educational reform are possible (Hargreaves & Dawe, 1990). An important part of collegiality is a sense of reciprocity where teacher and teacher guide share information that is indispensable to the success of the reform. Reciprocity not only gives teacher and guide a sense of professional self-worth, it also ensures that both participants are investing commitment, taking control, and adding vital information needed to determine the success of the goal.

Staff development programs are more effective when the activities that teachers and guides work with are situated in an authentic context (Bernal & Villarreal, 1990; Brown, Collins, & Duguid, 1989). The more the learning is distanced from the classroom where the teacher eventually has to use the practice, the less likely the teacher will implement the activity. Many people

assume a separation of knowing and doing. They falsely speculate if teachers know how to use the computer, they can teach and implement the curriculum using the computer. Brown et. al (1989) point out that knowledge is mostly not abstract, but situational and dependent on the context. Guides and teachers can practice authentic activities that are closely related to integrating technology into the curriculum by observing lessons in the classroom being taught using technology, co-planning, or co-teaching such lessons.

<div align="center">Goals of this Research</div>

So far this chapter has reviewed traditional and constructivist flexible concepts of knowledge and how they relate to the use of computers in the schools in the past and present. A vision of the use of the computer as a tool for revising knowledge in schools that is empowering has been projected. Finally, ways to cultivate that professional knowledge among teachers and students in schools have been discussed.

The focus of this study centers not only on what the computer can do, but also <u>what happens when teachers, students, and I, as the staff developer, face the challenge of helping students use the computer as a tool for revising knowledge</u>. This is the principal question of this dissertation.

The teachers and I approached our exploration by agreeing to explore the use of the computer as a tool for constructing and revising knowledge using student experts and cooperative learning approaches to develop a sense of student voice and an awareness for the audience. I hoped that as time passed,

we could develop a number of teaching techniques that would be helpful for us as we learned to use the computer as a tool for revising knowledge across the curriculum. This desire led to the formation of the first two subquestion of the study. What is the path teachers follow to make this transformation toward using the computer as a tool for revising knowledge? (b) What methods do teachers use to help students use the computer to revise knowledge across the curriculum? These questions are addressed primarily in Chapter 3.

During the course of the study, I noticed the participant structure of the classroom changed from one that used primarily whole group to one that used primarily small group instruction. I also noticed that over time, the learning took on a different character. To me this was a fascinating and unexpected evolution that led to the third subquestion addressed in Chapter 4 (c) What changes are evident in the social structure of the classrooms when computers are used as a tool for revising knowledge across the curriculum? What changes in learning are observed in the different social contexts? Although the benefits of this style of teaching were unexpected, as we noticed the evolution in character of the classroom in one classroom in particular, we began to consider this context as a tool for teaching in the classroom.

The fourth subquestion of the study addressed in Chapter 5 concerns the actual revisions students made in their writing that reflect their personal choices as opposed to revisions that reflect conformity to grammar rules or consistency in style: (d) What are the ways students express their personal knowledge,

<u>personal voice, and personal preferences as students use the computer as a tool for revising knowledge across the curriculum</u>? Here I am interested in a typology of the different types of knowledge that is expressed by students during the revision process. I'm also interesting in the different contexts in which that voice is expressed.

The above questions give direction to the content of what is to be researched. The next chapter should provide the methods that will be used to investigate these questions. At the end of the chapter, I describe the setting in which the research took place.

CHAPTER 2: THE METHODS AND CONTEXTS OF RESEARCH

The primary goal of this description of research methods is to provide the reader with a sense of how I came to understand the culture of classrooms where students and teachers constructed and revised knowledge using technology. In describing my research methods, I draw on thinking from various ethnographers to describe data collection and analysis. I also add some of the substance of my analysis during my data collection, analysis, and presentation for this manuscript.

I start by describing some of the history of the study by pointing out the shifts and narrowing of focus of the study. In subsequent sections, I relate how I collected, analyzed, and presented the data of the study. Other conceptual issues that guided my practice such as preserving the context and complexity of the evidence and my role as a participant observer follow. The second half of the chapter consists of a description of the contexts of the study where I describe the schools, teachers, and students involved in this study.

Research as a Process of Exploration

In contrast to some studies where deductive reasoning leads the researcher to establish and test a hypothesis, I used a more inductive approach to research that allowed "what was happening in the classroom" to lead my

topic of study. This does not mean that I had no area of focus when I started to gather data. On the contrary, as the four subquestions included in Chapter 1 illustrate, I focused on the area of staff development using technology. Although questions on that topic directed the general focus of my observations, the topic of study shifted and narrowed over time reflecting my growing understanding of the teachers and the context I studied. I therefore include this section on the evolution of the study to provide the reader with a sense of the history of the study in hopes that the reader might see how I arrived at results of my research.

From the time the general focus of my research was established, the study evolved continually until I finished writing the final draft of the text. In part, the focus of the study shifted based on my emerging understanding of the grounded theory I was becoming more thoroughly acquainted with. Even more than that, however, the focus of the study evolved based on patterns of behaviors I observed in the classroom. In this section and periodically in subsequent chapters, I will comment on my emerging and evolving understandings before, during, and after the collection of data. However, more importantly, I will show how the topic of study was a dependent interplay between my purposes for the study and what I observed to be happening in the field.

Ethnographic researchers decide conceptual issues before entering the site (Erickson, 1986). At first, I prepared for this study by identifying certain

general conceptual issues that were interesting for me to observe in the classroom. Even before my observations my thinking about the study was changing. In December 1992, I wrote a short summary of areas I had expected to focus on in my proposed observations. In this document, I focused on vague ideas of staff development for computer writing. Two months later, I established framing questions and a draft of a proposal which further focused my ideas including classroom management and content area writing using the computer in the classroom (research document, 2/5/93)[1]. My thinking had evolved to an expanded focus that included more areas to study. In subsequent longer drafts of proposals after I had done extensive background reading (research documents, 3/10/93), I matured in my understanding of grounded theory (Glaser & Strauss, 1967) concerning the use of computers in schools. As I read articles and organized the ideas presented in research on the use of technology, staff development, and writing, my ideas about the role of the computer in schools and more specifically in writing were clarified. I also came to understand some of the more and less successful methods of staff development. At this stage of my proposal, my research questions (as noted at the end of chapter one) became more specific reflecting a greater depth of knowledge. I also began to link ideas about teacher change to the larger issues of educational reform that are reflected in the first chapter.

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[1] Research documents consisted of my writings in log format and early thoughts of my study that were written before my study officially took place.

The focus of my observations shifted again in response to what I was observing in the classroom. After I gathered data during a visit to the site, I would often pause to analyze or reflect on the general directions of my observations. Most of the data that highlights shifts in emphasis was gathered in the researchers log (types of research are discussed later in the text). I used the log as a place to provide personal statements of belief and as a place for taking stock of the progress of the study as a whole.

This concept of *reflexivity* between the proposed goals and what is observed at the site allows the ethnographer to narrow the focus of the observations (Bogdan & Biklen, 1992). This narrowing of focus during the data collection, in turn, allowed me to focus my fieldnotes and interview questions. I pursued many goals while gathering data that I did not finally report on in the end. Part of the reason I narrowed my focus was because I had too much data at the end of my collection period to create a cohesive writing concerning all of topics for which I had gathered information.

Even before that time, however, I narrowed the focus during data gathering as I noticed interesting and significant shifts in the participant structures in the classroom. As I noticed shifts in the classroom toward small grouping, peer learning, and revision, my observations noted those areas of interest in more detail to the exclusion of other less interesting phenomena. I found these themes interesting in part because I do not believe these ideas have been fully explored in current research for this context. I also focused on

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these ideas because the shifts in the roles of students and teachers in this context of evidence of educational reform that was discussed in Chapter 1. I mention a few evolutions of change in emphasis here and others later on in appropriate parts of other chapters.

At the beginning stages of data collection, our progress in the staff development and student projects was slower than I had anticipated. I had recorded my frustrations in the Researcher Log (described later) with the thought that obstacles could be a possible focus for the study. During this time, teachers were asked to pack up their room for a building renovation project that was taking place. Teachers also complained about cutbacks in state and local funds to the district which resulted in staff layoffs and moving their principal to another building. The state government had also announced four means by which they would reduce funding to the district. Other proposals altering funding for the schools were pending in the legislature and at the ballot box. I recorded my thoughts about a general mood that we seemed to be in and the implications for my study:

> Right now I feel I could do my dissertation on obstacles to staff development. Teachers are so upset about what is happening in the district (and state) that capacity of information and change is being reached. I think I have to back off... (Researcher Log, 5/25/93)

My ideas for what the study could look like reflected what I was observing in the classrooms at the time. The emphasis on obstacles for the

use of technology would have been a shift in focus for the study that I did not foresee at the beginning of the study.

In addition, at that time in the study, the technology due to be placed in the school was just in the process of arriving. One new computer had been in the classroom less than a year previously and many teachers were still trying to get printers in their classroom. The building had not been wired for cable for television or networked with the server, and the library had not completed its transformation to become a media center. I had anticipated a period where we would be testing hardware and software to make sure it worked; however, after the first month, comments referring to obstacles to staff development became frequent.

During a period of two weeks in the second month of the study, four out of five of my Researcher Logs (5/21-6/4/93) recorded the mention of different obstacles we were encountering while pursuing the use of computers in the classroom. However, my observations of different obstacles did not persist. In subsequent logs, obstacles were only mentioned two more times in the entire study. In the final analysis, I decided not to pursue obstacles as a focus for the study since it was not a focus on subsequent reflections by the teachers on the use of the technology.

There was, however, a persistent interest in the roles and responsibilities of teachers and students and in establishing routines and procedures for computer use throughout the first months and continuing on until the end of the

study. The first fourteen Researcher Logs covering the first four months of the study reveal discussions on topics of routines, roles, and responsibilities of teachers and students using the computer in 12 out of 14 of the log entries (Researcher Logs 4/19-7-31/93). At this point in the study, we explored ways to use the computer consistent with a constructive philosophy and yet integrating with the classroom work. Since the teacher was not able to be at the computer all the time and the computer was still relatively new to students, we immediately discovered the need to establish routines and roles that allowed students to learn from each other.

Subsequent entries continued to reflect these same areas of focus but narrowed to include those concerning only revision, grouping, and gathering information from many multiple sources. Only as I approached the data analysis and writing stage of the dissertation did I come to realize that my most complete data came from revision, grouping, and gathering information from many different sources.

As I entered the writing stage of my dissertation, my topics for writing included a much broader focus. After I wrote the first chapter on revision and reexamined my data, I realized that I had a great deal of excellent data to use and decided to limit my focus to revision. One more major shift in focus occurred as I wrote the dissertation when it became clear that some of the most interesting and revealing data was found in Chapter 4 on the topic of social contexts for revising knowledge. Again the focus of the study narrowed to

reflect my thinking and understanding of the data in the writing stages of the study.

One of the purposes of mentioning the shift and the change of focus is to give the reader a flavor for some of the history of the development of the writing. More importantly it shows how my study was one of exploration and that there was a constant dependent and close relationship between the data that I was collecting in the field and the narrowing focus of my observation and writing. The events I observed in the field helped me to reflect on my purposes for the study and helped me refocus the topic of the study. The description of this process is intended to help the reader understand how the concept of reflexivity played a role in the writing of the study.

Over the course of the different stages of the study, from the proposal writing stage, to the reflections the data collection stage, to continued thought of the study as I was analyzing data and writing up the results, there was shifting and narrowing of focus. In my role as a staff developer, I was not without influence directing the course of the classroom events. I explain my role as a staff developer and how that role impacted the study at the end of the chapter.

Data Collection and Analysis

The purpose of the data collection has to become informed about the ideas and practices in the classroom concerning the use of the computer to revise knowledge across the curriculum. In the next paragraphs, I provide the reader with a general summary of the theory and practice for this study.

Starting in the section on 'Data Sources,' I have included in more detail the practices of data collection and analysis.

Data Sources

The following data sources were chosen because they generate different viewpoints of the classroom. Assertions that are supported with evidence from three different sources are considered to be more credible than evidence that comes from just one source. I worked to establish this triangulation (Bogdan & Biklen, 1982; Hammersly & Atkinson, 1983) of data for the different assertions. By presenting the occurrence of the events from the different sources, I hope to strengthen the plausibility of the assertions.

The different forms of data were useful to give a view of the work of revising knowledge that is heavily weighted toward the teacher's perspective. This perspective was particularly important because the teacher is crucial in promoting revision of writing and the use of the computer in the classroom. As the teachers come to feel comfortable with technology as a tool for literacy for themselves, they can begin to perceive it as a tool for the students. Also, because teachers have such a dominant role in the establishment of rules and procedures in the classroom, teachers can limit or expand access and the use of the computer. As a staff developer, my goal was to help the teacher integrate the practice of technology as a tool for achieving the curriculum. Hence, the study focuses on the teachers' perspective since their role as facilitator is so vital to computer use in the classroom.

The different data sources also provided confirming or disconfirming

evidence as I searched for significant patterns of thoughts and behaviors. I

collected and analyzed the following kinds of data: (a) audiotapes of classroom

events and informal debriefing discussions after lessons with teachers that

document changes in teachers' learning, thoughts, and observations about how

the classrooms change; (b) student work including computer printouts and

videos created by students; (c) audiotapes of formal interviews with teachers at

various points of the year to show the development of teacher thought; (d) my

fieldnotes recording classroom and contextual events; (e) the Researcher's Log

to express my feelings and to get a macro view for how the study was

progressing ("taking stock" of the study); (f) audiotapes of planning sessions

and planning documents from the teachers, myself, as well as district staff

development and outcome documents.

Different perspectives necessary to achieve triangulation are gathered

from different people and different contexts. Audiotapes of classroom events

differ in context from debriefing sessions which took place immediately after the

lesson. The audiotapes of the classroom events illustrate in detail what

happened at the time of the lesson. These were particularly helpful in teasing

out what was actually discussed during class time by the participants. Using

this instrument, student voices are also heard and lend a different viewpoint

from teacher and researcher. This source acts as a check against the

debriefings and the fieldnotes which recount chunks of the lessons through the

lens of the researcher in the case of fieldnotes and the teacher in the case of debriefings.

Student work on the computer was usually printed out as a final copy or in rough draft depending on the purpose of the printout. Other work students created with the aid of the computer was never printed out (see software section at the end of this chapter for further explanation). Instead they were recorded directly on videotape and sent home for the parents to view on their VCR. In this study, they are identified in the text by the word "video" followed by the date (e.g. Video, 8/6/93). The advantage of recording on video as opposed to printing on paper is that video allows for full color images as large as the television set, full motion, and audio.

Student documents, as artifacts for research, provide a perspective different from other data. Distinct from data that shows the *process* of classroom learning activities, student documents display *end products* that often are not recorded on an audiotape. The invisible thoughts that students have are made visible on paper or video and supply an additional different perspective.

In contrast, debriefings capture the teachers' thoughts in a context separate from the students before the teacher has a chance to organize or analyze the lesson. In this context, the researcher gains access to the teachers' thoughts which are often not evident in the transcript of the lesson. Since debriefings happen immediately after the lesson, the teachers' memories

are fresher, more detailed, and less likely to be altered by the teachers' interpretations. During the debriefings the topic of conversation was left somewhat open in order to capture in detail the thoughts the teachers had concerning that topic in particular. Since debriefings occur usually separate from children, teachers are able to speak more freely that they would around children. During debriefings I also voiced impressions as a staff developer and responded to the lesson.

Audiotapes from informal interviews were used to capture a teacher's ideas after she had a chance to think about classroom events over one week (in the case of the first- and fourth-grade teachers in the migrant program) or three weeks (in the case of the first and fourth grade teachers in the regular school year). I usually had prepared four questions to help focus the conversation and I refrained from giving my opinions for that period of time. The teachers' answers were usually longer and more detailed during the interview that in the debriefings. The teachers had an opportunity to express their ideas at a more general level. I discovered that teachers used that time to take stock of different aspects of the study and summarize what they had learned or what they were feeling.

In fieldnotes I recorded the actions and words of class lessons focusing on specific areas of interest for the study. Similar to the audiotaped lessons, with the fieldnotes I recorded the context of the classroom at the time it was occurring. Because the writing occurs during the classroom session, the

perspective is fresher and more literal from that of a planning session, interview, or log which typically takes place long after the events have taken place and allows for more memory loss and interpretation. However, while writing the notes, I was able to concentrate my observations in specific areas of study. In contrast to the audiotapes, I was able to record the *actions* and the *visual cues that added emphasis to the voice* of the participants whereas the audiotape was limited to the recording of the words. Fieldnotes were expanded in the field and then expanded again when I entered them into the computer each day data was gathered. Audiotapes were transcribed at the end of the study.

Occasionally I reviewed the data I had collected for emerging themes and patterns. Many of these themes and patterns were recorded in the Researcher Log. The Researcher Log was my chance to comment with my "voice" on events and themes that were not appropriate in fieldnotes or debriefings. I allowed myself more freedom to explore my thoughts and feelings about the study in general. The context and voice in this document differs again, therefore lending an additional perspective that is not present in other data sources.

I met with teachers not only to gather information, but also to ponder issues with them and co-plan our next steps. I wanted to develop jointly a vision for teaching using technology with the individual teacher and to implement the vision in that particular context. I recorded those planning times

with short debriefing sessions of a couple of minutes up to 10 minutes to think about how the lesson went and to revise subsequent future lessons. Often the planning and debriefing purposes of these sessions commingled. Our thoughts in a debriefing led directly into changing plans for the next session. We often responded to problems in past lessons by planning to change future lessons so that the same problems would not arise. In addition to the quick prelesson planning and postlesson planning/debriefing, I met with each teacher weekly for an approximately 20 minute extended planning period.

Again, the purpose and context are different for planning. Audiotapes of actual planning sessions and planning documents all take place prior to the actual lesson. At times plans are written or simply made by either the teacher or I and then discussed with each other for revision.

As significant themes and patterns emerged, I examined those aspects in the field more closely to see if the themes and patterns played a significant role to shift the roles and routines of students and teachers in the classroom. Significance is defined by how the words and actions of the participants described in the data affect their subsequent words and actions. If an event appears to be significant, I examine subsequent data to identify other events that confirm my belief that the event signaled a shift in the roles and routines of the participants of the study.

I also examined data to identify continuing patterns of generalization and disconfirming evidence to be able to define the question more exactly. I

pursued disconfirming evidence, examining showing discrepant cases especially closely to figure out why these cases did not follow the general pattern. At times the answers were very useful in illuminating locally distinctive subtleties in the different sites. Other times, the discrepant cases compelled me to modify assertions slightly. Also, I came to feel the need to recognize the existence of other pressures I had not recognized in earlier versions of the assertions.

It was helpful to establish a long-term relationship with teachers in order to get to know them better, to establish rapport, and to practice habits of thinking over time to effect change in teachers' thinking and use of the computer. In the Geneva School District,[2] I worked with a first- and a fourth-grade teacher from the end of March until June 1993 and August to February 1994. From September to February, we met to discuss plans to change the classroom to use of computers for authoring across the curriculum. I met with each teacher to plan, model lessons, debrief, joint teach, or hold interviews at least two or three times a week. We co-planned lessons and thought about routines and procedures that would allow computer use to continue during the regular course of the day. These routines and procedures included charts and grouping that helped students know when they had access to the computer and assignments and assigned roles that explained what students were to do at the computer. We usually planned during an art or gym planning period.

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[2] The Geneva District is described later in this chapter. Pseudonyms are used throughout this text when referring to the teachers, students and schools involved in this study.

Sometimes directly afterward, I modelled or tried out a lesson by myself or jointly with the teacher. We frequently had short five-minute debriefings discussing how the lesson went and confirming plans for future meetings. A formal interview was scheduled approximately every three weeks on Fridays. A sample week is shown in Table 1.

Table 1

Sample Schedule of a Classroom in the Geneva School District

Geneva	Monday	Tuesday	Wednesday	Thursday	Friday
Maria (first-grade teacher)	Plan & model lesson		Joint teach lesson & debriefing	Joint teach lesson	
Katie (fourth grade teacher)		Joint teaching & debriefing		Joint teaching & debriefing	Joint teaching & Formal Interview

Not every week of the study was the same. However, the above table is an example of the type and frequency of the activity that might take place in a typical week of data gathering.

In the Fruitland Summer Migrant School[3] more intense work needed to take place since the study lasted only six weeks. This site is important because it provided me with a contrasting context. Students came from a

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[3] The Fruitland District is described later in this chapter.

different background and teachers may have been willing to take more risks in this summer program that they would not have taken the regular school year.

I met with a first-grade and fourth-grade teacher with eight other teachers for half-day inservice/planning sessions before the students arrived. I also worked with the fourth-grade teacher for a half-day inservice before the summer school started. During the summer work, I worked with each teacher in class for approximately an hour every day during the time when each class had five computers to use. I held interviews and planning sessions every week and with short debriefings before and after most of the class periods. This schedule reflects a more intensive study than the study in the Geneva District because the duration of the study was limited to six weeks in the summer. The same cycle of planning, teaching, debriefing, planning, teaching, debriefing occurred in the Fruitland School as needed. Sometimes we planned for a number of lessons but after trying out the lessons we decided to alter the plans during the debriefing. We usually planned on for a series of lessons. As in the Geneva district, I modelled lessons when the format was different or when we tried out a new method. Planning sessions occurred based on our needs. We made new plans for each unit and then altered plans as appropriate to meet the needs of the students. Interviews were given most weeks on Friday for 15 to 20 minutes.

During the summer, I met with the teachers more times a week to become familiar with the teaching, context, and students to make progress over

the few weeks in which the study took place. Table 2 shows teaching every

day and periodical modelling of lessons, joint teaching and debriefing

throughout the week.

Table 2

Sample Schedule of Observations at the Fruitland Migrant Program

Fruitland	Monday	Tuesday	Wednesday	Thursday	Friday
Kari	Planning, Model teaching & debriefing	Joint teaching & debriefing	Joint teaching & debriefing	Joint teaching & planning	Joint teaching, & Interview
Patti	Model teaching & debriefing	Joint teaching & debriefing	Joint teaching & planning	Joint teaching & debriefing	Joint teaching & Interview

Data Analysis

In this study, data analysis was supported with theory building. As

themes emerge during the data collection (Hammersley & Atkinson, 1983),

potential theories of explanation were developed. These served to narrow the

study's focus and were tested against subsequent data. After my first reading

of the data, I formed 23 analytic categories[4] or codes that I used in the second

reading to identify specific evidence and categorize the evidence by one of

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[4]See Appendix C for examples of research analyzing documents.

those codes. Codes referring to provisional categories were selected based on their ability to inform my research questions and the frequency that the categories surfaced in the various texts.

The categories were divided into five main groups all focusing on using technology: (a) staff development, (b) obstacles, (c) revisions, (d) activities, and (e) context. In turn, each of those categories were subdivided to describe sub groups. Staff development was divided into examples of times when someone modeled a process to help teachers learn. That code was described SDM. SDT was the label of staff development that was directed toward technical procedures. SDI referred to staff development concerning instructional issues.

Drawing on the constant comparative method outlined by Glasser and Strauss (1967), I continually subjected my ideas to the categories identified to see that the data described the categories listed. In staff development, I noticed significant events were comprised of elements of teacher confidence or lack of confidence. Because there was no category to describe confidence as an element of staff development, I created a new category SDCON. While reading the data, I noticed the context of the staff development was also significant and created the code SDC.

Obstacles were divided into OT referring to technical obstacles, OC focusing on obstacles that were contextual in nature, and OK referring to obstacles "kids" caused.

Revision of knowledge (RK) was indicated next to data where students made idea level changes in papers. When the revision was carried out on paper I indicated RKP. I wondered about the length of the revisions and labeled those parts of the data with RKL.

Activities were identified in various ways. AESL referred to activities with English as a second language students. Activities where cooperation or lack of cooperation were noted, was labeled AC. Teachers devised different procedures for students to get access to the computer (AA). In some data, ideas referred to classroom management and were marked with AM. AMML referred to parts of the data where mini-lessons were taught. If there was mention of students using multiple sources I labeled the data AMS. When experts were used I marked AE on the side of the data sheets and then recorded that example in the chart.

The final categories allude to the contexts of the different classrooms. PC refers to Patti's context. In the same way, MC was marked next to ideas referring to Maria's context, KC for Katie's context, and KariC for Kari's context.

Categories that informed my questions, had high frequency, and appeared significant became candidates to develop into the focus of the study. Whereas information in other categories that proved less promising for the study were used less. Since I recognized the most significant and frequent data informed the category of revision of knowledge, that became a focus of the study. Given that I have recorded many examples of revision of knowledge

from every data source in those charts (Appendix C), I can be robust in my abilities to generalize the findings of this study to other classrooms.

All of the data except for some of the teachers' plans were recorded as files on disks and on the hard drive of my computer. All of the fieldnotes were identified by date and topic. I printed out the data and marked the evidence with the codes I had decided to use. Later, I photocopied all of the coded data so that enough copies were made so that evidence on a page containing one type of code could be placed in a folder designated for that code. I also made sure each page was dated and identified for the data source represented. The result was a group of file folders with data in the form of sheets of paper with a particular code on each of the papers in that folder.

I thought that the one sheet of paper would provide enough context to understand the code placed on the paper. However, I found myself wanting to read more of the context and so I sought out the computer files on disk. I read the context and additional information by accessing files on the computer.

I used a variety of different ways to organize ideas that were emerging as I worked with the data. The methods of organizing and thinking about the data in writing developed as tools along with the assertions for the study. As I discovered themes I recorded thoughts on a matrix I called "big ideas" where I recorded prominent examples of each code listed by data type. A sample listed in Table 3 for one of the codes. For example, as I was reading the "fieldnotes" and I discovered a comment or action by the teacher that served as evidence

of classroom "management," I recorded that date, a summary of the comment

or action, and sometimes a little quote from the fieldnotes in the table where it

crossed between "Staff Development-Modeling" and "Fieldnotes examples."

Table 3

Sample of Chart to Organize Coded Data

Codes	Fieldnotes examples	Interview examples	Researcher Log examples	Planning examples	Debriefing examples
Staff Development-Modeling					
Staff Development-Technical					

As I identified a strong or interesting example of each code I placed the

date and a description in the matrix (see Appendix C for example). In this way,

I was able to recognize clearly the frequency and significance of patterns

emerging in the data. As I looked across different categories, I could observe if

evidence patterns were present from different sources. The strength of the

assertion was measured in part by the frequency of the pattern across the

different data sources. When substantial data from three sources existed, I was

able to claim a triangulation of data (Bogdan & Bilken, 1982). This triangulation

allowed me to measure the significance and decide if the pattern was strong

enough to report in the study. In this way I was able to decide which themes

were worthy of closer study.

As I reviewed all of the data from different data sources all with the same code, I reexamined each piece of evidence to see if the events where worthy of further study. Sometimes upon rereading fieldnotes, I discovered those fieldnotes contained significant events. That is, the events for the first time signaled shifts in roles and routines of the participants. Many times these were the events that describe in this manuscript and examine in detail.

Based on the apparent strength of an emerging pattern which I observed forming on the coding table (Table 3), I wrote down some ideas in a narrative form to test out an assertion. Sometimes the narrative was simply a free standing text that stated an argument. Other times I tried to tie in ideas together forming what I could envision an abstract would look like. Sometimes I speculated on the composition of different chapters. In between forming the analysis, I talked to colleagues who helped me clarify some of the major emphases. I also drew semantic conceptual maps (example on Appendix C) that helped me clarify the emerging themes and patterns. An example of that semantic map is shown in Figure 5. The main heading, "Revising Writing" has subheadings of "social contexts" and "content." Each of these subheadings represent an emerging idea. Examples originating from the coded evidence are clustered around the subheadings to demonstrate support for each subheading.

As I wrote, discussed my ideas with others, and charted my thoughts patterns and routines surfaced as a result of the different ways in which I was thinking about the data. I found that narrative writing, interwoven into every

step of the process, became longer and more detailed. Eventually the narrative

writing grew to a point when I decided to write a chapter.
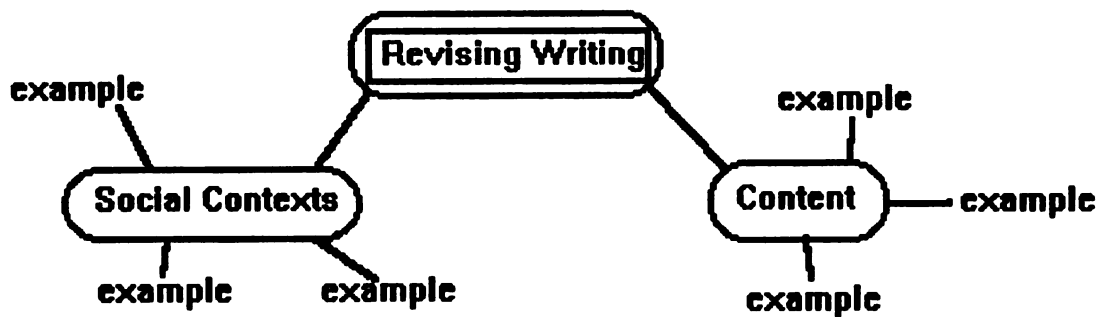
Figure 5. Example of a semantic map

Presentation of the Data

The aim of qualitative research is not proof in a causal sense, but the

demonstration of plausibility (Erickson, 1986). The first chapter includes the

question and subquestions that become the focus of the study. Using data as

evidence, I attempt to lead the reader to observe interesting patterns of

behavior that recur in the study that speak to the questions of the study. In the

previous section, I noted how I gathered and analyzed data looking for patterns

of generalization that occurred repeatedly in and across settings. At this stage

of the study I must organize and record that data in a way that makes the

assertions seem plausible. It is not enough that events were observed only a

few times. It is important to persuade the reader that adequate evidentiary warrant (repeated examples) exists for the assertions to be made. Therefore, a concerted effort has been made to support an assertion with many examples.

I used number of different ethnographic tools in the presentation of the data to help make my assertions plausible. Much of my evidence take the form of quotes from interviews or conversations I had with teachers. At times, I use longer quotes to give the reader a better feel for the context of the situation. In the same way, I use vignettes as a tool to help the reader obtain a clear, detailed understanding of the pattern of events I found to occur repeatedly. A vignette is a description of an illustrative event I wrote drawing on different sources such as interviews, written work of the participants, teacher plans, interviews, audiotapes, and fieldnotes. I started writing a vignette using a core event as a basis. Then I mixed in examples from other events that meshed into a coherent narrative. All the events in the vignette were taken from evidence, but the vignette does not describe the event exactly as it took place.

Usually I provide the longer quotes and vignettes at the beginning when I am just starting to develop an assertion to give the reader a fuller, more detailed sense of the event. The reader may use that quote or vignette as an easy way to remember the "ground" or "anchor" of the evidence for the assertion. As my assertion develops and the use of fully detailed examples appears repetitive, I tend to use shorter quotes reducing detail by removing sections. The places where I remove text is indicated by ellipses (...). This

allows the reader to focus on data relevant the assertion and allows the study to be more readable.

Preceding and following descriptive evidence, I provide interpretive commentary that links the evidence to the assertion and highlights important aspects of the descriptive evidence. In a vignette or a direct quote, there is so much rich description that is "multi-vocal in meaning" (Erickson, 1986, p. 152) that the reader cannot take it all in on the first reading. Therefore, the author has to point out to the reader the details that are significant for the author. Otherwise, the reader will get "lost in the thicket of uninterpretable detail" (Erickson, 1986, p. 152). Especially used as foreshadowing commentary, interpretive commentary acts as a road sign to give the reader a chance to anticipate the patterns to come. Following the descriptive evidence, interpretive commentary restates the links between the assertion and the data in more detail. This also gives me the opportunity to pause to discuss the significance of that piece of data and develop an aspect of the assertion that was not apparent in earlier data.

One of the problems I encountered in earlier drafts of my writing was that repeated long descriptive data passages became tiresome. I felt a responsibility to provide many examples in order to prove that the assertion made was not a one time occurrence, but rather common in the study, but I also did not want the writing to become tedious. To remedy my dilemma, I borrowed from Erickson's (1986) thoughts to provide a long vignette or quote to

instantiate the assertion followed by several other pieces of slightly different evidence that allow the reader to experience a range of examples. The first long vignette or quote makes the assertion clear and concrete with more detail and within a fuller context. These types of rich vignettes and quotes are called "particular description." The purpose of particular description is to *clarify* the assertion for the reader. The pattern the researcher is asserting is exemplified in the particular description. Following that, the many different examples supporting the assertion are called "general description" that provide evidentiary warrant by demonstrating the frequency and breadth of evidence (Erickson, 1982).

In this section, I have presented ethnographic tools in an order in which they are most commonly written in this study. However, the order presented here should not be considered the only order in which to present the data. I jostled the order where the data and the meaning was more clearly conveyed by a different order or where the order seemed unnecessarily repetitive.

Context and Complexity

Throughout the study, there was an attempt to conduct and report the study in the contexts and complexity in which they took place. This type of study contrasts with a study where isolated bits of coded information are recorded and lifted from the context of the situation (Bogdan & Biklen, 1982). As I have indicated in the above section on the exploration of the study, there is

an attempt to focus observations within the context in which they occur.

However, I made an explicit attempt to record the context of the situation in its complexity in my fieldnotes. Interviews were transcribed and analyzed in whole pieces. They were not broken up into separate parts. An attempt was made to provide the reader the context of the research sites as you will note in this section. In the parts of the study where I wanted to provide quick examples for the purpose of showing typicality, I provided the reader a sense of the context in the interpretive commentary preceding the data.

During the course of the study, I worked as a staff developer with two first-grade teachers and two fourth-grade teachers in two separate contexts and with two separate timetables. Below I describe those different contexts.

The Research Sites

The Geneva School District

The Geneva School District is located in a metropolitan area in the midwest near a major university.[5]   Students from the Geneva District come from neighborhoods that consist of a concentration of students of diverse cultures and languages. Other neighborhoods are composed of low income housing and neighborhoods similar to suburban areas. Support for staff development in the district exceeded opportunities in surrounding areas. Teachers were given five days to attend conferences of their choice with the approval of the administration. There were numerous voluntary inservice

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[5] An overview of the schools and classrooms is noted on Table 4 page 72.

opportunities. Many of the inservices took place after school. When an initiative was undertaken by the district to revise a curricular area teachers were provided with substitutes so that they could attend inservices during school times.

The district also encouraged teachers to develop personally and professionally by undertaking one of three different types of sabbatical lasting from one year to six weeks during the summer. Many times, teachers were given incentives to develop curriculum during the summer or to attend inservices. A series of eight inservices for the purpose of providing all staff with the basics of word processing, spreadsheets, and data bases were provided in August and after school three times a year at the high school.

The district had recently received some funds to enable the district to update and increase the amount of technology in the schools over several years. With the exception of one multimedia station per elementary school (purchased three years earlier), the elementary schools had not been supplied with new computers since each elementary school had been furnished with four Apple II computers ten years earlier.

A District Technology Committee consisting of parents, teachers, and administrators had recommended and had approved a plan to provide each elementary teacher one new computer. This occurred in the Spring of 1992, a year before the study began. Six months later the district made sure all

teachers were equipped with a printer.[6] The fact that the computer was still somewhat new to the teachers, who were only vaguely familiar with the basic workings of Microsoft Windows and the computer itself, was a constraint to the professional development and the use of the computer as a tool for revising knowledge, which was the focus of the study.

Two elementary teachers were to work outside of their classroom half time in the spring of 1992 as Teachers on Special Assignment (TOSA) for the purpose of developing the technology curriculum and to aid teachers to learn how to use the computer in a technical sense and to learn how to use the computer as a tool to aid classroom instruction. The district has a tradition of hiring existing classroom teachers who have special interests and special training in different curricular areas to provide staff development to their colleagues in the district. I was one of the TOSAs hired half time to help teachers in elementary schools in technology. The two teachers who agreed to work in this study were friends that I had known through our work on various district-wide committees.

The district curriculum in the Geneva School District is developed by committees of teachers in the district who take an interest in that subject matter. Committees give opportunities for all teachers to give input on the curriculum at various stages of the drafts of the curriculum. Although the writing curriculum had not been altered in recent years, the technology

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[6]Table 5. Time line for computer purchase and staff development.

curriculum had completed the development process and was approved just prior to the commencement of this study. (A copy of parts of the curriculum is listed in Appendix A). The curriculum focuses on the use of the computer as a tool for construction of knowledge and the management of information. I was co-coordinator of the technology committee and I facilitated the development of that curriculum in the various stages.

This familiarity was both a strength and a constraint for the study. My familiarity with the district allowed me easier access to the site and the people in the site. Because I worked in the district on technology, my familiarity with the equipment enabled me to recognize technical and professional problems common in this district. As an "insider" I also began the project with a certain level of rapport with the teachers that would not have been the case had I not been in the district. Finally, because I had a hand in forming the district curriculum, I had a sense of ownership and advocacy for the curriculum that inspired me to work even harder to make sure the main ideas of the curriculum were implemented in the spirit in which they were formed.

One of the tasks of the ethnographer is "to make the familiar strange" (Erickson, 1986, p. 121). My familiarity with the district was a disadvantage in the sense that I may not have noticed routines and patterns of the school that might have been more obvious to a person familiar with the district. Since I was aware of this fact, I worked at distancing myself from the site by being more observant and by becoming familiar with other settings in which

computers were used in different ways. By becoming more familiar with other sites, the differences in routine and patterns of behavior dealing with computers became more apparent to me in the Geneva district.

My Role as Participant in the Study

Whereas in Geneva I was working as a staff developer, in the second research site, the Fruitland District during the summer, I served as a director of the migrant program and staff developer for technology and other areas. (Overview of schools and classrooms is summarized on Table 4.) In Fruitland I had to balance these roles of ethnographic observer and participant (staff developer). The balance between researcher and participant was most difficult when I was demonstrating or co-teaching a lesson and unable to take fieldnotes during class events. In that case I recorded my thoughts in written form after the class session and/or recorded my thoughts or taped the lesson to help me recall the events when I wrote up the fieldnotes that night.

My work as a staff developer in both situations was to help the teachers develop an understanding of roles the computer could play in the schools. Part of that work involved transferring control of the task of teaching and devising methods and thoughts about the use of the computer to the teachers. I modeled often when I thought the teachers felt insecure teaching using

Table 4.

Table 4.

Overview of Schools and Classrooms

District, Teacher, School	Grade Level	Number of Students[a]	Number of Computers	Socio-Economic Status and Ethnic Origin
Geneva School District				
Maria at Tera Elementary	1	21	1	Middle income neighborhood & university housing where many international families live. Twenty-five %[b] of students born in Asia while 15% from Latin America and 15% from Africa.
Katie at Tera Elementary	4	20	1	
Katie at Highland Elementary[c]	4/5	24	3	Upper & lower income housing. Predominantly Euro-Americans with 40% total minorities.
Fruitland Migrant Program				
Kari at Star Elementary	1	17	5[d]	All low income bussed from urban and rural areas. Seventy percent hispanic, 21% African-, and 9% European-American
Patti at Star Elementary	4	18	5	

[a]Number of students changed over the course of the study and so an average was chosen.

[b]All percentages are approximate.

[c]Katie transferred to Highland Elementary School after three months of the study.

[d]In the Fruitland Program, one computer stayed in each class and four machines rotated to each class as a floating lab for one hour a day.

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technology because of their inexperience with technology as a tool. As Katie

explains at the end of the study:

> You did do co-teaching in the beginning....You started out kind of
> shoulder to shoulder teaching with me, first teaching it by yourself,
> and shoulder to shoulder teaching and you began to distance
> yourself from the actual instructor but you were still there as the
> resource person to talk over about what you saw or what we can
> do next or, you know, how things are going (Audiotape interview
> 1/10/94).

Katie notes that I worked closely with her modeling the teaching of experimental

methods. As the teacher gained in knowledge and confidence, I worked more

as a consultant reflecting ideas I had and on ideas the teacher had concerning

the lessons.

Although each teacher and classroom was a different situation that

necessitated slightly different styles of staff development, I worked with

teachers using the guided practice model (Feiman-Nemser & Rosaen, 1992)

which includes observation, conversation, co-planning, and co-teaching.

Finally, teachers taught by themselves and I acted more as an observer and

consultant. However, my goal was to have the teacher guide the instruction

without my input.

I met with teachers as a staff developer who was encouraged to provide

input as well as just listen to the teacher's perception and proposals for future

lessons. Therefore, some of the tapes document my suggestions and

proposals as a co-constructor of the event. Although I did have the authority in

the migrant program to force changes, I avoided exerting my authority because

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I know that to force teachers to make changes would have preempted co-planning.

Tera Elementary School

The school, with just less than 200 students, is a one story brown brick building located on the edge of a middle income neighborhood bordering on a church, a shopping center, and a park. The playground consists of a basketball court, a baseball field, a soccer field, and a large peastone covered area where children climb on a variety of climbing structures. On the inside of the school, the halls are covered with brightly colored art work and a dark green crushed stone floor inlaid with decorative stone tile. Over the course of the study a new gymnasium, art, and music rooms were added to completely enclose a grassed in courtyard area. Also offices and classrooms were rebuilt and equipped with a mounted television, telephone, and wired for cable television and a computer network.

The original library that existed for the first three months of the study was a cramped book room with a small room housing a rarely used multimedia outfit and four Apple II computers. During the summer the library was moved to a newly constructed area and the original space converted to become a spacious media center with large windows. A separate room in the media center houses the computer network and a stack of three videotape recorders. A multimedia cart loaded with a television, a monitor, a computer, a VCR, and a video camera sits on one side of the library next to a computer which accesses

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international news stories by cable. Unfortunately, water leaked into the media center a couple of times delaying the opening of the library for approximately the first two months of school.

In the first three months of the study, the atmosphere in the Tera Elementary School appeared somewhat confused. As described earlier in this chapter, teachers felt somewhat disappointed that there was no assurance of state funding for the next year pending a statewide vote in June. The Geneva School District had its state funding reduced four times over the previous year. As a result many staff in the Tera Elementary School had received a "pink slip" indicating that there was no assurance of their employment for another year. Budget reductions had also forced building principals to take responsibility for two instead of one building while taking an assistant principal. The staff, who had played a major role in selecting their current principal, was scheduled to lose their principal and acquire a principal from another building.

As soon as the weather warmed up in March, bulldozers, trucks, and front end loaders prepared the ground for the massive building additions that were to take place. The loud rumbling sounds and vibrations proved to be very distracting to teachers and students of the building. Finally, in the last weeks of school, teachers were pressured to pack up all their materials before the end of the school year so that workers could start the renovations of the existing building as soon as the school year was over.

Students at the Tera Elementary School in the Geneva District comprised a very diverse population. Many attend school coming from foreign countries while their parents study at the university. As a result, there are many students do not speak English when they arrive at school. Students for whom English is a second language frequently spend one to three hours a day in an English as a second language (ESL) room especially staffed to teach English.

Tera Elementary School is also the elementary school in the district where many hearing-impaired students come to receive instruction from specialists. Similar to the ESL room, students spend up to a half a day in a hearing impaired classroom depending on the quality of hearing the children experience. The fact that such programs and such a diversity of students exist at Tera was a major consideration in my selection of the site for study of the use of technology in the construction of knowledge. I was interested in how the context of the computer as a mode of learning would impact upon the learning of students for whom oral language is an obstacle. I was also interested in exploring the context of learning for special education children given the computer's ability to access and manipulate graphic images.

Over the course of the school week, classroom teachers had three hours of lesson preparation time while special area teachers taught their class. Students attended physical education classes, music classes, and art classes for approximately one hour a week. Other students were tutored or taught in

small groups by part-time teachers including a reading teacher, learning

disabilities teacher, a librarian-aide, and social worker.

Maria

Maria's first-grade classroom was largely unaltered by the building

renovation with the exception of the addition of the 21" television monitor and a

telephone. The following is a description from fieldnotes taken on

November 19:

> The room is colorful and the walls are full of pictures and figures. In
> the front of the room there is a "Smells We Like and Don't Like" chart
> with names of foods. A chart describing the parts of the nose is also
> tacked to the front of the board and hung down over the blackboard.
> Next to that is an ABCs chart, a Jobs Chart, November calendar,
> rules, and a seasons chart with colorful animals on it.
>   On the north wall, many small plants in plastic containers sat
> on the heater. Designs cut out of paper were taped to the windows
> above the heater. The clock is displayed on the monitor with the date
> and a revolving message displayed at the bottom of the screen. The
> science table with lots of projects making rainbows, rocks, and
> mirrors magnifying glasses.
>   In the back of the room are cubbies (eight inch square storage
> spaces) and a table were the crayons, scissors, and other supplies
> were stored. There is also a table that had a number of Korean
> books and artifacts on it. Next to that table is a bin full of folders
> labelled, "Take home folders." Behind that on the back wall is a
> birthday graph made of little cakes outlining how many birthdays for
> each month. Towards the door there were book shelves with paper,
> and supplies.
>   On the south wall near the door is the teacher's desk which is
> stacked with shelves, papers, a teacher planning book open and full
> of writing. A pencil jar had all kinds of writing instruments and
> scissors in it and a flower is in a small vase in the middle of the desk.
> In front of the desk is a round wooden table and in front of that is a
> book shelf were books were put in groups and space is made for
> displaying one book at a time. In the southeast corner of the room is
> the computer on a large table. There is a disk storage container that
> is full disks and a few other papers around the container. On the left
> side of the computer is a printer (Fieldnotes, 11/19/93).

In the center of the gray-carpeted floor, four groups of three tables with two chairs each were clustered facing each other. To the north side of the room, there was an open space where students often sat during group times. During sharing time each day, four students were scheduled to bring something to show the group from home and talk about. Students sitting on the carpet were expected to sit up and listen to the sharing. Students were expected to raise their hands to get a turn to ask a question or speak while they were sitting on the open space in whole group. Maria seemed particularly engaged in finding out why the children brought what they did and what stories they could tell about their sharing object. She supported students by asking them questions about their sharing and soliciting questions from the group.

Whole group lessons were also carried out while children sat on the floor "by the easel." Maria used the chart paper on the easel to record children's stories that students read over and over. Later in the week, students read books made up of the same stories to each other in paper books Maria made up for them. When a "language experience book" was read to another, the listener signed the book. Math and science lessons were also often started with a short group time in front of the easel.

After the group time, Maria often dismissed students one by one to go quietly to their table and perform an activity by themselves or with their partner. There were quiet times when students were usually allowed to talk

to each other briefly. During times other times students were expected to talk to their partners to fulfill their task.

Maria pursued professional development in a variety of ways. She attended workshops in technology, developed social studies curriculum and purchased materials with her own money, often sharing them with other staff members (Fieldnotes, 10/30). She was an active member of the local area reading council and at one point showed a video on portfolios over the cable television network as an inservice to all teachers (Fieldnotes, 1/26).

In the area of technology, Maria found the computer workshop classes provided by the district to be "intimidating" because "the person right next to you might be real competent and you're not" or "the instructor might point you out like you made a mistake" (Fieldnotes, 1/5/94). At home, Maria's husband provided programs and graphics for Maria to use at school, but she had trouble learning from him because he would become impatient or leave her alone. Maria used their home computer to write newsletters.

Maria often spoke of how the students of today learn quickly on the computer. At the end of the program she expressed her amazement that "first-graders know how to open a file and save a file." She claimed that students appear "confident" of performing tasks on the computer in front of the class whereas that is not the case on the "easel" (Fieldnotes, 2/4/94).

Katie

Katie taught fourth-grade at Tera Elementary School in the first three months of the study and then transferred to Highland Elementary School after the summer break where she taught a fourth/fifth-grade class. In the front of the room (east wall), a blackboard was framed by brightly colored bulletin boards to the sides and above the blackboard. One bulletin board described products in Michigan and the second posted newsletters and information of interest to the students in the classroom. Cabinets under the bulletin boards stored books and above the blackboard a projector screen and a set of maps were affixed to the wall. A door led to a classroom storage room filled with wooden cabinets and class supplies.

The northeast side of the wall had the entrance to the room. Otherwise the entire north wall was filled with wooden cabinets for storage. On the west wall (back of room) one IBM 386 computer was joined by the older Apple IIe, a rectangular table, a moveable storage cart, and a large round table. Groups of students often used the tables in the back when there was a group project.

A full set of 10 year old World Book encyclopedias was stacked in a movable book shelf near the southwest corner of the room near the sink and drinking fountain. The windows ranging from three feet along the south wall to the ceiling kept the room bright and warm on sunny days. Counter space along that wall was covered with language arts activities and science

projects (cup-size plastic potted plants). Desks were clustered around the room in groups of four with the teacher's desk and 36 six inch square boxes called cubbies near the door.

Students were split up into small groups for instruction in reading and language arts. Small groups of students met with Katie and were assigned work to read and other work inside their reading group. LEIR centers focusing on a similar theme were set up in different parts of the classroom. Students performed the tasks in one center and then moved to other centers to do the tasks there. Social studies and science lessons started typically with textbook reading and whole group discussion initiated by Katie followed by individual pencil-and-paper activity. Math activities commenced with a teacher-directed discussion and frequently followed with individual reinforcement exercises.

Students were allowed to use the computer without a time limit to write assignments or make an entry in the computer. Katie complained that students aren't "comfortable" using the computer to save their writing or access previous files. "They sometimes expect the minute they get back there it's just gotta be instantaneous [access to files and printing]" (Interview, 5/20/93). She also laments the fact that during recess time students also enjoy using the computer to play Tetrus, an action game with shapes instead of playing Carmen SanDiego, a problem-solving simulation game. Like Maria, Katie's husband uses their home computer quite often, but Katie

does not cite him as one of her resources for learning the computer. Both of Katie's teenage children used computers at home and at school for writing and editing regularly. "Their writing is done mostly on computer" (Interview 1/10/94).

Katie had experience developing district curriculum and constructing her own. For language arts, she employed the tools of a published language arts program called Language Experiences in Reading, but improved upon the content of the program's activities until she had created her "own" themes and content. Katie is also an active member of the local reading council and the district elementary technology committee that generated and approved a part of the district curriculum.

In the Fall of 1994, Katie transferred to a fourth/fifth-grade combined classroom in Highland Elementary School. Like Tera Elementary School, Highland had undergone renovations, but the renovations at Highland had taken place the previous summer. Since Highland had been a technology pilot school much of the networking was being tested there first and each classroom had three computers for every classroom from second- to fifth-grade.

Highland is an older elementary school constructed in a rural area that eventually became a suburban area. Highland was located on the corner of two major roads where there was a large grocery store and several other stores and businesses. Surrounding this intersection were

houses and apartments which were built in the previous twenty years. The students who attended Highland came from these upper-income houses and from apartments and condominiums ranging from middle to low-income housing. Students of a variety of races and economic levels attended Highland. The halls which had light colored tile floors, light colored walls and bright lights, were lined with student art work.

Katie's classroom at Highland was very similar to her classroom at Tera Elementary School. Similar to her old room, her room at Highland was filled with clusters of four student desks and encircled by three tables and many shelves for books and classroom materials. There was a wall of windows where she stored science materials and LEIR stations. Three computers (One 486 and two 386 PCs) and a printer dominated the back of the room contrasting with the one PC in her Tera classroom. Cubbies, storage shelves, an entrance, and two tables were located in the west wall opposite the windows. The bulletin board which framed the chalkboard was filled with the student's art work similar to Katie's room at Tera Elementary. Some of the differences was that the teacher's desk was opposite the entrance and the room at Highland was much shorter and smaller than Katie's room at Tera.

Fruitland School District

Fruitland is a middle-sized postindustrial city in the midwest. Although there is still a great deal of diversified industry in the area, it is

much reduced from the 1950s-1970s when foundries and factories provided parts for a flourishing auto industry. The depressed housing market caused by lack of jobs in the area has allowed low income people to continue to live in the area. In the south and west outskirts of the county there are many fruit crops and processing plants that provide seasonal work for many to supplement their income. Most of the intercity area is composed of middle to low income racially mixed population.

Fruitland Summer Migrant Program

Enough migrant workers travel and reside in the area to necessitate a summer migrant school for the children of people who work in the fruit crops. With the help of the Fruitland School District and the State Migrant Department, I initiated a program in Fruitland five years previously and served as director. Students, who had to move for the purpose of picking or processing food represent the lower classes with 70% of students of Mexican decent, Twenty percent are of African American decent, and 10% stem from European origins. Although the program has a home-study program, most of the 300 students in the program attended this school program which lasts four weeks in July and the first two weeks of August.

Almost all students are bussed from the urban areas to attend only morning classes in this school in one of nine classrooms from kindergarten to 12th grade. The classrooms are located in an older elementary school that occupies an entire city block. The school is surrounded on all four

sides by lower priced houses which are old but adequately groomed. Surrounding the school are spacious playgrounds and grassy areas. The basketball backstops have no hoops because as the principal explained, "I do not like to put them out because people steal them." There is a large backstop in front of a baseball diamond. The large shiny gray metal pipe swings, slides, and climbing equipment of the 1950s is set on a hard dirt surface where grass survives sporadically.

In the south end of the building, there are two dark wood trimmed portable classrooms with a porch to cover the entrance door. Just north of the portable classrooms is a one-story red brick structure which leads to an old two story darker brick portion of the building. The migrant program uses the portable classrooms and the classrooms at the south end of the building. At the south entrance of the building, some people sit behind a folding table full of plastic wrapped sandwiches and a piece of fruit on a foam tray. Students at the program were served breakfast and lunch which they ate on table clothes set on the grass (later in the summer 10 picnic tables were used).

The red-tiled floor in the south hallway is brightened with skylights. Empty coat racks are on one side of the hall and light blue shiny wall on the other side is covered with posters and newsletters from each of the classrooms. The first room was locked up and stacked with furniture. In the

rooms, cupboards and file cabinets were turned around to prevent access during the summer.

The curriculum for the summer school focused on reading and written literacy. Subjects such as science were to be integrated with reading and writing (expectations for reading and writing are listed in Appendix B). Experts from outside the district trained teachers and parents in science workshops and provided each classroom with equipment and help instructing two "hands on" science lessons.

Each classroom had at least one Macintosh LCIIIs in the room and the teachers were expected to integrate the use of the computer in their classroom. In addition, two floating laboratories of four Macintoshs (computers mounted on carts and wheeled to each room) were used in each classroom one hour a day. Students were also given a swimming lessons every day for two weeks at the end of the program.

Patti

Patti had moved into the area after preparing to be a teacher in another state for years. She was hoping to find a position teaching elementary school in the area. The migrant program hired her on the strength of her knowledge of the use of thematic, interactive, literature studies for children.

I provided a computer (like the ones we used at school) for her to take home. My main purpose was to understand some of the ways having

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the computer at home would be useful for a teacher. Patty had "very little background" of the computer programs we were using. Patti's daughter who was familiar with the computer, helped her when she got "stuck" using the computer. Since Pattie "ran out of time" at school she did "most of the work at home" since she had a computer at home (Audiotaped interview, 9/6/93).

I encouraged Patti to learn to use the computer over the summer by pointing out that computer knowledge might give her an edge when applying for teaching positions. By the end of the summer she felt confident enough to help in a workshop we gave concerning the uses of hypercard[7] in the classroom. She also put her hard copies of her hypercard books into her professional portfolio.

The strong presence of the computers was obvious during the hour that Patti's fourth-grade classroom had the floating lab. On the north wall of the room four computers were lined up in front of the chalkboard. On both sides of the chalkboard, Patti had put up two brightly colored bulletin boards with children's work. Students desks clustered in groups lined the west wall where two windows were located. In the south side of the room many tables were filled with science experiments. The teachers desk was situated in the south of the room in front of the bathroom and sink/counter area.

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[7] We used hypercard to present text and pictures with the computer.

Kari

During the regular school year, Kari worked in a smaller neighboring

school district with two other young teachers who worked for the migrant

program. Although she has not gotten a computer in her classroom in the

neighboring school district, she hopes to get one in the next year or so.

Kari does have an Apple IIe with a printer at home that she uses because

she is "busy in the classroom" and "does not have any time" to use the

computers at school. Kari used her computer at home to copy writing by

students to make personal books for each child. At the beginning of the

summer, Kari attended a half-day inservice about the use of computers in

general and the use of Kidpix[8] in particular. In addition, Kari attended night

classes regularly and planned on completing a masters degree eventually.

Kari placed all the five computers in the classroom on the southeast

portion of the room not far from the door which made it easy to place the

four floating computers into the room everyday. Further on the south side of

the room, two decorated bulletin boards framed the chalkboard. In front of

the bulletin boards was a large carpeted open space where students sat

while Kari and students shared books and where many whole group lessons

were taught. In fact, mini-lessons using the computer were also taught from

that spot since a computer was stationed at the southeast corner of the

carpet and all the students could sit within 10 feet of the monitor.

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[8] Kidpix is a drawing program for children.

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The teacher's desk was located in front of a wall of wooden framed windows on the west side of the classroom. In the northwest corner of the room, some furniture that was not being used in the classroom was stacked next to a tall wooden cabinet that Kari did not use. In the northeast corner of the classroom, a tiled bathroom protruded into the room next to a sink and a low counter top with cabinets. The upper half of the east wall was composed of windows to the hall way. Students performed individual and group work as they sat in groups of four at tables (two students per table) in the middle of the room.

Most of the day consisted of activities in literacy in Kari's classroom. Kari read to the students almost every day and allowed students to read and write every day. Students were allowed to talk and share ideas with each other in the classroom which is consistent with what Kari says are her "beliefs on what learning looks like and how kids learn." Kari explained, "I think kids learn from interaction....I think having at least two kids at the computer is great" (Interview 7/26/93). During reading students read stories they have written sometimes and other times they read from easy trade books. During writing, Kari encouraged students to use "magic spelling" [invented spelling] to write about themselves and their own experiences.

Why I Chose These Sites

I choose to do my research in two different sites to provide comparison and contrast. The Geneva School District is located in a

metropolitan area in the midwest near a major university. This setting contrasts with the Fruitland District which is a middle sized post-industrial urban city with a great deal of agriculture surrounding it. Students from the Geneva District come from neighborhoods that consist of a concentration of students of diverse cultures and languages. Other neighborhoods are composed of low-income housing and neighborhoods similar to suburban areas.

The teachers and school systems were also contrasting. At the migrant program in Fruitland, the teachers were newcomers to the system whereas the teachers in the Geneva system had been in the district over 10 years. I wanted to investigate the different contexts in which teachers might feel freer or less free to change their style of instruction. In my experience as director of a summer migrant program, I find that summer is usually a time when teachers may not feel as constrained by patterns and norms of traditional classroom behavior. In contrast, both Katie and Maria were observed during the regular school year when traditional expectations may serve as a constraint to change. Thus I felt the summer school contrast might help me learn about differences in the teacher's ease of change in routine and procedure in the different contexts.

I choose the particular sites for many reasons. Primarily the sites were schools in which the use of the computer had just been introduced and teachers would be just starting to determine how to use the computer in

their classrooms. Table 5 shows a timetable describing the period of time when teachers in the Geneva District received at least one computer and a printer. All computers were distributed close to April 1992. Over a period of several months, printers arrived and were allocated to classrooms. It should be noted that this study started approximately a year after all teachers received their IBM 386 computers. I thought that teachers needed at least this period of time to gain a personal sense for the use of the computer in the classroom. I felt that after a year of learning about and getting used to the computers themselves, the teachers would be ready and motivated to learn about instructional uses for students.

Teachers in all of the classrooms studied had a computer in their homes, but they had limited contact with the computer. In three of the four cases, the principle user of the computer in the home was someone other than the teacher in the study. Even after the year when the computers were in the classroom, we encountered over the course of the study many technical obstacles to overcome to get the computers and software to work seamlessly. In every classroom, students and teachers were learning technical procedures to write, edit, and print throughout the approximately first two months of the study. The teachers in the Geneva District had two opportunities to help students learn technical procedures (see Table 2). In April and May teachers helped students learn technical procedures. Then in

Table 5

Timetable for the Study.

the fall, with a new group of students, teachers helped another group learn to use the computer.

The study at the summer migrant program in Fruitland was considerably shorter, albeit more intense. Teachers worked in the classroom for six weeks during July and August 1993 (Table 2). Although extra technical support was given to each classroom in the form of trained computer experts from the high school, learning the basic and advanced technical procedures was an important first step students and teachers had to work through.

<u>Software</u>

A final part of the context of the study is the software that was used. In the following section, I describe the software briefly so that the reader can understand how the software works and also get a sense for the place the software plays in the context of the study.

In the two first-grades participating in the study, both of the classrooms used primarily a paint program for children called Kidpix. Kidpix allows the child to draw a picture, stamp some pictures that are already drawn, and construct text on the same screen. That screen is printed out and saved as a file.

Many of those screens can be made to appear in a sequence as if each screen was a page in a story. To put the screens in a sequence one

must use a presentation software. The presentation software for Kidpix is called Kidpix Companion. So with Kidpix Companion, students can create and save several screens in a linear fashion to create a "storyboard." Some people think of the storyboard as a slide show and each picture or file as a frame in the slideshow. In the migrant program, we were able to record those storyboards on a videotape for students to bring home and show their parents. In the Geneva School District, stories were put together in storyboards, but they had to be saved and played using a computer and a disk.

In the fourth-grade migrant classroom (Patti's class), we used a program in a way similar to how we used Kidpix in the first-grade classrooms. This program, Hypercard, can be used to create very sophisticated programs. However, we just used Hypercard to write a series of text and picture cards in a manner that allowed them to be presented as linear pages in a book. Many of these Hypercard presentations were also stored on a video cassette and taken home to show parents.

In both fourth-grades, Word Perfect (Katie's class) and Claris Works (Patti's class) were used as word processing software. Using that software, students were able to access pictures and integrate them into the text. They were also able to cut and paste text and change the size and style of the font.

In the previous chapter, I described theoretical and methodological concepts that guided this study. In a middle section, I described how those concepts were used to gather the data, to analyze the data, and to present the data in written form. Finally, I portrayed the context of the four classrooms from a rather wide angle to specific details of the setting. The larger context of the study includes the cities and schools in which the classrooms are located. I also narrowed the focus of the context to include the physical classroom, the teacher as a professional, and the software that was used in the school.

In the following chapter, these methods are put into practice to describe some of the many routines and procedures the teachers used to revise student writing. One of the most common procedures was to encourage students to revise a content area passage written by the teacher. I also describe other contexts where student revision occurs. Some students revised their writing at the keyboard. Other students revised information on paper and then input that information in the computer later. These different routines help the reader get a better idea of the inner classroom workings so that the reader can appreciate the changes in the participant structure that are described in the fourth chapter.

CHAPTER 3: NEW PROCEDURES TEACHING REVISION

The procedures that we, as teachers, used to teach revision on the computer over the course of the study were limited in part by the fact that we did not use complicated software. We used Kidpix for the younger grades and Hypercard and word processing software for the older grades. The only exception is the use of the multimedia equipment in one classroom for a couple of projects early in the study and the use of a card that helped us capture images made for computer on a videocassette recorder.

In order to be of use for a large audience of teachers and researchers, it seemed important that we use common and inexpensive software in this study. The four classrooms where the research took place had between one and four computers, which is typical in most schools and allows educators to apply ideas from this study to a broad audience.

Using relatively simple software also allowed us to focus more on learning school subjects other than technical computer procedures. Most of the teachers had very few experiences on newer computers and I was afraid that an intensive study of technological procedures and learning complicated software would shift the focus of the study from using computers as a tool to teach in classroom to teachers learning technical procedures on the

computer. In this study, the report of class routines and procedures is intended to demonstrate how these teachers changed teaching methods dramatically as a result of the use of computers and time to collaborate and think about the best role for the computer in a classroom.

The terms routines and procedures, teaching methods, and processes are used interchangeably in this chapter. They refer to actions performed sequentially or not, that provide a structure for teachers and students that allows them to learn how to revise writing more easily than they could without that structure.

Revision, for the purposes of this document, will be defined as a meaning-related change students made in a file on computer or on paper of a picture or text. Revision will also refer to changes students and teachers made in procedures. Revisions include replacing one word with another word to alter or clarify the meaning, adding personal knowledge, deleting text or pictures, and elaborations on text and pictures. At times the revision occurs just a moment after the author has written and other times change occurs days and weeks later when a person rereads the paper after a long break. When a student adds a sentence, word, or a graphic to improve the communication, those additions are all considered revisions rather than copy editing.

Because a child enters into learning situations with some kind of prior knowledge, any integration of that child's prior knowledge and school

knowledge is, in effect, a revision of the child's knowledge. When a child does not show evidence of integrating personal knowledge with school knowledge I do not consider revision to have occurred. This type of reaction to the subject matter is referred to as "duplication" or mimicking. However, if the child has revised his/her schema to integrate personal and school knowledge, revision is present. In every case, the revision as an objective in the lesson was subordinate to the construction of content knowledge and process goals for reading and writing instruction. This includes times when students revised pictures on the computer and words they had written or words that had been written by someone else. In most cases, students revised writing on a computer about a subject matter area. Occasionally, students edited pictures they had copied from clip art or pictures that they had drawn themselves.

Interweaving Reading and Writing Processes

Understanding and responding to text is one of the most fundamental activities that occur in schools. And yet not all students comprehend what they read. Others comprehend in a cursory way, but do not deliberate and contemplate texts. We find this to be true in content area reading in which students after reading a science text, for example, have no ability to recount any of the meaning of the text. This is a common frustration for teachers in content areas, but it is also common during reading lessons. Students often read a text but do not monitor their comprehension or evaluate what they

read. Teachers look for children to recite a dispassionate replication of the

text. In these cases students do not express their prior knowledge or voice

which gives them a unique understanding of the text. In the section below

on editing templates, students are invited to elaborate on the text by adding

their prior knowledge and voice to texts about Illinois and the ocean.

In the diagram in Figure 6 below, I have outlined the types of routines

and procedures the teachers and I developed concerning the revision of

knowledge in the curriculum.[9] These routines and procedures are divided
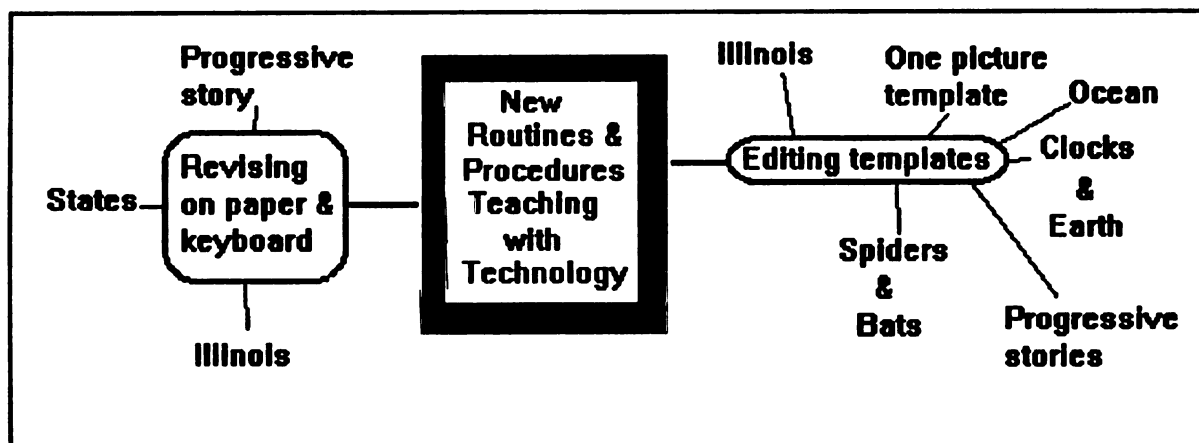
Figure 6. New routines and procedures.

into two parts: (a) revising on paper and at the keyboard, and (b) editing

templates. Much of revision occurred as students made changes on a text

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[9]This section concerning <u>routines and procedures</u> describes the methods and some of the purposes for using the teaching tools described. The processes described in the following typology of methods is limited to those used for the purpose of revision and elaboration. Although most of the information in this section portrays the use of templates, a short section at the end mentions the use of revision on paper.

already printed out. Revision was also common when student partners noticed mistakes or thought of elaborations while they were working on the computer. In other cases, the teacher prepared a picture or a text in advance to be revised by the student. The teacher then asked students to access the file that the picture or text was on and revise it (Editing templates). Surrounding the Revising on paper & keyboard and Editing templates are the titles of lessons we taught in those perspective areas.

In the next section, I discuss methods teachers and I used to help students revise templates that the teachers had created and saved on the computer. In the subsequent section concerning revising knowledge on paper and keyboard, I discuss teaching methods teachers and I developed to promote revision of knowledge.

Editing Templates

In these lessons we attempted to use the potential ease of revision and elaboration that the computer makes possible, to help students engage in the content of the text and foster a greater degree of constructive knowledge in their own minds. Students were asked to access a file on computer that had already been written and revise it to include personal knowledge. Most of the time a paragraph had been written by the teacher for the students to revise. Other times teachers drew a picture for students to revise. Often, we would insert meaningless phrases or deliberate mistakes in the text to force the reader to engage with the text. Since

teachers experience difficulty learning to use the computer or simply working on the computer during class, this writing happens at home or when students are not with them.

Katie demonstrates the use of such an editing template in a lesson recorded on audiotape (1/25/94). At first she stands to the side of the computer with the class gathered around the computer and she leads the class through the procedure to take a file off the hard drive, edit that file, and then save it on their own individual disk. She has made the text rather large on the screen so the students can see what she enters on the keyboard and what has been written. She asks questions that prompt students to explain the procedure. As knowledgeable students explain the procedure she demonstrates it by performing the procedure on the computer.

Afterward, in the lesson described below, Katie allows students to describe possible editing changes to the text as they are looking at the text which is still showing on the screen from the discussion about saving the text on disk above. Students are still gathered around the computer, but in this part of the lesson, Katie does not actually demonstrate the changes as the students suggest them. Of special interest in this classroom section are the procedures and purposes Katie outlines for editing this informational text on the state of Illinois. These thinking procedures and purposes are important because they depict how Katie uses the computer to help students

read actively and consider writing revisions in a classroom context.

First, she tells students they will personalize the template that she wrote for them. To familiarize the students with what she means by the word personalize, she solicits four examples from the group. We have had previous discussions about personalizing, so this does not take much time. Katie then tells students the three-step procedure for revising the social studies text. Later, as she is observing the groups revising the text on the screen, she notices that one student has increased the font size on the screen so everyone could see. We see a glimpse of a mini-lesson she gives as she points out the benefits of increased font size. Lastly, we see evidence of a student recognizing that the point of the lesson is *revision,* as a student recognizes a "trick" in the text. Before this event took place students had read about Illinois and had other experiences working in groups so they were familiar with how to work in groups.

Editing Illinois

10

Katie: We have been reading in the book about the plains areas... In your group you are going to be looking at the material that has been placed on the computer. Some statements are correct; some statements have misconceptions in them, or incorrect information. It's going to be your job and the job of your group to look at the statements that are made and use the information in your social studies book or other resources to correct those statements that are wrong. And also put a little bit of your own ideas, your own thinking into it. Okay. For example, if it says Illinois is a state in the plains region. How could you say that in another way that would have your own ideas into it but still have the same basic information? John.

Ardema: Illinois has, I mean, Illinois is in the eastern plains.

Katie: Okay, another idea in using the same information. How could we say it a different way? Ardema.

Andrew: Illinois is part of the plains.

20   Katie: Okay. That would work. Andrew.

Chris: Illinois has plains...

Katie: Chris.

Chris: Illinois is part of the Great Lakes region and is also part of the Central Plains.

Katie: Okay. So what we've just shown you are some examples of
30   ways of taking basic information but making it more personal by putting in your own ideas or your own concepts. Now, this is what I propose you do first. It's going to be kind of a three step process. ((a) You'll go to the computer, you'll look at the text; you'll make some changes; you'll print it out; (2) you'll go back to a table with your group, continue to make changes or additions on the printed page; (3) then you will take your printed page, go back to the computer and rewrite a final draft. So that during those three steps....As a group, you're going to have to take turns and decide who may be doing some of the typing, who may be doing some of
40   the reading, and as a group decide what you wanta keep, what you wanta change. (Students are assigned in groups to the computer with filled out note cards in preparation for the group editing and elaboration...

(After groups are divided Katie notices one computer where Brad has increased the font size to large font. Katie calls the group to look at what Brad has done.) That's a good idea, to organize jobs then call up your information. Okay. Good. Because this is such a large group, Brad, tell us what you did so everyone in your group
50   can see.

Brad: Well, I highlighted it and went up to size right here.

Katie: So you increased the font so your group could read the monitor. Excellent problem solving... (Students go back to their computers in groups as Katie floats from group to group observing revisions students make.)

60

Student: Why does it say California and Texas [are plains states]?

Katie: Why *do you think* it says California and Texas [are plains states]?

Student: ...to trick us. (Audiotape, 1/25/94)

Each group over the course of the next two weeks is told to (a) read and edit the text about Illinois on computer, (b) print it out and add and change the text again, and (c) input the new enhanced text on the computer editing a final time on computer. Katie gave the directions three times in the above section since it was a new procedure.

After giving brief instructions about the activity, Katie quickly reminds students that she wants them to write using their own words. She asks students to come up with alternative ways to say that Illinois is a Plains state. Four students use their own words and add nuances of difference to the idea that Illinois is a Plains state. One student remarks that Illinois is in "the eastern Plains." Another student points out that Illinois is only "part of the Plains." And finally, a student adds that Illinois as a state belongs to two regions. Katie affirms students' different expressions and elaboration on this fact.

Her goal is to help students understand that there are many ways to say the same fact and each are correct. This fact is important and points out (a) the diversity of truth, that true statements can be said in more than one way, and (b) that it is good to construct personally the facts in the text

using one's own language and not just read over a section to see if it is true. More will be discussed about personal voice in a later section of this chapter.

A small section in this passage shows how groups are expected to increase the size of the text on the screen so that all the students in the group can read it. In line 45, Katie took the opportunity to show the rest of the class what Brad did and had him demonstrate that little procedure very quickly just before students were to write on the computer. This quick mini-lesson shows Brad as an expert in this procedure. By occasionally pointing out procedures that children do, Katie is developing a group of experts in the class that can contribute to the classroom community. It also helps students to see that the teacher is a co-learner and not the source of all answers in the group (note discussion of experts in Chapter 4).

The original template text I wrote about Illinois is short and filled with inaccuracies. Katie and I hoped that the mistakes in the text would encourage the students to think of the text as a puzzle and read the text more carefully to find the errors. Katie asks the students to change the mistakes during their first viewing of the text. Then they print out the text and go to study Illinois to elaborate on the text. When the group finishes elaborating on the text they add that information to the already modified text for final editing. At the end of the passage, the text states that California and Texas are Plains states which the students disagree with. Students sense the inaccuracy in the text and point it out to the teacher calling it a "trick."

The students appear actively engaged in the text as they recognize the "trick" phrase. They seek to distinguish between the accurate and inaccurate sections of the text. The purpose of the reading has become more interesting as the author of the text tries to "trick" the students. The "trick" provides added incentive for the student to immerse him/herself in the content. Although students may not have intrinsic motivation to learn the content, the student becomes engaged in a sort of game with the teacher where the currency of the game is the content the teacher is trying to present. In the end the student is in fact tricked into reading and engaging the verity of the text.

The computer allows for easy revision of this "trick" in a small group setting. Technology plays a major role in this lesson because it invites students working as a group to revise the text and make the text their own with ease of revision. Students can add their own knowledge into any part of the text without recopying. In addition, with the aid of the computer as a tool, student cooperative groups added together their thinking and research seamlessly in a final report.

The important aspect of this example is the way in which it illustrates a new procedure that creates a context where students work together actively expressing their voice and personal knowledge with their peers instead of just with the teacher in a lecture style approach. The procedures and purposes Katie promotes in the classroom allows the computer to be

used as a revising tool where small groups of students work with each other to revise this social studies lesson.

Other Evidence of Editing the Teacher's Template

Editing the teacher's template was a popular activity through the course of the study. In this section, I would like to provide the reader with examples of activities that offer evidence supporting the assertion that editing the teacher's template was not uncommon as an activity. I will also provide the reader with some insights concerning the depth and breadth of these activities.

The first example comes from a lesson in Katie's science class called "The Ocean." That lesson was the first that we designed to allow students to revise a teacher-made template. Our goal was to consider the concepts student voice, revision, and the use of many technical and content experts (Audiotaped interview, 10/5/93).

In the section below, Lamar was called on to act as an expert to help Lisa, a quiet girl who smiled often. Snickers from other boys were heard although Lisa was smiling broadly. As Lamar got up to help Lisa, he gave a coy smile to the snickering boys and told them to "turn around" and face the teacher.

The following section describes how the class and the pairs working at the computer are both constructing knowledge on the same topic: oceans. The group at their seats are reading about the oceans and discussing. Only

a few people out of the entire class are able to respond personally to the text, but at the computer there was conversation between Lamar and Lisa. They also responded in writing using the computer.

In this example, Lamar helps Lisa think of ways to access her prior knowledge about oceans by suggesting she think of books she has read about oceans and television shows she has seen with or about oceans. By doing this he shares a strategy for accessing prior knowledge with her. Lisa and Lamar also make use of their knowledge about language to revise the style of writing to employ similes "it looks like night time" and "the ocean looks like a bath tub" to replace the teachers use of descriptive words in the template.

Lisa and Lamar also take ownership over the meaning of the text by changing words and claiming authorship. All of these activities in which they are involved in the following passage illustrate their active construction of meaning as they are reading and revising.

<u>Oceans</u>
     Students are editing the passage on Oceans that I saved as a file on the hard drive of each of the computers. Three pairs of students met in the back of the room at three computers to read over the page-long passage I wrote about oceans. The other section of the class about 15 are sitting in their seats with their science books open to a chapter about oceans. The students were reading silently. After a while Katie would interrupt their reading to make a comment on the text. Sometimes students raise their hands to comment or ask a question.
     The pairs on computer are generally engaged looking at the screen occasionally pointing out parts of texts to their friends. They usually read a sentence or a paragraph, talk and

then type on the keyboard. Lisa was reading the Oceans writing I had made up for editing. She was plodding slowly through the third sentence with Lamar when I came to observe. The title of the file on the screen was, "Life in the Ocean" and on the next line it read "by Lisa Bow." I saw that she had already erased Mrs. Katie's name and replaced it with her own. They were reading the passage and talking in muted tones. The rest of the class was quiet, "A few feet below the surface.."

Lamar pointed to the first sentence of the , "Do you want to change that one or keep that one?"

"I don't know. I don't have any experience with the ocean Lamar."

"Well, whatever. Ms Katie said if you saw anything on TV or you've seen in books."

I interrupted their conversation, "Lisa you can ask Lamar and use his experience about the water if you want." She asked Lamar if he had seen the ocean and he said that if looked like a big bath tub.

She changed the passage from, "If you look at the coean [sic] from the shore or from a boat, it looks like a hug4e [sic] mass of blue salty water" to "My friend Lamar looked at the coean [sic] from the shore and it looked like a big bath tub [bathtub] of blue, salty water." (Fieldnotes, 11/18/93)

Lisa starts to make the writing hers by changing the name of the author from Mrs. Katie to Lisa Bow. She begins to use Lamar's experience with the ocean in the text. This validates his experience and makes him an authority and expert not only in terms of content but also in terms of how the information is expressed in words. In the sentences above and in the examples that follow, it is interesting to note that the information does not change as much as the way the information is expressed.

Both Lisa and Lamar have power to claim truth in this event. By changing the words "huge mass of salty blue water" to the simile "like a big bathtub of blue, salty water" they express the text knowledge they have

(substituting "big bathtub" for "huge mass"). Interestingly, both these students have some of the same racial background characteristics as those in Heath's (1983) "Trackton" where the use of similes by African-American students is reported. By allowing students to use their own language to express the ideas in the text,[10] these two students express their ideas in ways compatible with their home culture. They change the style of writing to something more akin to their language style. They claim the power to change the text to their language style.

Their prior knowledge about the ocean interweaves with the information from the text to form a synthesis of information that is new and personal. During the course of the conversation they changed a number of words and sentences to use their own words. In the second sentence of the text, following the example above, Lisa and Lamar edit further:

> "But if you look deeper [in the ocean than the shore], you will find it is
> different in different places"
> *...got changed to...*
> "If you look deeper, it looks like night time"

The use of the simile, "it looks like night time," by these two children of African-American decent suggest that these students may have a different way of expressing descriptions than the teacher. Here they use a simile for the second time to describe the ocean. The teacher may begin to notice this to be

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[10]See lines 8-29 of "Editing Illinois' excerpt in which teacher suggests students express the information "in another way."

a pattern in these children's language. The two students deleted "you will find it is different in different places." Perhaps the students did not understand that "deeper" did not mean deep in the ocean but rather deeper than the surface of the ocean. The teacher may wonder if these students missed the flow of the meaning from the first sentence, or perhaps they do not understand the concepts of different environments in the layers of the ocean.

By the students' addition of "it looks like night time," they do display an almost poetic understanding about deep parts of the ocean. In this section, the teacher can assume students know that it gets pitch dark deep in the ocean.

Several aspects of assessment are important to highlight as a result of these interesting additions and deletions. First, these deletions and additions in the text enhance the teacher's ability to assess the students' understanding of the prior knowledge of the content and their style of expressing themselves. The teacher may doubt Lisa's and Lamar's understanding about the different levels of the ocean or the students' ability to understand fully the meaning across sentences and not only inside of sentences. If the teacher puts that information together with her understanding that Lisa's reading lacks fluency (see above notes), she may come to a fuller understanding of Lisa's comprehension of the content in science. The teacher may also notice the two students do have an understanding of the deep ocean and express that understanding with a poetic simile.

Secondly, the teacher can assess Lamar's and Lisa's engagement in the text as demonstrated by the revisions they make on their paper during the lesson. In contrast, those in the classroom reading the information in the book are leaving very little evidence of what they learn. The teacher's ability to assess and examine a child's prior knowledge of style and content of science information appears to be enhanced by this writing passage.

The Ocean assignment was the first teacher template Katie and I tried in her class. We noticed during our assessment of the unit that many students edited the first section of writing, but not the later sections. (I will discuss in more in depth on this finding in other parts of this study.) For example, in Lisa's and Lamar's paper four out of five of the sentences in the first paragraph were changed in some way. The second short paragraph showed no revisions. In later paragraphs a decreasing number of changes were made. We decided to reduce the amount of writing in subsequent templates to give students a chance to make changes on a greater breadth of information instead of just the introductory comments that exist in the first paragraph.

Using Prompts as Templates to Frame Student Writing

<u>Matter</u>

The next unit we used in Katie's class was a template in science on the topic of Matter. The template for Matter was much shorter than the template on the Oceans, consisting of sentence prompts with space for the student to leave comments, examples, and personal knowledge. Students were asked to erase

parts of the template they did not understand.

The phrases not only act as subtopic headings, they also provide information that the student can give examples for. Gina and Ardema wrote the following examples for their report on matter:

Matter and Its Properties
By Gina and Ardema

Matter is anything that takes up space. For example, people are matter. Physical properties are those we can find out with our senses. For example, smelling a flower.

Chemical properties describe how substances can be broken down or combined to make other substances. For example, mixing an egg with milk. (There were no further examples, deletions, or revisions given in the rest of the template) (student documents 12/9/94)

Students expanded on the meaning of the science concepts by listing examples of what they thought the concepts meant. It was our hope that by paring down the amount of writing, students would elaborate more on the writing (Fieldnotes, 2/4/93). We did not find a significant improvement in the volume of revisions, but we did find that students were elaborating with examples in full sentences.

Spiders and Bats

Patti, who shares the same grade in the summer migrant program, provided a similar scaffolding template. During reading, student interest groups had been studying different animals. Patti wrote a blank hypercard stacks (Figure 7 & 8). Each card in the stack simply stated a question that the students answered. Since we were just a summer program, we set up simple

Spiders

Other information...

Page 5

Where do spiders live?

They live in a hole under the ground.

Page 1

What do they do?

The spiders can walk sideways and they can walk backwards. They can walk upside down. They can climbe up the trees. Can not harm po.). They eat insents.

Page 4
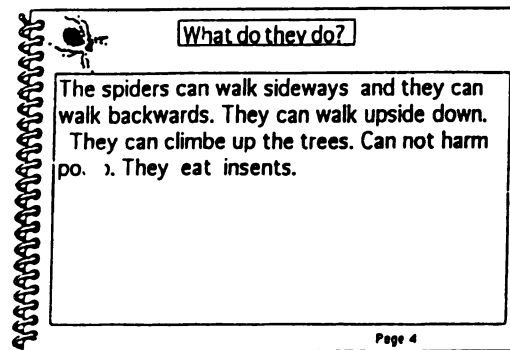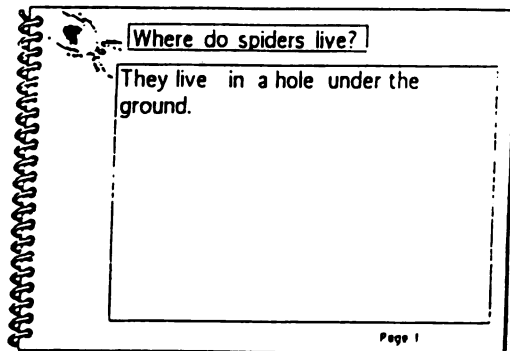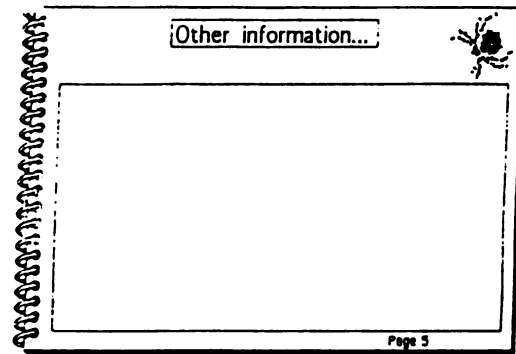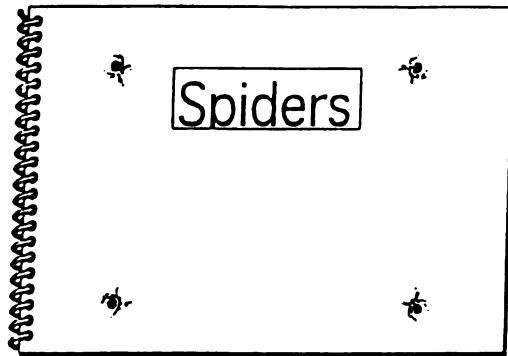
Figure 7. Revising spiders text.

Bat

By:
4th Graders
Summer Migrant
Program – 1993

What do they do?

They look for mice at nigh.

page 4

Where do bats live?

Bats choose dark crannies to live in. A log time ago bats lived with people. Bats hang from many kinds of places in the dark. And some bats live in the contrie.

page 1

Other information...

The vampire bat sucks blood out of people's body while the person is sleeping.

page 5

Figure 8. Revising bats templates.

hypercard stacks whereby the students only had to press on the right or left arrow to go from card (page) to card. In the examples listed about spiders and bats, Patti designed an attractive frame for the text and framing questions. This style is more appropriate when students only have a day or two to write the information. Also, notice that students are more dependent on the teacher to construct the process. It is the teacher who set up the hypercard stack and wrote the questions.

One advantages of the Ocean type of template is that students have to read and understand the passage. While they are reading, students look for possible places where they could edit or correct mistakes. In the process of reading, the students are being exposed to the content. The questions in this hypercard passage do little to teach students anything about Bats or Spiders as the students read the questions.

There are advantages to using this system, however. Although, it is written in a linear fashion, this hypercard stack could easily become interactive by simply constructing a simple menu. As the year passes and students add information about other animals, the students could have a simple encyclopedia.

Also, notice that the framing questions are the same for both Spiders and Bats. These categories that are created and that children have to fill out on a series of animals could come to serve as organizers students use to chunk their thoughts about any animal.

Clocks, Parts of the Earth, and Story Pictures

Editing templates for young children seemed to take the form of graphic representations more often than in the upper grades. In Maria's first-grade, students were learning about the different parts of the earth such as the crust, mantle and core. Modeling for Maria, I brought the children as a whole group in front of the computer and taught them how to draw a number of concentric circles on top of each other to simulate a cross-section of the earth. Then I labeled each part of the earth accordingly (Fieldnotes, 4/27/93).

Unfortunately, the first-graders had a hard time drawing their circles so they would be concentric. Jacob, a student whom we had trained to be an expert on the computer, suggested we use his cross section of the earth (as a template and erase the parts of the earth) and allow the students to attach their own thoughts to the picture to describe the different parts of the earth (Fieldnotes, 5/6/93). The fact that the expert student made the template that other students used and the fact that this template was a graphic made this template unique.

In the following examples, Jacob and Kelvin show the same picture of the earth, but different text. Students were free to add information they had learned about the earth on their picture. Kelvin choose to write only one sentence and then label the other parts of the earth (Figure 9). Jacob was more elaborate in his writing giving more information such as, "[The] Mantle is made of silicon, magnesium, and iron." This system of writing about the parts
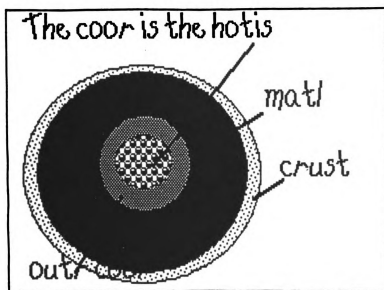
Figure 9. Kelvin's parts of the earth.
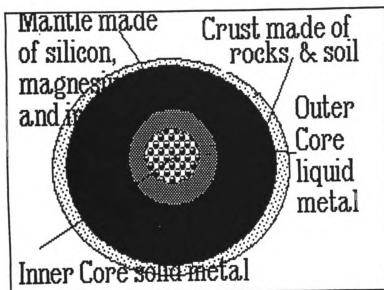
Figure 10. Jacob's parts of the earth.

of the earth allowed students to quickly construct their knowledge of the earth on the template (Figure 10).

A similar exercise was constructed as Maria had decided to teach the students to tell time. In an attempt to change the curriculum, we decided to have our next groups of students at the computer draw a clock with hands and a sentence telling the time of some activity. Ma, a student in Maria's class, got frustrated when she could only draw an oval instead of a circle. "It took us 20 minutes just to draw the clock which was too long" (Fieldnotes, 5/11/93). From that point on we decided to have the students access a clock without hands and allow students to draw hands on the clock and add text (see Figure 11 & 12).

In Kari's first-grade class, students were constructing pictures using Kidpix. After the students had drawn their picture using their own writing and the graphics library, they were to write a sentence that would tell the first part of a story. After the students had written their first page they were to make a
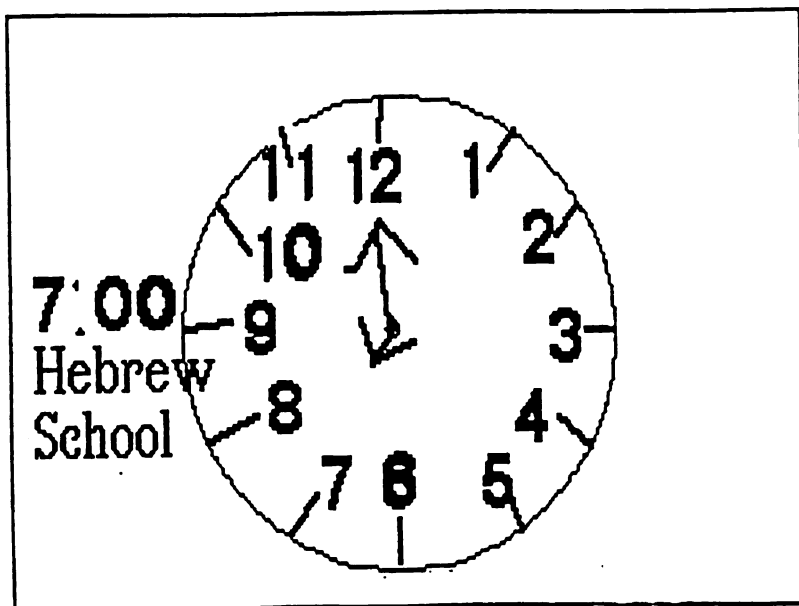
Figure 11. Clock template.
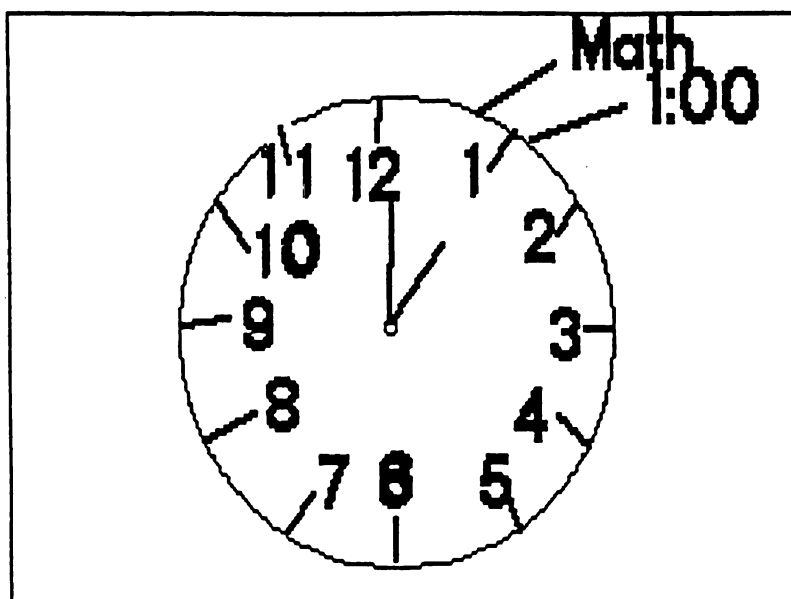
Figure 12. Math clock template.

second page and so on until they finished writing their book. Each page was then put on a storyboard in which the pages of the story appear in sequence.

As the summer progressed we realized that students were taking too long to create each picture. Having to create an original picture for each frame was becoming an obstacle to students finishing their stories (Fieldnotes, 7/20&26). To solve this problem, we asked the students to draw one picture that would fit every frame of the story and edit it just slightly to fit the meaning of the text, in effect, this one picture would become each child's template for the story. The child needed to revise that one picture to fit the meaning of the different screens of text.

These video books were eventually put onto videotape and sent home. Since we do not have a color printer, we did not print them out on paper (in black and white they are too dark). I modeled a story I wrote about my daughter learning to swim. The pool stayed the same but my daughter moved around the pool area (Video, 8/6/93).

Ferris writes about his adventure called Tubing. Ferris' title frame has a solid blue background and black letters that spell out, "Tubing by Ferris Walker." The other three frames show the same picture on a blue river running horizontally through the screen. On the river are four people in inner tubes. The text is written above the river and reads: "page 2, I went tubing. It was fun. page 3, I flipped my dad over. and page 4, I had fun. I ate a sandwich and some pop" (Video, 8/6/93).

This example of a template demonstrates individual expression and control. Ferris chooses his own topic for the story and the appropriateness of the text. In contrast to previous templates where the group and not the individual was in control. Ferris told an adventure for the purpose of personal expression during writing time. Since one of the goals in our writing was to tell personal stories, it would be inappropriate to illustrate using those stories by having a teacher drawing that all students could use. The focus here is on the individual and not the group story.

Progressive Story

Patti's class also used Patti's story starter as a template to get started writing a story that was added to and changed over the course of a number of days. In the story starter, Patti wrote the beginning of five different stories on the five computers. Then she asked students to continue the story. When those students were satisfied with what they had written, they asked if another wanted to continue. In the fieldnote below, Patti was trying to interest students in continuing a story she had written on the computer concerning a hotly contested basketball game. Later, on a second computer, Patti asked Andrea to read a story starter Patti had written about their field trip to the beach.

> The story was called, "The Big Game." The story was not finished and the student read "until....
> "Until what?" asked Pat. "Until what? Think back to when you played basketball. Think back to when you went to the beach or went swimming." She continued to encourage students to remember their own personal experiences and relate them to the unfinished story. "OK Andrea, did you want to read?" Andrea read a story slowly about the beach, sand, and dunes. It was time to go

> back.... Patti asked students to remember times when they had
> been at the beach especially on the field trip they were on. Patti
> told the group she had written these story starters on her computer
> at home (Fieldnotes, 8/4/93).

Students volunteer to go to the computer and write and then call in a loud voice to see if others want to continue the story. Patti takes the story home overnight and edits it. Pattie rereads the story with the new ending. Students can then edit that story and/or add or elaborate on the story.

The template in this story is the story starter. Students are encouraged by Patti to elaborate on an incomplete story using their own experiences. Each computer has a different story and children have to volunteer to go. The fact that students volunteer allows students who do not feel passion enough to write about the subject to pursue other writing. For others the progressive story is an opportunity to write about a topic they enjoy or a style of writing that is crazy fun. Some students never participate, although most enjoy hearing the stories read every day to the class (More discussion as it relates to personal voice in the progressive story is located in Chapter 5 on the Nature of Student Revisions. Another specific event where story starter was used is described in Chapter 4 in the section concerning the role of the partner in pairs when Brandy and Nicole work together on a story.)

This template, like the others, has common elements as well as elements that are unique to the particular interactions of learners and material. Thus there is both a ritual quality in the activities over time and across groups, but also a continuously inventive quality learners express to one another.

Students build on each other's story and make the project a class collaboration. However, students involved must contribute creatively if the project is to be successful. The students in their revision create a new template every day to revise and elaborate on. One of Patti's foci for the lesson is for students to see the connection between reading and writing. As students come to read text they will learn to be more critical and their opinions will be valued. This value rises out the teacher's respect and promotion the student voice and student knowledge in the paper.

Is the Computer the Best Tool for Learning Using Templates?

The editing template in this case is used as a scaffold for students to learn the content and the processes of reading critically and revising knowledge. To be successful, the student has to read the text to understand the content, assess it for its correctness or clarity, and elaborate with information they are learning in class. However, the question still remains as to whether the computer is the best tool for this activity. Could this scaffolding have occurred just as easily with pencil and paper? Certainly, we could have printed out the document and copied it for every student. Then we could have asked students to recopy their editing remarks on another sheet of paper. This seems like an equivalent activity, but actually it is cumbersome, less empowering, and denies students access to tools of the future.

Changing words, elaborating on text, and deleting text as revision activities are done more efficiently using the computer. One of the obstacles to

student revision is that they often do not want to recopy a whole text over to revise and so they feign perfection and avoid revision in order to keep from the drudgery of recopying text. On paper there is no easy way to insert some text or edit text neatly without a full recopying. The exception to efficiency occurs in this case when students have to elaborate on the text with pencil and later, they key that information in the computer. Unfortunate as it is, we found this duplication to be helpful in the process of editing. This discussion takes place later in a section on Revision on Paper.

When students edit their own texts using the computer they become more empowered by controlling more of the process and giving more voice to the content. As previously mentioned, students tend to avoid revision altogether in order to avoid recopying their text. The student is also empowered by controlling the text in a form that is more similar to the format other published authors publish in. Students' papers look more refined and important especially for those with sloppy handwriting or those who make unintentional errors in their paper and have to erase a great deal.

The particular appropriateness and ease of using the computer for this activity also encourages students and teachers to use such activities that allow students to express their voice in the writing, and helps them understand the relationship between reading and writing and between readers and writers. Because of the ease of revision on computer, students become encouraged to develop their own voice. If the teacher, parents, or students find their content

objectionable or even if students change their mind, they can easily modify the text to accommodate teacher concerns. The process they go through contrasts sharply with those who have to recopy the entire paper using pencil and paper. Since this study is not a comparison study, there is no data to show the hesitancy of students. However, the purpose of these lessons was to inspire students to deliberate carefully on text in order to revise and elaborate it.

The ease and effectiveness of using this activity with the computer also helps students understand the connection between reading and writing. As students immerse themselves in giving voice to their writing and access their prior knowledge, they come to understand that text can be changed to fit their needs and that authors have less power over them.

By using the computer, students are learning to use the tools they will one day be using as they become more proficient in language in high school, perhaps in college, and in the work force. As in other activities, the amount of time students spend on the computer managing text increases their fluency using those tools. Every day most of us see adults whose potential is never reached because they never gained fluency in reading and writing. The same is true for today's students if they do not gain fluency using the computer.

Finally, this activity provides for easy integration of the teaching of literacy strategies in the content areas. Although reading and writing skills did not start out to be the objective, in many cases teachers found themselves using reading and writing mini-lessons to promote the students' content area

knowledge. Katie's instructions about changing the wording in the text to the students "own words" invites students to process the meanings of the content and contribute personal style or content to the text.

In this section, new routines and procedures for teaching with technology have been examined through student revision of templates.

Revision on Computer and on Paper

The purpose of this next section is briefly to describe some of the processes that occurred during the course of the study involving revision on paper and revision at the keyboard. Most of the revisions took place as students were composing on the computer or while they were editing and elaborating templates at the keyboard. At times when revising at the keyboard was not sufficient, additional revising was required of the students on paper away from the computer. I do not intend to compare between revisions that occur on the computer with those made on paper. Instead the procedures themselves and how they emerged are explored. These emerging procedures further describe the context and evolution of classrooms where teachers and students are learning to use the computer. The events are significant in themselves because they describe routines and procedures of classrooms using the computer. These views of the routines and procedures also prepare the reader for the next chapter on shifting roles by providing a description of procedures students and teachers enacted in the classroom.

Often since computer work was not highly regulated by the teacher,

procedures and purposes for revision were defined by the students. Jacob is

the computer expert in the following section. Jerrod and Xu are the users. The

procedure is whenever Jerrod or Xu make a mistake, Jacob suggests a

correction. The program used is Kidpix. The "Uh oh guy" or "Undo guy" is a

button on the menu that reverses the last set of keystrokes or action done on

the picture.

> It is Jerrod's turn to draw. He accidently erases over some of
> the letters but remembers to hit the Uh Oh Guy. Jerrod puts
> traffic lights on a black wire across the screen. Jerrod draws
> a stop sign with the support pole but slipped and drew the
> pole right through the middle of the sign. I recognized my
> opportunity to teach Jacob and Jerrod something and I
> showed how to stamp the stop sign over the old sign (and the
> pole) to make the sign appear as if there is no pole in the
> middle of it. Later on, Jerrod clicks on a window stamp over
> top of an old window he has mistakenly drawn a cross
> through. Jacob's thirty minutes was up and so they saved
> their picture in order to print it out at recess.
> 　　　Jacob helped the children with their writing. When Xu
> clicked on the letter "A" she mistakenly clicked on the color
> red. Jacob started to correct them, "You accidently made the
> cursor on red. You want to have black so it prints darker."
> He pointed out red on the screen (and Xu changed the color
> to black). (Fieldnotes Maria, 6/4/93)

Jerrod edits his erasure gone wild by using the "Uh oh Guy" (undo). I

taught (part of my job was to develop the skills of the experts) Jerrod and Josh

the technique of stamping over something to cover it up. That was the second

revision. Jerrod demonstrates that he is learning by doing it himself later.

Finally, Jacob shows Xu how to change the color of the text when Xu had

mistakenly clicked on the color red. There were no other opportunities to edit

except when the student was writing or immediately afterward. There was no time given to contemplate or edit the picture.

Katie found editing during the course of the writing to be quite common. Most of the errors were pointed out by a partner or accompanying expert. "Kids keyboarding do not edit...they are not reading the screen" (Audiotaped interview, 2/4/94).

> Katie: They also while one person was actually typing, the other person was reading the screen; adding things to it. Saying, "Why don't you say this or let's put this in now. Kind of like a proofreader or just someone to help elaborate....

> Glenn: proofreader?

> Katie: Yeah. Going through and picking out mistakes or even saying, "Okay, here's something else you can say about that topic. So they were giving information as well as proofreading about it. (Audiotaped interview, 1/10/94)

In front of the computer one student typed in the information and the other person worked as a proofreader who could make suggestions about information the student might add or correct. Greater depth and breadth of editing experiences at the computer are cited in the section on Social Contexts for Revising (small group revision and pairs revision).

In the Editing Illinois account above Katie provides the students with a procedure they are to follow that interweaves editing on paper and editing on the computer. The students' first task was to edit their papers for incorrect grammar, spelling, or obvious nonsensical phrasing on the screen using the keyboard. Students were to print out the edited

template for group revision away from the computer. Students split up, assigning themselves to different sections of the report and gathering more information. After the students gathered the information, they met as a group and listened to each other's elaborations on the content of the template of the papers. When they had arrived at a consensus for what was to be added, students input the revisions on computer onto the edited copy of Illinois. Finally, students were asked to look over the paper one more time as a group to edit for a final copy (Audiotape, 1/25/94).

In this style of editing, Katie has the students step away from the computer and think about editing to the exclusion of all other activities. Katie felt that this time was important in order to get more information and more opportunities for revision. In this audiotaped interview, Katie's evolving thoughts about multistep revision are evident as she and I review with dissatisfaction the revisions on papers turned in:

> Katie: Right, they changed, but I think they changed very little. And I'm not sure if it's one of those things where maybe we have to incorporate, you know, you change it and then you've gotta go back and change it again. Maybe go through three changes to see if that would encourage them to elaborate more. Instead of just accepting one change. Maybe have it be a three-step process. Okay, now you wanta go back and let's put some more in. See what else you can do with it or maybe actually go through as a teacher, I as a teacher and highlight a certain area and say, Okay, this is a good start but I want to see more adjectives in this paragraph or something." Maybe we have to make it into a multi step process. I don't know. Instead of thinking, "one time, one shot, it's done." (Audiotaped interview, 1/10/94)

Katie's thoughts about the need for a multi-step approach to revising writing are driven by her dissatisfaction in the number of student revisions. She believes students will make more elaborations if they are given more opportunities to elaborate and revise. This three-step process bore fruit in the Illinois unit where students editing in three steps. Two of the opportunities for revision occurred at the keyboard and one opportunity was away from the computer on paper.

Teachers provided opportunities for editing on paper in other writing activities as well. In Katie's unit on states, students wrote brochures to attract tourists to visit the area they studied. We gave mini-lessons on editing and writing for the tourist audience (Planning documents, 4/28/93). In cooperative groups, students constructed a tourist flier with a digitized picture they took with a video camera. Students were then given time to edit their writing to make it more attractive to tourists. After students had edited their papers to the satisfaction of the teacher, they were allowed to go to the computer to input their revisions.

The two texts below were taken from the Hawaii group before and after the group editing session on paper. The unedited text on the left appears more factual in nature. On the right after the editing, many of the facts have been deleted or altered to accommodate the purpose of this paper.

Original version	Edited version
Hawaii	Hawaii
It is the Aloha State. Hula dancing is a special dance from Hawaii. The capital is Honallulu on Oahu. There is many rainforests.	You can find Hula dancing just about anywhere in Hawaii. Come and enjoy the rainforests.

As the two versions illustrate, students changed the edited version to include more language designed to attract tourists. (See Figure 13 for the original text) Instead of stating the fact that, "Hula dancing is a special dance from Hawaii," students changed the wording addressing the tourist audience, "You can find Hula dancing just about anywhere in Hawaii." In the last sentence, instead of stating a fact, "There are many rainforests," the edited version speaks to the visitor, "Come and enjoy the rainforests."

In the progressive story, Patti printed out a copies of each story that students had elaborated upon already, for students to edit. Patti combined and edited the children's suggestions overnight on computer and provided the edited story on the computer to be elaborated and extended for another day. She continued this process for a number of days.

The methods for editing on paper involve similar procedures. Students either write their own text or are provided a template to edit. Usually, they are given an opportunity to edit their paper on the computer as they compose or after they compose. The paper is then printed out by the students. Then

Figure 13. Original edited Hawaii.

Hawaii

It is the Aloha state.
Hula dancing is a special
dance from Hawaii.
The capital is Honallulu on
Oahu.
There is many
rainforests.Honallulu is the
most populated
city in Hawaii.On the island
Hawaii there is a volcano
national park.There is a
monument for the USS
Arizona in
Pearl Harbor.The coldest it gets is about
77 degrees.
There is a park called the Wainnea
Canyon Park on
Kauai island.Surfing (cowabunga) is major
in Hawaii.
You will enjoy scuba diving.Say hi to the
fish.

students are asked to join groups to delete sentences and insert new ideas on

the printed text. Students are then asked to input the alterations in the text.

Finally, they proofread the text and print it out.

This chapter provides the reader with an idea of the shifting routines and

procedures teachers used to promote the revision of knowledge using the

computer. Most importantly, this chapter leads us to an understanding of a

place where participants discover new roles themselves as teachers and

learners, in the next chapter on Emerging Participant Structures. These

changes in routines and procedures provided a context that enabled all

classroom participants to relate to each other in ways that changed the

character and the tone of learning. In the next chapter I explore how these new

routines and procedures acted as catalysts to provided for transformation of the

traditional roles for students and teachers.

CHAPTER 4: SHIFTING ROLES FOR TEACHERS AND PUPILS

New routines and procedures portrayed in the previous chapter not only altered the organization and appearance of the classroom, it created a number of new roles for the teacher and the students in the classroom that does not exist in traditional classrooms. In general, students and teachers were familiar with their roles, but as the classroom organization changed, it began to make sense to students and teachers to change the ideas that defined their role in different situations. Role will be defined as a group of tasks and attitudes students and teachers are expected to perform when the situation requires it.

Shifting Roles for Teachers

Past research regarding using the computer in the classroom claims that the computer is dependent variable in classroom learning (Michaels, 1990). That is, the computer itself does not improve student writing (Pisapia, 1992). Improvement in skills is dependent on the context. For purposes of this writing, the fact that revision is easy to perform on the computer does not mean that students will actually revise their writing. The best a computer can do is to facilitate revision in writing. Students do not just revise or edit their writing merely because they are using the computer. Rather, the teacher is obligated to provide contexts that are conducive learning environments and to guide

students to learn and practice revision of knowledge on the computer.

As a goal in staff development, I worked with the classroom teacher to provide different contexts that would promote student revision of writing by using student experts, small groups, and teacher directed mini-lessons. As learning professionals, both the teachers and I developed these tools as a part of our joint experimentation (Feiman-Nemser & Rosaen, 1992) to discover routines and procedures that would empower students to be capable learners by constructing and revising knowledge. In the first section, I describe a portion of the path we embarked upon to select these contexts as helpful for our teaching. Later in this chapter, I will describe these different contexts and how they affect student revision of knowledge across the content areas.

Evolving Participant Structures

As teachers began using the computers as a tool for constructing knowledge across the curriculum, the most obvious transformation observed in the classroom was the change in social organization and grouping for instruction and student work. The physical presence of the computers and our decision to use them were important factors in determining the context in which the students were going to work in the classroom. Since there were not enough computers so that every student could work on a computer, we did not have the option of teaching the computer within a whole group where each student or pair of students worked on their own computer.

Students who worked on the computers were considered one small group. If students working on the computer were working in pairs, those working in the pair were still referred to as the group working on the computer. Most of the time the teachers improvised management charts that described when each group was entitled to use the computer, so the teachers could easily say, for example, "The blue group is finished on the computers and it is time for the red group to use the computers." At least one other group was formed by the students who were not on the computer. Therefore, there were at least two groups in the class when students were using the computers.

In Katie's class, there were distinct transitional stages in the social systems the class progressed through as they moved from working without computers to working with them. At first, we were not sure what the different groupings would yield in terms of changes in social system, i. e., the organization of time, space, activity, and participants' rights and duties. When I first observed the classroom, social studies and science lessons often followed traditional classroom procedure. Students were reading the texts and discussing the contents of the text with teacher initiated questions (Log, 4/20/93). This is typical of an interactional style reported by Mehan (1979) and Cazden (1988) to be the dominant style of interaction between the teacher and the students. First the teacher would Initiate a question, a student would Respond to the question, and finally, the teacher would Evaluate the student response (IRE). Students' opportunity to speak was limited to responding to the

teacher's prompting questions.

As time passed, students were allowed to work in pairs at the computer and between pairs at the computers, but the group sitting at their seats was virtually following the same interactional pattern that dominated in the first stage of the study (Fieldnotes, 11/16/93). Katie stood in front of the group as one child would read the content area text. The reading was followed by teacher questions and comments with student responses.

In a third stage, Katie describes the social structure as small groups of students working together. The first group works at the computer. Another group "meets with" her in the corner of the room at a half moon table which is called the Reading Group Table as she guides students to proceed through steps "on their own" (Audiotaped interview, 12/7/93). Students in a third group are "at their seats doing research" by themselves. "The computer should be like a center so it's always a work in progress" (Audiotaped interview, 1/10/94).

In this final third stage, Katie does not *teach* students, she *meets* with them. This terminology marks a change in the role of the teacher from a teacher who thinks of teaching as presenting knowledge to the group. Meeting, in contrast, is a time to think about ideas and problems of study together *with* students. As Katie changes, she "meets" with the students as they are proceeding through the steps "on their own." The fact that Katie uses the word, "meets," implies a different kind of interaction than what was typical in the

first stage. Finally, as students do work "on their own," she indicates that

students have begun to become independent learners.

In retrospect, Katie also recognizes *our* development as learning

professionals as we moved through the different contexts refining our routines

and procedures. As she states in the exit interview:

> I talked about maybe doing it like in a reading group format...so
> what I saw you helping me with is kind of getting me to different
> plateaus, getting the class to different plateaus. *We* started with
> one idea and then we did the same idea again but we either
> changed or refined when we did it again" (Audiotaped interview,
> 2/4/94).

Our techniques evolved step by step as we responded to the needs of the

students to make the lessons better. Gradually, we moved from (a) whole

group instruction to (b) a small group on the computer and whole group

routines and procedures for the students who were not on the computer, to (c)

three small groups. It is significant that we moved through the stages of

refining methods of teaching using the computer. It is perhaps even more

meaningful that Katie has become metacognitive about this process of

professional learning.

Similar shifts in grouping from whole group toward guiding small groups

were not evident in other classes because of different contexts. Kari and Patti

were given inservice at the beginning of the summer describing how teachers

were expected to have a group at the computer and a group at their seats

working (Fieldnote 7/3/93). These summer migrant teachers did teach using

whole-group methods in other classes, but during the hour a day when they

had five computers, students worked in two groups while the teacher floated around the room helping all the students (Fieldnotes, 7/27/93 & 8/6/93).

Patti attributes the small groupings to the fact that the class has five computers for an hour "because that way you can break your class into two groups which makes it workable. If you only have two, you are doing more whole group things and the people on the computer are missing out" (Audiotaped interview, 8/6/93). This was, in fact, the case in Maria's first-grade classroom in the Geneva School District where there was only one computer in her first-grade classroom. There was no real shift in social structure of the classroom to small groups as was the case in Katie's classroom. Two students typically went to the computer, while the rest of the students worked much as a whole group would normally work. Although this pair of students at the computer did form a small group and acted much like a small group, the other students in the classroom were taught in much the same as they had been before the use of the computer.

Maria normally made rounds walking from student to student in the classroom to evaluate each student's work. This evaluation, she called "checking," included assessing the correctness of the student response and giving comments to help the student improve his/her paper. As she made her rounds she would stop off to visit the pair on the computer which was often doing the same exercise students were doing at their seats (Fieldnotes, 1/31/94). Students in Maria's class were not split into two groups. Students at

the computer were simply using a different medium to write and create their pictures than the other students did.

Maria's case notwithstanding, the other three classrooms did form a social structure that centered on the use of small groups as a medium for instruction. What seems significant about this finding is how the number and character of the computers seems to have acted as a *catalyst to change the participant structure of the classroom*. As the teacher uses the computer the amount of whole-group instruction seems to decrease and the small group and individual work of the students increases. In effect, this shift toward small grouping is changing the principal mode of instruction that has not significantly changed in over a century (Cuban, 1984). When the teachers in this study use the computer, they do not have whole-group instruction (except for mini-lessons) which has been the traditional standard mode of instruction. The use of three or four computers in the room acts as a catalyst for changing the social structure in the classroom.

As a result of small-grouping in the classroom, many new opportunities for student participation became apparent. As classrooms begin to use more pairs and small groups there is greater opportunity for the students to speak. In a classroom where lecture is the norm, students can have turns to speak after waiting for the teacher, who usually talks the majority of the time. In pairs, students could be speaking more than half of the time.

In this section, I have described the conversion that occurred in the social organization of one classroom and the emergence of small groups as a result of the shift the teacher making use of the computer in three other classrooms. These shifts from whole-group to small-group began to change the fashion in which students participanted in the classroom as learners. Students were now talking more to each other and teachers were talking with the students in a different manner.

In the next section, I will examine students revising knowledge in small groups using the computer. The next sections of the chapter are divided into three contexts of small groups. First, I examine the role of the student expert who is trained as a helper to one person who is assigned to work on the computer. Second, I will explore the revisions of students who worked together in pairs. Finally, I will assess the style of revisions students generated when they were in small groups of more than two. Finally, I include a third context for learning called the mini-lesson where the class learns as a whole-group. Throughout these sections, I will emphasize the change in character of the revisions and the participant structure in which the basic character of schooling for students and teachers have changed.

The Role of Students as Experts

In order to be successful learning to use the computer, students have to learn some technical knowledge to complete simple and complex procedures. Teachers seem particularly sensitive to the fact that if they have to fix the

computer all the time, the computer does not end up being particularly

beneficial. When interviewed about computers in her classroom, Katie, for

example, said:

> I think everyone's sorta feeling that (rush, rush, rush) at different
> times. I think all teachers are. Not having enough time to really
> figure out the problems for yourself. And it's not, I mean, you're
> gonna have problems like this all the time using computers.
> People that use them all day long run into problems. They just
> have to work it out. You're right. We don't have the time to do so
> (Audiotaped Interview, 1/10/94).

Here Katie points out the difficulty of learning how to solve technical problems

when there is so little time to do this in the school day already crowded with

academic responsibilities. To relieve the teachers of the technical burden,

technicians were hired to work for the entire district to deal with extraordinary

technical problems. Another group, Instructional consultants (my job), were

hired to help teachers figure out how to handle the technical problems without

disrupting their teaching.

As a part of my job, I recommended teachers train student "experts" or

have me or others train student experts in different software to provide guided

practice to novice students who were not yet able to work alone. In case

studies conducted by Murray (1986), experts evolved typically in classrooms in

spite of whether they were trained or identified by the teacher or not. We also

trained students how to manage specific problems that were common, but still

difficult for competent students to solve. These student experts were trained by

me to deal with simple and complex problems as well as short lessons in expert

etiquette. Expert etiquette included being polite and guiding the novice through the process instead of taking over and doing it for them.

In classrooms where most of the students were mostly competent on the computer, but who just needed occasional help with a problem, they could seek out the expert instead of the teacher to get a solution to the problem. To seek out the expert, the computer user simply got out of his/her seat at the computer and requested help from the computer expert. The expert would then go to the computer and give the student help. If the expert could not solve the problem, he/she would sit down and the user would select another expert.

This process of using an expert not only relieved the teacher from being contacted often by students to solve technical problems, but much more importantly, this process changed the participant structure in the classroom. Whereas in traditional classrooms the teacher alone had authority and appropriate knowledge to help students in the classroom, the use of student experts in the classroom recognizes that students in the classroom are also responsible enough to be authorities and knowledgeable enough to be teachers.

In using student experts there is the recognition on the part of the teacher that it is more efficient to draw from everyone's knowledge and not just the sanctioned knowledge of the teacher. In fact, often the computer experts became more knowledgeable about the computer than the teacher. At that point authority and sanctioned knowledge becomes less important. The teacher

becomes a learner and the classroom becomes more of a community of learners.

The use of experts in classrooms also provides a context in which students could work on their social skills such as being polite, communicating clearly with actions and words, and how to help people learn instead of just doing things for people. As important as those skills are, students rarely have opportunities to work on such skills in traditional classrooms where the teacher expects students to listen and not talk.

Expertise grew quickly in classrooms to the point where even students who were not trained as experts became capable and were called on by their friends to solve problems. At first there were only a few experts in the school who would be available to leave their classrooms. As students who were interested had the opportunity to be trained and watched more advanced experts solve problems, they became greater in number and more sophisticated.

There were usually three or four experts in every classroom. As students were just getting used to the computer or a new piece of software, the experts would often accompany a student or pair of students to the computer. In the context of individual or pairs of student with a computer expert, the less experienced novice can learn from the "knowledgeable other" (Vygotsky, 1978) In the example below, pairs of students in Maria's first-grade class get help from student experts. Note how student experts help the novice learn to use

the computer in a very kind way. Also, note that the expert helps to teach

capitalization skills by pointing out that mrs. should start with a capital "m."

> Ian (student expert) helped a pair of children, Yashee and
> Susie, with their writing. When Yashee clicked on the letter "A"
> she mistakenly clicked on the color red. Ian spoke in a soft voice
> to correct her, "You accidently put the cursor on red. You want to
> have black so it prints darker." He pointed out red on the screen.
> Yashee put the mouse over on the black but she didn't click on
> black she just held it there for a long while.
> Susie said as she jumped, "Click!"
> Ian also repeats, "Click!" Yashee took the hint from Susie
> and Ian and clicked on the black square so that she would type in
> black....
> (Later they switched and) Susie typed "mrs" in lower case
> letters.
> Ian responded, "Uh oh you need a capital to start Mrs..
> Here, you have to hit this to get a capital." Ian pointed to the
> CAPS LOCK key. Susie tapped on the CAPS LOCK key and
> typed MRS. "Opps, you forgot to turn the Caps Lock off." Susie
> clicks on CAPS LOCK again. "Ok Caps Lock off." says Ian
> (Fieldnotes, 6/4/93).

10

Here we see Ian helping and asserting his authority as expert by offering

Yashee and Susie technical support and some advice about punctuation. In

the first paragraph, Ian relaxes his authority by politely telling Yashee she has

"accidently put the cursor on red" and informs her that she "wants to have black

so it prints out darker" (there was only a black and white printer available). Ian

acts as a *authority* here to determine what color the student wants to use. He

does not ask the student the color that she wants. He tells her, albeit very

politely for a first-grader. In addition, he gives her technical information about

colors and printing that she might only discover by trial and error otherwise.

Susie, Yashee partner, helps Yashee perform the next step which is to click on the black space. Susie adds a little hop to the click. This kinesthetic hop accents the words and idea that Susie is trying to express to Yashee. Ian follows up with a "Click" of his own to help give direction to Yashee action. In this section, Ian gives more technical support to Yashee.

In the last part of the passage, Ian helps Susie by informing her that Mrs. starts with a capital letter and by giving the technical support to tell her about how to make the capital letter. He even follows up by guiding her to make it correct when she misunderstands his help. Ian helps not only with technical support to tell her how to make a capital letter, he also gives Susie punctuation advice to tell her that she needs to use a capital letter to start the word Mrs..

To summarize, Ian gave technical support at least four times in that short passage, including some information that allowed Susie to write with correct punctuation, and he imposed some authority as he informed Yashee to use the black instead of the red color for writing. As an expert, Ian made his thoughts very public, therefore allowing Susie and Yashee to benefit from his thinking. His cognitive thoughts, which normally would have been carried on silently in his head had he been sitting in his seat, were made public. This collaborative setting, with a public screen that all three children could see, allowed cognition to become visible by Susie and Yashee. Both of them were able to see what Ian was thinking and benefit from his thoughts.

Susie and Yashee did not just take information from Ian. They were responsible for generating the sentence and the computer drawing as well as providing most of the physical typing and mouse work. Since every person contributed, it was a collaborative effort.

Four aspects seem particularly significant to draw out of this examination of student learning. First, this context has allowed collaborative activity that makes the cognitive public (Reilly, 1992). There is a fundamental change in how learning takes place in this setting in comparison to the typical teacher-student interaction (IRE) where the teacher initiates and evaluates interactions. This type of collaborative effort also is a change from the "sage on the stage" model where the teacher is simply imparting knowledge to the students (Ringstaff, Sandholtz & Dwyer, 1993).

The second significant aspect of this example is that these students were learning computer and grammar in the context of actually using it for their own purposes. All three of the students in this group understood what the goal was in this learning activity and they all worked toward that common goal. The learning transpires in a context in which the student uses the information to complete a project. In that sense the learning is very performance-based (Kentucky Department of Education, 1991). In effect, the success of the performance is dependent on the effort of all the students in the group.

Thirdly, Ian appeared to be particularly skilled at giving direction and advice without being abrupt. First, he tells Yashee she has "accidently" chosen

the wrong number rather than telling her she was wrong or confronting her directly. He was good at signaling mistakes with endearing words such as "oops" and "uh oh." Ian also takes the blame on himself for not turning the caps lock off even though he sits furthest away from the keyboard. Certainly, Ian's interpersonal skills make working collaboratively a more pleasant learning experience.

Finally, Ian, as an expert, acted with a limited degree of authority in the group. Since his technical knowledge was necessary to complete the activity with success and this was a tool that Susie and Yashee were not familiar with, they accepted the expert's limited authority.

In the next passage, the expert asserts her authority, perhaps in a manner that makes it more directive. This passage marks a different tone from the previous passage. The following section contrasts Yu's style of teaching to Ian's. It demonstrates Yu's approach as more directive than Ian's and raises issues of when, how, and to what end students who occupy expert status in groups have an opportunity to learn politeness strategies to mitigate that authority as they help others to learn. It also illustrates some diversity in terms of the type of technical and subject area support that the expert offers. Yu models and collaborates with another student to spell words. Yu helped Jake and Andrea write about their hospital visit.

> "You have to set it down! You have to set it down! Press it! Press it!!" Yu leaned forward to the computer and then toward Jake as she raised her voice. Jake clicked on the mouse to place the cursor on the screen and Andrea started to write. Andrea types "we."

5   "No!" says Yu as she leans forward and points to the "w." "You
        have to put a capital." Andrea backspaces over "we." Yu presses on
        the Caps Lock key while Andrea types "We."
        "How do you spell went?" asked Andrea.
        "Sound it out." Yu asks Andrea. " Wa, wa, wa...eh, eh, eh...nn...t."
10   as Andrea types each letter Yu gives her the letter sound. Then Andrea
        spells "to the."
        "How do you spell hospital?"
        "Hu, hu, hu, hu...ah, ah, ah...ssssss." (Fieldnotes, 6/4/93).

In the middle and at the end of this passage Yu offers expertise beyond

the technical expertise that she is trained in by pointing out a need and

technical skill for making a capital "W" to start the sentence and by helping

Andrea sound out the words "went" and "hospital." These events are notable

mostly because it is an excellent example of peer teaching (Ringstaff,

Sandholtz, & Dwyer, 1993) of revision and scaffolding in a meaningful context.

Yu helps the children revise their knowledge of the technical processes of using

the computer as well as revising their text for capitalization as they are involved

in the process of constructing the text. In this setting students are not learning

isolated content which they are expected to practice later. They are learning in

the process of doing meaningful activity. The character of school that is

examined here differs from traditional methods (Goodlad, 1985). Maria explains

the character of this type of learning:

        That was wonderful dialogue because they were, they were
        coaching each other, plus they were helping each other to learn
        more about the computer but just wonderful conversations that
        you cannot have when a teacher is teaching them. You're giving
        them information and then they're almost regurgitating it back.
        But there, there was a lively discussion going on (Audiotaped
        interview, 6/4/93).

In the example in this section and in examples that follow in this chapter, students learned from the process of interaction that took place. And yet these learning contexts involved students talking to students and making sense to each other without teacher dominance. Certainly, one of the most profound differences between these group contexts and traditional classroom contexts is that in this context, students manage their own learning. One indication of student regulation of learning and of less dependence on the teacher is the dominance of student talk during most learning times and less teacher talk.

Another aspect of the character of the revision in this setting is the way in which these first-graders are able to use all their senses to experience the activity. Andrea *feels* the keyboard as she types in the letter. The entire group can *hear* the sound of the letters being typed through a simulated sound given off by the computer. Most importantly, all the students can *see* the text on the lighted screen which is set up high enough for every one to see clearly (Daiute, 1985). Maria characterizes the multimedia, multi-sensing nature of the activity below:

> For young children, it's almost like, it's, the computer is technical
> but at the same time, they're the ones that are manipulating it. It's
> not me. And it's almost like in first-grade everything has to be
> hands on. And they have to touch it and they have to feel it and
> you do not give them paper coins. You give them real coins to
> count. And they're touching and that makes learning, it's just
> more important to them. They were making the model. It wasn't
> me (Audiotaped interview, 6/4/93).

Yu is able to provide the encoding of the words "went" and "hospital" in a

way that allows Andrea to spell those words when she was not able to spell them without Yu's scaffolding. Yu helped just enough to allow Andrea to control some of the process and still be successful. This type of guided participation is comparable with the types of scaffolding Rogoff (1986) cites in her studies of how parents scaffold for their own children to allow them to be successful.

Yu shows another part of the character of her instruction as she demonstrates her impatience with Jake and Andrea. In line 1 she showed her agitation by repeating the phrases, "You have to set it down!" and "Press it!" twice each and correcting Andrea harshly with a "No!" as she corrects Andrea's capitalization. Yu's body posture also indicates a hostile tone as she leans into the monitor and then toward Jake to emphasize the importance of her words.

Part of Yu's training as an expert was that she was to refer to the monitor and keys on the keyboard or point with the finger to help direct the novice to what to do instead of performing the tasks on computer for the novice. Yu shows her aggressiveness again by actually pressing the CAPS LOCK key instead of just pointing to it or referring it.

This type of impatience and aggressiveness in revision demonstrates a discrepant case of student expert helping other students that is worthy of some comment. First we note that in this passage, in spite of Yu's aggressiveness, Andrea still feels comfortable enough to ask Yu how to spell words. This is not always the case. Maria comments that she had observed Yu being aggressive

with another student, Leon, and noted that he had lost his confidence and became frustrated as a result of Yu's being "so hard" on him (Audiotaped interview, 6/8/93).

The fact that student experts can be overbearing can be seen both as a pedagogical problem and an opportunity. When student experts are too "hard" on their fellow students learning may become disrupted when students become frustrated, argue, or one student stops talking because talking can be so unpleasant. However, this problem becomes an opportunity for the teacher to address issues of etiquette and equity among students in the classroom. If, in fact, the classroom becomes more of a community of learners where students help each other students will have to acquire the skills of working with each other gracefully.

In the previous sections of this chapter, we have seen how the teacher's use of the computers in the classroom has resulted in small groups. Whereas in the whole-group the teacher manages the learning and defines the content, in the classroom with small groups students have more control. In the classroom with only one computer, small-grouping is limited to one whole-group with a pair of students on the computer. Students gain authority and become technical specialists when they play the role of expert in some classes. In small groups, students have the opportunity to construct their thoughts and make revisions on their own. In the following section, we will examine the different roles students perform inside those pairs and groups.

<u>Revision in Student Groups</u>

There were many different contexts for small groups in classrooms. When students worked on the computer for this study teachers divided students in various ways. At times teachers allowed students to select their own partners. Other times the teacher selected the pairs and small groups of students. Self-selected or teacher-assigned *pairs* of students felt free to share information from pair to pair of students in the classroom. At times the pairs of students worked at the computer and some of the students worked at their seats. In some cases, cooperative groups of four worked together both on and off the computer. Most frequently, however, pairs of students worked on the computers while the rest of the students worked in small groups, as one large-group, or individually while getting help from each other as needed.

I have titled this section "Revision in Student Groups" in order to include data drawn from all group contexts. As I was reviewing the data I noticed that most of the data was applicable to both paired-groupings and small-groupings and so in this section I review that data together.

As the classroom breaks up into smaller-groups students are able to manage their own learning. By assuming their learning management, students become less dependent on the teacher and do more learning on their own. Students assume the management roles that were once reserved for teachers. In the next section, I examine the roles that the partner takes as a kind of learning manager.

The Role of the Partner in Pairs

Traditionally, students worked alone during writing time producing their texts without advice or revision by other students. Even the arrangement of the seating in traditional classes made it cumbersome for students to work in small groups (Cuban, 1984). In process writing, students are allowed to take on the roles of audience, co-author, and editor (Elbow, 1973). In this section, I explore the role of students as they work together on the computer. The context differs from many process writing classes in the sense that partners on the computers are not pursuing their own writing. They are co-constructing the writing publicly displayed on the screen. In the following section, Katie describes in a teacher interview the roles a student partner plays during the composition of a text. As you read through the text, notice the different roles Katie describes students playing during the writing. Katie outlines some of the tasks students perform as they work together in groups. She talks about working in pairs and small groups here. In those pairs or small groups, the writer sometimes composes or occasionally types in a text already written by hand.

The partner in each pair is the student who is not typing in the text. In the beginning section she refers to the partner having many functions: (a) trouble shooting - proofreading, (b) elaboration, (c)"relief when they are tired."

> Glenn: How, in terms of collaboration, how do you see kids collaborating on the computer? What's your sense for how or if

it's working well or if it's working not so well in instances.

Katie: There are times when they will collaborate. Sometimes it happens when someone has to go back and *troubleshoot*[11] for someone else. And as they're reading to see where the problem is, they'll go back and say oh, *why didn't you say this* or that so sometimes they're doing that. Not a lot yet. There was more

10   when we did have two children working on one text. There was a lot of collaboration then. And it worked very well.

Glenn: Can you, like specific examples of worked very well?

Katie: It worked well in that, first of all, *when one got tired*, actually typing the text, the other person took over. So it seemed to move quickly. Or they *took turns*. I'll type a paragraph, you type a paragraph. So one person didn't feel bogged down with all of the work. They also kind of, while one person was actually

20   typing, the *other person was reading the screen* and *adding things* to it. Saying why don't you say this or let's put this in now. Kind of like a proof reader or just someone to help elaborate. So that worked out very well.

Glenn: proofreader?

Katie: Yeah. Going through and picking out mistakes or even saying, okay, here's something else you can say about that topic. So they were *giving information as well as proofreading* about it.

30   And that seemed to work fine.

Glenn: So working, working in pairs seemed to increase the amount of revision or not?

Katie: I think so. It did. It seemed to. And it also made the job easier, I think, for them. For the students just because they had someone else to rely on (Audiotaped interview, 1/10/94).

The first function as she describes it is "*troubleshooting or proofreading*" (line 6)

when students read to find out where the "trouble" is. Later in lines 28-30,

Katie clarifies "trouble" by explaining students are "going through and picking

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[11]Note: Italics are added by the researcher reflect key points in the text.

out mistakes" and "proofreading." This type of editing consists of picking out obvious errors such as spelling and text that does not make sense. The first function Katie observes partners performing is editing on a surface level.

The second function of student partners Katie refers to that works very well is elaboration. Katie gives examples of how elaboration initiated by a partner by quoting what students say, "why didn't you say this" (line 8). She repeats this same quote on line 21. In two other locations she speaks of "adding things" (line 20) and finally she summarizes in line 30 by saying "giving information." Beyond these variations in terms there is no elaboration on her definition of elaboration.

The third function, described in the paragraph on line 14, refers to a kind of *sharing of the many tasks* a writer has to consider all at once. There she tells about students "getting tired" and "all bogged down" as they are typing and "doing all the work." The typing is a burden that appears to be taxing to the students. The person who is keying in the words is very busy cognitively just with the manual act of inputting the text. A child of elementary school age rarely has had enough practice with tasks such as correct spelling and keyboarding so as to make them automatic. Most may consume quite a bit of their attention just to concentrate on typing alone. In this instance, while one student is typing, the other student proofreads and elaborates. Taking turns, the partners switch when one is tired. At the end she adds "It also made the job easier for them."

Here she makes reference to the apparent heavy cognitive burden in composing and how the partner then performs an editing function. The two students share the burdens of the processes of writing that would be too much for one writer alone. This cognitive burden is referred to in Flower and Hayes's (1981) article on juggling constraints in which they claim students have a difficult time juggling many variables at once.

One of the first and most difficult questions for students concerns the content and style of writing. In the next example, students ask that question and as a pair of writers work together to motivate each other to write an adventure story. Patti, the teacher, has given the students a story starter that they access from the computer. Students are to read the beginning of the story and write a middle and an end. Brandy and Nicole, in their fifth and final week of summer school, play around with each other, talking quickly back and forth.

In these bits and pieces, taken from my fieldnotes, notice the roles that each of the partners takes as they work on the story playfully. They are having fun writing this story together and just talking about the story. Nicole and Brandy help share the burden of typing and thinking of a story line by switching roles during the session. Brandy reads the story line while Nicole types. Later they switch roles. Perhaps the most significant part of this quote is to see how the partners use each other's thoughts and elaborate with their own. This interplay of thoughts and ideas seems to motivate the girls to write and improve their text. The nontyping partner elaborates on the text and proofreads the text

for nonsensical wording and in one case starting the sentence with "and."

Finally, each partner seems impatient when they have agreed on something to say and encourages the other to work quickly with commands such as, "Type it." and "Write it."

"What we going to write? Nicole asked smiling at Brandy. Then Brandy accessed the file on the disk and read the story starter about a what happened on a class field trip to the lake when the teacher notices that Ben is missing.
"And then he went to go help us." Brandy blurts out.
"And then uh..." Nicole moves the keyboard to herself, types, and then pauses to put her finger to her mouth and still smiling looks up...
"Then he was playing in the lake and then he
10 diiiiiiiiiieeeeddd." Brandy speaks in a low voice and draws out the word died. "He drowned."
Nicole smiling even more than before is entertained. "Wait! We could put we found him in the lake dead."
"Yeah! So the rangers took them out to the lake." Brandy says quickly with looking with big eyes to Nicole. "Now type it." But Nicole doesn't want to and Brandy switches seats with Nicole and Brandy types the story.
"So we went down to the lake and we saw..." Nicole speaks as Brandy types
20 "...him dead in the lake." Brandy says as she types.
"lay...ing. Go, go, go....And the.." Nicole encourages Brandy playfully.
"And the rangers took him to the lake and out to the hospital." Brandy suggests looking at Nicole who nods quickly.
As Brandy is typing, Nicole reads over the story. Nicole reads: "Our elementary school had been planning a trip for weeks. The day of the trip arrived. When they went on the field trip they put their feet in the water. They also saw some lady bugs and other things that nature made. It was time to go back to school,
30 but no one could find Ben. We would get off the bus and go get the rangers. They, then we would ask if they would help find Ben?? She stops. "That don't make sense." Nicole tries the sentence again, "Then they said would go help us go find Ben...find Ben in the lake."
Brandy stops her typing and focuses her attention on the part Nicole says doesn't make sense. Brandy then edits that badly

worded section. Nicole gives suggestions about how to edit that section as Brandy types something akin to what Nicole is saying. Nicole continues to talk as if dictating to Brandy but Brandy only 40 types some parts of Nicole's ideas and adds her own. "Then we found him in the water face down. Then we took him to the hospital. ... And they go to the hospital."

Brandy, "H O HOU. How do you spell hospital."

"H A U...has, has pit tul. It's H O U S P I T A L." (Fieldnotes, 8/4/93)

In this quotation, again we see these students working with each other as proofreader, elaborator, motivator, and relief person, already mentioned in the previous passage. Nicole fulfills the role of the partner by performing a task that Brandy could not focus on at the time. As mentioned earlier, she performs the role of proofreader and sense-maker. Nicole provides some relief of the cognitive burden that lies so heavily on beginning writers. Working together these two writers can compose and proofread the text.

In addition to elaborating on each other's ideas and providing relief by proofreading, each of the students encouraged the other to hurry by comments they made. On line 15, Brandy becomes impatient with Nicole and urges Nicole, "Now type it." In a separate incident, Nicole encourages Brandy to "Go, go, go." This type of comment is more commonly expressed by teachers when students are not making progress. Here we see students, who both have ownership in the project, pressuring each other to hurry. Just as in the example above, these students are showing signs of being empowered by self-regulating and managing their own learning in a paired-group.

Finally, Nicole acts as an expert speller on line 44 when Brandy asks how

she spells hospital. Nicole acts in the role of an authority or expert which again is commonly the role that the teacher plays in the class. So, here are examples of students in a paired-group fulfilling roles such as expert, authority, proofreader, sense-maker, and elaborator that are all roles typically played by the teacher during reading conferences. The computer with its public display has allowed the students to act independently of the teacher and to take on the role of the teacher as dispenser of wisdom. The use of the computer in pairs has empowered students to look upon themselves as capable revisors of knowledge and has given them the opportunity to practice that role.

The student at the computer who was not writing was expected to fulfill many roles as partner next to the student keying in the words. Beyond fulfilling these roles, however, the most notable feature of the passage is in the interweaving of ideas and interaction between this pair of students. This interweaving of ideas begins when Nicole invites Brandy's participation with the question, "What we going to write?" Brandy answers her questions by accessing the story starter file about missing Ben on the field trip and read it. In essence Brandy leads Nicole through a process which she can use to answer the question.

Then they proceed to continue the story that the teacher started. Brandy tries out a sentence, "And then he went to go help us." It appears that Nicole does not exactly like that sentence because she begins to try out her own,

"And then uh..." This is Nicole's first attempt to change the Brandy's original thought.

Being unsuccessful at getting approval with Nicole the first time, Brandy tries again with, "Then he was playing in the lake and then he diiiiiiiieeeeeddd." This is the second shift to elaborate on the first thought. Later she adds, "He drowned." This is the third elaboration on the original thought and an attempt to get Nicole's approval.

Nicole seeks to improve on that idea, "Wait! We could put, We found him in the lake dead." Now we can see that the general direction of the story has been established by Brandy's suggestion and Nicole's elaboration and restating of the story line. It is not until Nicole makes a suggestion herself that she consents to using Brandy's ideas about Ben drowning in the lake to become the story line.

Brandy's agreement with Nicole's thought contains elements of what Brandy has been suggesting all along. Brandy then elaborates further on that idea. "Yeah! So the rangers took them out to the lake." The thought develops with the interaction of between the two students. It is the reciprocal interweaving of ideas that fosters the development of the ideas. Each student gives input, albeit simple elaborations on each other's ideas, until there is mutual consent to go ahead. Each student by giving consent and content to the ideas has a sense of ownership in the story. It is at that point, when there

is mutual ownership, that the ideas get composed into a story on the computer.

The next part of the text that demonstrates an interweaving of ideas on a common text between Brandy and Nicole starts on line 26 when Nicole rereads the section that Brandy writes. In fact, Nicole is proofreading the text while Brandy types in the text. In line 32 she reads a section with bad wording and brings it to Brandy's attention. Brandy's full attention is on producing the text and so Nicole performs an editing or proofreading role. Nicole points out the sentence, "They, then we would ask if they would help find Ben." Brandy focuses her attention on Nicole and the sentence in question. Brandy does not type what Nicole suggests, but rather types "something akin to what Nicole was saying" (line 39).

> *Nicole suggests Brandy write:*
> "Then they said would go help us go find Ben...find Ben in the lake."
>
> *Brandy modifies the statement that Nicole suggests and writes:*
> "Then we found him in the water face down."

Instead of writing exactly what Nicole suggests she write, Brandy writes a sentence that is similar to the sentence Nicole suggests. Brandy and Nicole share in the ownership of the text. There is an interweaving of ideas from the two students which results in the final written product.

The interweaving of ideas in this section may give us a flavor for the way that Schwab (1959) thought about the learning community. A most significant concept that was observed was the way in which students in the learning

community co-construct knowledge. Brandy and Nicole collaborated by providing valuable information that contributed to the whole story. They also demonstrated cooperation by building on each other's statements. In the case of Brandy and Nicole, collaboration involved working together toward a common goal that was constructed jointly.

These students also cooperated by giving up proposed story line sentences, if the partner did not respond enthusiastically to them. Perhaps this event is an example of what Elbow (1973) describes as audience. In other words, the person who suggested sentence or phrase allowed the other person to act as audience and censor. If the phrase did not sound good to the audience-censor, it would not be used.

Cooperation in this case can be defined as the willingness to go on even when you do not get your way. If students cannot compromise, give in, or give up on that part and go on to another part, the students are not cooperating. Collaboration, in contrast, implies a more constructive style of work. In collaboration, each person becomes more energized with thoughts and ideas when they are discussed in a group. Collaboration and cooperation seem to have been important qualities that made Brandy and Nicole's work successful in a classroom where students had some responsibility to regulate their own learning. Knowing and learning about cooperation and collaboration seem to be important in classrooms where students have to work together to co-construct knowledge.

In this pair and on this assignment, cooperation and collaboration were exercised to provide a context where perhaps each of them learned more in the group than they would have as individuals. In the next section, I will demonstrate how students in a small-group collaborate and cooperate to revise writings during a social studies class.

Revision in Small Groups

Rules and procedures for using the computer seemed to change often as we attempted to improve our instruction using computers. At one point in Katie's class, in an attempt to improve the revision and discussion of the writing, we shifted from using pairs of students working together to groups of three and four. In these class periods the only whole-group instruction took place in the form of mini-lessons. First, the proposed procedure is described in a class discussion. In the second passage, a group edits each other's texts in a group setting. The whole-group class discussion and following small-group session took place at the end of the study and confirms some of the roles students play as proofreaders, elaborators, and motivators as mentioned above. In this section, I present two long passages that give the reader a sense for what those roles look like in the context of small groups. They are examples of these roles that have been already described, but the purpose here is to display them for purposes of frequency and breadth of experiences in these roles.

Students in this project have already edited topic sentences for surface errors and some nonsensical phrases. They printed that edited version out and now have split up the topic sentences so that each person in each small-group has one. The procedure and student roles for grouping in Katie's class are expanded upon. Instead of what seemed to be simple elaboration from personal knowledge, in this project students were expected to access multiple resources outside their personal experience.

The roles the students play and the procedures that groups follow to finish the project are described by Katie. First she refers to a class session when students made some decisions about how they were going to proceed. This is an example to student control or self-regulation within the groups.

Katie's plans to have students edit, elaborate, and take turns on the computer, as quoted in the previous interview, bear fruit in the lesson we are about to view. Her earlier discussion on plans referred to revision completely at the computer; this lesson requires students to elaborate extensively away from the computer and then come together as a small-group to pool their information into one large expository report. Students also appear to have some role in deciding what steps they will move through.

Katie: But you met in groups and you made some decisions.
What decisions did you make before you started? Dell.

Dell: We split up the [topic] sentences to make paragraphs.
(Children expanded the sentence to make them into paragraphs.)

Katie: Okay. Tell me more about that then.

Steve: Well, we had to look, we had to look in resource books and things and then we wrote down on our paper what, a paragraph about that sentence and then we're gonna share it (in their own small-group).

Katie: Okay, so you're gonna elaborate....So you're going to elaborate on each of those sentences or each of those strands. Then what are you going to do, perhaps tomorrow? For example, John's group has divided up the facts and they each done elaborations on separate facts. Their group now has to go to the computer. John only has his fact written on his paper. How are you going to get the entire report done?

Marco: You're gonna maybe take turns ... [and type] what you have [written] in the different sentences. (The template was made up of topic sentences students were supposed to elaborate on.)

Katie: Okay, so you're each going to be typing up your paragraph and you're going to rotate when it's time for your turn. Today, you're going to get in your groups, you're going to continue the researching, using the social studies books or any other books you come up with.

Students are asked to write expository text by editing and expanding on topic sentences that are referred to in earlier sections of the study as editing templates. The group decided each student should take one or two topic sentences that was already written for them by the teacher on a computer file and expand on them to make them into a paragraph. Each student had a few sentences they were responsible for and they were to expand each sentence into a paragraph by gathering information from other sources. For example, a student might choose to write about a topic sentence on "animals in the desert." The student would research and write more on that topic sentence on "animals in the desert" until it was a paragraph.

In the case above, the elaboration is much more extensive than it was when students were to elaborate using personal experience. The template is a group of topic sentences that act as a structure and scaffold to help students frame their thoughts. In future writing students may be able to cover all the information Katie wants them to cover without using topic sentences as a scaffold but for this assignment the topic sentences indicate the areas Katie wants the student to work in.

Katie can determine that students learn specific content as summarized by the topic sentence. And yet students have some choice to determine the book, phone, video, or personal source they want to use. At the beginning of the quote, Katie alludes to a previous class when the students decided to split up the topic sentences given to them so that each student would have one or two sentences to expand into a paragraph. We see that Katie already is developing a sense of independence in the groups. She allowed them to manage the role of each member of the group in order to achieve a positive result.

She continues to ask students to proceed through the steps of the lesson to make sure the students know the entire process. The previous day they had made a decision to split up the sentences amongst themselves. Today the students would read in books and research the sentences they had chosen. Later, they would share their sentences with each other, the group revising as

they shared. Finally, students would take turns typing in their work on the computer and helping the typist with the final editing.

Here Katie demonstrated her knowledge that we have to teach students long strategies to complete successfully the task instead of teaching isolated skills. The fact that students reviewed the whole task from beginning to end makes their work seem much more meaningful. It also allows students to become more independent as learners because they know the entire strategy for composing these reports in groups. Katie gives students time to practice this strategy of researching, writing, and editing for themselves in their groups. Students are then given freedom to regulate their own learning with teacher guidance.

Throughout the lessons there is an important mix of teacher guidance and group autonomy that deserves mention. In the section above Katie asks questions about the group process by which students follow to complete their writing. Although she has determined the steps students will proceed, Katie allows for the possibility that a student may have a different but acceptable process to complete the writing by asking the students how they will proceed. Most of the process allows for a great deal of student input and student choice. During most of the study time, Katie guides students making suggestions about the process and the content of the study as students advance in their study. With certain broad teacher limitations, student make decisions inside of the

group. This guided autonomy helps the students invest themselves in the lesson.

The previous quote described the framework for a procedure the students had decided to work within. In this next section, a vignette during the same unit more clearly notes the ownership students take over the writing. Ownership in this case is defined as a sense of control and caring for the activity. Ownership is indicated by students making lots of comments and offering opinions about the text. Although the teacher floats from group to group and gives a comment, most of the input is from the group. They show a sense of independence from the teacher by expressing their own comments as well as accepting guidance from the teacher's model.

As empowered learners, they regulate their own group's information, changing what they do not think is correct according to their own prior knowledge about the world and their making sense skills. The term empowerment refers to the groups ability to pursue learning independently by regulating the information that belongs in the text. The students elaborate on their topic sentence in creating a paragraph, and they "share it" with their group who act as editors (proofreaders), changing and adding to what the child has written. Students have written their thoughts on cards which they read to the groups for their comments.

Students and the teacher encourage individuals to "write more" for the paper. After that incident students encourage each other to write more to each

other. The teacher acts as a model. Students have begun to take over the job of editor by asking each other to lengthen their writing thus supporting the teacher's comment to write some more.

Also note the group authority with which the group seems to move to force Brad to make sense and do it according to the group desire instead of just Brad's desire. The group is acting as a group and not as individuals. Most of the changes in the following are on the idea level and only involve a few words. Students find themselves even editing their own paper in progress as they are reading to the group. You will also notice that Jin, who speaks with a heavy accent, plays a less demanding role in the group than the others.

Groups were formed in different parts of the room. Each group of 3 or 4 sits together with papers they have written on but which also have the topic sentences printed out from the computer. Brad, Ashley, Jin, and Ardema sit together at the front of the room around a half moon table. One by one they take turns reading. During, after, and on top of each child's reading, the student's partners make editing comments for the paper.

Ardema reads her paper first. Brad wants her to mention Great Lakes again in her paper to clarify that she is referring to
10   the Great Lakes region in her report. She goes to add that, but Ashley with arms outstretched and looking at every one in the group says, "Wait a minute. Wait a minute. Do we all agree with that? Majority rules." They look at each other and nod their heads.

Ardema comments after Brad's elaboration on the first part of the paper, "You could write more. Make it a new paragraph." They agree.

Jin struggles to read with her broken chinese accent. She reads word for word but there is a lot of information. The other children in the group all stare at Jin. At the end of her soft
20   reading Ashley says, "OK that's good."

"Okay, Brad you're up again." Ashley leads.

Brad reading from his card, "Corn, coal, beef and soy beans are four of the most important farm products in Illinois."

Ardema cocks her head back and looks at Brad, "Four of the farm products?"

Ashley interjects grimacing and looking at Brad, "No, products, products. Coal is not a farm product."

"I changed farm. Now we just have products." Brad adds.

30 " O.K. corn, coal, beef and beans, or soy beans are four of the most important products in Illinois. Oil is found in southern states, mostly found in southern states. But it's also found in the great lakes states. Or would you rather have great lakes region."

"I'd rather have not even a thing, anything about the southern states." Ardema answers. We're not talking about the southern states.

Brad shook his head and grimaced...(long discussion here)

Ashley looked around, "O.K. let's vote." All the students raise their hands except Brad to vote to take out southern.

40 "Majority wins."

Brad rereads his sentence without southern, "Oil is found...oil is **also** found in the great lakes region."

Ashley encourages, "Okay, now are you adding more to that?" (Vignette from fieldnotes and audiotape recorded, 2/2/94)

The sense of ownership the students have for the group writing and signs of empowerment are evident in different places in this vignette. Each group member has done research and written some comments that they share with the group. The students are discussing as a group how to clarify and edit each student's writing so the text makes sense when they put it all together finally on the computer later. It is significant that each member is asked to contribute. Although Jin does not participate in the editing sections much, she receives a topic sentence to elaborate on just as the other students do and she is expected to present her writing for group criticism.

One of the signs of empowerment that is evident in this passage is the way the group self-regulates. For example, both Ardema and Ashley do not

think Brad has written enough and so they ask him to write more (lines 16). This encouragement by his group magnifies and repeats for the writer what the teacher is saying to the writer. A student can dismiss a teacher comment if the student and the teacher do not have a good relationship. However, when a student's peer group encourages a student to continue, the effect on the student may be more pronounced.

The group also shows self-regulation when they perceive that Brad could improve his writing much more than Jin who was struggling just to be able to read the words. The group shows how they can regulate learning, being sensitive to the cognitive burden that both Brad and Jin are experiencing. They are capable of sensing these variables, whereas a computer-management programmed software would not be able to sense those same variables. In this way they empower each other to do the best they can do for the group.

A third way the group self-regulates appears in the procedures in which they negotiate their differences to come to a group resolution. Katie has told the groups that majority rules when there is a dispute. However, she does not attempt to mediate the discussion in the group nor do the students seek her out. More than any one, Ashley seems to have taken the lead to move the events along, act as a pollster, and sergeant at arms informing Brad that "Majority rules!"

Part of the reason that the self-regulation is so successful is that there seems to be a strong sense of group among the members and an agreement

on the procedures for resolving differences. Perhaps this strong sense of group comes as a result of the procedures that were established with the guidance of the teacher. Although most have opinions that differ from the majority opinion, the students are more dedicated to coming to a group decision based on negotiation and voting as fair ways to resolve their differences. Agreement on procedures among the group occurs when students accept the counsel of others without a vote. When Ardema and Ashley suggest that "coal" is not a "farm product" (line 26) he quickly agrees and changes "farm products" to just "products."

At one point, Ashley insisted that there be a vote. Students in the group voted by "nodding" their heads (line 13). As they nodded their heads, they looked around. In this way they could verify that a majority gave their consent. This procedure was much more informal compared to the section where students disagreed whether to leave any mention of the southern states in the report or not (line 31-34). In this more formal section, Ashley calls a vote and students actually raise their hands. To confirm the process he calls out, "Majority wins!" (line 40) just as he had earlier in line 10. All these different methods of agreement and commitment to a group process promote self-regulation of the group. This self regulation allows students to be thinking and investing in the content area in a much different way that if they were listening to a teacher in a lecture setting.

Although revision is rarely found in typical content area instruction, this group also works together to revise each other's writing. The group points out to Brad that he has mistakenly included oil as one of his farm products. Brad also makes comments about the amount of oil in southern states. After a long discussion the group forces Brad to delete his comment about the south with a vote.

In this context, Brad is also finds ways to correct his own writing. As he is reading he decides that Great Lake region fits his purposes better than Great Lake states. He also adds the word "also" to "Oil is also found in the Great Lakes region. Perhaps with the group evaluating his writing closely he was also trying to improve on this writing. In any case, this context encouraged Brad to correct himself.

This practice allows students to feel invested in the decisions that are made. Students also get an opportunity to examine how other students revise and what they add to their papers. As students discuss their strategies for writing, they are making their metacognitive strategies visible. Students can learn different writing strategies from each other. Students also experience an opportunity to work with others collaboratively. This setting gives students the opportunity to see how and when others compromise and convince each other.

In this section on the character of revision in small groups and pairs there is evidence of students take control of their writing. Students self-regulate their own learning and metacognitive processes. There is also evidence that

they act as secondary authorities to coerce other students to join with the team. They act as proofreaders, elaborators, motivators, and relief to the other students in the group. This sort of language including self-regulation, ownership, and empowerment has come to sound like slogans in the field of written literacy instruction. What I have attempted to do in this study is to provide examples of what these terms and principles look like in real classrooms and to describe it in its complexity.

Katie's vision of computer use and student control contrasts greatly with the types of instructional management programs and drill-and-practice programs that are often used in classrooms. As mentioned in the literature review, most instructional management programs require very little teacher involvement or management since the computer gives the tutorial, the exercises, and the assessment at the end. In such programs, the processes and strategies for learning are controlled by the computer. The students are dependent on the computer to provide them with knowledge. There is no opportunity to construct or revise the knowledge they learn in the computer tutorial. Students merely copy the knowledge in the computer. Whereas in the instructional management and drill-and-practice software the correctness and assessment is determined by the computer, in Katie's classroom students manipulate the subtleties of knowledge and language and develop their own criteria for success.

Mini-lessons: Teaching Revision

One obstacle for using the computer effectively in the schools is the lack

of teacher and student knowledge about its usefulness (Yeaman 1993).

Another context where students and teachers learned to use the computer as a

tool for revising knowledge was the mini-lesson.   I define a mini-lesson in a

broad way to mean a five to 10 minute lesson (Routman, 1991) usually

modeling a strategy and eliciting responses from students. Normally, students

are gathered closely around the computer as the teacher performs the tasks

sitting at the side of the computer. Designated computer experts are requested

to sit in front so that if others have questions, the experts know the answers.

Not everybody learns in this setting. However, since students can ask the class

experts and their group partners when they need to, enough students learn the

lesson so eventually all learn the lesson.

In this section, I will review examples from three types of mini-lessons

used for revision of knowledge using the computer to give the reader a flavor

for the diversity and depth of mini-lessons used. The first set of mini-lessons

was given for the purpose of teaching writing revision, the second recorded the

revising of graphics, and the third described revising teacher's and students'

knowledge about the processes involved in using the computer as a tool.

I often modeled mini-lessons for teachers so that the teachers could

learn to teach using the mini-lesson tool and because teachers did not know

how to work the computer. In the following example, before the lesson started,

I gathered students around the computer on the carpet and enlarged the print

of the computer so all students could see the writing on the screen. In this

passage I model for the teacher a mini-lesson that helps the students add

personal knowledge to the writing template on the topic of the ocean. I give an

example of revision and provide opportunity for students to come up with their

own example.

> Glenn: Our job today is to make this a personal document,
> something that contains some of the information from your head
> about the ocean as well as information from Mrs. Katie. Has
> anyone in here seen the ocean...in person or on TV? Raise your
> hand if you have. (Everybody raises their hands) Everybody...The
> first sentence doesn't have to say, ""If you look at the ocean from
> the shore from a boat, it looks like a huge mass of salty, blue
> water. You can say, "I've been to the ocean and it looked like
> nothing was there."... Let me read, "A few feet below the surface,
> the ocean is a sunlit place...How could you make that more
> personal?... Have you been in a lake or an ocean?
>
> T.J.: A lake... We sorta went scuba diving and we dove down in
> the water and we looked up at the sailboat and it seemed like
> there was light going out of the sailboat. Things would like reflect
> light.(Audiotape 11/2/93)

In the first few sentences I give the objective of the mini-lesson,

which was to add personal knowledge about the ocean to the template.

I attempted to help the students recall their prior knowledge about

oceans by asking them to raise their hands if they had seen an ocean in

person or on television. I gave the students an example of how I would

make a personal response to the template sentence describing the

appearance of the ocean. I added, "I've looked at the ocean and it looked like nothing was there."

Later in the text, I read a sentence describing the sunlit section of the ocean and elicit some personal examples from students in the group. T.J. tells the class about an experience he had scuba diving and seeing the bottom of a sailboat reflecting light. In these mini-lessons students had the opportunity to observe models to revise knowledge. In this passage, I gave the model of my own personal thoughts as I surveyed the ocean and saw "nothing."

Secondly, students had the opportunity to try their own revision with teacher guidance such as TJ did with his example of the light in the ocean. Of course other students observed and learned from TJ's example. During mini-lessons teachers allowed time to present teacher and student examples of revision.

The content of the lesson is also noteworthy. Again, there is an emphasis on integrating the student's personal experience with the subject matter. By making personal knowledge the focus of the lesson and raising the status of the students experiences, I intended to encourage students to use their prior knowledge about the ocean in their writing. Most students had seen an ocean in person and other students had seen pictures of the ocean on television.

It is also significant that as a staff developer, I was able to explore my vision of the integration of the mini-lesson as a context for teaching

revision along with my vision for what the goals of the lesson were for examination by the teacher. The integration of the concepts of personal knowledge with the tool of the mini-lesson provides an integrated example which is so important for staff development (Brennan 1991). It was important for the teachers and me to examine a concrete example to the kind of teaching the district was trying to promote. This type of concrete example that is then discussed before and after the experimental mini-lesson is an example of Guided Practice (Feiman-Nemser & Rosaen, 1992) that I used to foster staff development among the teachers.

At times, when teachers did not know how to use the software, they gave mini-lessons on revision by modeling learning strategies for the class. Expert students gave these teachers lessons in front of the students. Teachers then acted as models for students in the learning process. Maria, who appeared unsure of herself in her first mini-lesson (Fieldnote, 9/29/93) sat down with Ian in front of the class to give students a lesson on revising using the computer. Students gathered close to the monitor and smiled while Ian taught Maria how to use Kidpix. We view the conversation just as Maria has learned to stamp pictures on the screen that form a pattern in preparation for their patterns practice in math. Maria has just finished writing "this is a pattern" on the screen with the help of Ian.

Maria: Okay. And then I'm going to put a period. Ooooop! Look what I just did! I messed up. A sentence that begins with what? Tell me out loud.

Kids: Capital letter!..

Maria: I've got to go back. It's not backspacing.

Ian: Now you hafta do it, erase this.

Maria: Where's the eraser? Right here? (She points in the wrong place with big eyes and open mouth.)

Ian: Right here. (Ian smiles) Just erase the t.

Maria: I'm erasing the t. I like the eraser because it makes a little sound. Now what do I do? (Audiotaped mini-lesson, 12/6/93 and Fieldnotes, 12/6/93)

An important part of revision in first-grade is the ability to recognize that as a learner and a writer you make mistakes. We all know that other people make mistakes but first-graders sometimes have trouble recognizing they have made a mistake and that they can revise their mistake. In the section above Maria models that it is alright to make a mistake, to fix the mistake, and to get help from others.

Maria modelled this think aloud revision with the Kidpix program for her children. The students were entertained by Maria's expressiveness and perhaps by the role reversal. Maria was playing the part of the learner and Ian was the teacher. At the beginning of the passage, Maria recognizes that she has forgotten a capital letter at the beginning of the sentence and admits to the mistake by telling the group she "messed up." There is no apparent shame in

words or actions. Maria treats the realization that she has not placed a capital at the beginning of the sentence as an impetus for revision. She asks Ian where the eraser is and then erases the lower case t so she can put a capital T in its place.

Kari conducts a similar mini-lesson with her expert next to her to help her when she has difficulty. At one point during a lesson she asks, "How do I change this to get something else?" Steve points to the eraser and leads her to the firecracker which explodes the current screen and leaves a blank screen. Again in this example, Kari asks a child for help, therefore modeling her need for assistance.

These last two examples of teachers getting help from students mark another dramatic change in the relationships between students and teachers in the classroom. Ringstaff, Sandholtz, and Dwyer (1993) call this abandoning the "sage on the stage" model of education. Here students and teachers work together as genuine learners in the same community. Past studies have shown experts evolving from classrooms even when they were not planned (Newman, 1990). In this study, teachers use experts as a tool to model revision and an unashamed attitude toward getting help and revising their work.

Some mini-lessons were structured more like a reminder. The teacher would describe a few points she wanted the class to remember. These quick reminders were typical after we had studied a certain type of revising for a number of lessons. In the following passage, Katie reminds the students about

adding information even after three months of revising templates in Katie's

class for personal knowledge, punctuation, and adding multiple resources using

the phone, friends and resources on CD and in books at the library. Students

have already edited this passage twice and Katie asks the students to revise for

a final time. After Katie's quick reminder there is a short period of interaction

with a few students before the students get started on their writing.

> Katie: (speaking to the class who are sitting at their seats) The
> first sentence says, "The Great Lakes include ..." The first decision
> they need to make is how can we elaborate in that sentence.
> How can we put more information in it or put it into your own
> words. The second thing they can do with that statement is make
> corrections, do we need capital letters? Do we need periods? Do
> we need commas? Are there spaces that need to be deleted?
> The third thing we need to do with that statement is can we add
> any other factual information. Can we use our resource list (a
> chart in the class that lists all the different resources for
> information including themselves, other human resources, the CDs
> and books in the media center) and come up with more
> information of these states, or more information necessary
> (Audiotaped class session, 1/26/94).

Katie is modeling her thoughts about revision here for the whole group.

She quickly takes a sample sentence of some student writing and then

examines that sentence to see how it can be revised. She reminds the

students of a few different types of revisions they should make on the

templates. First, Katie reviews revisions by urging the students to elaborate

using their own words. Second, she emphasizes the need for proper

punctuation and asks a number of specific questions concerning the need for

"capitals," "periods," and "commas." Third, Katie's third request concerns

adding more information from the different resources that we had worked with at length in the class.

In the above section, I have examined a number of examples of teachers using the mini-lesson as a tool for revising content and punctuation in writing. I also provided a brief example of the use of experimental staff development models that provide for the integration of teaching methods (mini-lesson) and important curricular goals (integrating personal knowledge with content are studies). All of the above examples were limited to revision in writing.

The first of the next two sections will briefly describe the use of the mini-lesson to teach revision of *graphics* on the computer. The last section of discussion about mini-lessons pertains to the revising of knowledge concerning the function of the hardware and software. The purpose of providing these examples in different areas is to provide the reader with depth and breadth of the use of the mini-lesson to teach revision of knowledge.

Mini-lessons: Revising Graphics

Teachers also provided mini-lessons to teach the revision of graphics. Occasionally, teachers would teach a new tool on the computer and include a part of the lesson about revising. In one event, Patti gave a mini-lesson on using graphics to elaborate text by cutting graphics from a clip art library and pasting them into text cards in hypercard stacks (Fieldnotes, 7/26/93). Patti's strategy was to gather students in a group on the rug in front of the computer and to model the process for the students. As students watched and learned

the procedures, students were called up to perform the procedure for the class with varying degrees of scaffolding from Patti, depending on the need.

I provided another example using mini-lessons as a tool for revising knowledge when the class was learning to use the video camera to digitize pictures of themselves and print them out (Fieldnotes, 4/23/93). I and students who were using the camera digitized pictures of students and redigitized the pictures until eventually the camera operator digitized a picture that was acceptable. Later, we added text to the images and printed them out.

This type of revision contrasts with previous definitions of revision in the sense that a new image replaces an old image completely. The revision was performed by the camera operator and the subject or objects of the picture. On these pictures the subject of the picture stood with their backs to the window. The result was that the face of the subject came out dark and the background was overexposed. The camera operator and subject of the picture work together to put the subject in a setting so that the subject is in focus and the correct shade of gray. Sometimes the camera operator revised the picture by changing to use a telephoto lens to make sure the subject is larger in the picture. Although these revisions are expressed by the camera operator on a camera and not with a pencil on a paper, I consider the changes a camera operator makes to be a revision because they are changing features on the camera or moving to improve the image. Likewise, a subject that is to be digitized by changing a pose or altering a background to improve the picture.

Mini-lessons: Revising Technical Procedures

Frequently, teachers decided to use the mini-lesson as a tool to quickly revise the students' understanding of the procedure for using the software and hardware. In some cases, teachers would notice a misunderstanding about a procedure using the computer. Instead of telling everyone in the group individually, the teacher called all the students together and gave a mini-lesson to revise student's thoughts about the procedure required for the lesson. These are often quick impromptu lessons.

> Katie circulates going from group to group talking to each group. Part of the way into the lesson, I saw a group start to type from the beginning their information instead of just editing their previous file. She called the class over around the computer and asked them to look at it. She showed how to recall the file and then change it. She talked about how that would be so much easier. "Got it?" (Fieldnotes, 2/2/94)

Katie revised the students' understandings of the procedure needed to complete the task successfully. This quick mini-lesson helped students understand how to revise their writing more efficiently.

Sometimes teachers choose to start or end a day's work with a short mini-lesson to review some the problems students had that day. These mini-lessons allow students to increase their technical knowledge and continue to focus on teacher goals even when they work most of the time in small groups. In the following passage, students in Yu's group (see quotation in the section of this chapter on experts) had trouble during their lesson setting the cursor down, pushing CTRL "A" to use the keyboard, and being nice to each other.

We had to stop the writing to do a whole group session before the
students were to go out for recess. I explained problems that
students had (1) setting the cursor down, (2) CTRL "A" to use the
keyboard, (3) Being sweet in your comments to the learners
(Fieldnotes, 6/4/93).

Since students had trouble with these skills during their work period on

the computer, the mini-lesson addressed those very problems. This style of

teaching responds to the need of the whole group to learn basic technological

skills important for completing the task. Rather than teach such lessons to

each person individually, the teacher can very efficiently teach the whole class.

Since students work in pairs, small groups, and with student experts, it is not

necessary to expect mastery learning in the mini-lesson context. Students who

do not learn the entire basic technical procedures during the mini-lesson will be

able to co-construct the procedures with their partners and call on the expertise

of other students.

Who Revises Knowledge?

Traditional classrooms in the past and now are places where students

have learned from "the book" and the teacher. Students listen to lectures the

teachers give in the classroom and read the book for other information. These

two sources were the primary source of content students were compelled to

use (Cuban, 1984). On tests, students are judged by how well they can copy

the textbook information. When we limit students to this type of information we

devalue their own personal information. We want students to accept the

institutional power that the teacher and the textbook have over them (Scollon,

1989). During the course of this study teachers learned to use different social arrangements to provide opportunities and motivation for students to revise the content of the lessons to include some personal element. These social contexts allow for students to share the power and negotiate decisions about what information is important enough to study in school. In these contexts students may find it possible to express their own thoughts in a style that suits them and yet is also conventional in that it makes sense to other readers and writers.

In this chapter, we viewed social contexts which promoted the role of students as the main editors in their school work. The students play the role of authority. They are empowered because their thoughts makes a difference in their education. Students become authorities in areas such as spelling, flow of the sentence, rhetoric, layout, as well as technical expertise. Students also demonstrate their understanding of the assignment and what they believe to be correct in the revisions they ask students to make.

The fact that students have become authorities in writing marks a significant shift in the nature of schooling. Whereas teachers have typically played the role of arbiter of the truth, in these classes students have begun to take over the standard of correctness and level of creativity and thought by making comments on revision in schools.

Inasmuch as students have been inhibited by the social context because there were few opportunities for students to speak, in the style of education

demonstrated in this study, a student's absence of "voice" is a deficit. In this chapter, we saw how groups with experts, paired learning groups, and small groups increase conversation opportunities for students to make schooling more meaningful by expressing their personal experiences and voice.

In the next chapter, I will examine the revision of knowledge to add personal voice and personal experiences by viewing the nature of the revisions. By examining the character of the students' revisions, we see that students can integrate personal knowledge, and personal voice, and revise the appearance of text and graphics files to suit their personal interests.

CHAPTER 5: PERSONAL KNOWLEDGE IN REVISION OF STUDENT TEXTS

This chapter concerns the content of the changes students made when they revised their writing. It is important to note that revision of student writing is not monolithic. In fact there are many different kinds of revision including revision for conventions such as spelling, punctuation, or word use. Revisions that are meaning driven examine writings as a whole to see if they achieve their purpose or they just examine word choice. This study focuses on the content of the revisions that express personal voice or personal knowledge.

In Chapter 3, new classroom routines and procedures were examined that allowed students some choice and control in their learning. In Chapter 4, emerging participant structures were examined. Teachers and students' roles shifted as students took on many of the roles traditionally reserved for teachers. The focus of classrooms shifted from whole group lecture style to discussions with individuals and in small groups. In these chapters students were able to express their ideas in unique and personal ways. In this chapter, revisions are examined as personal voice or personal knowledge and the relationship to school knowledge.

In the first section below, two of the principle reasons to promote the integration of personal knowledge and preference with school knowledge are

considered. The first reason examines knowledge as a political and cultural act. The second reason pertains to the understanding that meaningful learning requires that students do more than just to reproduce school knowledge.

For many school children the implicit authority for information rests with how the teacher interprets the book. What counts as acceptable information to share in class is limited to textbook sources that come from outside of the students' immediate community where the textbooks were written and to particular ways of teaching and responding to those texts. This is a very forced situation where there is little opportunity for students to define their own situation. Traditional forms of teaching are very forced because the teacher defines the time, size of group, and limit on feedback (Scollon, 1988). Even the teacher often considers the book to be a more authoritative version of the truth than the learning community of the classroom. In one instance, students in Katie's class worked on a social studies lesson about living in the Soviet Union, even though the Soviet Union had broken up over two years previously (Fieldnotes, 11/19/93).

Students often do not use the personal knowledge they have concerning topics they study. Students and teacher often "count-only-what-is-taught" as knowledge appropriate for school use (Smith, 1983). Students often have abilities that are not "counted" as learning because they do not fit the narrow school definition (Heath, 1982). Schools sort students out according to this definition school knowledge and criteria. Schools label students as successes

or failures according to the degree by which they conform to the school standard of knowledge.

In many cases, however, what students know does not conform to the way the schools definition of knowledge. In fact students often learn information that allows them to be successful in their own local cultures (Delgado-Gaitan, 1983; Heath, 1983; Jordan & Au, 1986; Ogbu, 1981; Phillips, 1979). In effect, by denying and even not inviting the use of local and personal knowledge, the teacher is setting up a priority list and asking the students to choose the school culture and, at least as long as they are in school, to temporarily dismiss their home culture. Many students perceive themselves facing the difficult choice of either accepting the school's artificial standard of knowledge and rejecting their own community or rejecting the school culture and accepting their home culture (Ogbu 1981).

Prior knowledge has been an important part of schooling that teachers must help students access so that the new knowledge is integrated with the child's existing knowledge. According to this theory, many researchers feel that unless the child integrates curricular knowledge with the child's existing knowledge, the child will form schemas of information unconnected to their own personal knowledge about that area. As a result, the child reproduces the teacher's and book's knowledge for school purposes. They learn the curriculum to pass the test or write the report but the students do not internalize the information. In similar ways, Putnam, Roehler, and Duffy (1987) describe

teacher learning. They refer to memorized knowledge as that knowledge which does not belong to the learner or come from the learner. The learner feels no sense of caring about the knowledge. When one restructures, however, he/she must internalize the information and feel a sense of ownership for it. The learning is internalized because the learner's old structure is replaced by a new one which becomes firmly established in the learner's head through repeated practice experiences. Similarly, ownership is developed because the learner does not just take someone else's idea, he/she also takes some thoughts of his/her own (background knowledge) and arranges them in a form that makes sense to him/herself. Since the knowledge is co-constructed, the learner feels a sense of ownership and caring about the knowledge because it is part of him/her. These qualities greatly enhance the potential use of the knowledge.

This disconnectedness between the child's personal knowledge and the curricular knowledge of the school has been a reported cause of school failure for children. In some cases, students simply do not access the prior knowledge necessary to understand the new information being presented. In other cases, the presentation style of the teacher does not match the style of communication the child is accustomed to at home (Delgado-Gaitan, 1983; Heath, 1982; Jordan & Au, 1986; Ogbu, 1981; Phillips, 1979). Students who work in groups on the computer may find that they can use the communication style they are most familiar with. During the use of the computer in small groups students

may use a communication style that is common in their community even though that unique style of communication is not typical at school. A greater degree of student control has been seen in small groups and allows for a context in which students' voice exists.

In the previous chapter, we have observed how students found the social context of small groups more conducive to their style of learning. In this chapter, we examine the types of revisions students make and how those revisions reflect the child's personal style and preferences. Allowing the student to make choices in the content and process of learning denotes a shift in the role of revision of writing.

I have divided the chapter into five sections that display the use of personal background knowledge, personal voice, and personal preference. These revisions of personal knowledge are evidence of a link between school knowledge and personal knowledge that teachers seek to connect so that students actually integrate school ideas with personal knowledge into one schema. By integrating these two groups of information, school knowledge may become more useful to students in their daily lives.

Integrating Personal Knowledge with School Subjects

Given opportunities, students express their personal voice concerning issues surrounding the teaching units. During the study of life in the ocean, Julio was frustrated about the lesson. Since his native language was Spanish and the books and instruction were offered only in English, he did not

understand much of the content or discussion. Julio was isolated, since in

Katie's class, none of the other students spoke Spanish. I advised Julio in

Spanish that he could just delete the English text he did not understand and

write what he knew about oceans.

Julio had fewer resources to draw on for content. I explained much of

the page-long template about the ocean to him in Spanish, but he could not

read it in English later. Even given his smaller group of resources in this

English speaking school, Julio's writing contains a great deal of voice. In the

next section, you will observe a great deal of personal knowledge that is not

present to the same extent for students who had more access to the facts in

the ocean template (see Appendix B)

Life in the Ocean
by Julio Gutierrez

(translated from Spanish) The ocean is blue. In the ocean there
are animals and plants. In the ocean, it's very cold. I swam in
the ocean. When I tested the water it seemed salty. I passed
over the ocean when I came to the United States from Venezuela.
The ocean is beautiful, very beautiful. Hopefully they will stop
contaminating it. It's possible but I think you have to do
everything possible [to keep it from becoming contaminated]. You
see, it's the people that don't have respect for anything and they
don't care about anything. They just think about themselves.
Some don't even care about their family. We must make sure this
[contamination] doesn't happen any more.

Julio starts by discussing physical attributes of the ocean including the

facts that the ocean is "very cold," "blue," and there are both "animals and

plants" in the ocean. These statements are written as if they are undisputable

facts. Although the fact that the water is very cold or blue is dependent upon where you see the ocean from. In some cases the ocean is warm and has a greenish or even a black look. Julio lists them first in three short isolated sentences.

It is interesting to note that he never gives another fact. I got the impression from reading Julio's "Life in the Ocean" that these were sentences he knew would be appropriate in school. Often, since written papers are evaluated based on the number of facts presented, this makes sense. From the context of the situation, we also know that Julio did not have a fund of information available to him to draw on. There were no Spanish books or Spanish-speaking persons beside myself who could provide him with more facts outside. It is possible that if he had more facts that he would have filled up his paper with facts.

Although Julio had appeared to start his science writing by establishing these consistent, static truths, in a very real way, these facts he records are dynamic in nature. Several authors talk about this ever-changing state of knowledge. Schwab (1978) refers to the evolution of scientific knowledge when he writes:

> No knowledge structure is an ultimate or true picture of a static world but the forms serve us well, in the present state of knowledge, as means for pursuing more knowledge. In consequence, the forms will change. As they succeed, they change the state of our knowledge. New forms become necessary as the potential of the old ones is exhausted. So science, like practical knowledge, fluid, dynamic.(p.177)

Dewey (1956), in speaking about a child's world, said, "the universe is fluid and fluent; its contents dissolve and re-form" (p.6). So even though Julio wanted to express consistent truths, he was actually expressing his voice and exposing his experience with the ocean by giving these facts. These slices of information and the intention with which they are communicated give the teacher information about the prior experience and sophistication of the writer.

It is not clear from the text whether he has personally experienced the plants or animals or any of the other physical attributes in the ocean or whether he knows those facts from books, stories from others, or television. He does, however, tell about another personal experience when he refers to having passed over the ocean on his trip to the United States. These two personal experiences add to his credibility because he has some personal experience and is not merely repeating the knowledge other people have about the ocean.

From personal experience swimming in the ocean, the ocean "seemed salty" to him. By the word "seemed" he was able to give the appearance of some doubt about whether it was salty or not. This is the first statement where a shade of doubt is expressed. From the wording of the sentence, Julio does not seem sure of the verity of this fact. This statement contrasts with earlier assertions concerning the ocean being "blue" and "very cold" which he expressed with certainty.

Next, Julio makes an aesthetic response by remarking that "the ocean is beautiful very beautiful." Julio does not just say the "ocean is beautiful," once. He repeats the word adding very to it to voice a more intense feeling. It appears that his thought is not a fleeting, cursory reflection, but rather something felt deeply. Implicit in such a statement is a sense of awe and love. In this composition, this phrase seems to be a turning point. In the first section, he expresses facts and his hands on experience. Then he expresses his affinity with the ocean and acts as an advocate for preserving it in its beauty.

At this point, Julio attacks those who contaminate the ocean, saying they do not respect or care about anything except themselves. "Some don't even care about their family." He expresses his interest and strong position about the "people" who contaminate the ocean. From a writing perspective, Julio has found his voice in a meaningful context. Julio shows a sense of caring and ownership about the topic. From an assessment perspective, we learn that Julio appears to have a sense of family and group loyalty that has been noticed in other studies of Hispanics (Delgado-Gaitan, 1983) and a disdain for those that "just think about themselves."

In total, he voices his concern about contamination in three sentences. He expresses an extreme environmentalist point of view and presents his argument as an advocate for the ocean. He states that they "must" make

sure this does not happen any more and "you have to do everything possible" to make sure the oceans are not contaminated.

As we examine Julio's writing as a whole, we discover his revisions about the template on oceans express advocacy, anger, and expression of beautiful. This is especially true in the second half of his writing. Given his lack of ability to review the teacher written template and his strong beliefs, he introduces new topics that express a range of emotion. These are among the expressions that give meaning and purpose to science study. Sadly, they are also feelings and expressions that many educational experts have found lacking in the school (Cohen 1988; Freire, 1985; Goodlad, 1984).

More Examples Integrating Personal Knowledge

In the next few paragraphs, I briefly review several more examples of personal voice that give the reader a sense of the depth and breadth of the revisions that expressed voice during the study. Throughout the study most of the demonstrations of voice and personal knowledge in school writing occurred in the first draft and not in the revision. Before any writing took place, teachers encouraged the students to include their own thoughts and their own selves in the stories and the content area writing. Since the scope of this study is limited to student revisions, these examples are not analyzed in this document.

Most of the revisions that integrate voice or personal knowledge into literacy lessons and content area lessons take place as students are revising

the teacher's template (see Chapter 3). In many of the expressions of voice, the authors express advocacy by putting themselves directly into the text by placing the composition into the first person. So, for example, the sentence "Matter is anything that takes up space" on the teacher template becomes, "I believe that matter is anything that takes up space" (Missy, 12/9/93). Students also placed themselves as the main subject of the sentence by using, "I say..." and "I noticed" (Amos, 11/11/93).

Many times younger students did revise their writing, but they did not often include voice or personal knowledge as a revision except when they were revising a teacher's template. While learning about how to tell time in Maria's first-grade class, students often revised the clock face by drawing hands and then writing a sentence that told what the child did during that particular time. Next to the clock faces, students wrote phrases such as, "I go to school," "I go to violin class," "I eat dinner," and "We have gym." These students are allowed to write about what is important to them and at the same time they practice telling time.

Another very common occurrence of integrating personal voice or personal knowledge into school subjects took place when students gave examples of related events they have actually experienced and wove those into the discussion about the subject matter. For example one student wrote about what she saw, "I have looked at the ocean and believe me, it looks like a huge mass of blue water" (Karen,11/16). Other students describe what

they tasted, "I have been to the Pacific Ocean. It is very salty." Jeff (11/17/93) tried to relate the concept of the different temperatures in the ocean to an experience he had scuba diving, "I have been to the Gulf of Mexico. As I went deeper, it got colder."

Students also commonly described experiences they encountered vicariously through a friend, the television, or books citing the source. Ardema and Jeff (11/17/93) note, "We have looked at the ocean on TV before..." The fact that students can cite the source of their experience provides for the reader a way to measure the verity of the statement and decide for themselves whether it was true under the circumstances described by the author. Many students read from the science or social studies texts or trade books and, using their own words, revised the teacher template to use those ideas.

Finally, students used imagined situations to express their emotions as if they were personal experiences. Anna imagines what might happen when she is at the ocean, "When I touch the water, I think something is going to jump up and pull me under the water." Martina writes a similar section about the study of the rain forest, "Animals that have sharp teeth and can sneak up on you." In these two examples, we gain a glimpse of the fears and fantasies of children. These two students perhaps have background experiences about the ocean that lead them to believe that the ocean in a dangerous place because of "animals" or things that may jump out at them.

Since it is unlikely that anything like that has actually ever happened to them or anyone else, one has to assume the girls experienced this event by way of television. I find it interesting, as an elementary school teacher, so many experiences children have are a result of their watching television. In fact, television and movies a major source for students ideas for writing during process writing time (DeVoogd, 1989). The fact that students gather so much information from television could be important assessment data for the teacher and could impact on teaching methods.

In addition to personal voice and personal knowledge, students were encouraged to express their personal preferences by changing the appearance of the text and graphical images. The next sections explore many ways students personalized school work by changing the appearances of the document.

Revising the Appearance of Text and Graphics

Changing the Font Size

Students made many changes in the text to suit their personal preferences. These revisions make the appearance of the text unique to the individual. The computer affords many options for the child to leave his\her personal mark that handwriting does not. One of the most common changes in the appearance of the text was with the size of the text. Students seemed to change the size of the font to create the illusion that they had written a great deal more than they actually had. This was the case when Ardema

was trying to impress her friends.

> Ardema looked at her friend on the next computer and told her, "It's fun when you write in big letters. It looks like you wrote a lot. Then when I print it out, I'm going to make it small so it doesn't take up so much paper.
>
> Dixie nodded her head in agreement, "O.K. I want mine big too." I showed her how to change the font size on her writing. I put on the ruler which contains a button allowing the user to change the font size. She changed the font size to 48 which makes the letters about a half an inch tall. Then I showed Dixie how to make the font size 80 and I left. Although Ardema was sitting right next to Dixie and when I showed Dixie how to change the font size to 80, she hadn't been watching very closely. Dixie wouldn't tell Ardema how to change the font to 80 and so Ardema proceeded to follow me around the room while I helped others asking me many times in a whiny voice to teach her how to change the font size to 80. (Fieldnotes, 1/5/94)

Ardema seemed to enjoy the sense of accomplishment one gets from writing a long passages without writing a lot. She could simply write a little and then increase the font size to write a long paper. Ardema expresses her joy by saying that writing with "big letters" is "fun." She follows that up with, "It looks like you wrote a lot." For Ardema writing "a lot" seems to be a fun activity she strives to achieve. Of course she is also concerned that she not waste paper and so she reduces her font size to small type in order not to use too much paper before she prints it out.

Dixie, hearing her explanation, appears attracted to this easy way of increasing the size of her paper. She learns how to make 48-point text and then also 80-point text. In her competition for the appearance of having the high status of writing the longer paper, Ardema asks Dixie how to make the 80-point

font. Feeling the competition, Dixie does not give away her secret knowledge of changing the font to 80-point size.

Ardema is not satisfied. She then goes around the room following me to find out how to make the text into 80 point font size. Finally, Ardema is willing to resort to asking me how to make 80 point font over and over in a "whiny voice." Ardema is willing to risk the humility of begging to obtain the high status of long paper.

This short example is an indication of the desire and excitement students have to manipulate the text for their own purposes. The competition between the two girls is an indication of the strong desire to change the appearance of the text. These girls appear to want a long paper and relish the opportunity to make it longer without writing more. These students are happy to revise by changing the appearance of the text to suit their personal interests to make a longer paper.

Changing the font size was common throughout the study. On one occasion Katie reports to me in an interview that students in a group of three used very large font and did not bring the font size back to normal size before printing. Their text was nine pages and they had to print out 5 copies for a total of 45 pages! (Interview, 2/4/94) Again the students demonstrate the ability to manipulate the appearance of the text to suit their own purposes.

Students do not always increase the size of the font just to make a longer text. In the next two paragraphs evidence is cited to help the reader

recognize the breadth and the depth of changing the size of the font for other purposes. For example, in a passage already cited in the chapter on Processes of Revising Writing, Katie, pointed out to the whole class when Brad, enlarged the font so that all the students in the group of four could read the text even though they were not all able to sit close to the monitor (Fieldnotes, 1/25/94).

In another class (Fieldnotes, 4/93), students were creating a travel flier in three cooperative groups in the class. The students' goal was to write interesting and eyecatching facts with a graphic in a page. This seemed like a real-life application since most fliers are only one-page long. Students found that after they had written their text and selected their picture, they had to adjust the size of the font in order to make the text no more than a page.

They discovered however, that the flier did not look appropriate when the text was too short. Most of the groups manipulated the size of the graphic and the text size so that the flier was exactly one page long. Students editing a report-style text about the state of Hawaii decided to increase their graphic size so the text would end at the end of the page. Also, they wanted their graphic to fill up the page in order to make good use of the whole page instead of leaving a space at the bottom of the page (see "Hawaii" on the next page). Again, students manipulated the size of the font and also the graphic to suit their personal needs.

Changing the Font

Changing the font was just as common with students who knew how to change the font, but there were few obvious reasons to change the font style. Usually, any software that allows the user to utilize text such as a word processor, paint program, or hypercard, will also allow the user to change the font style. There is a default font style for users who do not want to change the style.

With the limited styles of font available for use with these programs, there was little reason to change the font styles except for aesthetic reasons. One font was as good as another for practical reasons. All fonts gave the same message. However, to certain individuals some fonts were more attractive or readable than other fonts. In any case, font selection was another way in which students could manipulate the appearance of the text to make it reflect the individual or group desires.

In Maria's first-grade class, students were required to draw a picture (or create a graphic) that related to something they were studying and then write a sentence about the picture. In the following passage, Maria tells of an instance in which students chose a font that was very hard to read and then decided to change it back to a more readable font. Note that the ability to read the text was a priority over the choice of the fancy text. Isaiah was the expert in this instance and was offering Yen different choices. One the choices Yen had to decide was the font he was to use for writing.

Maria: Today I let them try. Isaiah was with Yen and he said,
well, what kind of lettering would you like? And he said this one.
So they tried it and it was....you could hardly read it. And they
said well, what is this, Ms Maria? I said, "I think that was Old
English." And I said, "Well, what do you think about that?"
        (Yen and Isaiah responded,) "We're having a hard time
reading it."
        "Well what should you do..."
        "I think we should go back to the old text." (Interview,
12/7/93)

At first Yen and Isaiah had chosen a fancy Old English/Gothic font to
type with. This font is very ornate with extra lines and curls. This type of print
is not very commonly seen for first-graders. They discovered, however, that
they could not read the text very easily. So for reasons of ease of readability,
the students chose to change the font. The most important aspect was that the
text communicate and only secondarily that the text be aesthetically pleasing.

Editing Graphics

To most readers, the quickest and most obvious cue to the meaning of
the story is the pictures that accompany the text. Sometimes students write
their story and then think about pictures and graphics they want to add to
writing. They can look in files on the computer where graphics are stored and
may be copied from that file and pasted on the user's text document. A
graphics library is the generic term for the place in the computer's memory
where the graphics are stored. Unfortunately, computer graphics are at a
relatively primitive stage of development. One handicap is a relatively small
number of graphics available for children to use when illustrating their stories.
Most of the images are of a very general nature or oriented toward business.

Graphics for children often do not represent an acceptable image for the meaning the child is trying to create.

As a result of these small and inappropriate graphics libraries, there is a great need for students to edit the images available to them to fit their own purposes. However, even editing graphical images on computer can be awkward with today's computer tools. Students are forced to use a bulky mouse which is a rather cumbersome instrument compared to a sharp pencil. Yet even given these awkward tools, most children are drawn quickly to pictures on the computer. They enjoy the color and instantaneous recognition of a situation. In the same way, child writers enjoy using pictures in their writing to extend and elaborate beyond the meaning of the text.

The most common editing took the form of erasing and drawing. Students were able to choose a number of widths and shapes of eraser as well as erase the entire picture or file. Sometimes instead of erasing the child simply drew a larger picture over a smaller one (Fieldnotes, 5/5/93). Another favorite form of erasing was undo. Children discovered they could erase only that which they had just drawn by using the undo button (Interview Maria 6/6/93). In cases in which photographs were digitized or drawn and pasted into word processing software, students spent a great deal of time changing the size of their graphic (Fieldnotes, 7/28/93).

When students used graphics with which to elaborate texts, I observed two practices. One practice was that students elaborated text with graphics

they used as simple decoration. Especially at the younger ages, students just found graphics they liked and could not resist placing them in their writing even though the graphics do not contribute any meaning to the story.

In the picture included in Figure 14 below, the child writes, "I love the minicomputer because I can do alit of thing with it, like adding and minus" The sentence the boy writes is a personal expression written in first-grade for the school subject of writing in Maria's class. Following that message, the child stamped many graphics images that do not appear to have any relation to addition or subtraction, including teddy bears, the moon, stars, and women walking very big dogs. Below that is a tool they use in this math program called a minicomputer.
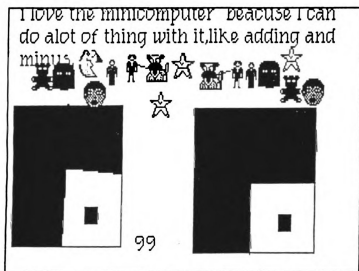

Figure 14. Minicomputer.

The teddy bears, stars, moons, dogs, and people all come from the graphics library that the child stamped on the paper. They are not meaningful except as a decoration around the text. The squares below that the child actually drew with the aid of the computer and the number 99 represent an elaboration on his thought about the minicomputer. These graphics represent a kind of revision called elaboration that the child uses to give additional personal expression to his work. On a very simple level, this child has elaborated on his sentence by adding this graphic decoration and the minicomputer.

Another example of using graphics occurs when children add fancy background or other kinds of decorations to their papers. In another picture the child writes the time of day he goes to karate class. Joe, the student, is asked to access a computer file where a clock face without the hands drawn comes on the screen. The students are then able to revise this template (the clock face), putting on the hands where they belong to show the time of something important in their lives. Below, Joe revises the blank clock face and places the clock hands to indicate that at 4 o'clock he will "go to karate class" (Figure 15). Then students are asked to write a sentence. Joe goes far beyond the teacher's suggestion to explore with his artistic talent using letters and designs. In the picture below, notice all the ways Joe personalizes his writing.

It was common for students to want to use a background such as Joe uses here in this picture. On the computer screen that background of a shiny

ball pattern is usually a color other than black. However, color printers and ribbons, being expensive as they are, are not very common in the schools.
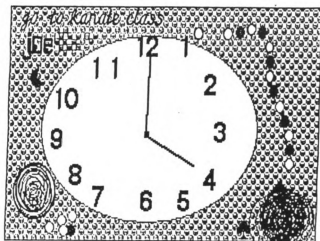
Figure 15. Joe goes to karate.

Joe's colorful picture was printed on a black ink printer. Eventually, printing with background was even discouraged because it used up too much of the expensive ink cartridges. On top of the pattern, Joe has drawn a line of black and white balls, a pacman, a tree, circles (bottom right) and a series of increasingly smaller fill circles (bottom left). Although Maria's goal in suggesting this assignment to the students was to promote growth in math, it appears that this first-grader has explored also in the areas of writing and art. All of these elaborations on the clock stress the individual and unique character of this boy.

The second and more common purpose of elaborating texts with graphics was to use pictures to add to the meaning of the text. Children often draw their own pictures to elaborate on the meaning of the text such as above, where Joe draws a picture of the minicomputer to help the reader understand the meaning of the text. Below Alejo and Matteus warn all about the danger of selling drugs on four screens (pages) of the hypercard program. "Drugs can kill you and Destroy your life. If you sell them to people." After writing the entire program the students took a look through the clip art to see if there were any images that would be appropriate for their topic. When they saw the skeleton on the clip art their eyes lit up and Alejo said, "Yeaaaaaaaaahh! Let's use the skeleton" (Fieldnotes, 7/19/93). In fact they liked the skeleton so much as a symbol of death and danger that they cut and pasted a plain skeleton next to the text on three of the four pages of their hypercard program (Figure 16.).

```
Drugs can kill   you and
Destroy your life. If  you
sell them to people.
```
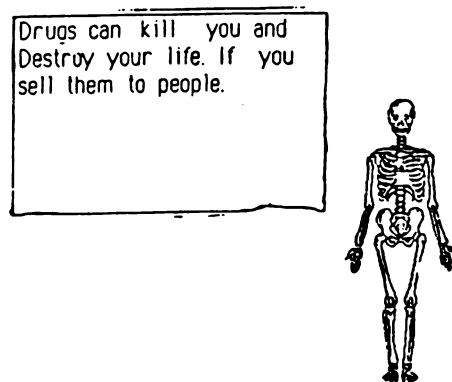
Figure 16. Drugs can kill you.

On the fourth page the students drew straight lines around the skeleton to make it appear that the skeleton was in jail. Alejo and Matteus used a graphic as a symbol to dramatize their point. The skeleton was drawn in a fashion they would not have been able to do on their own with a mouse or a pencil. The skeleton provides the reader with a sense of mortal fear that is common to most people. The skeleton is not the message, but it lends an intensity to the message that would have been impossible if the students had attempted to draw a skeleton themselves.

Students often times insist on revising to preserve the meaning of the event that they remember and want to write as a story. The tension occurs when the child wants to illustrate a story, but the graphics library does not have acceptable graphics to illustrate the story. Sometimes that story is a true story and misrepresenting the story with inaccurate illustrations would violate the integrity of the story in the child's eyes. Other times the story is not true and the child is unwilling to alter some of the facts of the story to fit the images in the graphics. Since graphics libraries are very limited and difficult to revise, this happens quite often. In fact, many students do not like to use the prepackaged library graphics without revising the graphic itself in some way.

In Kari's first-grade class, students were making books with many pages using Kidpix. Each page had text and a drawing that students created all with the computer. Part of the way through the summer, we had the problem of students taking too long on the computer to draw each page of the story and as

a result they were not finishing and were losing interest in their story. In order to resolve that problem and move children through their stories more quickly, Kari and I decided to ask the students to use the same graphic for each frame making only minor or no revisions to the pictures.

Frazier wrote a story about his whole family going tubing down a river together. At one point in the story, Frazier writes, "My dad flipped over." However, on the picture that he was asked to keep the same, his dad was still on the inner tube. The picture did not show him flipped over. Frazier objected to the picture, saying that it was wrong. As he was telling me, he began to erase the entire picture and text with his eraser (he had selected with his mouse). I told him that it did not matter that much that the picture did not reflect the text, but he continued to protest and we edited the picture of Frazier's father so that it looked like Frazier's father had flipped over (Fieldnotes, 7/28/93).

For Frazier, revising the graphic was an issue of being true to the story line. He wanted the text and the picture to be consistent on the page where his dad flipped over while using the innertube. If the text and pictures did not make sense to him then he was willing to take out the complete frame by erasing it all. Frazier was *compelled* to revise the graphic to fit the text. In this instance, the purpose of revision was not to improve upon or elaborate with added information. For Frasier, there was a standard of correctness below which he was not willing to go.

A similar event in Kari's class occurred when Neva wrote a story in many pages on Kidpix about going on a walk with her mother. The first frame (page) of the story, showed Neva and her mother leaving a house to walk on the street. The next frame showed the same scene but Neva and her mother were walking further down the street away from the house. The text read that she walking down Michigan Avenue which was not near her home. Neva insisted on erasing her house in the picture because her house was not near Michigan Avenue (Fieldnotes, 7/26/93). Again, in this event, Neva saw the text did not match the picture and so she revised the picture to reflect the situation she knew to be true.

Often, the clip art graphic itself had to be modified to make it acceptable looking to the children. Rafael and Marco were writing a reenactment of a basketball game between their sports heros Michael Jordan and Charles Barkley. The clip art that resembled these players best of all was a businessman in a suit with a hat, briefcase in one hand, and newspaper in the other. Marco and Rafael erased the briefcase and replaced it with a basketball. They also erased the man's hat and gave him a bald head and dark skin.

Throughout the course of this study I have been reminded of the importance of the personal nature of writing when considering student's rights and needs to revise their pictures. The works children create and attach their names to are very much a reflection of their own character, background, way of life.
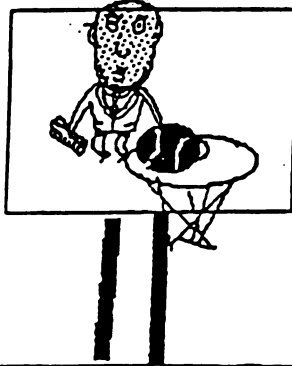
When Jordan glided from the freethow line.   Jordan jumped over Barkley.

Page I

Figure 17. Jordan jumps.

CHAPTER 6: WONDERING ALOUD ABOUT TECHNOLOGY, TEACHER EDUCATION, AND LITERACY

The roles and routines of teachers and students have remained relatively static for the past 150 years since the rise of the common schools (Cuban, 1984). Students sit in desks facing the teacher, deriving knowledge from the teacher or from books. The teacher's traditional role among many has been to provide information and check to see that the student is receiving the information. The students' role, simply put, was to receive the information and repeat as much information as possible back to the teacher.

Some think computers could be a catalyst for reform in education, but many challenges still exist. While the schools in this study have proposed the goals of using the computer as a tool for accessing, managing, and constructing ideas, in reality a wide disparity exists between the goals and the practice of technology in classrooms. Among those challenges, most researchers agree that effective staff development is the most significant factor determining what role computers will take in the classroom (Brennan, 1991; Bulkeley, 1988; Schlug, 1988; Yeoman, 1993). The mere existence of computers will not reform the classroom. It is the teacher's use of the computers that creates change (Michaels, 1990).

The teachers in this study and I accepted the challenge to formulate ideas about how to help students use technology to construct knowledge in the classroom. Instead of being a staff development project where I, as an expert, implemented one specific method of teaching, we worked together discussing, planning, experimenting, and refining classroom roles and routines. I was not sure of what new classroom roles or routines would develop, but I wanted to bring my knowledge about classroom teaching and social constructivist theories to the teachers in planning and debriefing meetings. Teachers, in turn, brought their knowledge of the students, knowledge of the curriculum, their own technical and professional knowledge about teaching to our planning and debriefing meetings. Together we thought about how to change the classroom to make it a place where students could construct personal and content area knowledge using the computer.

Over the course of the study, the teachers and I constantly reorganized the classroom routines shifting from a whole group telling style of teaching to a style where small-group work and mini-lessons were used. In this new context, we noticed the development of participant structures that indicated a major shift in roles for teachers and students. The teachers and I also developed the role of student as computer expert in the classroom to assist the teacher. The expert related to other students in a manner we had not seen in the classroom previously. We noticed students in small groups and pairs of students assuming roles in the classroom that had been previously assigned to teachers.

There was also a shift in the way the teachers participated in teaching, learning, and organizing the classroom.

In the following pages, I outline the shifting roles and routines in the student revision of writing that occurred in the classroom and the significance of these changes for educational reform. In later sections I discuss implications of this study of student revision of writing. A large part of that discussion focuses on why computers can be an important tool in learning revision in writing and education in general.

Teachers Shift Roles and Routines to Improve Revision

Teachers designed new roles and routines in order to use the computers as tools for revising writing. After the teachers devised the new routines, they had to develop new participant structures to meet the needs of students who were working more in small-group settings and relying on their peers to help them perform their learning tasks. Students and teachers learned a different way of schooling as they took on these new roles in the classroom.

New Routines as Scaffolds for Writing Revision

The teachers wanted to use the computer in a fashion that would capitalize on the unique strengths of the machine. At some point in the study, all teachers decided to use the computer to teach writing revision. However, revision was a difficult task for most students and it took a great deal of time. So teachers provided scaffolds for students' revisions of writing by furnishing templates that consisted of information from the textbook that students were

expected to revise. Since students only had to revise the texts and not reconstruct them, they were able to focus more time and attention to higher level cognitive tasks such as integrating personal knowledge and voice within the text. When students were using templates, they did not have to use their cognitive capacity to think of general content and style of writing. Instead, they were able to focus exclusively on revisions to the text. This particular technique allowed the student to spend their short computer time learning revising strategies which are more difficult to learn using paper and pencil.

In other attempts to encourage students to focus on revisions, the teacher organized class procedures so students had to print out the text they had keyed into the computer. Later, each small-group met together with their printed out text to revise it on paper. Examples of these revision activities at the keyboard and on paper are described in Chapter 3.

In the states writing assignment students wrote a tourist flier about Hawaii, printed out a draft, and then, with the printout in hand away from the computer, considered how they could make Hawaii appear more attractive by making revisions. Again, when the students' only task was to revise, they were able to generate the necessary revisions. In all of these examples, teachers learned to change the routines and procedures of the classroom to teach writing revision using technology.

Small Groups and Pairs of Students

Perhaps the most significant shift in role and routines happened as the classroom shifted from a place where the teacher directed the entire class to times when students worked in pairs, small groups, with experts, and sometimes in whole groups as mini-lessons. These changes in routines and procedures provided a context that enabled all classroom participants to relate to each other in ways that changed the character and the tone of learning.

As the teacher changed the classroom context to small groups and pairs of students, participation of the students in the classroom changed also. Students acted as proofreaders, motivators, elaborators, and provided relief for the writer at the keyboard. These roles are quite different from the roles students normally perform in the traditional classroom (See Table 6). In traditional classrooms, teachers often see it as their role to help the student by proofreading texts, motivating, and elaborating. In this case, when students have the job of editing their partner's writing, they often take on the traditional role of the teacher.

The data also suggest that students in pairs or groups are sharing the heavy cognitive burden of tasks an individual writer usually has to bear when they write. According to cognitive theory, young authors often have trouble remembering the content and style of their writing since they use up so much of their attention on thinking how to spell the words and form the letters (Flower and Hayes, 1981). When a pair of students is working together and the

Table 6.

Shift in Roles From Traditional Group to Small Groups Using Technology

	Traditional Lecture Style Group	Small Groups Using Technology
Grouping/ Control	-Whole group, individual work -Teacher control	-Small groups, pairs, individual work, and whole groups -Teacher and students share control
Dialogue style	-Teacher Initiation of question, Student Response, and Teacher Evaluation (IRE) -Lots of teacher talk	-Many styles including conversations similar to those outside of school from different cultures and linguistic groups -Mostly student talk
Teacher role	-Telling -Management of group of goals and content -Teacher scaffolds -One standard assessment	-Teacher is a learner -"Meeting with" groups, floating, checking, conferencing -Asking questions -Teacher observes & listens -Assigns students to groups -Mini-lesson based on students' needs
Student role	-Duplication of teacher and textbook knowledge -Obey teacher	-Construction of knowledge -Self-management -Students and teacher are experts, elaborators, motivators, proofreaders, co-authors -Scaffold learning for others
Social skills	-Student interacts with teacher seldom	-Interactions between teacher & student and between students
Knowledge used	-Textbook defines knowledge that counts -Teacher elaborates on the textbook	-Student must use personal knowledge -Multiple sources including teacher and textbook

typist is unable to do all the writing tasks at once, the partner can pay attention to elements of the writing the writer is not able to address. This is evidenced when partners alternately play the role of proofreader, co-author, and elaborator.

More experienced writers who work together can borrow from and build on each other's thoughts as they jointly fulfill writing tasks such as thinking about what to say, how to say it, spelling, and punctuation improvements. Nicole and Brandy in the section The Role of Partner in Pairs (see page 156) experienced an *interweaving of ideas* in which their joint interaction seems to spur them on to a synthesis of ideas that may not have been possible without both students writing. In one case Brandy does not type what Nicole suggests but types something akin to what Nicole suggests. Thus each child also plays the role of audience-censor deciding whether to accept the phrase proposed by their partner.

The Role of Experts

The role of expert provided some of the same scaffolding that pairs and small groups were able to provide. In part, the expert's purpose as a knowledgeable other was to assist performance by providing a scaffold that allowed the author to achieve a level of writing they would have been unable to achieve on their own (Vygotsky, 1978). In the section The Role of Students as Experts (page 143), while Andrea was thinking about the words she wanted to write and was typing them in on the keyboard, Yu, the expert, was able to focus

her attention on the writing appearing on the computer monitor. In this first grade classroom, Yu provided a scaffold by pointing out that Andrea had to place capital letters at the beginning of the sentence and by teaching Andrea how to sound out "went" and "hospital." The expert shared the cognitive burden with the student she was working with by proofreading and supporting sounding out strategies while the writer was focusing on immediate concerns of what words to write and keyboarding the words in the computer. Experts performed other roles that in traditional classrooms are reserved for the teacher alone. The expert role was not anticipated but arose serendipitously as we planned the computer activities.

In fact, the original need for creating an expert was simply to provide technical assistance to students since the teacher could not always be available to help students experiencing technical difficulty. For the teacher who is just starting to use technology, these frequent interruptions of students with computer problems can be particularly frustrating. The well-trained expert eases that frustration by assisting students so the teacher can work with other students in the classroom. However, the expert role quickly became more powerful than we originally intended. Experts were also empowered by the teacher to provide a secondary authority. In some cases, students were fulfilling some roles the teacher had previously performed. But in other cases, students filled roles such as technical assistance, usually performed by school staff outside the classroom.

Since experts are performing tasks that had been reserved for teachers, there is a great deal they have to learn to be effective in that teaching role. One of the areas we have discussed briefly in this text is what I call expert etiquette. Student experts were asked to allow the writer to sit in front of the keyboard and be the only one to touch the keyboard in most cases. These guidelines were developed after we noticed that the experts would almost always rather do the writing and editing for the writer than to assist. Experts were also trained in the social skills of politeness and patience.

<u>Teacher Role</u>

With so many changes in classroom routine and student roles, teachers have to consider their new role in the classroom very carefully. Teachers who want to control the class will not be able to use many of these procedures easily. Teachers have to be willing to give up some control and educate students in strategies that would allow the students to make good use of their learning time. As the teacher was teaching short lessons in social skills, cooperative learning, and technical computer skills students gradually took over more control for their own learning.

The most common teacher role was to provide short mini-lessons on a topic that fit the immediate needs of the students. At the beginning of the year, the teacher had to give a mini-lesson teaching students how to turn on the machine and learn the basics of the software to be used. At first I taught some mini-lessons to model for the teachers. After they had seen me teach a few

times, teachers started to co-teach a mini-lesson with me and eventually they taught a lesson themselves. At times, teachers also provided times for students to teach the class a particular feature of the software.

The mini-lesson was not a regularly scheduled event. It took place when the teacher noticed a need based on reflections after class. For example, Maria noticed Yu, a computer expert, being impatient with students she was helping. So, over the course of about 7 minutes, Maria gathered the students around the computer and without mentioning Yu, she fabricated some scenarios of students working on the computer when the expert was impatient. Then she gave examples of appropriate words to say instead of being impatient. By teaching this mini-lesson, Maria was scaffolding for experts by modeling appropriate language to use in a group. The lesson was purposeful and timely since it took place close to the time and with students who needed that mini-lesson.

One of the teachers' first role was to decide on a management system that helped students know when it was their turn on the computer. Maria designed a chart with the students names on it to hang from the wall. A clothespin was affixed next to the name of the student whose turn it was. When the child was finished the clothespin was moved to the next name down. The other teachers formed pairs of student groups and rotated the groups when necessary or by the half hour.

Along with shifts toward different participant structures, the character of

the classroom instruction began to change. During group-work times, Katie had "meetings with" a group of students. This term "meeting with" students had a much different tone and looked very different from "teaching." Since students had some choice about topics to write about, the teacher had to listen to the student or read their work to understand what the individual or group was doing. Certainly, this is a dramatic shift in role from the traditional teaching where the teacher did most of the talking and the students did most of the listening (See Table 6). As the teacher was listening, they had the opportunity to come to understand the individual student's ideas as the student constructed them.

Patti "floated" around the room helping students complete their task for the day. "Floating" to Patti meant having little conferences with students when she would read their work and then comment on the writing. Maria also moved around the room to "check" students work and comment on it. Kari conferenced with each writer talking about the story and asking questions. These teacher roles contrast greatly from the traditional teacher roles.

In Table 6 notice the shift in from traditional style group to small-group as observed in this study. In large groups, teachers have more of a tendency to dominate, and control learning. In the small groups teachers have a tendency to ask, check, and understand, what the student is doing. Students in the traditional role take the textbook and teacher as the only sources of knowledge whereas in small computer groups, students get information from personal

knowledge, the textbook, the teacher, and other sources.

Part of the significance of the new type of work the teacher performed was that the image of teachers changed from that of a source of knowledge in whole groups to that of a learner in small groups where the authority to define worthy information is shared.

Because so many teachers have so little experience with technology, perhaps it will prove to be an area where teachers find it easy to be a learner from other staff and students. For example, in Katie's class, Brad gives a mini-lesson on using the CD ROM encyclopedia in the library as Katie learns with the rest of the students. Maria learners how to use Kidpix by asking Ian to teach her and the rest of the class new aspects of the program. If teachers accept personal knowledge as well as other sources knowledge as they become available with computers, teachers will have to become comfortable as master learners.

The Engaged Learner

Central to changes that were recorded in the study is the engaged learner. Students began to take a more active role constructing and revising knowledge in the context of pairs and small groups. Whereas traditional sources of knowledge in the classroom included the teacher and the textbook, in these classrooms student experts, personal knowledge, student voice, and other sources were common. During the times when students revised teacher templates, they were asked to revise the teachers' or the textbooks' ideas.

This activity pressed the students to read actively, raise their own prior knowledge, and revise the content. The use of technology offered a different context and medium that changed not only *who* was expressing themselves in the classroom (the student), but also who was able to make decisions to revise the content of the work in which they were involved. These changes allowed the student to become more empowered and engaged as a unique person.

A Personal Machine

At one time people were afraid that the advent of technology meant that life would appear less personal and more detached from human interaction. In fact, the opposite is true in the classes described in this text. One of the benefits of a classroom where students are thinking about what they know and expressing themselves is that the teacher becomes more familiar with the child as a unique person who lives in a culture other than school. As the teachers come to understand the students' experiences and prior knowledge better, they can fit the unit to meet the needs of the student. The shift in the teacher's purpose to think about individual student knowledge instead of filling the student's head with the teacher's knowledge would indicate a significant change in the role of the teacher in schools.

As a new source and creator of credible knowledge, students' range of possible types of revisions to social studies and science texts were expanded. Some students began to integrate their personal experiences with school knowledge from the content areas. Other times students would express their

voice about the particular topic of study. Students also used the computer to personalize their writings using computer-aided pictures and different font styles and sizes of text.

Since students were required to communicate with each other to perform tasks in pairs and small groups, many of the students' interactions were with other students instead of the teacher. Students were allowed to talk more, constructing their own ideas and comparing them with their partners. Again, these shifts toward using the computers in small groups allowed for a more personal, active part for the learner.

Addressing Cultural Diversity

Often students who come from backgrounds not matching the teacher's cultural heritage can become alienated from schools because of the stark cultural differences between the home culture and the school. As described Chapter 1, some researchers argue that school practices should be more congruent with the community they serve to avoid alienating students with a different culture than that of the teacher (Heath, 1983;Singer, 1988). Contrasting views claim the purpose of school is not to become congruent with home (Zeuli & Floden, 1987). These scholars argue that the purpose of schooling is to teach a particular set of knowledge (Bloom, 1986;Hirsch, 1987) not necessarily shared by all. The basic assumption is that a teacher would have to choose which curriculum and style of education to pursue in a classroom.

These arguments of cultural congruity or discongruity are less relevant in the contexts described in this study. Because students work more in groups and pairs, it is possible that different groups of students could study in their own style and learn different content all in the same classroom. In effect, these findings transcend earlier arguments by claiming that all can study what they choose in a style that is effective for themselves.

Cultural information that is often expressed in participant structures differing from traditional school participant structures can be easily expressed in classrooms that break up into groups using technology. For example, students whose style of speech resembles the talk-story of Hawaiian students, in which students tell a story with many contributing voices (Au & Kawikami, 1986), would have more freedom to use that form of conversation and construction of story in the pairs and small groups. Conversational participant structures of different cultures (Delgado-Gaitan, 1987; Heath, 1982; Phillips, 1972) could even be accommodated in the same room (See Table 6) if students were meeting in small groups.

In addition to providing a context where diverse cultural styles of learning can be practiced, student linguistic style could also be accommodated. In fact, students are encouraged to use their own words in the text. An example of this phenomena occurred when Lamar and Lisa used similes to describe the appearance of the ocean at different depths. At the computer, students have

more freedom to control the style of interaction with one another and the linguistic style.

New routines and procedures mentioned in this study allow students to express personal ideas and cultural norms which the teacher may not be aware of. This cultural exchange of information could also benefit the school by revealing minority cultures for students who have a prejudiced or incomplete understanding of other cultures.

The benefit of individual student expression could result when student integrate their background experiences and voice into school lessons by revising writing using the computer. This integration of ideas could help students understand the value and relationship of school to their personal lives and the people of their culture.

Using technology teachers have shifted from traditional whole-group practices and have learned to develop new roles and routines that have made education appear very different in these classrooms. In the small-group technology model, learning is defined by both the student and the teacher. Opportunities for accessing many sources and accepting student sources of knowledge allow the teacher to give up the image of the "Sage on the Stage" (Dwyer et al. 1991). In this model, students have choices about what is considered valid learning in the classroom. For in the end, learners must construct their own learning and not rely on the teacher's knowledge.

Obstacles for Teacher Development

Of course there still are many pressures that will motivate teachers to continue teaching with traditional roles and routines. The way knowledge is defined in schools is important in how educators think of their profession. Teachers may feel that they can teach the type of static, isolated facts students have to know to pass standardized tests by teaching in large groups and by limiting their comments to the facts that are being tested. If teacher effectiveness is evaluated by the students' performance on the tests, the teacher will feel pressure to teach in a way that will allow students to achieve high scores. School districts may also require teachers to follow curriculum guides written in ways that reflect a belief that knowledge is static and isolated. The teachers' perceptions about schools and schooling may also color their understanding of the curriculum in a way that cuts off creative thinking about how to achieve the objectives in ways other than using isolated lessons and a whole-group information lecture.

In these previous sections the shifts of roles and routines in classrooms where the computer is used to revise writing has been examined. The significance and implications of those changes has also been considered. In the next sections, specific contributions of this project to the study of writing revision using the computer are reviewed.

What Can This Study Say About Writing Instruction?

Much of what I have learned about writing instruction has been interwoven into discussions in the preceding and the following pages. We have drawn heavily from the writer's workshop tools such as mini-lessons, some student choice in writing, students helping each other, and an emphasis on revision. The significance of a writer's personal knowledge and voice are also important concepts of the writer's workshop that are integrated into subject matter teaching.

Integrating Writing Revision Into Other School Subjects

Although a portion of this study took place in the context of reading classes, a large portion took place during math, social studies, and science classes. The integrative processes and contexts could be informative to those seeking ways to integrate content area studies with literacy studies. The sections entitled New Routines Editing with Templates and Revising on Paper and on Keyboard comprise a group of classroom routines teachers could use to meet the needs of students who have to revise their writing more in the content areas.

Relieving the Cognitive Burden

The most noteworthy of the findings are the definitions of the roles students play as partners and experts to improve the revision of student writing. As we know, young students have a difficult time juggling all of the burdens of a writer. As a result, students' writing never reaches a very complex level

because the cognitive load is too heavy for students who try consciously to do to many things at once. When two or more students work in pairs and groups, students can play different roles in the writing process for one text. If partners could share the cognitive burden (scaffold) then perhaps students could write at a higher level than they could if they were working alone.

Perhaps one of the experiments writing teachers could try would be to encourage students to perform different roles in the writing as they work on the writing together. Other contributions to the field of writing are discussed in the next section concerning the use of technology for writing revision.

Revising Writing With Computers

While it is true that some of the study of revision and content could be performed without the computer, I will argue that using a computer is more attractive and advantageous for the author.

Let me start out by conceding that most of the work done in this study can also be performed without a computer. It is possible to revise writing and pictures on paper without using a computer just as it is possible to walk to the store or to bake your own bread. Sometimes there are even good reasons to use paper instead of computers. However, for a number of reasons, it is not efficient. In the next paragraphs I explain principles that detail the advantages of using computers for revising writing.

The first principle is the *convenience principle*. It is not so significant that without the computer you can or you ca not do a particular task. One chooses

to use the computer as a function of convenience. If Katie wants to write a template for students to edit, it is more convenient for her to write it on computer and save it on disk for students to access and revise on the computer. It is more convenient than it is to write it by hand, or type it and use whiteout to make make minor changes in the text. If you change your mind and want to make some major changes in the document you are writing by hand, rewriting the text is very inconvenient. After the handwritten copy is finished, you have to leave the classroom and take it to be photocopied.

This activity is of course impossible if you have students in the room or some just staying in from recess because they have a cold for example. Since there is usually only one photocopier per building you may have to wait in line. After the students edit the text, they may have to recopy the text to make the revisions understandable or reduce the revisions they make to surface changes. Certainly students who are adding paragraphs and moving around sections of text will have to recopy. Most students do not consider it convenient to recopy the text and so they become satisfied with making small revisions. In this case, it is much more convenient to use the computer than to use paper.

Likewise in Patti's class, Marco and Rafael wanted to put a picture of Michael Jordan in their basketball story. They could have brought a picture of Michael Jordan from home or gotten permission to go to the library (open on Mondays only during the summer) where there may have been some pictures of Jordan or someone who looks like Jordan. Then they would have had to go

to the office and get copies made and sized to cut out and paste in their book. Instead, without closing their file, they just accessed the clip art graphics library on their computer and made a few changes to make the businessman in the clip art file to look acceptably like Michael Jordan (Figure 17). They also made other changes in the picture of Jordan to make him look like he was dunking the basketball or blocking a shot on the computer. It was more convenient for the boys to use the computer than to obtain and edit another picture.

Of course Marco and Rafael could have just drawn a picture of Michael Jordan on every page of the book. Instead, they used the drawing they made of Michael Jordan and the basketball backstop and hoop one time. Then they cut and pasted parts and put them on the next pages editing slightly to illustrate the next part of the story. In the editing graphics section of this study (Chapters 4 and 5), there are many examples of students editing graphics they or others have already created to make a new graphic.

A related principle obvious to people who use the computer is the *ease of revision principle*. In the examples cited above, teachers and students who wanted to make changes in their writing or drawing were able to do so without fear that the paper would rip or be discolored because of erasures. This is particularly true with color drawings. It is difficult to impossible to revise a picture drawn with color markers on paper. On computer, text can be changed repeatedly without fear of ruining the paper. Most people fear destroying the paper if they have to erase more than once.

Using the computer to revise is also easier since you are easily able to see how your new wording works in the text. When Brandy and Nicole were writing their adventure story in Chapter 4, they revised and reread the text constantly to improve the quality of the story. The ease of revision encouraged them to make multiple revisions. It is somewhat more cumbersome to read through the revision and cross parts of that revision out to replace it with other revisions. The limitations of revising became evident on one of the drafts of the Hawaii tourist flier. Students did not have much paper left to write on after they had made some comments in the margins of the paper.

Some scholars, teachers, and students who are adept in language do not find these advantages particularly convincing. However, for students who find putting together words in an understandable way a challenging task, the computer advantage is significant. Students who struggle in writing have the capability, through multiple revisions, to make their writing as fluent and creative as the proficient writer. As an instrument of writing and revision, the computer allows students of diverse abilities in writing to approach the skill of capable writers.

Many believe that writing is an excellent tool for thinking (Calkins, 1991). The construction and the revision of writing help form, change, and sharpen our thinking. If this is true, by promoting the use of revision, we are promoting improvements in students' thinking. The ease of revision, as students

experience it on the computer, may allow students to become more articulate and to be sharper thinkers.

One advantage of the computer is that the text, once written can be changed to suit another purpose. *The transformation principle* describes the ease by which information can be altered to fit a different style of presentation. In Patti's class students wrote text in a word processing software which is more flexible for writers. That same text was then cut and pasted into hypercard format so that the different parts of the text could be accessed in a nonlinear fashion. In other words the class created an introductory screen with a lot of buttons for topics of possible interest to the reader. Instead of going page by page to get to the text the child wanted to read, the child simply pressed the topic button and the computer moved the child to that text.

These same students were also required to publish books. To meet that goal, they simply altered some of the pages slightly and printed them out to be colored and stapled for publication. The same group of tables could also have been printed on overhead transparencies for viewing in a large-group setting. The ease of transforming the text was evident also when Brad increased the size of the text on the screen for his whole group to see easily. Without the computer this change in form is impossible.

Of course information is not often presented to students in a manner than makes the ideas easy to revise. Students typically see information in a textbook where text seems static and unchangeable. Information in this form is

not open to revision or elaboration. Students are highly discouraged from writing personal perspectives or crossing out information in textbooks. In contrast, students become more empowered when the same information is presented on the computer screen. With computers, students can join in an intellectual discussion with the author providing information freely without penalty. Again, because the computer is so malleable, students in these classrooms are much more likely to revise in these classrooms than in traditional classrooms.

The writer's fear of ripping or smudging paper inhibits the writer from making changes on the paper. It is unattractive to have stray marks, rips, or smudges on papers and so writers avoid revision when they are using paper. The desire to have the writing look neat and appealing is called the *Attractiveness Principle*. The print that comes out of the printer is most often more attractive for most school functions than students' ability to write with paper and pencil at this age. Likewise pictures that get printed out often have a more finished quality than a drawing a student at this age could draw.

Finally, text can be put into different fonts and sizes as indicated in Chapter 5 in the Revising the Appearance of Text and Graphics section. The layout and organization of any text and graphic can be revision to make it more attractive. Gaining this degree of attractiveness and individual preference is impossible to do in the classroom with paper.

The appearance of the writing and revisions also raise the status of the writing in what I refer to as the *status/credibility principle*. Children's writing often does not enjoy the same status as printed or published writing simply because the print looks more professional. Many feel, if only subconsciously, that printed text has more credibility than that which is written by a child. When students in Katie's class integrated their personal comments in the ocean text, the students and teachers/textbook ideas appeared to have the same credibility. When a beaming Ferris showed his storyboard video to the class, complete with the sound of him reading the text and moving pictures, the story of his trip about going tubing with his family gained the status of a video show.

Some authors sometimes mourn the passing of paper and pen as writing tools. They talk about their pleasant memories of the look and feel of the paper. These sensory experiences are enjoyable for them. Although the senses are different, with computers students are actually stimulated with even more of a multisensory experience. Using Kidpix, students view a brightly colored screen, feel the keyboard, and hear the clicks of the keys and the funny sounds the computer makes when letters and graphics are placed or edited on the screen.

In the section entitled The Role of Experts in Chapter 4, Maria talks about the computer as a "hands-on" experience. In that same section Susie responds when Yashee neglicts to click on the mouse by jumping up and saying, "Click." Ian follows up by saying "click" himself. Students who were

hearing impaired and developmentally behind other students in Maria's class became highly stimulated by the computer. During one mini-lesson, a hearing impaired girl named Teri who had never spoken in group, suddenly stood up from where she was sitting in the middle of the group and pointing at the screen and let out a stream of comments. This desire humans have to experience their senses and the computer's ability to deliver them is called the *multisensory principle*.

Even if none of the preceding principles existed, the sheer fact that students will have to be fluent in their understanding of this machine to obtain further education or a job is reason enough to encourage teachers to allow children use the computer as much as possible. Currently however, many students are restricted to using the tools of the past for writing. Denying students the advantage of using the tool of the future limits student growth. This is called the *future principle*.

Perhaps the most interesting finding to come out of this study is the way in which using the computer in these classes created a context that forced the use of small groups. The way students participated in these groups changed the tone and character of the teaching and learning of the classroom. But of course, paired students and small-group work can and has occurred without the computer for many years. The advantage the computer writing has over paper-and-pencil writing is the public screen that allows the group to see the text (Daiute, 1985;Reilly, 1992).

In contrast to handwritten text, the information on the screen can more easily belong to a group rather than an individual. The writing on the screen bears none of the distinctive handwriting particular to individuals. When writing is displayed on the screen it could just as easily be the handwriting of any number of students. When students take turns writing with pencil and paper in a paired or a group project there is a sense as indicated by the different styles of handwriting, the ideas come from unique individuals. The fact that the font is the same from one person to the next washes out some of the individualism and provides a sense of common group ownership.

Throughout the text there is evidence of this *group principle* as students work together viewing the computer screen. From Katie's classroom when Brad increased the size of the font so that the group of four could all participate to computer experts elaborating and proofreading the text on the screen to Brandy and Nicole in Patti's class where these coauthors switched back and forth in their keyboarding and motivating roles.

Writing is truly one of the most difficult and important tasks that students are required to perform in schools. During writing, students have to think about the movement of their fingers, spelling, the content of the writing, the organization of ideas, and the style to present those ideas (the rhetorical problem). This is such a cognitive burden for novice writers that they can not possible think of all those elements at the same time. Working in a group allows students share that cognitive and physical burden of writing. When one

student focuses on the actual keying in of information, other students can concern themselves with proofreading and elaborating the text. While one student is writing the text another student is free to reread the text and examine the way the ideas are organized on the page. When one student gets tired of working on the keyboard, another can step in. In many ways, novice writers share the cognitive and physical burden of writing because the public display of the writing allows each student to participate.

The Future of Research and Schools

Part of the uniqueness of this study lies in way in which the text contributes to the different fields of writing revision, technology, and staff development in an integrated fashion. Some future writing for different audiences could focus on any one field of writing revision, technology, or staff development. These studies might include ideas in a particular area that extends beyond the limitations of this study.

Students working in pairs and small groups are more in control of their own learning than students in classrooms where the teacher feeds information to the whole group. For the teacher, this is a pedagogical problem and an opportunity. In this context, to be successful, students need to develop a metacognitive awareness and strategies. Students will need to ask themselves how they learn and under what conditions can they learn the best. In order for teachers to develop these lifelong learners, they should define procedures

and roles that would guide their behavior to develop a metacognitive awareness in students.

Future research might also address questions teachers have in terms of addressing diverse learners in the classroom. How does a teacher group students of different abilities so each child learns and helps each other? Is it wise to group capable readers with students who have ready difficulties?

Also, although I have defined a number of roles for experts and pairs, there needs to be further definition and articulation of these roles in the classroom. Since these classrooms relied so heavily on students working in their roles, future research should also cultivate teaching practices that help teachers support students search for learning. What are the different ways teachers can guide experts and group partners in expert etiquette?

Future studies might also examine classrooms with experienced pairs of students, students working in small groups, student experts, and teachers giving mini-lessons for longer periods of time to examine the evolution of the groups. The roles students played may be examined in more detail and with more examples than I was able to achieve in this study. It would be interesting to explore how the role of the expert shifts from person to person, depending on the need of the students. The social status the expert may have, apart from working on the computer, may also play a role in the authority or ability to sway other students to revise their writings.

As technology becomes an increasingly more important medium of communication and literacy learning, the classroom will become fundamentally different. There will be more opportunities for revision of knowledge than there would have been without computers. Written communication will certainly include more graphics and the ability to emphasize or deemphasize text with size, font, color, audio capabilities (such as music or speech), and underlining.

As the computer becomes more capable of recognizing and converting children's speech to print, revision of that converted speech will become the central task of the writer. Students will find revision easier to perform on a mechanical level but perhaps more demanding from a rhetorical perspective.

For the future, with the aid of technologies such as computers and telecommunications, teachers may be able to provide a curriculum where students can be even more actively engaged in grappling with the excitement of ideas. Students could link their ideas with the ideas of social scientists, artists, and mathematicians both in and outside of the classroom. Learners could compare their knowledge with others or simply express their voice or sometimes just listen. An important aspect in the use of technology supported in this work is the inclusion of the learners' personal thoughts and opinions of the activities. In all these instances, the learner becomes active, constructing thoughts and revising ideas.

Other possibilities for the use of computers exist also. Computer technology, like television, could become the ultimate provider of specific

knowledge for students in schools. Students and teachers could become so engrossed with the fast-moving slick images, sophisticated technology, and well- placed words that they find themselves unable to think on a critical level about the knowledge or story presented.

For educators, the danger is that software writers could take control of the curriculum. In the same way that teachers follow the teacher guidebooks for the basal readers, teachers of the future could accept the role of manager for computer-managed software. Just as the teachers of the past were deskilled because of their adherence to sanctioned practice of the basals, teachers of tomorrow could unthinkingly follow the paths of the software programmer without considering the needs of their students.

The danger is that we, as a society, with the sheer volume of information circulating, might become immersed in knowing as much as possible and not expressing or constructing our own ideas. We could deaden students natural instincts to express themselves by feeding students information and then asking them to repeat it back to us. Like Gargantua, we could gorge ourselves on the mass of information available without reflecting or constructing our own ideas.

With the coming inundation of information in our society, teachers will have to help students learn to take the time to select, evaluate, and revise their own information and information from other sources. All educators will have to work together to develop teaching methods, teaching contexts, and conceptual insight so technology becomes a tool that benefits education.

Much has been said about how technology will change the classroom. Most people are amazed at the emergence of developing technology and the role technology is playing in modern life. However, educators have been slow to use technology in schools. Technology should become increasingly easy to use. Most signs indicate that software and hardware developers will construct forthcoming technology to be more user-friendly. However, even though the technical aspect of technology should become better to use, educators will also have to invest their energy on professional knowledge so that technology can be used as an effective tool for improving education for the future and not just a tool for reflecting the educational values of the past.

The final witness to improvement in education with and from computers will lie with their use by educators as tools for implementing a curriculum that empowers students to become higher quality learners.

APPENDICES

APPENDIX A

Overview of Classroom Technology Tools
Geneva Elementary Schools

Preface

The purpose of this document is meant to enhance our curriculum and not to determine curriculum. Therefore, you won't see any computer programs related specially to math, social studies, science, etc. The tools we recommend in this document can be used across the curriculum. These programs are tools to enhance and support all teaching and learning. The selection of instructional materials, on computer software, is not the responsibility of the District Technology Advisory Committee. This does not mean that software like Math Blaster, Carmen SanDiego, and Oregon Trail is not appropriate. The decision to purchase these types of programs should be made by individual teachers and curriculum committees. Funds to purchase such instructional supplies should come from building instructional supply accounts.

At the present time we are unable to fulfill the goals of this document because all the equipment will not be in place until the last phase of the bond. However, we have decided that it is important to look toward the future and have some vision for what could be. It is also our hope that as the district develops curriculum that technology can play a part in student assessment.

BELIEF STATEMENT
ADOPTED SPRING 1991

A. Provide for accessibility for instructors and students.
B. Use technology to support the district curricula.
C. View technology as a tool rather than an end in itself.
D. Provide for measurement of effectiveness through defined outcomes.
E. Provide for inservice of staff.
F. Assign responsibility for monitoring and directing the plan.
G. Determine present needs, plan and budget for maintenance, upgrading and future replacement.
H. Consider function, service, price, warranty, ease of use, and basic compatibility in selecting hardware and software.
I. Comply with licensing and copyright laws.

OUTCOMES
ADOPTED SPRING 1991

1. Be an author using technology.
2. Be aware of and adhere to copyright laws when using technology in different media.
3. Be able to access and manipulate information from several technological sources.
4. Be a responsible, confident user of technology.
5. Learn how to adapt to changes in technology.

6. Enhance learning by acquiring and applying technical skills.

Outcomes for Technology
at the elementary level
5/5/92

Kindergartners & First-graders

OUTCOME #1 Be author using technology

A. Use a mouse appropriately including the click and double click.

B. Students will become familiar with a graphics interface environment using programs such as Playroom, Treehouse, Kid Pix programs.

C. The children will experiment making pictures with letters (words, sentences depending on the level of the student) using Kidpix.

OUTCOME #2 & #4 Ethics - Responsibility and Copyrights

A. Students will write their names on work they do.

B. Students will learn that if a student copies another's work, they must put the other's name on it.

C. Students will learn to use the computers in appropriate ways.

OUTCOME #3 Accessing and Manipulating information

A. Students will learn how to turn on/off the machines. The student will learn what to do if the computer freezes.

B. Exit programs

C. Use icons to launch a program

D. Will be able to identify parts of the computer:monitor, disc drive, cpu, keyboard,mouse, return key, shift key, space bar, all letters and numbers.

E. Students will be able to follow teacher instructions to access reading and math readiness activities on the computer.

Fourth-grade

OUTCOME #1 Be an author

Multimedia (perhaps Storyboard, Linkway, or other software)

A. Students will learn to digitize pictures taken with the camera

B. Students will use camera, CD, and VHS tapes to record a multimedia presentation (if they are using Storyboard)

C. Students will save, edit, retrieve, and print these images within multimedia reports.

D. Students will create and publish multimedia reports related to math, language arts, science, or social studies

E. Students will be able to make multiple copies of multimedia reports using videotape and other types of storage.

F. Students will save and access information from A and C drives.

G. Students will use reference materials on CD-ROM and Laser Disc to complete their research reports without teacher assistance

Word Processing

H. Students will begin to use the editing features of a word processing program such as margins, use of the ruler, and fonts

I. Students will write a class newsletter combining text and graphics

J. Students will complete their common writing assignments with a word processing program.

Keyboarding

K. Students will refine their keyboarding skills with regular practice. Students will change a ribbon or cartridge in the printer

M. Students will load paper into printer

N. Students will format blank disks

O. Students will utilize all memory storage capabilities (for example they will be able to save on A and C drives)

OUTCOME #3 Access and Manipulate information

A. Students will learn the procedure for multi-tasking (switching from program to program w/o exiting).

C. Students will access and manipulate graphics from camcorders, scanners, and graphics libraries.

Telecommunications

A. The concept of telecommunications using a modem will be introduced in fourth-grade. Students will become members of bulletin boards and will have pen pals with other schools

D. Students will take part in distance learning projects through telecommunications

E. Students will use ITV to enhance learning in the areas of science, social studies, language arts, and math

F. Students will use video as an information delivery system (eg. Math Talk by Tom Snyder Productions)

OUTCOMES #2 & #4 Ethics

A. Students will give credit to audio, graphic, and textual sources.

APPENDIX B

Handbook for the Fruitland Migrant Program
A Federal Program under Chapter 1 July 1, 1993
BASIC AGREEMENTS

The classroom program will last from July 6 to August 13. If you are sick call for a sub as soon as you know that you will be absent. As always you are responsible for leaving sub plans. Teachers are asked not to plan vacation activities during school time, however exceptions that we know about at the beginning of the summer will be accommodated when possible. Home study guidelines are noted in a separate manual. Classroom teachers will work 4.0 hours per day from 8:15 to 12:15 Classes will be formed by age. We will try our best to get appropriate classroom furniture for students. Typically, older students get the eight foot folding tables with chairs. Furniture that is clearly marked can be moved into other classes with the knowledge of the coordinator. At the end of the summer the teacher is responsible for returning the furniture and notifying the coordinator.

Teachers must have written long range and daily plans for all subjects. The written parts don't need to be extensive or have any particular form. However, teachers should have extensive thoughts about how to implement them.

Youth Corps students must type, print out, and give to our secretary to photocopy an "introduction letter" to parents on the first day of school. Please hand write a quick hello, introduction, and restate what areas you are teaching. Also, mention swimming which will take place August 2-13. Also, the computer experts (and not you) will be responsible for sending home a weekly newsletter EVERY FRIDAY. You should tell them what to write by Wednesday or Thursday at the latest. This is a big deal for the Youth Corps because we post all the letters in the hall. We give out awards for letters that are attractive and well formed. Please allow the computer experts to be the experts in the classroom. Call on the computer experts for help whenever possible. We want our computer experts to gain an identity as a person who "knows about technology and writing." Whenever possible and it seems appropriate, the "computer experts" should be working with students at the computer.
PHILOSOPHY OF LITERACY FOR THE MIGRANT PROGRAM

We value literacy no matter what language it occurs in. However, we also realize that access to jobs, entertainment, and schooling is limited for those who only speak Spanish. Therefore, we have to promote the use of English among our students to prepare them for success in society.

One of the very simple ways students can learn English, is for the teacher to speak English all the time. To the Spanish speaking child this presents comprehension problems. Spanish speaking students don't understand all they hear in English. Therefore students instruction should be modified so that they do understand.

There are a number of ways to modify instruction. One way to modify instruction is to provide a context that will give away the meaning of the text or the language teachers use. Pictures give the most obvious clues about what the language of the story is about. The best books to teach limited English speakers are books where the pictures add to the meaning of the text. Make sure and point out to students the important features of pictures and how they relate to the stories.

Books and stories are given context when a teacher describes the setting of historical fiction or the setting of a story told about Africa. Any kind of prior knowledge that allows students to understand stories adds to the context of the story.

Another way to modify instruction is to be more fully explicit about what you say. If you want students to discover what it is that causes suspense in mysteries or spooky stories, don't just tell the students with words, act out an example of suspense. Be very sensitive of which vocabulary words

students may not understand and give synonyms or explanations.

A fourth way one can provide context is by reading many texts with a similar setting, theme, characters, plot, or writing style. For example, while students are reading one Beverly Cleary book during reading time you may want to read another Beverly Cleary book during your read aloud time. One book lends context and builds background so the student can understand the other book.

As much as you can use audio-visuals, books with pictures, give explanations, act out situations, use props and manipulative to help students of limited experience in English understand your instruction.

Writing

1. Students will choose their own topics.
2. Students will write rough drafts and edit their papers.
3. Students will meet in large groups to discuss their writing and to ask for more ideas for writing.
4. Students will have their writing published (most commonly done in book form)
5. The teacher will model their own writing in order to improve student writing.
6. Students will write for meaningful purposes. Students can write to entertain, inform, scare, or to excite people.

Reading

1. Teachers will engage with children by reading to the students every day, discussing vocabulary and higher level ideas about the text (If you pick a 200 page book, plan on reading it for a month).
2. Books the teacher reads aloud will be viewed as models of writing that students can borrow from to do their own writing.
3. Students will read excellent literature.
4. Teachers will instruct students on reading strategies for better decoding and comprehension
5. You must do an individual informal assessment using a graded reading passage (If you don't have a passage the director will find one for you.) You should have the general reading level, strengths, and areas of needed improvement. You may also include a short attitude survey (Make it up yourself.)

Every day students must do a number of activities that are essential to academic growth. Students will be read to every day. Select very interesting books for this time. If you select boring books, tell the kids the book doesn't interest you and set it down. DURING THIS TIME MODEL THE SKILL YOU WANT THE STUDENTS TO USE IN THEIR OWN READING.

Students will READ every day. This does not mean they will cover material or be in a group that reads. The individual child must read. To do this the child must have material that is appropriate to their level. It can be created by you or the tutor or they can read it out of a book. The mediocre teacher will see that they read. The excellent teacher will provide that they read a great deal.

Chapter I, of which the migrant program is a division, is paying to keep the library open for the summer at school from 10 to 12 for the community and migrant school use. The librarian will tell you what is available. Please plan the week far enough in advance so that you can take advantage of the library when it is open.

COMPUTERS

Computers will be used in classrooms to construct knowledge with reading, writing, pictures, hypercard, etc. You may use programs like Ecology Time if you happen to be studying ecology and not when you are not studying ecology.

APPENDIX C

DATA GATHERING TOOLS

	Fieldnotes	Taped Interviews
SDM Staff Development when 1 or another modes processes for a person or group		
SDT Staff Development that is technical How to do a technical program		
SDI Staff Development that promotes instructional expertise using computer		
RK Revision of knowledge and inclusion of personal knowledge is common in the younger grades		

LIST OF REFERENCES

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