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ABSTRACT

A study examined the integration of computers into the writing practices of a ninth-grade remedial English class in an urban high school in the San Francisco area. Computers and word processors were introduced midway into the school year. The class was observed and recorded daily through the academic year, and all written work collected. Six students were selected for in-depth focus as they carried out writing tasks. Analysis focused on how classroom writing practices were structured and carried out and how students participated in writing tasks before and after the computers arrived. Although many changes accompanied the use of computers, the study concluded that the teacher's structuring of writing instruction had the greatest impact on both student writing and the ways computers entered into that writing. Findings suggest that computers do not function as independent variables in classrooms, but rather as part of a complex network of social and pedagogical interactions. (Six tables of data and five figures are included; 58 references are attached.) (SG)

CENTER FOR THE STUDY OF WRITING

Technical Report No. 57

TECHNOLOGICAL INDETERMINACY: THE ROLE OF CLASSROOM WRITING PRACTICES IN SHAPING COMPUTER USE

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CENTER FOR THE STUDY OF WRITING

Abstract

This study examines the integration of computers into the writing practices of a remedial English class in an urban high school. Computers and word processors were introduced mid-way into the school year. The class was observed and recorded daily throughout the academic year, and all written work collected. Six students were selected for in-depth focus as they carried out writing tasks. Analysis focuses on how classroom writing practices were structured and carried out and how students participated in writing tasks before and after the computers arrived. Although many changes accompanied the use of computers, the study concludes that the teacher's structuring of writing instruction had the greatest impact on both student writing and the ways computers entered into that writing. It is argued that computers do not function as independent variables in classrooms, but rather as part of a complex network of social and pedagogical interactions.

Author's Note

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TECHNOLOGICAL INDETERMINACY: THE ROLE OF CLASSROOM WRITING PRACTICES IN SHAPING COMPUTER USE

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Rafi, a ninth grader, has been asked by his English teacher to help his classmate, Lynnette, edit her essay using the computers and word processors in the classroom. He is one of a few students who have learned how to check the spelling of a word processing file using the computerized spell checker. When Lynnette becomes annoyed with the way the spell checker highlights words and phrases in her story, Rafi responds with a tempered view of the technology:

Lynnette: This thing is stupid. Look. This computer stupid.

Rafi: What you talking about?

Lynnette: That- that- that is a good sentence. "I'm very very nervous." [The sentence actually reads, "Iwas very very nervous."]

Rafi: No, it's not talking about your sentence. It's talking about the way you didn't space between the 'I' and the 'w.' That's no word and it- oh you think the computer's smart as you? You think the computer's sitting around all day, "What am I going to eat for lunch? Microchips?"

Like many students, Lynnette initially imbues the computer with an intelligence beyond its capacity. Rafi, however, is able to appreciate both what the computer can and can not do to help him with his writing. As Lynnette and Rafi explore the limits of the technology, their talk recalls another conversation, one carried out over the past decade in the writing and speaking of educators, one that began with the introduction of computers into classrooms and curricula across the nation.

As it was told, the machines in their classroom were part of a revolution that promised to restructure the economy, redefine the skills that comprise literate citizenship in the nation, and remedy long-standing educational problems. Early writings suggested that computer-based tools, like the word processor, would reform the teaching and learning of writing. Many educators still find the promise of a computer revolution an appealing remedy for educational problems, as the considerable literature devoted to computers and education will testify. Yet, those who pioneered research on computers and writing instruction have reduced the expectations of computer technologies to a more realistic level; they have begun to recognize the complex interactions among computers, the social systems operating in classrooms, and the instructional activities and pedagogical goals promoted by teachers.

Many of the earliest, enthusiastic discussions about computers and writing, however, exhibited an implicit technological determinism which fueled the enthusiasm and the high expectations of educators. In this literature, teachers were told that computers and word processors would change the way their students write, freeing them from the physical and psychological constraints of writing with pen and paper, turning them into freewriters, planners, and most especially, revisers with a stroke of the key (see, for example, Daiute,

1983; Green, 1984; Levin & Boruta, 1983; Mackenzie, 1984). Even more recent discussions about the value of computer technologies for writing instruction made bold predictions about the ways these technologies would change the way students learn to write (Pea & Kurland, 1987). Computer technologies were also predicted to change the social structure of classrooms, making them more collaborative and communal (see, for example, Bruce, 1986; Dickson & Vereen, 1983; Levin et al., 1985, Mehan, 1984; Rubin & Bruce, 1983). The most prevalent view of new technologies promoted in this literature was that of technology as an independent agent of change operating on student writing processes and products and on social contexts like the classroom.

Research on the effects of computer use on writing processes has been inconclusive. A synthesis of this often contradictory literature indicates that writers seem to revise more locally, at the word and sentence levels, but to revise less globally at larger levels of text organization when they use the word processor for their writing (Collier, 1983; Daiute, 1985, 1986; Harris, 1985; Lutz, 1987). Further, the kind of revising writers do at the word processor seems to mirror the strategies for revision they had before using computers (Bridwell, Sirc, & Brooke, 1985; Collier, 1983; Woodruff, Bryson, Lindsay, & Joram, 1986) Some studies seem to indicate that word processing is a particularly effective tool for basic writers (e.g., King, Birnbaum, & Wageman, 1984; Pivarnik, 1985; Cirello, 1986) whereas others find no evidence that word processing results in higher quality writing for these students (e.g., Hawisher & Fortune, 1989). Such pioneering studies, by investigating the claims that ushered in the new technologies, tempered the enthusiasm for the magic computers might do and promoted more sober and reflective views of the impact of computers on student writing.

The research launched by early discussions does indicate that the computer can influence the social context for writing by making the process of composing more public and thus more accessible for interaction and collaboration (see, for example, Daiute, 1986; Dickenson, 1986; Heap, 1986; Mehan, 1984; Michaels & Bruce, 1989; Selfe & Wahlstrom, 1986). However, the ways social contexts can influence and even determine the uses to which computers are put has rarely been considered (but see Dickenson, 1986; Michaels & Bruce, 1989; Herrmann, 1987). The simple model of the computer as an independent variable is especially evident in studies of student writing before and after computer "treatments"; these studies frequently ignore the important influences of the teacher's goals and pedagogical choices, the social structure of classrooms, and the prior experience of students.

Researchers, frustrated with the confusion of results amassing from studies of word processing, have begun to call for a more complex look at this technology. Hawisher (1988) recognizes the importance of studying the instructional contexts surrounding the use of word processors, stating, "It is entirely possible that until we direct our efforts to examining the different kinds of teaching and social interactions that computers tend to encourage, we shall continue to find contradictory results." That is, in the absence of information about the instructional and social contexts in which word processing treatments are embedded, research of this kind will continue to yield contradictory results and will remain uninterpretable. Hawkins and Sheingold (1986) warn against a simple technological determinism, reminding us, "*That* the technology can have a particular impact on classrooms does not necessarily mean that it *will*. Effective research must examine how the use and meaning of technology are shaped in classrooms over long periods of time." And Mehan (1989) articulates an emerging understanding of the ways computers and social contexts like the classroom mutually influence one another: "Recognizing that micro-computers are always part of a larger social system enables us to see the relationship between classroom organization and computer use as a mutually influential, not a unidirectional, relationship."

The study reported here grows out of the complex, evolving view of the interaction of computers and classrooms. Through this study, I examine how integrating new technologies into the writing practices of a low-tracked, ninth-grade, English classroom influences the ways writing is defined and practiced there. With this work, I hope to contribute both a methodology for the systematic study of complex social systems like classrooms and a contextualized picture of the living processes of writing in one such classroom. This research focuses on both the social practices and interactional contexts that define how writing is done and the roles computers and word processors play in these living processes. It aims to contribute to our understandings of the role of computer technology in writing instruction not only because it situates computer technology in the socially-enacted and socially-constructed context of a living classroom, but also because by doing so, it brings into focus the role of the social environment in shaping the uses and influences of technology on writing.

THEORETICAL UNDERPINNINGS OF THE STUDY

This study of computers and the teaching and learning of writing is guided by an emerging social and cultural theory of learning and development which views learning as a process of appropriating the ways of perceiving and behaving particular to specific social activities and contexts (e.g., Bruner, 1983; Vygotsky, 1962, 1978). This theory emerges, in part, from the work of sociolinguists (e.g., Cazden, John, & Hymes, 1972), anthropologists and ethnographers of communication (e.g., Heath, 1983; Hymes, 1971; Scribner & Cole, 1981), and learning theorists who assume that all learning is embedded in the lifeways of a culture and in the meanings and motives attributed to particular cultural practices by participants in these practices.

A central notion underlying this study is that writing is a social activity, grounded in the particular meanings and practices of particular writing communities (e.g., Freedman, Dyson, Flower, & Chafe, 1987). Writing, like all communicative acts, takes place within the constraints and conventions of a language-using community (Bartholomae, 1985; Bizzell, 1982, 1988). Social historians add to this view of literacy as a context- and culture-sensitive practice, cautioning educators against viewing literacy as an objective technology outside of its immediate contexts of use (Graff, 1982; Ohmann, 1985; Street, 1987). Drawing on empirical research among the Vai, Scribner and Cole (1981) contributed to this view of literacy with the notion of "literacy practice," that is, "the patterned ways of using technology and knowledge to accomplish [literacy] tasks." According to these authors, the nature of literacy practices determines the particular skills that will be associated with literacy in a given setting. Thus, students of writing need to learn not only how to write (the cognitive and physical processes involved in writing), but ways to write (the social functions involved in writing in particular discourse communities).

The patterned ways of writing, or "writing practices," valued and promoted in classrooms thus constrain the lessons available to students and the skills they are likely to acquire. In fact, recent criticisms of writing instruction in school decry the seemingly counterfeit uses to which literacy is put (see, for example, Applebee et al., 1984; Edelsky & Smith, 1984; Heath & Branscombe, 1985). Yet, classrooms can be seen as discourse communities in their own right, in which particularly valued uses of literacy arise. Bruce (1986) writes, "It should be recognised that school is the first and most important writing community in most children's lives." Furthermore, skill in academic writing admits or denies students admission to the broader discourse community of the academy, and to opportunities to learn knowledge and skills valued in the greater society. It seems important, then, to study the literacy practices indigenous to school to investigate what children learn about written language in our classrooms.

From this sociocultural theoretical perspective, finding out how computer writing tools influence a writing class requires a broad investigation of the nature of the writing conducted in the class. The questions guiding this study thus focus on the social practices that constitute writing in Ms. Cone's classroom before and after the computers become part of the writing classroom:

1. What are the writing practices promoted in this classroom before, and after, computers are introduced?

2. How are writing practices carried out—that is, what are the particular patterns of activity and interaction within writing practices—before, and after, the computers are introduced?

3. How do individual students participate in a selected writing practice, and how does their participation contrast with teacher intentions before, and after, the computers are introduced?

METHODS

Overview

This was a study of potential change, change introduced when a classroom teacher and a researcher from the university collaborated to integrate computers and word processors into the writing curriculum of a ninth grade English class. The computers were introduced into a class designated as remedial as part of an intervention designed to retain students who were seen as at risk for school dropout. Mid-way into the school year, twelve IBM PCjr computers and printers were installed in the classroom, lining the side and back walls, and the students were taught to write with version 3.0 of the WordPerfect word processing software. Accordingly, the school year was divided into two phases for analysis: Phase I, before the computers entered the classroom, from October 27 to February 13; and Phase II, after the computers entered the classroom, from February 23 to June 15. This data collection allowed me to characterize classroom writing practices before and after the computers arrived, and also to describe the behaviors of selected individual writers on assigned writing tasks.

Since all social practices, in classrooms or otherwise, arise in the process of social interaction, we would expect transformations in the writing practices of the class to arise in the interactions among the teacher, her students, and the writing activities of the class. These practices accordingly take shape over time in the memories and activities of the classroom participants. Further, when people work together, they reveal their mental strategies and their understandings of activities to one another naturally and voluntarily (Miyake, 1982; Suchman, 1985). Teacher-student and student-student interactions are therefore good places to look for the understandings and strategies of the participants. To describe both the social practices in the classroom and what these practices meant to the teacher and the students, I adopted observational and ethnographic techniques of data collection.

The Context of the Study

The School

The urban high school where this study was conducted is situated in the East Bay of California's San Francisco Bay Area. One school document describes the school as an "aging, shabby, neglected, dirty, and graffiti-marred" building that is in need of complete

restoration. This document states that the school is suffering from the effects of decreased state support in the past years, and in turn has reduced its course offerings and staff in response to tax cutbacks. One of six high schools in its large district, the school draws from a stratified community. In the hills, middle class families, largely, but not entirely, white, send their children to this high school, which sits well within the visible boundaries of middle classdom in this community. Children from the "flatlands," often ethnic minorities, ride busses to this high school in the hills, which is known as the "good" high school in the district. Because it draws from the district's entire population, the school is ethnically diverse, with a population of roughly 32% white and 68% minority students including mostly African-Americans, Asian-Americans, and Hispanics.

The Participants

The teacher. The classroom teacher, Ms. Cone, had been teaching English for over twenty years when the study began. She is dedicated to her students and their success, interested in research and the application of research to classroom teaching, and open to the possibilities introduced by computers into writing instruction. At the time of the study, she had recently completed a Masters Degree in the Graduate School of Education at UC Berkeley. She became convinced, as she pursued her degree, that teachers need to read more of the research literature and consider how it could apply to their classroom teaching. She had already incorporated much current research in writing into her pedagogy through the Bay Area Writing Project, and emphasized that writing is a process when teaching her students.

Ms. Cone was involved with an intervention project during the year of the study which targeted low-achieving, incoming ninth graders for special attention. This project, part of the School University Partnership for Educational Renewal (SUPER) program at UC Berkeley, involved Ms. Cone and other teachers at her school in weekly reading and discussion groups wherein she and her colleagues discussed ways to promote success for their students and created goals for themselves as a team of teachers (see Weinstein et al., 1991, for a complete description of this project). Some of these goals included raising expectations for all their students by giving them the kind of high-level thinking tasks that they usually expected only of high-achieving students. Thus, this study took place within the larger context of a teacher-researcher, school-university collaboration and innovation.

The class. Designated as the lowest track of ninth grade English, the class in this study was composed of students who were seen as at risk for school dropout. According to high school policy, students were placed in the remedial track because they scored below the twenty-third percentile on the California Achievement Test in reading. However, according to classroom teachers, Ms. Cone included, students also were placed into low academic tracks for other than strictly academic reasons: on the basis of previous teachers' recommendations, because they were frequently absent from school, or because they had behavior problems that made teaching them difficult. Such judgments often result in lower tracked classes in which poor and minority students are overrepresented (Oakes, 1985). Indeed, the majority of the fluctuating enrollment of 26 students in Ms. Cone's class, from 70 to 75%, were African-American, with a handful of white students, a few Hispanic students, one Iranian immigrant, and one Vietnamese immigrant. The population of this low-tracked class was thus largely minority (22, or 85%). Surveys of national patterns of computer use in schools demonstrate that lower achieving and minority students do not generally have access to computer technology, especially for high-level skills like composition (CSOS, 1983-84; Hull, 1988). The project thus represented a rare opportunity for these students to gain whatever competitive edge computers might offer, as well as an opportunity to study the influence of the new technology on classroom writing for this underequipped and thereby understudied population of students.

The focal students. To answer questions about the learning of individual writers within the social context of the classroom, I selected six students to observe as they interacted with classroom writing assignments. The criteria I used for selecting these students included the gender, ethnicity, and relative literacy skills of the students as judged by the teacher, as well as regular attendance in class. To avoid the difficulties of making cross-cultural comparisons (see, for example, Phillips, 1972) and because the majority of students in the class were African-American, I selected only African-American students, three girls and three boys. Within each gender group, I chose students representing the range of literacy skills displayed in the classroom, as determined by their scores on the California Achievement Test in reading, their first quarter grades, interviews with Ms. Cone, and a holistic assessment of an early writing sample.

Of the chosen students, Davon and Lorraine displayed a relatively high degree of competency with school literacy tasks, while Lamont and Lareisha ranked relatively low in comparison with their peers, with Rafi and Shawndra representing the mid-range of skill in the class. Each student's incoming constellation of skills influenced his or her subsequent experiences in the classroom. In this paper I summarize changes in the writing behaviors of the focal students as a group and illustrate these trends with the changes Davon made as the year progressed. Although he began the year as a potentially strong student, Davon's classroom behavior was neither trouble-free nor was his progress in writing miraculous. I focus here on Davon not because he represents either the worst or the best that we might expect when students use computers in their writing classes, but because his case demonstrates particularly well the key changes students made as they adjusted to changes in classroom organization, writing instruction, and writing technologies.

The researcher. The collaborative nature of the work Ms. Cone and I planned to do—integrate computers into the curriculum of her classroom—demanded that I carefully define my role in the classroom so that I could conduct research and be a participant in the classroom setting at the same time. As a researcher, I was interested in the interactions of the computers, the classroom writing environment, and the writing experiences of the students. I wanted not to experiment but to see how an experienced and knowledgeable teacher would approach the use of computers in her writing pedagogy. I therefore constrained my participant role to that of a technical advisor, both for the teacher and for the students. I trained the students to use the computers and the software, served as a technical support person in the classroom, and had weekly meetings with the teacher in which I listened to her curriculum plans and apprised her of the ways the computer had been used to support writing and writing instruction. She then was able to choose to use the technology in the ways she thought fit with her plans and in the ways she thought feasible for her classroom and her students. To the students I was a technical resource person and a researcher, uninvolved with issues of authority and unconcerned about maintaining classroom discipline, but clearly interested in their writing. I was also the one who brought the technology to the students from the university, and thereby a resource of a different kind to students, most of whom recognized the study as an opportunity to do something unique and were predisposed to welcome my prying into their school lives.

Procedures

Data Collection

While observing the class from the beginning of October, 1986, to the end of the school year in June, 1987, I collected field notes describing classroom events and teacher and student behavior; audio tapes of whole class and small group interactions; and drafts and final versions of the papers written by all students for the class. In Phase II of the study (from February 23 to June 15), I also collected the word processing files of each

focal student each day, thereby obtaining the results of each day's work at the computer. During this phase I also made video tapes of the computer screen during student composing sessions. Tabie 1 details the amounts of the varied kinds of data collected for the study in both phases. The data provide multiple, rich sources of information about class activities, Ms. Cone's goals and intentions, and individual student perceptions and behaviors, as well as student writing.

Data Analysis

Defining and comparing the writing practices of Phase I and Phase II. Because a major goal of the study was to locate and describe the writing practices indigenous to this classroom, it was necessary to allow categories of practice to emerge from the data. I first reviewed each writing assignment Ms. Cone gave, reading through the field notes and listening to the audio tapes, looking for how Ms. Cone framed each assignment, how she characterized it to her students, her directions, and her behaviors during the course of the assignment. From Ms. Cone's talk, I described rhetorical and social dimensions of each writing assignment. *Rhetorical features* included the audience and purpose projected for the writing, the form or structure students were to follow, and the degree to which topics were specified for students. *Social meanings* included the function the writing was said to serve and any evaluative criteria applied to the writing. To enable comparison among the writing activities characterizing different assignments, I segmented each assignment into writing episodes marked by noticeable shifts in activity, labelling the episodes by the type of writing activity Ms. Cone engaged in or asked students to engage in during the episode. The order and types of episodes observed during each assignment constituted a *sequence of activities* for the assignment.

Similarities in the ways Ms. Cone talked about the writing she assigned and the ways she structured writing activities to fulfill her assignments then formed the raw material from which superordinate, writing practice categories could be constructed by grouping separate writing assignments into a taxonomy of practice types (see Figure 1). I began forming writing practice categories by first sorting the writing assignments of Phase I into groups. I then sorted and grouped Phase II writing assignments, looking for writing practices similar to those of Phase I in addition to new writing practice categories. As the categories grew, I compared the writing assignments during Phase I of the study to those given during Phase II within each type of writing practice, to see if changes in the writing practices accompanied the change in writing technology.

Comparing patterns of activity and interaction in Phase I and Phase II. To find the patterns of activity and interaction that characterize writing in this classroom—the types of help Ms. Cone may offer to students as they work, the roles students take in one another's writing, the contexts in which writing activities take place—as well as if or how these patterns shift with the introduction of the computers, I conducted a more detailed analysis of the writing episodes I had identified within the writing assignments, comparing the writing episodes of Phase I as a group to those of Phase II. First, each episode was identified by the phase, assignment, and type of writing practice in which it occurred. I then coded each episode, working from my field notes and audio recordings (see Table 2 for a summary of the coding scheme). Coding each episode along these many dimensions of interest enabled me to compare the frequency of different writing practices, different writing activities, particular types of help offered by Ms. Cone, particular types of peer interaction, and particular contexts within which writing activities took place in Phase I of the study versus Phase II. Using SPSS+, I also determined when differences between the two phases were statistically significant.

Table 1: Data Corpus

Field notes

Field notes were taken as events actually unfolded and supplemented from memory immediately after class. Informal interviews with the teachers and students were also described in the field notes.

Observations during class periods	118 hours
Observations before class and during lunch when students came in to use the computers	20 hours
Observations during teacher preparation periods	8 hours
Total classroom observations	**146 hours**

Audio recordings

All whole class lessons were recorded to capture the talk of the teacher and students as they interacted over writing tasks. When students broke into small groups for their work, group sessions were recorded as well. During Phase II of the study, audio recordings were made of students interacting with neighboring students or with the teacher as they worked at the computer.

Whole class lessons	123 hours
Teacher-led activities when class was split into writing and non-writing groups	5 hours
Peer group sessions	20 hours
Interaction at the computers	29 hours
Total hours of audio recording	**178 hours**

Written work

All first drafts and final copies of papers written by every student participating in the study were photocopied during Phase I. Once the computers entered the classroom, all papers turned in to the teacher by all students were photocopied. In addition, the word processing files created by focal students, comprising multiple in-process drafts of each writing assignment completed on the computer, were collected.

Drafts	195
Final papers	866
Brainstorming and/or freewriting papers	32
Miscellaneous, including 21 unassigned papers written voluntarily by students at the computers	50
Total papers collected	**1143**

Video tapes

Two video recorders were used to tape the composing sessions of students at the computer during Phase II. Taping was direct from the video screen of the computer to the video tape, and accompanied and supplemented the audio tapes of students when they were working with others at the computer.

Total hours of videotaping	**29 hours**

Other

The data also include class handouts, the dialogue journal that Ms. Cone and I exchanged, a few articles about the project that appeared in the school newspaper and in the SUPER newsletter, the literary magazine published by the class at the end of the school year, and photographs of Ms. Cone and her students working at the computers.

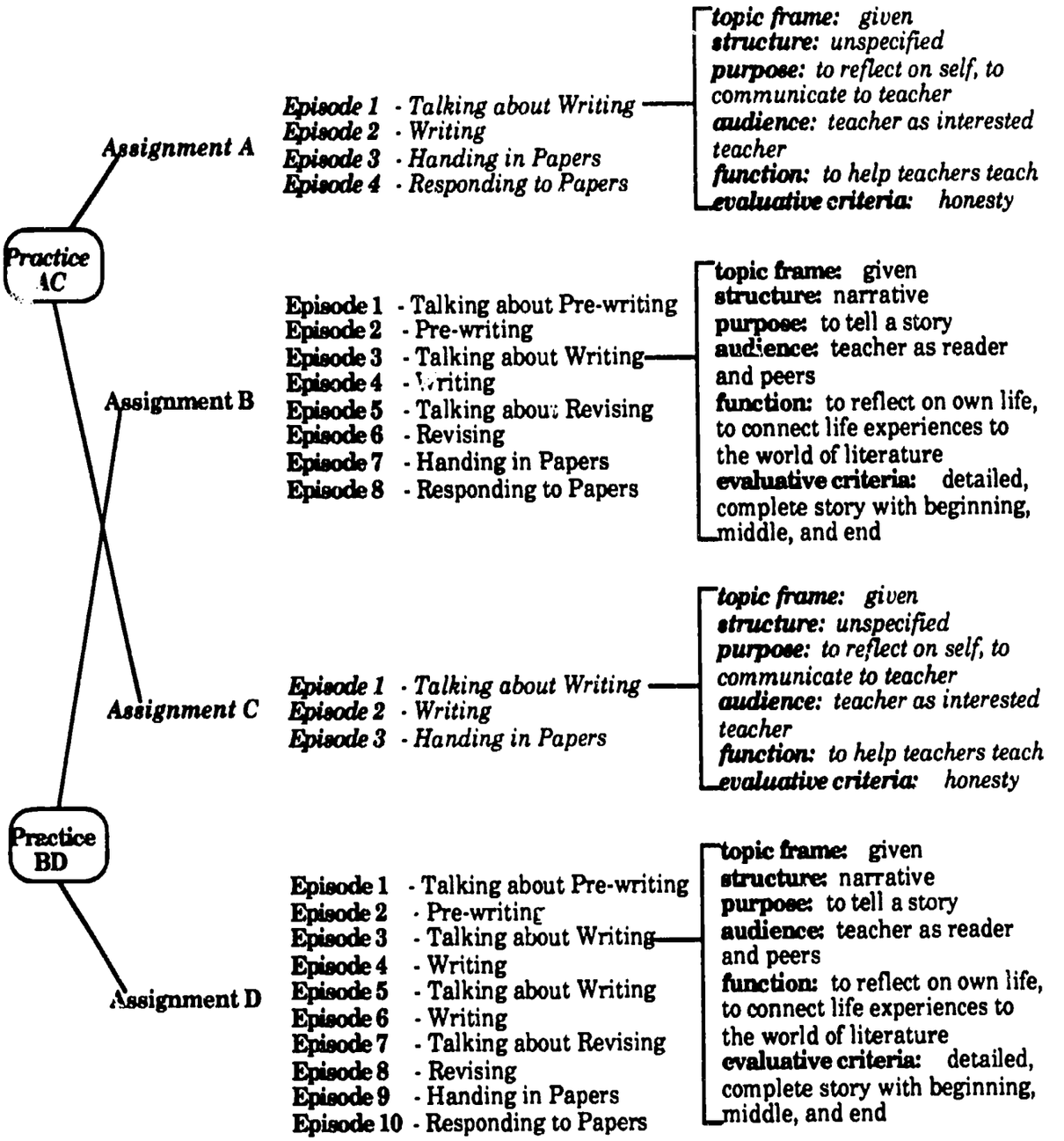

Figure 1. Schematic drawing of the derivation of writing practice categories.

Table 2: Coding Categories for Writing Episodes

Coding Category	Coding Levels
Activity type	Pre-writing; writing; responding; rewriting; proof-reading; publishing; editing; reading, viewing a film, or story-telling; pre-writing & writing; writing and responding; writing & rewriting; writing & publishing; responding & rewriting; rewriting and publishing; reading or viewing & writing; procedural tasks; talking about an upcoming activity
Computer	Used for the episode; not used for the episode
Teacher's help	Commenting or evaluating; responding to student questions; modelling processes or products; responding as a reader; writing collaboratively with students
Peer interaction	Formal and specified; informal and unconstrained
Peer initiation	Assigned by the teacher; voluntary on the part of the student
Context	Whole class; half class; small group; individual

Comparing student participation in a selected writing practice in Phase I and Phase II. To analyze how the six focal students participated in a writing practice over the school year, I first selected the writing practice, writing personal narratives, which figured prominently in Ms. Cone's writing pedagogy across both phases of the study. I then selected two personal narrative assignments from early and late in Phase I and two personal narrative assignments from early and late in Phase II for comparison. Working from the field note record, from audio tapes of teacher-student and student-student interactions, as well as from student papers, I described the students' behaviors during each writing assignment analyzed, contrasting these behaviors with Ms. Cone's expectations for student work. Then I compared the behaviors of individual students in Phase I of the study to those of Phase II, looking for changes that accompanied the introduction of the word processors into the classroom. I was interested in whether student writers modified their writing processes and products when they worked with word processors, and whether the focal students engaged each other more often in interactions that were focused on their writing when they used the word processors to write, as previous research and discussions about technology and writing had suggested.

The results of the study were thus arrived at by collecting multiple sources of data and conducting a multi-leveled analysis of these data, enabling the analyses to converge on reliable and valid interpretations and findings. Familiarity with the classroom and participants over the length of the school year further insured greater accuracy of interpretations and gave access to multiple perspectives on the data. As a final validity check, I presented formative interpretations and analyses to the classroom teacher for comment and response. In all cases, Ms. Cone validated my judgments.

RESULTS

The Writing Practices

In this section I describe the writing practices Ms. Cone promoted in her classroom. I then show how Ms. Cone chose to integrate the word processors into her existing writing curriculum, how she experimented with new writing practices to exploit their capabilities, and how her choices and experiments transformed the whole of the learning environment for writing in her classroom.

From Writing Assignments to Writing Practices

Although writing assignments differed in the specific kinds of talk and activities comprising them, they were similar in that Ms. Cone never simply gave an assignment that students were to go away and complete. In her talk and in the way she structured classroom activities throughout writing assignments, Ms. Cone endeavored to help her students complete them. Her teaching provided interpretive frameworks for students in the way she talked about the assignments and in the way she structured classroom activities in the course of carrying them out. These interpretive frameworks guided students' understandings of the writing they did for the class, and they indicated for the observer the way the teacher understood and valued the writing practices she promoted.

In the first phase of the study, before the computers were installed in the classroom, Ms. Cone led her students through fifteen writing assignments. They wrote personal narratives, letters, New Year's Resolutions, and tests. They wrote personally to their teacher, wrote about their own lives, and wrote about characters and events in books and films. Some writing assignments involved students in a series of thinking, talking, and writing activities over a period of days to produce one piece of writing. Other assignments involved students writing several small pieces over time, repeatedly. For example, Ms. Cone often asked students to write about the events and characters in books they were reading for homework, telling everything they knew so far. She usually asked them to write about the same characters more than once in the course of a unit covering the book. For some assignments Ms. Cone expected students to produce a piece of writing in one sitting in class, turning the paper in at the end of the period. Some of these one-day assignments were tests on the books the class had read, and were given letter grades. Another type of writing that lasted one class period occurred when Ms. Cone asked students to reflect on their academic experience, writing to her, personally.

In Phase II, after the computers were installed and the students trained to use them, Ms. Cone led her students through seventeen writing assignments. She continued to ask students to write personal stories, to write about books—both as they read and when they completed them, and to write personal pieces addressed to her. New for this phase, she asked students to write letters to a real audience, a partner in a remedial writing class at UC Berkeley. She had students write collaboratively for the first time, with a partner at the computer, and gave them many written quizzes over reading assignments. During Phase II Ms. Cone had some, but not all, writing completed on the computer. As in Phase I, some

writing assignments were drawn out in time in Phase II, with students writing the same piece over a period of days, and involved many different thinking and writing activities. Ms. Cone also had students complete assignments within one period, as in Phase I. They wrote to reflect on their grades and how they might improve them, and they wrote quizzes and tests about completed books. They also wrote reflective pieces about a speech or a short story they had read and how they felt about it.

The many diverse writing assignments observed during Phase I of the study fell neatly into seven writing practice categories, and those observed in Phase II fell into nine writing practice categories. Of the nine practices of Phase II, five overlapped with those from Phase I. For each practice category, Table 3 describes the shared dimensions of the assignments included in the category, as they were talked about by the teacher, as well as the activities that accompanied each assignment included in the practice category. (For the five practices shared in both phases, Table 3 shows only how each practice differed from Phase I in the Phase II column.) On Table 3, assignments in each writing practice are numbered by their sequence of occurrence in each phase; writing subtasks within assignments are designated by lower-case letters. As Table 3 reveals, in general the majority of differences between those practices that were shared across the two phases occurs in the sequences of writing activities rather than in the rhetorical features or social meanings and values associated with the practices.

Computer Use in Classroom Writing Practices

As Ms. Cone incorporated the computers into her writing instruction, she made choices about where in the curriculum to allocate these resources and how to organize student use of them. These pedagogical choices resulted in many changes, both directly and indirectly linked to Ms. Cone's instructional use of the computers. Of the five writing practices shared in Phase I and II, only personal narratives, one assignment involving writing to learn, and writing to analyze literature involved the computers in Phase II. Despite her expressed desire "to be using [computers] constantly," Ms. Cone chose only those writing practices that involved extended writing processes, both in terms of days as well as numbers and variety of writing activities, as candidates for integrating the computers. Personal narratives and literary analyses perhaps required this extended teaching because they fell into Ms. Cone's prototypes of "writing instruction," where the focus was on teaching students to produce canonical discourse forms in written language. Once the computers were integrated into these particular writing practices, the practices gained greater prominence, foregrounded against the background of less extended writing tasks.

Writing to display knowledge, one of the less extended tasks, was completed after finishing a text or film and required all students to write at once. There were not enough computers available for this kind of practice. Moreover, it is not clear that the set-up time, when students picked up disks and started the word processing program, was worth the effort for writing assignments that were finished within one period. Writing to learn required students to write iteratively about an unfolding text or film. Initially Ms. Cone wanted students to "finish the day with a five minute session on their word processor writing what they learned about the characters in the book or what they think is going to happen next or why they think the author put in a specific detail." However, she used computers for this purpose for one book only; practical realities (required set-up time, the limited number of computers, and priorities for computer writing time) interfered with this goal. Writing to communicate to the teacher, like writing to display knowledge, was completed within one writing session. The focus for these more functional writing activities, additionally, was not on writing *qua* writing. Rather, it was on communicating

Table 3: Changes in Writing Practices from Phase I to Phase II

Writing Practices	Phase I	Phase II
Writing Personal Narratives	Assignments 1,2,4, and 12 Rhetorical Features Topic frame given, sometimes to complement reading Narrative structure Purpose - to tell a story Audience - teacher as reader and peers Social Meanings Function - to have students reflect on their lives and connect their life experiences to the world of literature Evaluative Criteria - a detailed story with a real beginning, middle, and end. Sequence of Activities Segmented, extended writing process, including peer groups for story-telling before writing, peer groups for reviewing drafts, multiple drafts written inside and outside of class, and written comments from the teacher, ungraded, some papers published by reading aloud	Assignments 8 and 13a Rhetorical Features Topic frame always given to compliment reading Audience - teacher, peers, and others outside of class Sequence of Activities Extended writing process, but less segmented: no structured peer groups or peer interaction, but frequent informal interaction at the computer, composing on and off the computer in class, & frequent teacher/student collaboration while writing, all papers published as text
Writing to Learn	Assignments 6a, 11a, 14a, and 14b Rhetorical Features Topic given in question form Structure not specified Purpose - to answer questions about events and characters Audience - teacher as evaluator Social Meanings Function - to help students keep track of characters and events in the book or film, to keep students engaged Sequence of Activities Accompanies reading or viewing films, iterative, brief writing tasks, no structured peer interaction, one draft, no rewriting, usually done outside class, collected & checked	Assignments 4a, 7a, 10a, 10b, 12a, 13b, and 15a Sequence of Activities Accompanies reading or listening to a play, identical in both phases, except Assignment 4a, which is a cumulative writing task, rather than an iterative one. During this assignment, students collaborate with the teacher and peers as they write and rewrite in class on the computer --all other assignments hand written, checked or graded
Writing to Display Knowledge	Assignments 6b, 8, 9, and 14c Rhetorical Features Topic given in question form Structure variable Purpose - to demonstrate knowledge on items tested Audience - teacher as evaluator Social Meanings Function - to test student knowledge, to hold students accountable for their class work Evaluative Criteria - focused on information content, not on quality of writing, per se Sequence of Activities Follows completion of a book, one lengthy writing session only, no sanctioned peer interaction, one draft written in class and edited before handing in, graded	Assignments 4b, 4c, 4d, 7b, 7c, 7d, 10c, 12b, and 15b Sequence of Activities Follows completion of a section of a book or a whole book or film, long writing sessions (tests) and brief writing sessions (quizzes) during which students write by hand, graded or checked
Writing to the Teacher	Assignments 3, 5, 6b, and 15 Rhetorical Features Topic frame given Structure unspecified Purpose - to reflect on self and communicate to the teacher Audience - teacher as interested reader Social Meanings Function - to find out information about students and their learning that will help with teaching Evaluative Criteria - although unevaluated, teacher praises honesty Sequence of Activities Follows class discussion of topic, one writing session, no structured peer interaction, one draft only, written in class, collected but not graded or checked, teacher summarizes and responds orally in class	Assignments 9 and 17 Sequence of Activities One draft only, written in class, by hand
Writing to Analyze Literature	Assignments 11b and 13 Rhetorical Features Topic frame given Structure - a paragraph with a topic sentence Purpose - to make a claim about a character and support the claim with evidence from the film Audience - teacher as evaluator Social Meanings Function - to have students learn to think and to do more difficult, challenging writing tasks Evaluative Criteria - statement of claim and adequate support from the film for proof of the claim Sequence of Activities Follows viewing of a film, no writing sessions in class, no structured peer interaction, one edited draft, written outside of class, collected and checked	Assignment 4e Rhetorical Features Topic constrained by template Structure - specified by template--two paragraphs with topic sentences in a particular format Purpose - to analyze the effect of characters in the book on one another Audience - teacher and exchange partners at UC Berkeley Sequence of Activities Extended writing process including class discussion and collaborative writing of topic sentence, peer group discussion of topic accompanied by note taking, multiple writing and rewriting sessions in class on the computer, with informal teacher and peer collaboration, collected but not graded, published in written form

Table 3 (continued)

Writing Practices		Phase I	Phase II
	Writing New Years Resolutions	Assignment 10 Rhetorical Features Topic frame given Structure - paragraph, form recommended Purpose - to make a resolution Audience - writer, teacher as reader, peers, and parents Social Meanings Function - to have students reflect on their lives and resolve to make their lives better Evaluative Criteria - although unevaluated, the teacher praises honesty Sequence of Activities Segmented, extended writing process, including brainstorming list of resolutions, no structured peer interaction, multiple drafts written inside and outside of class, oral response from the teacher, ungraded, some papers published	
	Practicing Writing Skills	Assignment 7 Rhetorical Features Topic specified Structure specified and content given Purpose - to punctuate dialogue Audience - class Social Meanings Function - to give students practice punctuating dialogue so they can include dialogue in their own stories Evaluative Criteria - correctly punctuated dialogue Sequence of Activities Class lesson on punctuating dialogue, iterative, brief writing tasks, one draft written in class, not turned in, not graded	
	Practicing Computer Use		Assignments 1, 2, and 3 Rhetorical Features Topic unspecified Structure variable Purpose - to write a story or a description Audience - peer author, teacher, parents (Assignment 3) Social Meanings Function - to have students write on the computers Evaluative Criteria - detailed, full narrative or description Sequence of Activities Follows completion of computer training, unsegmented writing process, extended over two days, paired, collaborative writing, writing and rewriting at the computer with a peer, not graded, one assignment published
	Writing to Correspond		Assignment 6 Rhetorical Features Topic frame broadly defined Structure - personal letter Purpose - to write a letter about oneself Audience - exchange partner at UC Berkeley Social Meanings Function - to have students participate in an exchange of writing Evaluative Criteria - lengthy letter Sequence of Activities Accompanies receipt of letter from partner, unsegmented process, extended over several days, no structured peer interaction, written in class, on and off the computer, not graded, sent to partner
	Writing to Do Work		Assignments 11, 14, and 16 Rhetorical Features Topic - given, often in question form Structure - variable Purpose - to respond to questions Audience - teacher as evaluator Social Meanings Function - to give students work to do outside of class Sequence of Activities Accompanies or follows other classroom activities, brief writing tasks, no structured peer interaction, one draft, written outside of class, collected and checked
	Writing to a Classmate		Assignment 5 Rhetorical Features Topic unspecified Structure - personal letter Purpose - to write to classmate Audience - classmate who is ill Social Meanings Function - to give the teacher practice on the computer, to cheer an absent classmate Sequence of Activities Accompanies teacher training on computer, one brief writing session, only, no structured peer interaction, no drafts turned in, but written on the computer before and during class

personally to the teacher or keeping track of characters and events in a book or on demonstrating what the writer had learned. Only when the focus was on writing itself, and the quality of writing, did the computers seem to have a place in the practice.

It seems a testimony to the prominent impact of pedagogy that in a classroom equipped with word processors, not all writing got done on the computer. However, Ms. Cone's use of the computers affected nearly all the writing practices of the classroom, even when computers were not directly involved in the practice. Since Ms. Cone chose to give writing personal narratives and writing to analyze literature priority for the use of the computers, and since only half the students could work on the computers independently at once, the other half of the class had to be busy doing something else. While some students wrote at the computers, others could read aloud in a group or independently, and thereby chisel away at the ninth grade reading curriculum specified by the district. Efficiently, Ms. Cone usually assigned writing to learn as homework or seat work to the reading group while the writing group worked at the computers on other, more extensive, writing tasks. Writing to learn thus became the complement of writing personal narratives and analyses of literature; because the word processors were assigned for the one, they could not be assigned for the other.

Like writing to learn, writing to display knowledge was affected, albeit indirectly, by Ms. Cone's use of the computers in other areas of the curriculum. Writing to display knowledge did not involve computer use in Phase II, but many more quizzes were assigned in Phase II of the study. These quizzes were given to the reading group while the writing group worked at the computer. As mentioned earlier, Ms. Cone's response to having half the number of computers as students was to diversify the classroom, running multiple activities at once. Keeping track of individual student progress in this diversified classroom became a bigger management task than had been required when the students all moved simultaneously through an identical set of activities. Ms. Cone adapted to the new situation by giving more quizzes to keep track of student work.

Of the five practices shared across the two phases of study, only writing to communicate to the teacher seemed unaffected by Ms. Cone's integration of the computers into classroom writing, except for the fact that the topic for one of these assignments in Phase II centered on student experiences with the computers. Students never were asked to use the computers to write communicative pieces to Ms. Cone.

All four writing practices that newly appeared in Phase II seem to owe their appearance, in part at least, to the uses to which Ms. Cone put the computers. Writing to practice using the computers, writing to communicate to an unknown correspondent, and writing to communicate to a classmate all involved using the computers. Writing to have school work to do, while it did not involve the computers, occurred when students wrote in class on the computers and as a result had little homework. Ms. Cone gave three assignments when the computers entered the classroom that were experiments during which she was having the students practice writing on the computers, and during which she was "practicing" herself in how to use the computers in her teaching. In all of these, students were paired to write collaboratively. After these first three assignments, students never were asked to co-author a piece of writing again. Instead, Ms. Cone began splitting the class, running two different class activities at once.

Students wrote to an unknown correspondent when they wrote letters to their partner in the UC Berkeley writing class, assisted by telecommunications software and telephone lines. Ms. Cone wanted to experiment in this way. However, such personal letter writing to UC Berkeley happened only once, in part because in the busy end-of-the-year push to get through the district-wide mandated curriculum, there was insufficient time

for such experiments. In addition, Ms. Cone was not sure the interactions between the two groups of students had been valuable the one time they occurred.

Writing to have school work to do arose out of pressures coming from outside Ms. Cone's classroom. One influential force was the intervention project which committed Ms. Cone to increasing her expectations for her students. Part of this commitment meant that she needed to give students challenges like those given their age-mates in other classes. Another part of this commitment meant that she needed to consistently reinforce successful student behaviors with these potentially disaffected and unsuccessful students. Writing to have school work to do was a response to this need. When it seemed to Ms. Cone that students had not had any homework for a long time, she assigned writing for homework. These particular writing tasks were clearly not important to the curriculum itself. This way of using writing, however, is probably one of the most prevalent ways writing functions in schooling. Writing is often used to socialize students to behaviors that are associated with schooling alone and to make students accountable for school tasks (Applebee et al., 1984).

The final writing practice that arose during Phase II, writing to communicate to a classmate, occurred because Ms. Cone needed a writing task herself. She asked a student who was often in the classroom before class started to show her how to use the word processor. She set herself the task of writing to a student in the class who was out sick due to a softball accident. When class started, she invited students to add to the letter she had begun. In a way, she was writing to practice using the computer. By contrast, those students who added to the letter were writing to communicate to a classmate.

Ms. Cone's experimentation with the computers thus both introduced new writing practices into the curriculum and affected established practices, like writing personal narratives and writing to analyze literature, which formed the core of the writing curriculum. Next I describe in detail how one of these practices, writing personal narratives, was transformed by Ms. Cone's use of the computers. This detailed description of the changing learning environment establishes the background for understanding changes in the ways students participated in these assignments.

Writing Personal Narratives

Writing personal narratives required an extended writing process and involved multiple writing activities, including pre-writing, response from teachers and peers in the process of writing, revising, and publication. Ms. Cone gave a general topic frame, and often thematically tied this frame to literature the class was reading. For example, students wrote stories about a time they learned a lesson when they read Tolstoy's "How Much Land Does a Man Need?" in Phase I; in Phase II, students wrote about a time someone treated them unfairly while reading a book that depicted racial violence in the South. Within the topic frame given by the teacher, students were free to choose the specific incident they wanted to write about. They were to write a complete narrative; Ms. Cone stressed the use of details and complete beginnings, middles, and endings in the narrative form. Ms. Cone described what she desired in their personal narrative pieces: good narratives "start from the beginning and go to the end, with all kinds of exciting details." Great stories develop from honest writing, from writing that takes risks: "You take a chance; you say I'm really gonna tell it how it is; even though it might be a little embarrassing, I'm gonna tell it. That's when you get a great story." Ms. Cone did not grade these papers, but wrote comments on them and sometimes gave them a number on a scale from 1 to 9 or checks, plusses, and minuses. She often responded to the quality of the papers, in general, aloud in class.

In Phase II, Ms. Cone asked students to draft and redraft their personal narrative papers on the computer, and often when they did so, they had the help of their teachers and classmates. Ms. Cone did not talk much about the form the narrative should take at this point in the year. Unlike Phase I, all writing of personal narratives during Phase II was done in the classroom, much of it during class, but some before class, at lunch time, or during sixth period for students who could get away from their reading class. (The remedial reading class was taught during sixth period by Ms. Cone's friend and fellow participant in the SUPER intervention project. Several of Ms. Cone's students also attended this remedial reading class, and could elect, with the reading teacher's permission, to come into Ms. Cone's class to work on their writing.) Because Ms. Cone chose to have students write personal narratives on the computers, she had to provide time for them to write in class, and as a result, students had the opportunity to interact much more frequently with one another and with their teacher while they were composing personal narratives in Phase II than in Phase I. Ms. Cone did not have students meet formally in peer groups in this phase, but invited them to help one another informally as they sat at the computers and wrote.

In Phase II of the study, the formal way Ms. Cone structured peer groups and peer interactions thus gave way to more informal interactions among writers, peers, and teachers. The peer interaction that occurred, occurred spontaneously as students worked side by side in the classroom. Without peer groups to divide the writing process into drafting and rewriting phases, moreover, Ms. Cone chunked writing and rewriting activities, giving directions for student writing and rewriting together and allowing students to work on the tasks as they felt they needed to. At the same time, however, the teacher read over student texts and suggested changes as students worked at the computers, thereby interactively marking some of the boundaries between one computer "draft" and another. Even so, the fact that this feedback occurred while students were actually writing, rather than when they paused between drafts, made the process of writing in Phase II more fluid, with students moving from writing to rewriting and back.

Many changes in the practice of writing personal narratives thus occurred in Phase II of the study. These changes stemmed from the structure of the practice itself and exploited the possibilities offered by the new writing technology: writing a personal narrative, as Ms. Cone defined it, required an extended writing process including revision and thereby justifiably entailed the use of the word processor; it involved social interaction and feedback on developing texts, interaction that changed form when students wrote in the classroom. However, the goal of writing a personal narrative remained for students to tell a story about themselves and to come to an understanding of their own experience of the world, often in juxtaposition to a text that spoke of a similar theme.

Summary

Extensive changes accompanied the introduction of computers into the writing curriculum in this classroom. Yet these changes did not occur across the board, affecting all assigned writing tasks. Rather, they resulted from the pedagogical choices Ms. Cone made, from the ways she chose to exploit the new technology for the particular constellation of writing practices she promoted: she introduced computers into some writing practices and not others; she conducted distinct, multiple, simultaneous activities in the classroom rather than having students co-author pieces together at the computers; she invited informal peer interaction rather than setting up formal peer review groups; she offered her assistance to students as they wrote; and she increased her homework and quiz assignments. The statistical analyses conducted to compare how writing was carried out in the two phases of the study confirm and reinforce these observations.

The Patterns of Activity and Interaction

While the analysis of writing practices reports changes across the two phases of the study, the coding and analysis of writing episodes reported in this section narrows in on transformations in the patterns of activity and interaction, the participation structures and social contexts, that characterized the writing carried out in Ms. Cone's classroom. My observations indicated that peer interactions changed when Ms. Cone began integrating the computers. Overall, there seemed to be more social interaction during composing after the computers appeared, despite the disappearance of peer groups. Whenever students wrote at the computer, frequent interchange between the writers, their teacher, and their peers seemed to be taking place. Ms. Cone seemed to work collaboratively with students more often after the computers came in, sitting down with students at the computer, taking the keyboard in her lap, and helping students to think of what to write, to put their thoughts into words, and to edit what they had written. The contexts for classroom writing seemed to be shifting away from whole class interactions to more individualized or small group activity. Statistical analysis of the writing episodes of Phase I, taken as a group, compared to those of Phase II, enabled me to investigate these changes.

The contrasts from Phase I to Phase II show how the patterned ways of carrying out writing were transformed by the ways Ms. Cone made use of the computers. As indicated earlier, changes Ms. Cone introduced into the curriculum through her use of the word processors reverberated into other areas of classroom writing, even where she chose not to have students write with the word processors. These changes reverberated broadly: computers were only used for 14.3% of the total number of writing episodes during Phase II of the study; these episodes occurred as part of only 7 of the 17 observed assignments. Yet significant changes in classroom writing as a whole coincided with Ms. Cone's incorporation of word processing into these few writing episodes, as Table 4 indicates.

Changes in Frequencies from Phase I to Phase II

Changes in patterns of writing activities. Comparison of the five writing practices shared across the two phases shows significant differences in distribution of writing episodes among the practices. In Phase I, the emphasis of Ms. Cone's instruction was clearly on writing personal narratives (34%), writing to learn (38%), and writing to display knowledge (16%). In Phase II, the frequency of episodes devoted to these practice categories changed significantly as Ms. Cone adopted the computers into her writing curriculum: writing personal narratives (20%) and writing to learn (37%) decreased in frequency, and writing to display knowledge increased (29%). The distribution of different kinds of writing activities also changed significantly from Phase I to Phase II; 23% of the 97 writing episodes observed in Phase I involved students writing first drafts in the classroom, whereas in Phase II, the percentage of episodes involving drafting in the classroom increased to 30%. This difference increases when all episodes involving writing in the classroom (such as pre-writing and writing) are considered. In addition, combined activities, like reading and writing, writing and rewriting, and the like, accounted for 13% of the episodes in Phase II, whereas these were almost nonexistent in Phase I (1%). Although 13% seems small, it reveals an important shift in the way Ms. Cone organized classroom writing to include multiple parts of what had been a segmented writing process.

Changes in patterns of interaction. The type of help Ms. Cone offered to students shifted as expected toward greater collaboration in Phase II. This increase in teacher collaboration (from 5% in Phase I to 16% in Phase II) is accompanied by a decrease in the amount of commenting and evaluating (from 16% in Phase I to 6% in Phase II). This change is also reflected in the decrease of episodes devoted to responding to student

Table 4: Changes in Activity and Interaction from Phase I to Phase II

Category	Phase I	Phase II	Chi-Square
Practice Type			21.06***, df = 4
Total Number of Episodes	219 (100%)	240 (100%)	
Personal Narratives	75 (34)	49 (20)	—
Writing to Learn	83 (38)	89 (37)	—
Writing to Display Knowledge	34 (16)	70 (29)	—
Writing to Communicate to the Teacher	11 (05)	6 (03)	—
Writing to Analyze Literature	16 (07)	26 (11)	—
Activity Type			31.54*, df = 12
Total Number of Episodes	97 (100%)	137 (100%)	
Pre-writing	3 (03)	1 (01)	—
Writing	22 (23)	41 (30)	5.73**, df = 1
Responding	24 (25)	12 (09)	3.36**, df = 1†
Rewriting	8 (08)	6 (04)	0.07, df = 1
Proof-reading	2 (02)	0 (00)	—
Publishing	6 (06)	5 (04)	0.00, df = 1†
Editing	1 (01)	0 (00)	—
Reading, Viewing, or Story-telling	30 (31)	55 (40)	7.35*, df = 1
Pre-writing & writing	1 (01)	1 (01)	—
Writing & Rewriting	0 (00)	7 (05)	—
Writing & Publishing	0 (00)	1 (01)	—
Rewriting & Responding	0 (00)	4 (03)	—
Reading & Writing	0 (00)	4 (03)	—
Types of Teacher Help			15.76**, df = 4
Total Number of Episodes	125 (100%)	135 (100%)	
Commenting or Evaluating	20 (16)	8 (06)	—
Responding to Student Questions	35 (28)	41 (30)	—
Modelling Process or Product	59 (47)	62 (46)	—
Responding as a Reader	5 (04)	2 (02)	—
Writing Collaboratively with Student	6 (05)	22 (16)	—
Formal vs. Informal Peer Interaction			5.49*, df = 1
Total Number of Episodes	26 (100%)	57 (100%)	
Formal	11 (42)	9 (16)	—
Informal	15 (58)	48 (84)	—
Assigned vs. Voluntary Peer Interaction			2.84
Total Number of Episodes	24 (100%)	50 (100%)	
Assigned	10 (42)	10 (20)	—
Voluntary	14 (58)	40 (80)	—
Types of Instructional Contexts			21.25***, df = 3
Total Number of Episodes	234 (100%)	312 (100%)	
Whole Class	184 (79)	209 (67)	—
Half Class	0 (00)	20 (06)	—
Small Group	14 (06)	14 (05)	—
Individual	36 (15)	69 (22)	—

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

† Yates Correction for Continuity applied to Chi-Square statistic to correct for cell frequencies < 5

writing (from 25% in Phase I to 9% in Phase II), since responding now frequently took place in the collaborative context of assisting students with their writing. The quantity and quality of peer interaction changed from Phase I to Phase II as well. The percentage of episodes in which Ms. Cone involved peers in student writing increased from 11% of the total episodes observed in Phase I to 18% of the total observed in Phase II. In addition to an overall increase in the quantity of peer interaction, the quality shifted from formal to informal and from assigned to voluntary interaction. Although the percentage of voluntary peer interaction increased perceptibly from 58% in Phase I to 80% in Phase II, the increase is not statistically significant. The greatest percentage of all writing episodes occurred in a whole class context (79% in Phase I and 66% in Phase II). However, in Phase II, whole class lessons decreased in frequency, as Ms. Cone split the class into two groups and engaged the groups in two different activities. Significantly, the episodes involving one-on-one instruction with individual students increased from 15% to 22% in Phase II. The differences in the frequency of episodes occurring in the different instructional contexts in Phase I and Phase II are significant, both statistically and in terms of what they mean about the changing instruction of the classroom. A diversification of instruction, a decrease in whole class lessons, and an increase in one-on-one interactions all point to a shift toward individualizing instruction.

Summary

In many ways, the results of the analysis of writing episodes replicate and support the results of the analysis of writing practices, but this analysis also reveals important similarities and differences in the structure of writing in the two phases of the study that do not come into focus by concentrating on the more global characteristics of writing practices. Ms. Cone adapts her writing curriculum, shifting the frequency of particular writing practices, from writing personal narratives in Phase I to writing to display knowledge in Phase II. However, these particular writing practices, as well as writing to learn, hold prominent places in Ms. Cone's writing instruction throughout the school year. Reading and writing increase in frequency in the classroom, and formerly separate parts of a writing process are chunked together as Ms. Cone has students write and rewrite during the same writing session at the computers. The social context for writing shifts in Phase II toward a more collaborative classroom better attuned to students' individual needs as Ms. Cone encourages peer collaborations, as she writes collaboratively with individual students, and as she shifts her instruction from primarily whole class lessons in Phase I toward more one-on-one interactions in Phase II. The next section shows how individual students adapt their interactional patterns and writing processes to these many classroom changes.

Student Participation in Personal Narrative Units

Moving from formal to informal peer interaction, from lock-step activities to multiple simultaneous tasks, and from teacher control to teacher collaboration reconfigured the relationships between writing tasks, writers, their teacher, and their peers. Transformations in the organization of classroom writing activities affected how different students interacted with others, how they sought and received help with their writing, and how they carried out their writing tasks. In this section I chart student writing behaviors along two dimensions: changes in the writing processes and products of the focal students, and changes in the social context these students interacted with and helped to construct as they carried out their writing tasks.

As individuals, the focal students made unique developmental strides characteristic of individual growth. However, taken as a group, the growth and development of the focal students, their changing patterns of participating in writing personal narratives, suggest

Table 5: Contrasts in Student Writing of Personal Narrative Assignments

Phase & Date of Assignment	Focal Student	Number of Words	Revision Strategy Used: Adding Detail	Re-reading & Editing	Adding to the End
Phase I	Lorraine	200	√	√	
October	Davon	208			
	Rafi	145	√	√	
	Shawndra	124	√	√	
	Lareisha	188	√	√	
	Lamont	162			
Phase I	Lorraine	438	√	√	
January	Davon	314	√	√	
	Rafi	219	√	√	
	Shawndra	[307]		[√]	
	Lareisha	443		√	
	Lamont	200			
Phase II	Lorraine	393			√
April	Davon	467			√
	Rafi	357	√	√	√
	Shawndra	183			
	Lareisha	311			√
	Lamont	555			√
Phase II	Lorraine	443		√	√
May	Davon	191	√	√	
	Rafi	544	√	√	√
	Shawndra	318	√	√	√
	Lareisha	388		√	
	Lamont	554		√	

trends in the overall response of Ms. Cone's students to the changing classroom. Tables 5 and 6 chart features of the writing processes and products of each focal student, as well as features of their interaction in the social context of writing personal narratives. At a glance, these tables summarize the performance of the focal students in each of the personal narrative assignments studied, and show the general trends of change across the school year. As indicated earlier, writing personal narratives in this classroom entailed meeting expectations about the text itself—its length, form, and topic; about the process of writing; and about the social context in which writing processes take place. Student conceptions of these dimensions of writing changed form over the course of the school year, and it is these changes, distilled from student talk and observations of student behavior, that I summarize here.

Table 6: Contrasts in the Social Context of Focal Student Writing during Personal Narrative Assignments

Phase & Date of Ass't.	Focal Student	Conflict in Peer Inter-action	Type of Help T. Offered	Init. by	Type of Help P. Offered	Init. by	Type of Help W. Offered	Init. by
Phase I October	Lorraine	yes	e	T	g e	P P	e	W, P
	Davon	yes	-		g e	P W	g e	W W, P
	Rafi	no	-		r	P	g	W
	Shawndra	no	-		-		-	
	Lareisha	yes	-		-		-	
	Lamont	yes	-		e	P	e	W
Phase I January	Lorraine	yes	-		-		r	W
	Davon	yes	g	W	r e	P P	r e	W W, P
	Rafi	yes	e	W	e	W	r e	W W
	Shawndra	yes	-		r e	P W, P	r	W
	Lareisha	no	-		e	P	e	P
	Lamont	yes	-		e	P	e	P
Phase II April	Lorraine	no	g	T	-		e	P
	Davon	no	e	W	g r e	P P W	-	
	Rafi	no	e	W	e	W	g r	W P
	Shawndra	no	-		e	W	-	
	Lareisha	-	e	W	-		-	
	Lamont	no	g e	T T	e	P	e	W, P

Types of help are categorized as generating (g) or revising (r) content, or editing (e) for correctness. Interactants are identified as the teacher (T), student writer (W), or peers (P).

Table 6 (continued)

Phase & Date of Ass't.	Focal Student	Conflict in Peer Inter-action	Type of Help T. Offered	Init. by	Type of Help P. Offered	Init. by	Type of Help W. Offered	Init. by
Phase II May	Lorraine	no	e	T	g	W	e	W, P
					e	W, P	r	W
	Davon	no	g	W, T	g	P	-	
			r	W, T	r	W		
			e	W, T	e	P		
	Rafi	no	r	T	e	R	g	W
			e	T			r	P
							e	P
	Shawndra	no	r	T	e	W, P	g	P
			e	T			e	W, P
	Lareisha	-	e	T	e	W	-	
	Lamont	-	e	T	-		-	

Types of help are categorized as generating (g) or revising (r) content, or editing (e) for correctness. Interactants are identified as the teacher (T), student writer (W), or peers (P).

The writing behaviors of the six focal students were analyzed as they participated in four personal narrative assignments:

Phase I

Retelling an Adult's Story
a story about something that happened to an adult who is close to the writer when he or she was young

Learning a Lesson Story
a story about a time the writer learned a lesson, written after reading Tolstoy's short story, "How Much Land Does a Man Need?"

Phase II

Unfair Treatment Story
a story about a time someone treated the writer unfairly, written concurrently while reading Stewart's book, *Dream Killer*, about racial prejudice and violence in the South

Doing Something Hard Story

a story about a time the writer did something that was either emotionally or physically difficult, written concurrently while reading London's short story, "To Build a Fire"

Changes in Student Writing Products and Processes

Text length. As Table 5 shows, student papers grew in length when students wrote at the computers in Phase II. [A planned comparison using a repeated measures analysis of variance design (Keppel, 1973) showed papers written for the second two assignments (mean = 784.0, S.D. = 212.2) to be significantly longer than those written for the first two assignments (mean = 494.7, S.D. = 130.9), $F(1,15) = 20.72$, $p < .001$.] The increased length of student papers resulted from both a strategy the students invented of adding to the end of a story in subsequent writing sessions, and from the editing and revising stimulated by Ms. Cone. Students said they enjoyed working at the computers, which may also have encouraged them to write longer papers.

Revision strategies. By the end of Phase I, most of the focal students showed evidence that they were beginning to revise to clarify and add detail to their stories and/or to edit to eliminate errors. The students seemingly lost these skills, however, with the introduction of the computers in Phase II. Almost none of the versions the students created for the Unfair Treatment story at the beginning of Phase II bore any evidence of re-reading and re-writing, although the students modified their texts as they composed, limiting their changes to typos and spelling errors. While students omitted the rereading and rewriting steps they had included when composing for Phase I, they invented a new approach to writing—adding to the end of their texts—when given the opportunity to write in multiple sessions at the computer during Phase II.

The students did not begin to reread and edit again until the end of Phase II, for the Doing Something Hard story, when Ms. Cone intervened in her students' writing in a new way, reading and writing comments on their drafts in a word processing file that students could subsequently edit and revise. Ms. Cone stressed both revision and editing in her written comments, prompting students to both add detail to their stories and to perfect them for a literary magazine she would compile at the end of the school year. She then gave students more class time to rework their stories and personally assisted them with the editing and revising prompted by her written comments, encouraging the students to work with one another, as well. This new organization of writing at the computer provided students with multiple sources of help while they were in the midst of writing their stories. Within this context, the students again showed an ability to insert detail into a story and edit it for correctness.

Changes in the Social Context of Writing

Conflict, hostility, or humiliation in peer interactions. Early in the school year, Ms. Cone's goals of providing a peer audience and a collaborative environment in which students could receive help revising and editing their papers were not fulfilled in the peer groups. Students often neither focused on editing punctuation to correct sentence boundaries nor on asking probing questions to generate details for revising content but invented their own procedures for group activities. Most importantly, many students showed marked discomfort with sharing their writing in such a public, peer forum. This discomfort manifested itself in destructive interactions among students who sometimes resorted to ridicule and open hostility toward other students.

Types of help available to students. Table 6 shows the categories of help available to students as they composed their personal narratives. Comments, questions, and suggestions were categorized as help generating ideas when they were attempts to prompt student writers to create text or when they clarified or explored topics. They were categorized as editing help when they concerned mechanical correctness (spelling, punctuation, etc.), grammar (subject-verb agreement, past tense endings), or sentence boundary adjustments (run-on sentences). They were categorized as help revising content when they concerned detail to be added or deleted from the story or when they rephrased or reordered information. The table details for each focal student and for each assignment the types of help received and offered, as well as the source and the initiator of the help. It thus shows the interactional consequences for each focal student of the many changes in writing practices discussed earlier.

Type of teacher assistance. In general, the teacher responded to student requests for help during Phase I, but did not otherwise insert herself in the composing processes of the students. Since the teacher wandered along the rows of computers as students composed in Phase II, students could call on her help as she passed by. The teacher also intervened more directly in student writing in this phase, checking student work before allowing students to turn it in, or helping students by reading through and correcting their papers with them. Moreover, when the teacher was able to insert herself into the composing process of the students, students received help of a qualitatively different kind than they typically received from their peers. In general, when the teacher initiated helping interactions with students, she focused not only on local concerns such as spelling, but also on generating content for the story.

Type of peer assistance. Despite the discomfort students often experienced in their peer groups during Phase I, the students did receive editing and revising help and sometimes help generating ideas from one another, and offered one another help with these same tasks. In this phase the focal students assisted one another to find and correct errors and over time developed the ability to assist one another in adding detail to their stories within the formal structure provided by the peer groups. In Phase II of the study the focal students continued to seek help from and offer help to one another. Importantly, they now interacted at the computers *during* the composing process, instead of during a pause between drafting and rewriting their texts. This new timing of interaction within composing focused the students more often on local, editing concerns, rather than on revising their texts to add detail; most of the students spontaneously asked for help spelling particular words while they were in the process of writing at the computers. They did, however, seek and provide help generating ideas and revising content as well.

Initiating help giving and help getting. Table 6 shows the degree to which students initiated helping interactions with their teacher in Phase II compared to Phase I. In Phase I, when students participated in peer groups, student writers (W) most often initiated the rare interactions with Ms. Cone, frequently by asking her for help spelling a particularly difficult word. Notably, the teacher (T) often initiated interactions with students over their writing in Phase II of the study, actively intervening in their writing processes. Students, in turn, increasingly availed themselves of the teacher's assistance in this phase. The ability of students to control the help they received from their peers increased when they wrote at the computers in class. Early in the year, peer readers (R) most often initiated help giving to student writers in the context of the peer review groups, whether or not the writers desired this input from their peers. During Phase II, however, the writers themselves most often initiated seeking help from their peers.

Summary

In Phase II of the study, Ms. Cone's students showed growth in the productivity of their work with one another on writing tasks, in their own writing processes, and in their performances as writers of personal narratives. In general, papers written on the computer were a great deal longer than those written by hand. Changes in student writing processes, however, did not reinforce currently wide-held beliefs that word processors will encourage students to revise their writing. Quite the contrary: the majority of students revised or edited substantially when they wrote personal narratives before the computers arrived in the classroom. When they used the computers to write their narratives, however, the majority neglected revision and editing, perhaps since Ms. Cone did not create distinct times devoted to these activities at the beginning of Phase II, as she had throughout Phase I. Instead, students invented the strategy of adding to the end of their papers without changing the body of what they had written before. When Ms. Cone intervened to assist students with editing and revision for the Doing Something Hard story at the end of Phase II, the computers did facilitate the performance of these tasks, but only with Ms. Cone's active participation in student writing processes. The computer, widely held to "facilitate revision," thus actually did nothing, in and of itself, to encourage students in this classroom to revise. Revising, as part of the writing process, only occurred when it was made to be a salient part of the practice of writing a personal narrative. Clearly the most important influence over student writing processes was the instructional environment, constructed by the teacher, of which the computer was only one part.

Perhaps most significant were the changes that came about in the social context of writing in Ms. Cone's classroom. The teacher became a collaborative assistant while students composed their stories and later when they revised and edited them. The students interacted informally, and comfortably, with one another as they composed and as they reworked their papers, as well. They heard one another's comments on their own and others' writing. They watched other students write, and listened in as their peers conferred with the teacher over their writing. They incorporated the skill and expertise of Ms. Cone into their own written work. The voices and activities of the whole class thus became integral parts of the individual writer's achievement. These changes had a profound effect on student writing, which was no longer an isolating task to complete in solitary silence, but a communicative event taking place in a socially active environment, the act of an individual writer working in the company of others. The new organization of the classroom transformed Ms. Cone's classroom from a writing classroom into a community of writers.

Davon: Writing and Revising in the Company of Peers

Davon's Writing Processes and Products

Davon's personal narratives, written over the course of the year, demonstrate particularly well how the changing learning environment affected the writing processes and products of students. Early in the year, Davon seemed completely unfamiliar with revising as Ms. Cone had defined it for the class in the context of writing personal narratives. For instance, when Ms. Cone told him his paper for the Retelling an Adult's Story assignment was too short, he protested, "But that's how long the story is!" He seemed genuinely perplexed when he asked her, "How do you make a story longer?" He finally resorted to writing a different story, one that was "longer," rather than revising his first one to lengthen it with detail. Like many students, Davon also initially understood revision to be recopying a paper to make it neater. His final draft of this "longer" story was identical to his first draft.

Description of accident from Davon's first draft:

When we finally arrived we ate and sat around. Later on we all went swimming K.C. thought Michael and I took our swimming test because Erica wasn't there she was coming the next day. Micheal and I thought we had it made but know longer than ten minutes I went into the water and I slipt everybody was laughing because they thought I was playing but I wasn't I was scared to death but K.C knew I wasn't and he jumped in and saved me. Now I know why we take swimming test.

Description of accident from Davon's final draft:

When we finally arrived at Lodge Lake we sat around and ate Lunch. Later on we all went swimming, K.C another counsuler that was with us thouht Micheal and I took our swimming test. Erica wasn't there to stop us either she was coming up the next day. Micheal and I thought we had it made but know longer than ten minutes I went into the water. I slipt everybody was laughing because they thought I was playing but I wasn't. I was drowning and I was scared to death but K.C. knew I wasn't playing and he jumped in and saved me. Since I came very close to suddent death when someone tells me to take a safety test I do it.

Figure 2. Excerpts from first and final drafts of Davon's "Learning a Lesson" story.

However, Davon's paper for the Learning a Lesson story, written late in Phase I, illustrates the development of editing and revising skills. The story describes how he and a friend went swimming at the end of a long hike without having taken the water safety test required by the summer camp staff. Figure 2 excerpts a description of the resulting accident from the first and final drafts of Davon's paper. Whereas he made no changes between drafts on his paper for the Retelling an Adult's St , assignment, for this paper, Davon supplemented his description with clarifying detail in his final draft.

After the computers arrived, Davon's writing showed the lapse of revision and editing characteristic of the majority of the students in the class. For instance, he wrote a lengthy paper for the Unfair Treatment assignment in three composing sessions at the computer. Beginning his story during one class period, Davon came in the next morning before class started to continue writing. He completed his story that same day in class, talking frequently with his friend, Rafi, who showed great interest in the story, encouraged Davon to write it despite its controversial nature, and gave him specific advice about how to write and revise it. Figure 3 shows how Davon's story grew over the three sessions (additions from the second session are underlined, those from the third are both underlined and in boldface). Despite Rafi's support for revision, Davon simply adds to the end of his story from session to session.

Although Davon had demonstrated revision and editing skills earlier in the year, these drafts indicate that he did not edit or revise his text from day to day when he worked on the computer. For example, he both misspells and correctly spells the word "because,"

THE MISUNDERSTANDING

It all started off when I went for the track team the first couple of days was fun but then he came. Tom Barns was one of the coaches and he thought he was big time. One day we did'nt go to practice Maurice and I that is because we had to go get our track shoes but Tom did'nt believe us so he started giving us a speech and Maurice turned his head and Tom said you look at me when I'm talking to you boy. Maurice said I was looking at you, Tom just came straight out and said shut up and don't come back out hear until you treat me with respect. Maurice got back on the team but since that day I never liked Tom. Another thing happened but this was like two or three months ago it was rainning and we had to practice in the gym we had to do all these differnt exsercises. Tom told us to do push ups at his own past but he was going to slow and my friend Ron was doing his fast but Tom had to have it his way and he told Ron to stop but he kept going. Tom said get out and don't come back until you learn to listin but Ron stayed and did it right. Today was dooms day we were about to do five three thirtys and tom had said we had to get sertent time and I said what do the girl's have to get and he said you don't worry about them worry about your self I did'nt say anything. William one of my friends turned around a said thhat's what you get and I said shut up William then Tom turned around and said what did you say I told him I said shut up William but he thought I was talking to him and he said you "A" is grass you mother "F" and go tell your mother I cursed at you too. I'm not going to say what else he said but it was'nt very nice after he got done saying all of this he told me togo clean my locker out and don't come back because I don't take "shit" from little "A" holes like you. So I was kicked off the track team becaues of something I did'nt do but when I tried to tell him that I was'nt talking to him, he went off even more since that day I have'nt been able to face anybody. In my oppion I think that Tom Barns should be fired but I guess he can do anything he wants to because he is a county shieff.

Figure 3. Versions of Davon's "Unfair Treatment" story from three consecutive composing sessions at the computer

which suggests that he did not read through his paper in order to edit it. The double "H" in "thhat's" also hints at this neglected step. In fact, the video record shows that the only changes Davon made to his text were immediate corrections of typing mistakes. And, while Davon showed his story to Rafi on the computer one morning before class, he did not take the opportunity to edit or revise the story. Taking class time and making extra time before class, Davon's composing strategy seemed to be "finishing" his story. For Davon, finishing the story did not entail editing or revising, despite over a semester's experience writing and revising personal narratives and even though Ms. Cone had directed students to re-read and revise their writing as they worked on the computer. The strategy of adding to

THE SENIOR

This year I really liked someone but she didn't like me because she had a car and I didn't (DON'T YOU THINK A PERIOD GOES HERE?) (ALSO, YOU SAY "ONE OF THE REASONS" BUT YOU ALREADY HAVE GIVEN A REASON. WHY NOT BEGIN THE NEXT SENTENCE IN A DIFFERENT WAY?) one of the reasons was that she was going to graduate. She thought I was nice and she wanted to be my friend but I wanted to be more than friends (DOESN'T A PERIOD GO HERE?) I just couldn't face the fact that she didn't like me. When football and basketball season was in and since she was a cheerleader I would go to the games just to see her. She was the prettiest cheerleader on the squad. We talk so that means we are friends but it was very hard to get over her (OOPS! YOU LEFT OUT ANOTHER PERIOD.) I will miss her next year because she was the first girl I really liked.

WHAT A NICE PARAGRAPH. I BET THAT KIMBERLEE WOULD LIKE TO HAVE A COPY OF IT. REMEMBER TO INDENT THE FIRST WORD OF YOUR PARAGRAPH. NICE WORK.

Figure 4. Davon's first draft of "I ing Something Hard" story with Ms. Cone's written comments inserted.

the end extended the narrative without reworking it internally. Student narratives like Davon's gained in length when they used this strategy, but often because the stories simply went on and on.

Davon's final story for the year does display the strategies for editing and revision his writing seemed to promise at the end of Phase I, however. When assigned to write his Doing Something Hard story, Davon hesitated at the computers, engaging his teacher and a friend in a lengthy search for "something to write about." He admitted, "I have something but it's too personal. I don't want people be reading it." Finally, assured that only his teacher, and not the students from the writing course at UC Berkeley, would read the story, he wrote shyly about a crush he had that year. Ms. Cone collected Davon's disk in the days following this session. She read his story, inserting questions in capital letters to set her comments off from the rest of Davon's story. Davon's draft and Ms. Cone's written comments are shown in Figure 4.

Ms. Cone's comments directed Davon to edit, as well as to revise his story, "beginning the next sentence in a different way." They announced Ms. Cone's concern about Davon's punctuation errors. However, Ms. Cone did not leave her comments to serve as revision prompts in her absence. She also took care to make sure Davon understood them by demonstrating how to respond to her comments. Working on his own, and prompted by Ms. Cone's comments, Davon adds the missing punctuation. He then responds to Ms. Cone's suggestion to "begin the sentence in a different way" by inserting the detailed description of Kimberlee. During another revising session, Davon produces the final version of his paper, calling repeatedly on Ms. Cone for assistance, and accompanied throughout by Rafi, who reads the story and makes suggestions for its revision. The resulting final draft is shown in Figure 5.

THE SENIOR

This year I really liked someone but she didn't like me because she had a car and I didn't. Her name is Kimberlee MacDougal. She is a senior at El Cerrito High. She is eighteen, four foot eight, she has dark brown eyes, long black hair, a tan skin complexion and has the cutest smile along with the prettiest face. But there is one thing I didn't mention. She has the most beautiful legs in the world. You have to see them sometime. She thought I was nice and she wanted to be my friend but I wanted to be more than friends. I just couldn't face the fact that she didn't like me. When football and basketball season was in and since she was a cheerleader I would go to the games just to see her. She was the prettiest cheerleader on the squad. We talk everyday so that means we are friends but it will be very hard to get over her because she meant a lot to me. I will miss her next year because she was the first girl I really liked.

Figure 5. Davon's final draft of "Doing Something Hard" story.

Davon's final version of this story is not the longest piece of writing he did for the class, owing to its personal and reflective nature, but it is nearly error-free, a product of Davon's collaborations with his friend and his teacher. Moreover, it is a product of Ms. Cone's new organization of classroom writing which provided specific times for editing and revision, gave access to expert help through Ms. Cone's written comments and collaborative problem-solving, and welcomed and effectively included the assistance of peers.

Davon's Interactions with Peers

Like Davon's changing writing processes, his changing interactions with peers demonstrate the powerful influence that the writing environment exerted on student participation in writing tasks. Davon was easily one of the most offensive and defensive members of his peer groups during Phase I. His responses to other students' writing ranged from the impolite to the humiliating. During the Retelling an Adult's Story assignment he told Lorraine, for example, "You have to write your story over" adding bluntly, "It don't make no sense." And later, he called her stupid because she forgot to double-space her writing. Similarly, he made fun of Christian, a boy in his group, for his many misspellings, asking him, "What you learn in eighth grade, nothin'?" Davon's behavior seemed to become even more offensive as Phase I progressed. He told Lynnette, during the Learning a Lesson assignment, that her story "don't make no kinda sense." Echoing bits of her story for ridicule, he announced to other group members that Lynnette's story was "all messed up" and "ain't got no punctuation mark, no periods or nothing." More than once he told the unfortunate Lynnette, "You stupid, Lynnette. You don't know nothin'. You dumb." Had these groups maintained a friendly tone, Davon's comments might be taken as good-natured teasing. Since the groups dissolved into open anger and hostility, however, Davon's remarks were clearly understood and taken as insults.

Davon's defensive reactions to feedback on his own writing were equally unpleasant. During the Retelling an Adult's Story assignment, he avoided his turn to read, bossing other students instead. When he finally did read his paper, he read quickly and nervously and responded argumentatively to other students' comments. For example, when Christian's questions indicated he had not understood Davon's story, Davon blamed Christian for not understanding the story, rather than accepting the responsibility to make the story clearer. Davon also avoided reading during the Learning a Lesson assignment. When pressed to read, he followed his story with the plea, "Don't tell me anything, huh?" When Shawndra and Lynnette asked clarifying questions or made suggestions, Davon became more and more annoyed, finally resorting to telling them both to "shut up." The following excerpt from the peer group interaction, while missing the tone of voice that marks Davon's interaction as increasingly defensive, indicates Davon's discomfort:[1]

D: [reading] "I was hot and sweaty, and we had to go over" what?

L: I said-

D: Shut up. [reading on] "over cliffs and rocks."

S: Hmm? Oh you was running? You had to run?

D: No, we were walking, we went ten miles and we was going. We were trying to get to this one spot. But that one spot ain't in here, either.

S: Yeah.

D: [reading on] "It's- it's not nice to be around girls when you are sweaty. Flies, flies were flying all around me, and-"

S: Oh god, you had flies- flies was around him. You must have been really smelling.

D: No, not that. We were walking through grass and stuff, you know, flies...

S: Oh, in the grass and stuff?

D: Yeah.

S: Put that in there. Bugs, just say bugs.

D: You don't talk. I warn you don't say nothing to me. I'm serious.

S: Oh, I'm just trying to make your story better.

(...later in the group session...)

D: [reading] "Michael and I thought we had it made. But no longer than ten minutes I went into the water and slipped. Everybody was laughing because they thought I was-"

S: You slipped.

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[1]In transcripts of student interactions, pauses in the talk are indicated by double (..) or triple (...) periods. The longer the pause, the more periods used.

D: On a rock, okay?

S: Well put that. You slipped on a rock and you fell in the water.. [responding to Davon's glower] Okay, I'm not gonna say nothing no more.

Davon's clarifying revisions, shown in Figure 2, originated, then, as grudging or even angry responses to Shawndra and Lynnette, who were eventually intimidated by his demeanor.

In dramatic contrast, Davon interacted comfortably with his peers while writing in Phase II. No longer in teacher-mandated peer groups to tell his unwritten stories or to work on a draft, he was free to seek help from his computer neighbors over his writing when and if he wanted it. Recall, for instance, how Davon invited Rafi to read his "Unfair Treatment" story before class one day. And while writing the story, he seeks Rafi's advice:

D: I shouldn't write this story, huh?

R: There's nothing wrong with that story. I want you to write it. Great stuff. It's something you thought was unfair so put it on there. Don't ever back down. ... And don't skip anything! Put "Then, I was thrown off-"

D: [composing orally] "He didn't want me to keep talking, so I turned around and I started to say-"

R: Get into it!

Davon also turns to Rafi for help spelling "misunderstanding" and "Maurice," to which Rafi responds, "I don't know, but you gotta put 'my friend, Maurice.' They won't understand what's up." Although Davon ignores Rafi's suggestion for revision, he seems encouraged by Rafi's enthusiasm and comfortable with his help. Finally, during the Doing Something Hard story, Davon is able to collaborate comfortably with a peer to revise his story:

D: [reading] "..it will be very hard to get over her but I will."

R: "..it will be very hard to get over her."

D: Then I have, "I will miss her, " and that sure don't sound right.

R: "'Cause she meant a lot to me," or something. And put "I wish we could give each other addresses because I want to keep in touch with her."

D: No, Rafi, 'cause she's gonna read this.

R: Just put this stuff on the copy for Ms. Cone.

With Rafi's assistance, Davon thus revised the last two sentences of his story, freely accepting and rejecting Rafi's suggestions as he saw fit. Just as comfortably, Davon frequently assisted his computer neighbors, who often were his closest friends, with computer commands, editing, and spelling, as well. The transformation in Davon's behavior, the ease with which he collaborates with his peers at this point in the year, is indeed dramatic.

When Davon wrote in class at the computer, he was able to select his seat, and always elected to sit near friends. He darkened his screen periodically while he wrote his "Doing Something Hard" story, even darkening the screen when the teacher came to review his work as he finished his first draft, asking her to "read it when I'm not here." Thus, when Davon wrote at the computers, he was able to both initiate and refuse help with a degree of control that he exercised only with difficulty in the peer groups earlier in the year. This control enabled him to interact comfortably, rather than combatively, with his peers.

Summary

Davon's progress over the year shows the power and reach of the changes in the writing environment created by a teacher's pedagogical innovations with a new technology for writing. Without support from Ms. Cone, either through formally structured peer groups or class time devoted to revision, Davon does not integrate revision into the process of writing personal narratives, despite his access to a technology specifically designed to enable editing and revision. However, changes in the social environment for writing move Davon's patterns of interacting in the classroom in new, positive directions and afford him access to the assistance of both his teacher and peers.

DISCUSSION

All technologies are embedded in social practices which they are designed to augment; computers are no different from other tools in this regard. Yet computer enthusiasts embrace the arrival of word processors in the classroom precisely because they expect transformations in student writing to follow. Many studies of the effects of word processing on student writing seek to enumerate changes in the quality of student writing or student writing processes. Most such studies are blind to the social context of the classroom that defines how word processors enter the writing process of individual students, yet here—in the patterned ways of using literacy, in the writing practices indigenous to a particular classroom—is the meeting ground of writing technology and writer.

Contrary to the technological determinism underlying previous studies, this research demonstrates how the instructional environment created by a classroom teacher shapes the influences that computer writing tools, in this case word processors, have on student writing. Clearly it is the case that the new technologies for writing can and do help shape the instructional environment, as well, that the instructional environment and the writing technologies are in fact mutually constituted. In this study, for example, the computers helped to facilitate collaboration among students and their teacher by making the developing texts of writers visible and accessible to potential collaborators. They clearly amplified Ms. Cone's process-based, collaborative pedagogy, making possible more collaboration among writers, more access to help for individual students, and more fluid writing processes. It is certainly true, then, that word processing can influence the ways writers go about their work; however, this study demonstrates that the teacher's structuring of writing practices determines what these influences on student writing will be.

Ms. Cone used computers only for writing practices that formed the core of the writing curriculum from her point of view, not for writing the tests or quizzes or homework that comprise the more functional core of writing for school. Within the practices chosen for word processing, Ms. Cone's goal of promoting collaboration with and among students and her model of composing led to her innovations with the computer: formal peer review sessions were transformed into informal interactions at the computer; teacher collaborations with students became prevalent; and formerly separate components

of a writing process were fused. Ms. Cone adapted the classroom and curriculum to make room for computer writing sessions in the classroom: she increased the frequency of reading and writing in the classroom; she individualized instruction more; she increased her expectations of students; and she diversified the curriculum by running multiple concurrent activities.

As the classroom became a more flexible environment where students were able to choose between varied activities and to choose the type and source of help with their writing, varied student strategies for learning and interacting with others worked more successfully. Reluctant members of peer groups became eager collaborators at the computers. Students voluntarily came in outside of class time to write. Papers increased dramatically in length when students wrote using the computers. However, students did not spontaneously revise and edit their writing with the computer tools, but added to the end of texts during multiple writing sessions. Only when the classroom teacher changed the organization of writing activities to intervene more directly and more collaboratively in student writing did students begin to incorporate revising and editing into their writing at the computers.

Through this detailed look at a classroom, we are able to witness how pedagogical goals are translated—through teaching methodologies and materials—into instruction. Yet at the same time as this study contributes a detailed view of how a classroom teacher integrates computers into her writing instruction, it defines and describes the writing practices indigenous to her classroom. In so doing, it aims to extend our knowledge of what students learn about written language in our classrooms. Student behavior markedly differed from one writing practice to another, suggesting that students appropriated not only the forms of written discourse Ms. Cone promoted, but also the forms of social activity which characterized the production of these discourse forms. Student help-seeking and help-giving, for example, showed how the students understood the work of writing personal narratives. They turned to one another for help correcting mechanical errors, sought one another's advice with the topics and contents of their stories, and intervened in one another's writing to offer help in these areas. Within the structure Ms. Cone provided for writing personal narratives, the students learned that it was customary and appropriate to entertain these kinds of concerns, and more than that, that it was customary and appropriate to engage others in them. Unlike writing to display knowledge during test-taking, or writing to learn about literary plots and characters, writing personal narratives was an inherently social activity where concerns about the final product influenced the lengthy process of writing.

A fully articulated theory of written language acquisition will demand careful attention to classroom teaching and learning in many classrooms and at many levels, since the patterned ways of using writing in classrooms constrain the lessons available to students and the skills they are likely to acquire. This study represents one small step toward that lengthy undertaking. Toward that end, it details a methodology for abstracting categories of social practice from an ongoing stream of social interaction. Using this methodology, writing practice categories are built up from units minimally abstracted from the data, a process which requires few inferential leaps and instills a methodological rigor into the knotty problem of analyzing ethnographic and observational data.

Beyond the specific findings and methodology of this study, implications can be drawn for educational practice, in general, and for the process of introducing pedagogical change, in particular. With each new pedagogical innovation, either hope or pessimism springs eternal. We hope that the new curriculum, the new machinery, the new method will be a panacea. At the same time, we fear that nothing will ease the tremendous job of teaching children in schools. The findings of this study suggest that neither hope nor

pessimism are called for, but rather care. Curricula, machinery, and methods will never be "teacher-proof," but instead will find their way into classrooms in the hands of teachers, in the light of teachers' perspectives, and in the service of teachers' goals, of course shaped by what teachers know about their students. Just as Ms. Cone's uses of the computers shaped their influence on student learning, the uses to which teachers put new curricula or methods will determine their effects.

This implies that if curriculum specialists, building supervisors, university researchers, computer manufacturers or teachers wish to produce particular desired changes in classrooms, they must attend to the ways they introduce and maintain these innovations. Because I was able, as a participant observer, to take a direct and supportive role, introducing the computer to students, training them on the word processing software, and remaining as a technical support person throughout the year, Ms. Cone was free to focus on higher-level pedagogical goals and to completely restructure writing instruction in her classroom. Without my support she may not have been able to accomplish such radical change. While it was no doubt critical to the success of the innovation that I provided this early help, Ms. Cone continues to use the computers independently and naturally in her writing instruction, running multiple, simultaneous classroom activities, collaborating with students on their writing, and encouraging peer collaborations. It may be that intensive, early support for pedagogical innovations can influence not only their direction but also their duration.

This study also suggests that to affect change, would-be innovators are well-advised to work in active partnership with classroom teachers, who are the single most powerful influence on classroom teaching and learning processes. In this situation, care taken choosing a particularly talented teacher committed to teaching writing and knowledgeable about writing research and instruction resulted in powerful and productive changes as she reorganized the classroom to integrate the computers. This study demonstrates, then, what it is possible to achieve in a writing classroom where low-tracked students use computers for their writing tasks. Since few innovations can rely on such carefully hand-picked collaborators, attention to teacher education seems a minimum prerequisite for successful innovation. At the same time, innovators from outside of the classroom need to recognize the constraints under which teachers operate, constraints which were visible in Ms. Cone's need to cover the mandated curriculum, to monitor student progress through quizzes, and to provide students with school work to do. Instructional innovations will be shaped by forces outside the classroom. Thus, "process approaches" to writing instruction can transform in the classroom into "product assessment" because of standardized tests of written language, as Applebee et al. (1990) suggest. Classroom innovations may sometimes fail simply because they are unrealistic, given the complexity of demands on teachers.

When Ms. Cone and I began our collaborative work with the computers, other teachers assumed that we meant to introduce them to "honors" students. The success of this collaborative intervention calls into question the common view these teachers expressed, that only high-achieving students can benefit from educational resources like computers. It questions, equally, the drill and practice focus on low-level skills that characterizes most computer use by remedially-placed students. Here, low-tracked students were introduced purposely to high-end, business software and were given computers for the complex task of communicating in written language. Yet, all of these students mastered the word processor to the degree required by their writing assignments. A few students, like Rafi, learned more advanced word-processing skills and shared these skills with other students, becoming "computer experts." Moreover, skill on the computer was not necessarily correlated with skill in reading or writing; students who were seen by their peers as deficient in language arts skills could gain the respect of their peers when they

operated the computers. This study demonstrates that all students, not just those designated as "honors" students, can benefit from the careful integration of word processing into the writing curriculum. Social equity and human fairness require, then, that all students have equal access to technological resources for high-level thinking tasks such as writing.

With regard to computer innovations in classrooms, we can anticipate the need for further research. In this study, I investigated the complex interplay of pedagogical goals, classroom organization, writing instruction, and word processors in one high school classroom. The specific ways this classroom was transformed as a result of this interplay are not necessarily generalizable to other instructional contexts. However, the patterns of change in this classroom are instructive for the ways we view technology in classrooms: they suggest that how teachers make use of computers and word processors, the ways they organize writing instruction, and the social environment of the classroom as it is constructed by participants are critical determiners of the influences computers can have on student learning and writing. Since specific contexts and teachers are so profoundly important to the ultimate deployment of computer technology, adequate knowledge to judge the educational value of this technology will arise only from many similar studies of specific classrooms. We need, then, to study the integration of word processing into many and varied classrooms so that instructive patterns will arise. From multiple studies in varied settings, the key variables influencing the success of computer innovations will also emerge.

Some variables suggested by this study include the experience and expertise of the classroom teacher, the degree of support for the innovation, the focus and goals of the pedagogy, the organization of classroom learning, and the amount of equipment available to the teacher and students. For example, one important influence on the ways Ms. Cone ultimately made use of the computers for writing instruction was the limited number of computers available. In a class of 24 to 26 students, she had 12 IBM PCjr computers. I have discussed how Ms. Cone adjusted her teaching, splitting the class in two to write at the computers or to participate in other activities that did not involve use of the computers, and how this variation in the classroom affected students. In many schools and classrooms, far fewer classroom computers are available to writing teachers; others may have access to computer laboratories only outside of their regular classrooms. We need to know more about how the ratio of students to computers influences the pedagogical choices teachers can make and the value of these choices for learners.

This study focused on a year of tumultuous change as an experienced and successful teacher adjusted her teaching to a new technology for writing. Ms. Cone continued to experiment, shifting the way she organized writing at the computers throughout the year, beginning to collaborate with individual writers more frequently toward the end of the year. While lending support to the premise that computers and word processors facilitate collaboration in classrooms, that changes of this significance took place up until the last minute also suggests the need to study not only classrooms in the process of integrating computers, but classrooms where computers and word processors are already a part of the writing curriculum as well. Through follow-up interviews I learned that Ms. Cone continues her collaborative work with student writers at the computer. No doubt the practices in her classroom have continued to evolve. Long-term studies of computer interventions can help us avoid premature conclusions.

Studies that are longitudinal and observational–that focus on not only computer technologies but also on the instructional goals of teachers, the ways teachers organize and teach writing, the ways they structure the social environment of the classroom, and how they integrate technologies into this web of interactions–move us away from technological

determinism, from the hope that word processors will transform our classrooms and the way our students write independent of our making it so. This study makes vivid the need to acknowledge the profoundly important role of the classroom contexts into which computers are placed when drawing conclusions about the educational impact of this technology. It also situates the responsibility for transforming the classroom where it always has lain—in the hands of educators making the best of the situations and technologies at their disposal.

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