1999

To change or not to change: A case study of one urban high school's technological transformational process.

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Dissertation submitted to the College of Human Resources and Education
at West Virginia University
in partial fulfillment of the requirements
for the degree of

Doctor of Education
in
Curriculum and Instruction

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1999
Morgantown, West Virginia

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300 North Zeeb Road
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Ann Arbor, MI 48106-1346

ABSTRACT

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This study utilized a case study format for examining one urban high school's inclusion of technology and subsequent changes to the curriculum, school design, school organization, and teachers' pedagogy brought about as a consequence. Specifically, the study addressed five broad questions: (1) How do teachers view technology's role in their curriculum? (2) What is the role of computers in curriculum change? (3) Does extended work with computers change the types of communications processes used? (4) How does work with computers change (a) instructional practices, (b) overall school design, and (c) school organization? and (5) What is the role of change management theory in educational change?

Data was collected through the use of a 61-item, Likert-type questionnaire; in-depth conversations with randomly selected teachers; classroom observations; and analysis of documents relating to technology integration.

Teachers reported strong beliefs in both traditional and non-traditional uses of computers, but these beliefs did not necessarily reflect actual classroom practices. In terms of curriculum changes, teachers reported that student learning had increased overall and that student expectations were changing. That belief was supported by student editorials calling for widespread teacher integration of technology. Fully 79% of the teachers responding stated that they had made changes to their curriculum within the past five years.

Teachers felt positive about support that they received for using and integrating technology. They had access to an on-site school technologist, a supportive principal, and specific technology courses offered by the school district.

It appeared that when teachers and students had access to, extended work with, and support in learning to use technology, the communications processes within the content classrooms did begin to change. This was apparent as students reassessed the audience for writing tasks they completed, or as they considered issues of plagiarism and copyright laws.

Within school design, there did not appear to be major design changes in classrooms. Student desks were typically in straight rows, and in classrooms with one computer, the computer was usually placed on the teacher's desk or very near to it. Only 25% of the teachers felt that the computer area in their classroom had become a major focus area.

DEDICATION PAGE

To my mother, Loretta Parsons Dulaney,
who encouraged me when I wanted to quit my job to pursue my
Masters Degree, and when I finished that, still encouraged
me to continue toward my Ed.D., and who continues to
encourage me each and every day.
This is for you.
Thanks, Mom!
I love you.

To my husband, Michael James Wisell,
who knows the insanity of living with someone
who is completing a doctorate and still chooses to continue living
with that person.
Thanks for the support and help throughout the years!
I love you.

To my mentor and friend, Jeanne Marcum Gerlach,
I couldn't have done this without you!
I hope that you know how much your support and encouragement
have meant to me.
I love you.

To my teacher, Raymond Figlar,
this dedication is from the heart
of the kid from Pine Grove, West Virginia.
I learned to question things in life while sitting in your
social studies classroom.
Thanks for caring!
It's no book of poetry, but it'll do.

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CHAPTER ONE

Introduction to the Study

> "It is tempting to think that the many educational problems we face today can be solved with technology…Many of these tools do not fit into the current layout of classroom instruction and yet designers are confident that they will enter and transform the classroom" (Riel, M., 1994, p.453)

I first became interested in the issues surrounding technology in our nation's public schools as I sat talking with my son, Michael, and daughter, Carolyn one spring day in 1995. We somehow got onto the topic of computers in the classroom, and we discussed their experiences at the junior high school that they both had attended. This school had at least two computer labs at that time. One lab was used predominantly by English and advanced mathematics classes, and the other lab was housed in the Gifted Program classroom. Michael was part of this gifted class; these students spent a minimum of 1-2 periods each day as a self-contained group with two teachers who team taught. Mike's class had opportunities to interact with computers on a daily basis; in fact, the teachers encouraged this interaction process. Thus, Mike became both comfortable and fairly proficient in basic use of a personal computer. Carolyn, who was enrolled in average-ability classes, on the other hand, spent two years (7^{th} and 8^{th} grades) at this school without ever once getting to turn on a computer switch. By her senior year in high school, she was still uncomfortable around computers and did not possess even minimal knowledge of their use.

That spring during that conversation, I found myself feeling both shock and anger that two children could attend the same school with the same teachers in the same state where technology money was being poured into the school systems at an astonishing rate and where the state government was touting the educational advancement of our children due to increased use of technology; yet, these two children could have such divergent experiences in being taught how to use this communication medium. The whole situation

seemed to parallel Riel's quote at the beginning of this chapter in which she appears to be saying that many people believe that simply placing computers into our schools in labs or in individual classrooms will somehow automatically enhance learning opportunities for our children. Interestingly, many specialists in the field of organizational change talk about the phenomenon of the "magic bullet" theory of informational technology (IT). This theory holds that information technology empowers people to do things that they could not do before and that it prevents them from doing things in old, non-productive ways. "…we heard expectations about what it means to be a change agent…Even nonadopters of change management best practices believe that they are change agents if they initiate or develop information technology, because they think IT itself has the power to create organizational change. These people describe IT as a magic bullet…" (Lynn & Benjamin, 1997, p. 58). Of course, it seems that no one bothered to ask teachers how, or even if, they were using this relatively new technology in their instruction.

For my children this type of technology-related experience continued into their high school where the math and English departments had computer labs and the journalism class had its own Mac lab. Mike took journalism classes and worked with the school newspaper and yearbook, so he again frequently used computers. Carolyn during her four years of high school had the opportunity to visit one of the computer labs as part of class activities on two separate occasions. As surprising as this narrative might seem, I can vouch for its accuracy because of my personal experiences at this school. For the academic years of fall 1996 through spring 1998, I often substituted for many of the teachers on days when I was not teaching university classes. A majority (approximately 90%) of these high school teachers did not have a personal computer in their classrooms, and gaining access to a school computer lab was not always possible due to factors such as location and time. Thus, despite the infusion of technology into this school; the purchase of educational software; and the extended duration of having computer labs (the labs had been in the school for over five years), teachers were still mainly using traditional modes of information delivery such as lecture, films, and worksheets. If one

expectation for the use of computers is that we will see significant changes in the collaborative designs of humans with the enabling effects of technology (Riel, M., 1994), then the first line of change in our schools must begin with our teachers.

One pleasant note is that during the spring 1998 semester, I got to read through that high school's planned curriculum goals for the year 2000 and beyond. Starting with the fall 1998 academic year, all incoming freshmen would be required to complete four weeks of basic computer training including turning on the machine and basic keyboarding skills. While this goal does not nearly begin to tap into the communication possibilities for this technology, it is at least a beginning. Students will at least touch the machines and have some idea of how to use them.

Background

So, from an educator's viewpoint, how did we arrive at our present stand on information technology in our public schools? At a point in the early 1980s, America began to realize that it faced a technology upheaval. Personal computers began to show up in offices, at schools, and even in homes. Documents such as A Nation at Risk (1983) and others pointed to a crisis in education and the recommendations in these reports placed greater stress on the "new technology." One crucial step that was called for was the rapid infusion of computers into our schools (Apple, 1987). "In the three years between 1985 and 1988, the number of computers in American public schools jumped from 800,000 to 1.7 million" (U.S. Congress, Office of Technology Assessment, 1988). Soon, Americans began to look at computers in a new way; we were no longer looking at the massive main frame computers, which filled entire rooms and were operated only by the encoded, secret language of computer programmers. Now computers could fit on office desks, do the same tasks as the main frames, and be operated by the average citizen. America began to see the possibilities inherent in personal computers.

It didn't take long in this evolutionary process before the public and business sectors called for computers to be placed in our public schools. The worry was that our children would become computer illiterate before we could even evaluate the full range of uses for this new technology. And like the impact of Sputnik in 1957, America worried that other nations might beat us to the forefront of the technological revolution.

State governments began pouring money into buying hardware and software in a sometimes "willy-nilly" manner. Computer companies were often awarded state contracts to supply the hardware to all the public schools in the state without the people who would ultimately be using this technology, i.e. teachers and children, being consulted. Often the important decisions concerning what types of computers and their accompanying software and classroom use was determined by school administrators, local school boards, or state politicians, who never entered the classroom to work with children or to interact in any way with these new technological tools. "How computers are introduced into our society and, particularly, into our schools is ultimately a political question with serious implications for us as teachers, as members of school or university communities, and as citizens" (Hawisher & Selfe, 1991, p. 275).

There were many questions that needed to be addressed prior to the infusion of computers into our schools: What types of learning activities should our students be engaged in, and in what ways will the use of computers aid that learning? What types of computers are best suited for each school's educational needs? What software best supports the students' learning? What percentage of class time will be spent with students using computers? Will the teacher and students have access to a computer lab? What time restrictions will apply to use of the computer lab? What training in using computers will the teachers receive? Will the school district provide a technical support specialist? Will each school have a full-time computer coordinator? These are only a sample of the major questions that should have been addressed before placing computers in the schools; yet, these questions were usually not considered. Lewin (1947) was the first to suggest that an effective technique for facilitating change was to reduce participant's resistance by directly involving them in the process of change. In the education arena, we expected that the addition of computers in schools would magically transform or change how teachers taught and how students learned; yet, these participants were never directly involved in the change process plan. "Technology is only the enabler. A technology initiative will only be successful when the users are willing to embrace technology for its true, not always quantifiable, value and see beyond the silicon, bits, and bytes" (Puccinelli, B., 1998).

Purpose of the study

The purpose of this study was to examine one high school's inclusion of technology into its environment and to examine the impact of that information technology on changes in curriculum overall and on the changes in specific teachers' pedagogy. To achieve this purpose, one school was examined, which had actively incorporated technology into its environment for a period of at least five years, but which still had "institutional memory" of the period prior to this inclusion. I selected a period of five years for sustained computer use because as Sheingold and Hadley (1990) conclude in their study, at least five years of computer use are required for teachers to develop computer expertise and comfort. To select a pool of schools fitting these criteria, I enlisted the aid of Lee Allen, Head of Technology Services for the Dallas Independent School District.

Research questions

There were five broad questions that my study attempted to examine and address:

(1) How do teachers view computer/information technology's role in their curriculum?
(2) What is the role of computers in curriculum change?
(3) Does extended work with computers change the type of communications processes used in a high school setting?
(4) How does work with computers impact or change (a) instructional practices, (b) overall school design, and (c) school organization?
(5) What is the role of change management theory in educational change?

Research methods and procedures

This study utilized a case study format for examining one urban high school's inclusion of technology within its environment and of the subsequent changes to the curriculum, school design, school organization, and teachers' pedagogy brought about as a consequence of that infusion. Case study as defined by Yin (1984) is an empirical study that investigates a current phenomenon within its real life context when the boundaries between phenomenon and context are not clearly evident and multiple sources

of data are used. I conducted my research in four phases: dissemination and collection of a 61-item questionnaire; review of school documents relating to the implementation of existing technology and future plans; in-depth conversations with randomly selected teachers and administrators; and observation of instruction and students' technology-related projects.

Importance of this study

This study should contribute to the field of education in the sense that it examined an area that has basically been untouched in the literature. We have not had a case study or comparison study of the types of changes that occur (i.e. curriculum, pedagogy, physical classroom organization to enhance and promote technology use, and school-wide organization/design) when technology is introduced into a school. What long-term changes do we encounter in terms of human modes of communication? How do teachers view the role of technology in their classrooms? What do teachers believe students should be doing with technology?

Limitations of the study

Ironically, what was one of the strengths of this study, i.e. that it was a case study of one urban high school, which meant completing a detailed analysis of the state of technology within that school and all of its accompanying changes, was also one of the study's greatest limitations. The Dallas Independent School District (DISD) has 217 schools (K-12), total enrollment of over 157,000 students, and 30,000 computers (Allen, L., personal conversation, 1999) within its management. The selection of one high school with a student population of 1,000 – 2,000 and a computer base of 157 – 318 machines, limits the information that one can collect. Thus, we have to remember that that picture is like one small snapshot of a panoramic view.

Definition of key terms

It is important for this type of study that all parties share a common idea of what was meant by a particular term; therefore, I established working definitions for the following terms as they were used within this study. The reader may want to refer to the five research questions found on page 5 to see the context of each term.

(1) information technology----- this is generally the "catch-all" term for computers,

printers, and related peripherals

(2) extended work---- classroom activities that integrated computer technology for a period of one semester or more. Within this context, students had to use the computers for applications other than word processing, i.e. other options such as PowerPoint presentations, Excel spreadsheets, browsing Internet websites, or other activities.

(3) curriculum change----- changes that teachers made in the content of what was taught. Thus, teachers began to eliminate older, outdated information from their lesson plans, and started to incorporate materials and methods of instruction that seamlessly integrated technology into their classrooms.

(4) instructional practices----- for this study, this term referred to the delivery of what was taught. Thus, a change in instructional practices meant that teachers began using technology in ways that promoted (a) group learning activities, (b) critical thinking and problem solving, (c) connections among various content areas, (d) the use of the Internet to gather information for research, (e) the use of communications sources such as e-mail to discuss topics with professionals and other students in the field, (f) distance learning capabilities to allow students to be part of learning situations/opportunities that they otherwise would miss, (g) opportunities that allowed students to view issues from multiple perspectives, and (h) other non-traditional ways of enhancing student learning.

(5) school design----- within this study, this term referred to the physical layout of classrooms including: the types of student desks or tables provided; location and ease of access to computers, printers, and peripherals; use of physical space to enhance student learning such as space around a computer terminal for two or three students to work on group projects; television monitors placed near the back of the classroom with connections to at least one computer so that all students could view on-screen presentations, etc.

(6) school organization----- this term referred to changes in scheduling classes, such as the use of block scheduling, or in other school-wide initiatives that promoted technology use within the school.

CHAPTER TWO

Review of the Literature

In order to come to a more complete understanding of what the implementation of technology within a school culture meant and how that inclusion created change in curriculum design, school structure and organization, and in teacher pedagogy, it was important to examine the literature related to: (1) how teachers view computer/information technology's role in shaping their curriculum; (2) the role of computers in creating curriculum change; (3) the types of communications processes used in high schools and the ways in which those processes change when exposed to extended technology use; and (4) the role of change management theory in educational change.

First, I examined the theoretical base of change management. According to Kudray & Kleiner, (1997), change management is defined as the continuous process of aligning an organization with its marketplace – and doing it more responsively and effectively than competitors (p. 18). Obviously, this is a definition borrowed from business; yet, it is possible for us to continue with this consumer metaphor into the realm of education. Since public education is paid for with tax dollars, we can argue that our students and their parents are our customers and our product is knowledge acquisition/learning. Thus, to teach consumers how to stay competitive in a global economy, our schools have to adjust and align their services to fit this need (growing market). Thus, the concept of change management should be vitally important for anyone in the education field. We also have to consider that an overall truth in life is that things change, and an equally important consideration is that people have a natural tendency to resist change. Fortunately, for most of us change is a relatively slow, constant process that we often take no notice of in our everyday comings and goings. However, one of the most difficult types of change to deal with is a sudden, major change in our work place. These changes often seem to confront us on many levels including our emotional well-being and innermost values and beliefs about our work. Teachers are no different in this respect from other people, so when a major change is proposed and initiated in how we perform our duties, the natural urge is to resist the change, or, in

worst case scenarios, to sabotage the initiative. Thus, in the mid-eighties, when computer technology began to flood into our schools, teachers were suddenly expected to embrace this new communication medium and use it to improve student learning in their classrooms. "According to the National Center for Educational Statistics (NCES) 1995, 69% of all first through eighth grade students and 58% of all ninth through twelfth grade students use computers at school. In contrast, only 49.1% of teachers reported using the computer at work" (Chiero, 1997, p. 133). As Bob Puccinelli (1998) reminds us, "New technology also introduces change. People don't fear the recommended technology or process improvements. They fear the accompanying change. Fear is the primary obstacle to embracing change (and the technology that caused it)" (p.40).

In a study reported in *Electronic School Journal,* Howard D. Mehlinger states: "A major obstacle to the integration of technology across grade levels and the curriculum is the lack of a sufficient number of teachers who are comfortable using technology. " (pg. 4 of 7 online) He continues in the same report to show the disparity between how business trains its employees and how the public school system trains teachers. *Fortune* magazine reported that in 1994, U. S. businesses spent over $2 billion training their employees in how to use technology, whereas *Fortune* reported that 90% of U. S. teachers said that they were 100% self taught (Mehlinger, 1999).

Mehlinger (1999) includes a chart prepared by the National Information Infrastructure Advisory Council, which conducted an analysis of teacher skill requirements and the amount of time required to reach each stage. At the most basic skill level of computer use, ENTRY, the teacher struggles to cope with this technology in the learning environment or has no experience at all. This stage requires no professional development hours. In contrast, at the INVENTION skill stage, the teacher can actively use the technology as a flexible learning tool, in effect integrating the technology within the curriculum. To arrive at this skill level, the teacher needs 80 or more hours of professional development training and 4 to 5 years of actual experience. (Refer to Appendix E)

Mehlinger further discusses studies of experimental schools supported by Apple Computer Corporation that show that even when teachers do have access to

computers and do receive training in how to use them, it takes at least three years before they feel comfortable enough to begin thinking instinctively and creatively of how to incorporate this technology into their lessons (1999). This is important information for any school system that wants to change its system of instruction in any major way. Teachers must be part of the change system from the beginning and they must have the necessary support and training in order to gradually become comfortable and adept at integrating the technology.

For several years now, business leaders have been looking at the issue of change, the process that people go through, and possible models for helping people to overcome resistance to change. This research would seem to have a great deal to offer to the field of education.

For instance, Gjerstsen (1998) reports that one study begun in March 1998, and continuing through June of that same year, was undertaken by the Chartered Property Casualty Underwriters Society and ODR, Inc., a change management firm based in Atlanta, Georgia. This was a national research study on change and how change is affecting the insurance industry. The study was designed to discover how much change was happening in the industry, what was successful in that change, and how companies can help individuals to become more resilient at dealing with change. Clearly, this company believes that both organizations and the people who work for them can benefit from a greater understanding of how to deal with change. This belief should also seem to hold true for education; yet, how many times have administrators or politicians made major policy or instructional decisions for teachers without considering how these professionals would deal with the impact of such changes? According to Bob Puccinelli (1998), a senior consultant with Lighthouse Consulting, LLC, a company focused on blending people, process, and technology to effect business strategy, change management always has three phases. The first phase is for an organization to identify a need for change, and included within that phase is aligning the new cultural values with the structure of the organization and to determine which individuals will crusade for these proposed changes. The second phase of change management is motivating employees to accept the proposed change. They must see why the change is needed within the

organization and why their lives will be improved if the change takes place. And finally, the third phase of change management involves measurement and adjustment. These efforts need to be constantly monitored, reevaluated, refined, and reapplied because change is never easy. Thus, if we look at this information, we can see that teachers must be part of the decision making process right from the beginning of change initiatives if these initiatives are to be successful. "Because people have to create change, they must be empowered to do so….Empowerment is a state of mind that people must enter on their own. In addition to valid information, empowered people require opportunities to make informed choices….People are empowered about information technology (not by it) when they thoroughly understand and hold themselves accountable for

…results of their own decisions about initiating, selecting, building, buying, using, or managing IT….They are not empowered when IT related decisions are made for them, or when the information they need to make good decisions about IT is biased or withheld" (Lynne & Benjamin, 1997, p. 61). When states were busy pouring tax dollars into computer hardware and software and expecting teachers to willingly and knowledgeably integrate this technology into their classrooms and instructional strategies, consideration was usually not given to whether teachers felt qualified, comfortable, or willing to learn about and utilize this technology. "…Full integration of computers into the

educational system is a distant goal unless there is a reconciliation between teachers and computers" (Marcinkiewicz, 1994, p. 234). And Marcinkiewicz continues, "…If reconciliation does not occur, then a series of propositions emerges: (a) the integration of computers into teaching may not be possible; (b) the selection or training of teachers must be restructured in order to integrate computers into teaching; or (c) as Fullan (1990) suggests, the schools must be restructured because the restructuring is a prerequisite to accommodate any significant innovation" (p. 234). Again, these comments suggest the idea of deep change at organizational levels, and we, in education, have not examined and incorporated ways to help teachers deal successfully with major change.

Scott Sink (1998), president of the World Confederation of Productivity Sciences,

has proposed a model for change. The model is: C=(a) (b) (d) > R where C= readiness for change; (a)= level of dissatisfaction with the status quo; (b) = the clearly understood and desired future state (after change); (d) = the practical first steps in accomplishing the overall goal of change; and R = the perceived risk of changing. Sink states that promoting successful change is similar to action research in that the change manager plans a step, does the step, reflects on the step, and then plans the next step in the process. Mainly, change management seems to be about confronting and managing resistance. " We can predict that change will be resisted because it requires human beings to go outside their comfort zones" (p. 38).

The research in this area has shown that four types of change are likely to occur within this change process (Kudray & Kleiner, 1997). Linear change is when a company makes a major move within the same market, product line, or business. Geometric change is when an organization takes part in an overall industry change. In quantum change, a company makes a move to extend its core business, such as merging with or buying out another company. The deepest type of change, however, is metamorphosis in which a company completely remakes itself. "Because technology is advancing at an unprecedented rate, we must learn to assess the impact of each new medium, method, or piece of software on our students' learning" (Anson, C. A., 1999). Starting in the eighties, computers were placed in our public schools at a dizzying rate and teachers were expected to embrace this new technology and run with it. A metamorphosis was expected to take place within the halls of our academic institutions; yet, it would seem that this change has not taken place as expected.

It is obvious from all of the literature that people must buy into the idea of organizational change in order for change to be effective. The literature suggests that there are only three approaches to change in any human system (Seddon, J., 1997):
(1) coercion approach, (2) rational approach, and (3) normative, or re-educative approach. As a strategy to produce change, coercion is not useful because as people feel forced, they do not really change; instead, they hide their feelings and may exhibit dysfunctional behaviors.

Rational approaches to change have usually emphasized training. The usual

problem with training is that the ideas promoted are fought off by the receiving culture. The object of change is to change the system. Training by itself does not change the system. Training as a strategy works best with those who are already converted---those who buy into the change.

Normative change strategies by definition change thinking, or norms. Re-education implies giving up practices that we are used to and taking up new ones or managing in a new and better way.

"A change process that has a lot of action at the top of the hierarchy, but little among front-line sales people and customers will not be very effective" (Hurley, R. F., 1998).

Now that we have examined the concept of change management and how that can connect to the field of education, we need to examine the next line of inquiry. For the purposes of this study, I would like to take a look at how teachers view the role of technology in our society.

A study by Jay Becker (1994) examined the information from an international survey (the I.E.A. Comp-Ed. Survey) which collected information about the patterns of computer use in elementary and secondary schools in 20 countries and including teachers and administrators in approximately 1,400 schools in the United States. It was the information contained in this study that helped me to form the basis for the research questions that I wanted to examine in my case study in one urban high school.

In the study completed in 1989, only one secondary teacher out of every six in the fields of math, science, and English used computers in any substantial way. Within the survey, this idea of substantial was phrased as "throughout the year" or "intensively, but only for certain units" (Becker, 1994, p. 293). For example, only 1% of computer-using math teachers said that their students used spreadsheets on more than five occasions and only 11% of computer-using English teachers said that they regularly had their students use spell checkers. Also within the study, the majority of teachers indicated that their primary goal in getting their students to use computers was in order to master basic facts or skills (p. 293).

For each group of teacher-respondents, 12 – 15 standards were identified. These standards represented the types of answers that exemplary computer-using teachers in a given field of study might be expected to give. "…But taken together, the standards represent a classroom environment in which computers were both prominent in the experience of students and employed in order that students grow intellectually and not merely develop isolated skills" (p. 294).

This study identified four characteristics of the teaching environment wherein exemplary computer-using teachers are more likely to be found: (1) a school that has a social network of computer-using teachers; (2) sustained use of computers at that school for important activities (not merely teaching basic skills) used to accomplish a goal; (3) organized support for computer use at that school such as a full-time computer coordinator and an organized staff development program; and (4) acknowledgement and support for resource requirements for effectively using computers, such as smaller class sizes and funds for software purchases (pp. 293-303). Interestingly, of 51 separate teacher environment variables examined, the one variable that accounted for the greatest amount of difference between exemplary and other computer-using teachers was simply the total number of teachers at their school who used computers.

Among the teacher groups studied, only mathematics teachers were as likely to become exemplary computer-using teachers when there were not other computer-using teachers at their school. Science and English teachers (within the survey sample) seemed to be especially dependent on the presence of other computer-using teachers in order for them to develop high-quality practices using computers.

Basically, the study concluded that exemplary computer-using teachers were involved in environments that were more computer active. There were more computers in the school and a larger percentage of these computers had been purchased in the previous two years.

Becker points out that the work that people do in real life is very different from school-based computer activities. In real-life our activities have consequences for others----an audience, a clientele, a marketplace, or colleagues. Computer work in schools usually mimics traditional school work, with computer-based drills, tutorials, educational

games, etc. However, he also makes a case for the fact that students can be encouraged to use computers for activities that are more authentic. It is also interesting to note that exemplary computer-using teachers were found in greater numbers in schools where the principal's technology priorities were stated in terms of using computers for authentic types of writing activities as opposed to being stated in terms of keyboarding or word processing skills (p. 304).

One of the most consistent findings in the study was that exemplary computer-using teachers (hereafter referred to as ECUT) worked in school districts that had heavily invested in staff development and on-site training and support. It seems that ECUT were much more likely (40% versus 17%) to have begun using computers initially at the suggestion of their school-level computer coordinator or district coordinator than to have started on their own initiative (p. 305). It is also important to note the class organization/environmental factors for ECUT. In general, their classes were 20% smaller than the class size for other computer-using teachers (about 4 fewer students) (p. 306). And ECUT spent more than twice as many hours personally working on computers at school than did other computer-using teachers (p. 307). The second largest difference identified in the study is that ECUT had more formal training in using and teaching with computers (p. 309).

Becker points out that to a large degree the level of expertise in computer use in teaching comes with time and experience. However, Becker continues that not all important distinctions between ECUT and other teachers are likely to be erased simply by giving the teachers more training, more experience in using computers, or even greater access to computers. Two other factors were very important in this distinction---how much formal schooling they had (measured in credit hours and degrees) and whether they had majored in education or the liberal arts and sciences. Sixty-three percent of the ECUT majored in math, science, the social sciences, or the humanities (p. 310).

A very important point is that the teachers classified as ECUT reported that they changed their coverage of curriculum topics more than the other teachers did. Four times as many ECUT (47% versus 11%) reported that they introduced new topics in their course as a result of using computers. Five times as many (38% versus 7%) reported

having de-emphasized or dropped certain topics in a class as a result of using computers (p. 312). This is incredibly important since one of the greatest barriers to deep-level curriculum change has been the reluctance of teachers and other curriculum regulators to drop existing content. This study suggests that computer use may be effective in getting teachers to make changes in curriculum.

An incredibly interesting finding of this study is that ECUT did not individualize their computer assignments any more than other computer-using teachers did. These teachers even reported that they were less likely to use software that allowed students to move at an individual pace through a sequence of computer activities. However, they reported that they were less likely to have students do identical computer assignments; instead, they emphasized more small-group work, with each team of students working together and using different software (p. 315).

Karen Swan and Marco Mitrani (1993), in a computer pilot program in the New York City schools with students needing basic skills in math and reading, make some comments about curriculum change also. "The lecture-and-text-based model of education is so strongly entrenched many argue, that it will not be supplanted or altered by any medium in the foreseeable future" (p. 41). However, as they point out, this model of teaching and learning is itself the product of the introduction of a new technology, the printing press in the 16th century. Swan & Mitrani (1993) take the position that changes in our present educational structures which result from the infusion of computers into our schools, will most likely appear first at the level of individual interactions among students, teachers, and computers. These changes are not likely to show up first at the district, school, or even individual classroom levels.

These researchers conclude that teaching and learning in computer-based classrooms is significantly more student-centered and individualized than in traditional classroom settings. In the high school classes that they observed, they found that the control of student---teacher interactions was dominated by teachers in the traditional classroom setting, but was shared equally among participants when they were involved in computer-based learning (p. 50).

In addition, a study by Marcinkiewicz (1994), which examined the use of

computers by elementary teachers in four schools, found that teachers were largely underutilizing computers even though computers were available. He points out that there is a discrepancy between the level of computer use expected of teachers and the actual level of use. Marcinkiewicz (1991) created the LEVELS of USE (LU) Assessment, and with the use of that instrument, he was able to identify three levels of teacher use of computers in their classrooms: (1) non- use ---- absence of any use of computers at all for teaching; (2) utilization; and (3) integration. It was interesting in this study that the number of teachers not using computers at all for teaching was nearly equal to the teachers at the utilization level. Actually, about half of the study sample of 170 teachers did not use computers at all for teaching; and of those who did use computers to teach, it was at a level where the computers were not really necessary for the instruction to occur.

Thus, the research that has been reported and additional studies support the fact that teachers are not using computers much in their classrooms, or when they do use computers, they are not using them in innovative ways indicative of curricular change.

CHAPTER THREE

Research Methodology

This chapter presents and explains the methods and procedures which were used to obtain the data for this case study.

In order to help me gain the necessary information about: (1) the type(s) and amount of technology training and support that high school teachers in the Dallas Independent School District received in order to help them incorporate computers into their curriculum; (2) how teachers at one high school in the DISD actually used computer technology in their instruction; (3) how these teachers viewed the role of computers/technology in education, and; (4) how these teachers believed that their school, their colleagues, and they have changed since the introduction of computers into this high school, I created a 61-item questionnaire, or survey (appendix A) that allowed teachers to respond to these four broad questions in an open-ended manner. Anderson (1983) defines a survey as "an empirical investigation in which naturally occurring phenomena are studied by asking predetermined sets of questions"(p. 455). Through thoughtful question development and selection, a researcher may glean information that can be generalizable across the larger population from which the sample is drawn. I hoped that these teachers welcomed the opportunity to voice their views on the state of technology at their school.

The first phase of this research involved disseminating the questionnaire to all of the teachers at the high school and giving them a period of two weeks in which to answer the items. During that two weeks, I began phase two of the research, which was to investigate school documents such as the mission statement and long-range goals as they applied to the implementation of technology into that school. Part of my reasoning in selecting this school was because of its "institutional memory." There were teachers there who had been present at the school before computers were incorporated into the community/social fabric of that high school, and they were present when computers were first introduced. Thus, some of these teachers were well aware of any technical support

or instruction that had been provided at the district level and at the school level, such as support or encouragement by the principal, fellow teachers, and involved parents. This level of involvement in the process of a school's becoming technologically immersed yields the rich, "thick descriptions" (Geertz, 1973) that allow us to catch a glimpse of the change process for teachers involved in this school/curriculum transformation. The use of case study in this research permitted the use of general questions, which led to a total analysis of the issue.

The third phase of my research was a random sampling of in-depth "conversations" with the teachers and administrators at this school. The protocol for these conversations followed the original 61-item questionnaire, but then probed for more elaboration and explanation of responses. In addition, I used this opportunity to ask additional questions that arose as a result of examining the school's documents relating to technology or as an outgrowth of other conversations. During these sessions, I took extensive field notes.

The final phase of my research involved the actual on-site visitations and observations of actual lessons, the day-to-day life of this school. Through these observations of classroom instruction and the physical arrangement of the classroom to incorporate technology, I was able to determine the fit between the teachers' responses to questionnaire items and actual classroom practices.

Thus, all of these pieces of data, i.e. written responses to questionnaire items; close examination of school documents related to technology; in-depth conversations with the teachers and administrators; and observations of classroom instruction provided a snapshot of what types of change had occurred at this school as a result of the infusion of technology.

CHAPTER FOUR

Results

Sometimes to fully understand the significance of an event or artifact to a particular culture, it is necessary to view the artifact from the broader perspective of the larger society. My research at this high school showed me that I needed to first examine what the Texas Education Association (TEA) at the state level and what the Dallas Independent School District (DISD) at the district level had to say about the integration of computer technology into the state's schools. Thus, I would like to begin this chapter with a brief discussion of my examination of documents from both agencies as those documents related to the utilization of technology within Texas schools.

Texas Education Association "Long-range Plan for Technology

In its document "Long-range Plan for Technology, 1996-2010" the TEA states: "The state's current initiative to redefine the curriculum by specifying essential knowledge and skills across all discipline areas offers a rare opportunity to position technology as it should be---integrated into all aspects of teaching and learning for all students and teachers." (p.24) Please refer to Appendix F for a comprehensive list of actions and recommendations for teaching and learning incorporating technology as given by TEA.

In this document, TEA affirms that research in the area of professional development reveals that all members of an institution must share a common understanding of the goals and knowledge base in order for the institution to improve. This idea is also consistent in the research regarding change management (Gjerstsen, 1998; Puccinelli, 1998; Sink, 1998; Lynn & Benjamin, 1997; Marcinkiewicz, 1994; and Fullan, 1990) as presented in Chapter Two.

Background information on the Dallas area

Now, turning to the Dallas Independent School District's interpretation of the importance of technology inclusion for its students, I would first like to give some background information (taken from Vision 2003: District Five-Year Plan, April 1999) about the Dallas District. The population of the city of Dallas is 1,052,300, which makes

Dallas the eighth largest city in the United States. The city's population is approximately 47% Anglo, 29% African American, 21% Hispanic, 2% Asian, and 1% American Indian. Within a 65-mile radius of downtown Dallas, there are 43 college and university campuses. This area, along with the Arlington/Fort Worth area is home to 15 Fortune 500 companies and the Dallas area has over thirty-five major manufacturers with 1,000 or more employees. Interestingly, the Dallas area is rapidly becoming a center of technology development. According to an article published in the *Dallas Morning News*, Dallas is second only to San Jose, California in the size and importance of its high-technology economy, based on a study of 315 U.S. metropolitan areas (Dworkin, July 14, 1999, page 1A).

Current census figures reveal that approximately 194,000 children between the ages of five and seventeen live in Dallas with enrollment in the Dallas Public Schools standing at 160,078. Of those students, 49.3% are Hispanic, 39.4% are African American, 9.2% are Anglo, 1.6% are Asian and .43% are American Indian. The District encompasses an urban and suburban area of 351 square miles in the eastern portion of the Dallas/Fort Worth Metroplex. The Dallas Independent School District is the tenth largest district in the United States and it is also one of the fastest growing districts with approximately 5,000 new students each year.

By the year 2000, it is estimated that the state's labor force will have increased by 128% for Hispanics, 35% for African Americans, and 6% for Anglos. The majority of jobs commonly referred to as unskilled labor will no longer exist. Currently, many entry-level jobs require technology and problem-solving skills. Because of these facts, DISD has chosen to embrace the concept of life-long learning and to continually question what constitutes a quality education for all of its students. This philosophy can be seen in the District's mission statement: "Our mission is to prepare all students to graduate with the skills to become productive and responsible citizens." (Vision 2003: District Five-Year Plan, April 1999, p. 37)

Dallas Independent School District's Vision 2003 document

These are the measurable goals for the inclusion of technology as set forth on page 50 of the Vision 2003 document:

- By the year 2003, the Dallas Independent School District will provide one computer for every four students in the District, meeting the Texas Education Agency's (TEA) guidelines and recommendations.
- By the year 2003, 90% of the students within the District will be able to effectively integrate computer-related technology into all curricular areas.
- By the year 2003, all students will have access to information, communication, research and productivity tools in the school and classroom, including computers, peripherals, software and the training, support and infrastructure necessary to maintain those systems.

As you can see, these goals are extremely inclusive and assume that each school in the District has one or more trained technology specialists, a faculty which has been extensively trained in all aspects of technology inclusion, an infrastructure capable of supporting such technological demands, and the hardware, software, and peripherals to allow students this total integration of technology into all curriculum areas.

The high school's demographics

Now, let's examine some information about the high school in this study. According to information gathered during the interview of the school technologist, the enrollment is approximately 1,022 students in Fall 1999 with 99.2% of those students being African American and approximately 1% being Hispanic. This information is supported by the 1997-98 Campus Profile of the Academic Excellence Indicator System (AEIS) of the Texas Education Agency (TEA). In Fall 1997, the total enrollment was 1,154 students: 365 in grade 9; 259 in grade 10; 277 in grade 11; and 253 in grade 12. Of those students, 98.2% were African American, 1.4% were Hispanic, .1% were Anglo, and .3% were Asian. That year 626 students (54.2%) were considered to be economically disadvantaged and these data have remained consistent.

In Fall 1997, there were 84 persons considered to be "Professional Staff" with 70 of those people being labeled "Teachers." Again, that number has remained consistent. During Fall 1997, of the 70 teachers listed, 33 were female and 37 were male. Additionally, 50 of the 70 teachers were African American (71%), one was Hispanic, 17 were Anglo, one was Asian, and one was Native American. While I did not specifically

ask any interviewees about the ethnicity of the faculty, I did observe through repeated visits to the school, interviews with faculty members, and lunchtimes in the cafeteria that the ethnicity data from the 1997-98 AEIS report appear to be consistent with Fall 1999 numbers.

An important piece of data from the 1997-98 AEIS report is the years of experience for the teachers at this school. The majority of the teachers had eleven or more years of experience (59.1%). Seventeen had 11-20 years of teaching experience, and 25 teachers had over 20 years of experience. This fact was important to this study because in Chapter Three, I had stated that I had partially selected this high school for this study because of its "institutional memory", i.e. teachers who had been present at the school before the inclusion of technology.

Research questions

As may be recalled from Chapter One, I identified five research questions to guide my study:

(1) How do teachers view computer/information technology's role in their curriculum?

(2) What is the role of computers in curriculum change?

(3) Does extended work with computers change the type of communications processes used in a high school setting?

(4) How does work with computers impact or change (a) instructional practices, (b) overall school design, and (c) school organization?

(5) What is the role of change management theory in educational change?

Phase one-----the technology-related teacher questionnaire

The first phase of data gathering in an attempt to answer the five research questions involved the development and dissemination of a 61-item questionnaire (refer to Appendix A). Items 1-15 were designed to reveal teachers' beliefs about the role of computers within their curriculum. These 15 items were answered on a Likert-type scale with 5 = strongly agree; 4 = somewhat agree; 3 = no opinion; 2 = somewhat disagree; and 1 = strongly disagree. Items 16-30 were intended to display the amount and types of support that teachers received in learning to use and to integrate computer technology

into their curriculum. These items were answered by circling either "YES" or "NO". Space was provided for any additional comments that the teachers might want to make. Items 31-35 asked for short answer responses to questions such as, "How long (months, years, etc.) have you personally used computers in any capacity?" Items 36-38 examined the question of instructional practices by listing possible learning activities involving technology and having teachers respond on a Likert-type scale where 5 = always; 4 = often; 3 = no opinion; 2 = seldom; and 1 = never. Items 39-45 were developed to explore the research question of school design. Teachers responded to items 39-44 by circling "YES" or "NO", and, again, space was provided for any additional comments. Item 45 asked for open-ended written responses regarding how the physical layout of the respondent's classroom has changed over the past five years and any impact that physical change has had on instruction. Items 46-54 were designed to elicit information about curriculum changes that the teacher has made due to the use of technology and to curriculum changes that s/he has seen made by other teachers in that school. Again, the teachers responded by circling "YES" or "NO" and space was provided for additional comments. Items 55-59 were added to coincide with some principles of change management theory that state that all stakeholders must have input into the change process. These items help to show the amount of decision making about technology for teachers. Respondents circled "YES" or "NO". The final two items, 60 and 61, relate to the global, holistic feelings of satisfaction that individual teachers have toward how they personally incorporate technology into their curriculum and in any changes to instructional practices, curriculum, or school/classroom design.

Thus, to summarize, the questionnaire was carefully developed to reveal data about the following areas: (1) teachers' beliefs about the role of computers within their curriculum; (2) the amount and types of support that teachers received in learning to use and in how to integrate computer technology into their curriculum; (3) instructional practices; (4) school design and the impact of that design on instruction; (5) curriculum changes; (6) decision making by teachers about technology purchases; and (7) global satisfaction with their technology use within their classrooms.

I first disseminated 80 copies of this questionnaire along with self-addressed

stamped envelopes into the teachers' mailboxes near the end of the school year in May 1999. This distribution included two substitute teachers and three teacher assistants, so the actual teacher count was 75. From that distribution, I received twenty questionnaires mailed to my home address. In August, I returned to the school with additional copies of my questionnaire, and the principal made an announcement to the faculty asking them to return their questionnaire from the summer or to stop by the receptionist's desk to pick up another copy. From this effort, I received an additional 24 completed questionnaires. Thus, the total return rate for the questionnaires was 44 out of 75 or 58.6%

Teacher's beliefs about the role of computers in the curriculum

Let's begin an examination of the data by looking at items 1-15, which reveal teachers' beliefs about the role of computers in the curriculum. For purposes of discussion, I have broken this data into two tables. Table 1 is labeled "Traditional Beliefs About the Role of Computers" and Table 2 is labeled "Beliefs About Integrated Uses of Computers." Let's examine the data in Table 1 first.

It is important to note here that this data reflects teachers' beliefs and not necessarily actual classroom practices. From the data in Table 1, it is evident that a majority of the teachers completing the questionnaire believe that the role of computers in public schools should include: creating student worksheets or handouts (91% strongly or somewhat agree); computers being used as management tools for grades, attendance, etc. (90% strongly or somewhat agree); self-paced instruction (82% strongly or somewhat agree); educational games (73% strongly or somewhat agree); the instruction of basic skills or facts (72% strongly or somewhat agree); and use as a reward when a student has done well in class (71% strongly or somewhat agree).

Traditional Beliefs About the Role of Computers

Role	5	4	3	2	1	NR
Computers used to teach basic skills or facts	15 34%	17 38%	0	8 18%	1 2%	3 7%
Computers used for self-paced instruction	14 32%	22 50%	0	6 13%	2 4%	0
Computers used as management tools for activities such as grades and attendance records	35 79%	5 11%	0	0	2 4%	2 4%
Computers used for educational games	22 50%	10 23%	2 4%	6 13%	4 9%	0
Computers used as a reward when a student has done well in class	13 29%	19 43%	3 7%	4 9%	4 9%	1 2%
Computers used to create student worksheets or handouts	26 59%	14 32%	2 4%	0	2 4%	0

Table 1

(n = 44)

5 = strongly agree
4 = somewhat agree
3 = no opinion
2 = somewhat disagree
1 = strongly disagree
NR = no response

It is probably not surprising that a majority of teachers hold these traditional beliefs about the role of computers since we have long seen teachers use computers for drill and practice activities and for managing some aspects of classroom life such as creating and printing seating charts, monthly activity calendars, and maintaining attendance data. Indeed, what may be more surprising is the data contained in Table 2.

Within that table, it is clear that the majority of teachers believe in having students use computers to gather research information from sources such as the Internet (91% strongly or somewhat agree). This information is supported by research conducted by the Center for Research on Information Technology and Organizations (CRITO) in Report #1 by Jay Becker (1999) in which he discusses that teachers do have students use the Internet to gather research information more than for any other Internet related purpose. Becker adds, "In fact, in the past two years, Web searching has become the third most common use of computers by students at school, after word processing and use of CD-ROMs. Web searching even slightly surpasses skills practice by computer drills and learning games in terms of how frequently teachers have students use computers in that way" (p. 6). This data is reported in percentages of teachers from a national probability sample of 4th through 12th grade classes in U.S. public and private schools conducted in the spring of 1998. Approximately, 2,250 teachers (elementary, middle, and high school) responded to the survey, which was 69.4% of the teachers identified and sampled.

Also, in Table 2, it is evident that 91% of the teachers in my study strongly or somewhat agree with using computers to add new information to their lesson plans. It is interesting to look at the two lowest scoring items, i.e. using computers for group learning activities (68% strongly or somewhat agree) and as a way to work collaboratively with other teachers (only 67% strongly or somewhat agree). These beliefs are surprising when we consider that both activities are ones that would promote the ability to work with others and to think creatively; yet, over 20% of the teachers who responded did not believe that these were valuable activities. It is clear from examining the responses in Table 1 and in Table 2 that teachers seem to believe in many activities with computers that could be considered to be part of an integrated curriculum.

Beliefs About Integrated Uses of Computers

Roles	5	4	3	2	1	NR
Computers used for group learning activities	14 32%	16 36%	5 11%	5 11%	4 9%	0
Computers used for critical thinking and problem solving	22 50%	14 32%	0	6 13%	1 2%	1 2%
Computers used with teams composed of Students with differing abilities and levels	17 38%	19 43%	0	4 9%	4 9%	0
Computers used to help students see issues from multiple perspectives	16 36%	18 41%	4 9%	0	6 13%	0
Computers used to help students work on connections among various content areas	16 36%	16 36%	4 9%	4 9%	3 7%	1 2%
Computers used for research gathering projects such as internet sources	29 66%	11 25%	0	2 4%	2 4%	0
Computers used as a way for teachers to eliminate older information from lesson plans	18 41%	18 41%	4 9%	2 4%	2 4%	0
Computers used to add new information to a lesson plan	25 57%	15 34%	0	0	4 9%	0
Computers used as a way of working collaboratively with other teachers	17 38%	13 29%	4 9%	5 11%	5 11%	0

Table 2

(n = 44)

5 = strongly agree
4 = somewhat agree
3 = no opinion
2 = somewhat disagree
1 = strongly disagree
NR = no response

How teachers actually use computers

Now, let's examine items 36-38 in which teachers respond to ways in which they actually use computers with their students. Refer to Table 3, "Actual Use of Computers" for this data. Not surprisingly, a fairly large percentage of the teachers (46%) always or often have students word process their assignments. Again, this information is supported by the Becker national study (1999) in which he reported that 45% of the high

Actual Use of Computers

Assignments	Always	Often	No Opin	Seldom	Never	NR
Word process assignments	10 23%	10 23%	2 4%	6 13%	14 32%	2 4%
Find research materials on the Internet	11 25%	9 20%	1 2%	8 18%	12 27%	3 7%
Follow learning events such as NASA's Arctic exploration	6 13%	4 9%	7 16%	6 13%	21 47%	1 2%
E-mail with students in other classrooms or other schools	2 4%	0	3 7%	10 23%	28 63%	1 2%
Complete group projects involving problem solving activities	7 16%	11 25%	3 7%	4 9%	18 41%	1 2%
Use self-paced learning programs	3 7%	9 20%	7 16%	9 20%	15 34%	1 2%
Play educational or other games	0	9 20%	1 2%	15 34%	17 38%	2 4%
Complete collaborative projects with students of varying ability levels	3 7%	11 25%	3 7%	4 9%	16 36%	7 16%
Create unique presentations such as PowerPoint or multimedia	4 9%	6 13%	1 2%	8 18%	18 41%	7 16%

Table 3

(n = 44)

5 = strongly agree
4 = somewhat agree
3 = no opinion
2 = somewhat disagree
1 = strongly disagree
NR = no response

school teachers stated that they have their students use computers to word process assignments. This would be considered a traditional use of computers in the classroom. Also, a fairly large percentage of the teachers in my study report having students find research materials on the Internet (45%) and to complete group projects involving problem solving activities (41%). However, one has to be careful in interpreting this data as I discovered during an in-depth conversation with one teacher. She reported having students use the Internet to research science project information even though she did not have computers connected to the Internet. Her students could gain access to the Internet through school computer labs or the Dallas Public Library (most of the students at this school live near the library). Technically, she had the infrastructure necessary to connect with the Internet (she did not realize this, but the school technologist explained it to me), but the three computers sitting unplugged in her classroom did not have that capability. These three computers (which she had recently received) literally used floppy disks and had little actual functioning use for today's classroom, such as running school purchased science software.

Also, as I learned through my interview with the school technologist, every classroom has access to the Internet if they have a computer in their classroom that supports this application. The school finished wiring the building for the Internet in 1998, but there was no actual Internet service at that time. Refer to Appendix G for newspaper articles/editorials regarding Internet connections at this high school.

Also, it is important to note that until the week of October 11, 1999, there was no e-mail service provided to the teachers. Thus, it is not surprising to look at Table 3 and see that 86% of the teachers reported that they seldom or never have students e-mail other students either within their school or to outside locations. Again, this information is consistent with the national Becker study (1999) in which he found that only 8% of the high school teachers reported having their students use e-mail. The two teachers, from my study, who reported using e-mail may have select students (such as AP classes in which most students may have computers at home) who are required to e-mail these teachers at home addresses. For example, one teacher during an in-depth conversation stated that he had left Dallas for one week in early September to visit the Boeing

Manufacturing Plant in Washington state. During his absence from school, he required his students to e-mail a written assignment as an attachment file to him. He simply took his laptop computer on his trip and was able to access his e-mail and the students' assignments. This teacher strongly believes that his students need to know how to use current technology to be productive citizens so he required that they use e-mail. It was not a problem that this high school did not have e-mail access since most of the students live fairly close to the Dallas Public Library, which has approximately 50 computer terminals.

Now, returning to Table 3, "Actual Use of Computers", it is evident that fully 60% of the teachers responding do not have students following specific learning events such as NASA's Arctic exploration. An additional 18% of the teachers had either no opinion or no response to this item; thus, we might infer that fully 78% of the teachers do not take advantage of these types of ongoing, in-depth learning activities. This information is sobering when we consider that educators agree that content should be relevant to our students' lives and involve authentic tasks. What better opportunity for a science class than to be involved in ongoing research with actual specialists in that field of study.

While the majority of teachers reported that they believed that computers should be used for group projects (41%) and for problem solving activities (82%), only 41% of the teachers stated that they actually used computers in this way. The number of teachers who stated that they seldom or never used computers for student group projects or for problem solving activities and who stated that they had no opinion or no response comprised 59% of the total. Thus, we see a disparity between what teachers state that they believe to be a purposeful use of technology and how they actually engage students in using it. These are important findings when we consider our changing economic market. We are most certainly in the midst of the Communications Revolution when individuals' ability to use skills to effectively communicate in face-to-face group situations or on-line around the world would be enhanced by opportunities to practice these interpersonal communications skills with technology applications within the classroom.

Also interesting within Table 3 is the percentage of teachers who seldom or never had students create unique presentations such as PowerPoint or multimedia (59%). Another 18% of the teachers stated that they had no opinion or no comment on this issue. If we infer this to mean that the latter teachers do not use this technology, then fully 77% of the teachers avoid this application of technology within their classes.

From the data presented in Table 3, it would seem that teachers are not making a tremendous amount of change in how they actually use computers within their classrooms. Additionally, there would seem to be a conflict between what teachers state that they believe about the use of technology in their classrooms and actual application.

Support for the use and integration of technology

Now, let's turn our attention to questionnaire items 16-30 which look at the amount and types of support that teachers received in learning to use and to integrate computer technology into their curriculum. Please refer to Table 4, "Support for the Use and Integration of Technology."

We can see from this data that of the 44 teachers responding to the questionnaire, only 45% of them reported having a computer in their classroom for the past five years; however, even with this data, we have to be careful in interpreting this information. For example, the science teacher with the three outdated, floppy disk computers only recently received those computers (Fall 1999), and one $11^{th}/12^{th}$ grade environmental science teacher with whom I had an in-depth conversation had received her brand new Compaq computer and color printer only three weeks prior to our conversation (Fall 1999). The Industrial Technologist, who had a whole room full of new computers (24 PCs) was getting the wiring completed for the computer hookups on the day that we talked (Fall 1999). Thus, my point is that from a simple questionnaire, it is difficult to get a clear picture of the state of technology within a school. This may in part be due to questionnaire design flaw, such as question ambiguity, or due to teachers misinterpreting what is being asked by some items. As part of this discussion, I should also include some of the specific comments written on some of the questionnaires in response to these numbered items. One teacher wrote at the top of his/her questionnaire, "There is no computer or printer in my classroom at this time." Another teacher wrote in response to

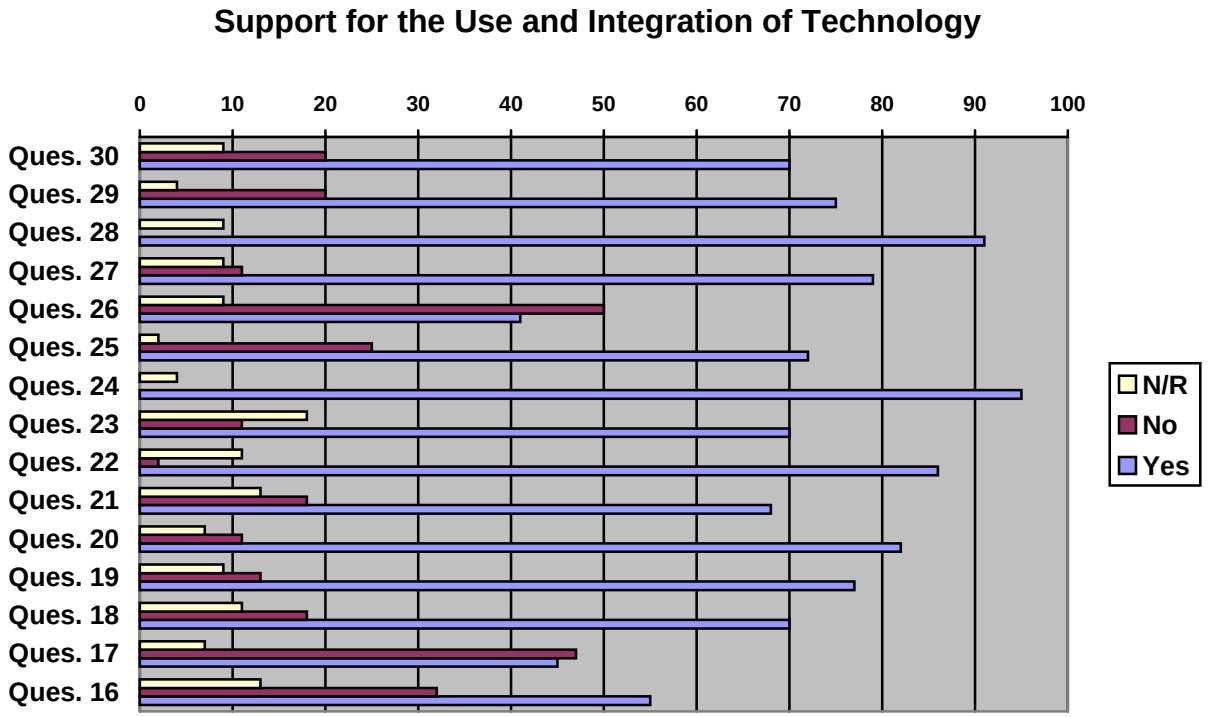

Table 4 Technology Integration Use and Support Questions (n = 44)

16. Computers have been integrated into your school for over five years.
17. At least one computer has been in your classroom for the past five years.
18. Staff development has been ongoing for the past five years.
19. Staff development was required for all teachers.
20. Specific courses or classes dealing with technology were offered by the district.
21. This training or staff development was helpful in learning how to integrate technology into your classroom.
22. Your school has a full-time computer coordinator.
23. Your school has access to a District-level computer coordinator.
24. Your faculty have access to an on-site staff support person.
25. You began using computers on you own before they were introduced into your school.
26. You began using computers after one, or more, was placed into your classroom.
27. Your principal has been supportive and encouraging in helping you to integrate computers into your classroom.
28. The principal has made it clear that s/he supports the use of technology.
29. You have access to one, or more, computer labs in your school.
30. Your fellow teachers have given support and expertise in integrating computers within your instructional area.

item #17, “no computer in my class.” In response to item #16, a different teacher stated, “inadequate number of computers; many do not have CD-ROM or printers” and this same teacher stated that s/he had had a computer in the classroom for the past three years. Another teacher in response to item #16 commented, “some, but not enough.” Perhaps the quintessential comment was made by the teacher who for item #16 circled YES and NO and wrote, “not mine.” However, one teacher, who obviously had the “institutional memory” that I spoke of in Chapter 3, wrote, “20 years” in response to item #16. Thus, it is clear that computers have been present in this school for an extended period of time (over five years), but as one teacher wrote in response to item # 16, “but on a limited basis until recently.”

It would seem apparent from the responses to these items that the teachers have received support for learning to use the technology that they have available. Ninety-five percent of the teachers stated that they have access to an on-site technology support person. This is true in that each school in DISD has a Teacher Technologist. This person provides a direct link between his/her campus and the DISD Instructional Technology Department. According to the handbook *Teacher Technologist Program 1999-2000* (June 1999), the responsibilities of this position include: (1) campus hardware and software support; (2) support for the infusion of technology as indicated in the campus improvement plan (see Appendix H for a sample copy of the Campus Improvement Plan for this high school for 1998-99); (3) sharing of expertise through campus and district wide teacher training; (4) Technical Assistance Center (TAC) liaison and minor trouble shooting; and (5) inventory updates. These Teacher Technologists receive extensive training not only on how to use technology, but also on how to use technology to teach. The Teacher Technologist is selected by the school principal on a yearly basis and receives a minimum stipend of $750 funded by the State Technology Allotment for each semester. I have attached (refer to Appendix I) a copy of the *Checklist for Selection and Evaluation of Teacher Technologists*. It can be noted under the section on “Observable Behaviors” that the first item is working with teachers and students to integrate technology into their content activities. Thus, we can see that this idea of curriculum integration of technology is important to DISD, and the District has

tried to move forward in this area with the use of the Teacher Technologists in each school since Spring 1993. That year, each of the 200 Teacher Technologists received 20 hours of training. Two classes (8 hours each) included an introduction to computer hardware, operating systems, and troubleshooting hints. A final four hour session stressed shut down procedures. Refer to Appendix J for a copy of the DISD *Teacher Technologist Training Summary*.

It should be stated that a limitation of having the on-site Teacher Technology person is that this person works half-time in this position and teaches his/her regular classes half-time. During an in-depth conversation with this school's technologist, he stated that schools really need one full-time person to handle software and curriculum integration and one full-time person to handle repairs. Much of the technologist's time is eaten up with teachers requesting help when they have problems running programs or in making repairs. Within the DISD Technologist Program, this high school is unique in that it is one of two or three schools which has a full-time Teacher Technologist.

Also, Table 4 clearly reveals that the teachers at this school believe that their principal supports their use of technology in the classroom (91%). This belief by the teachers was supported within an in-depth interview with him on September 22, 1999. When I asked, "What types of educational activities would you like to see in _____ High School's classrooms as you walk by or stop in to visit?" He had a quick response.

"I would love to see groups or teams of students researching themes, projects, etc. through focusing on the Internet. I want to see excitement in the classroom, and students understanding how to use technology to do all of this research. I want to see student-directed classrooms with lots of discussion occurring. These things are happening in some settings such as with the journalism teacher, but there needs to be more in the business, educational technology and web mastering classes to name a few." he added, "You always have to tie in a training module with technology."

I asked, "Are your teachers aware of your goals for technology integration over the next five years?" and "How do you make them aware of these goals?"

The principal responded, "Some teachers are more aware than others and some teachers are more directly involved in these goals. At the beginning of each year, I go

through the goal setting agenda for the school year in general terms." He added, "Teachers are given choices to upgrade their technology skills. I try to meet their technology requests within reason, and I prioritize those technology requests." He then went on to explain to me that the high school does not have a budget allocation for purchasing computer hardware, software, or peripherals. Instead, the school relies on DISD allotments, government grants, corporate sponsorships, etc. to fund technology initiatives. The principal added that he felt that, "The District has pretty strong technology goals especially in the areas of multi-media and Web mastering. I want to see modems, computers, and Internet connections in each classroom."

Thus, in looking at Table 4, it is obvious that teachers at this high school seem to feel strongly that they have support for the use and integration of technology in the areas of an on-site technology support person (95%); a principal who supports technology use (91%); and specific courses dealing with technology being offered by DISD (82%). These would seem to be important points in the process of teachers beginning to integrate technology into their curriculum. These teachers were less satisfied when asked about computers being in their classrooms for the past five years (only 45% of the teachers responding answered YES to this item), and with item #26, in which they were asked about beginning to use computers only after one or more was placed into their classrooms (41% answered YES). Approximately 72% of the teachers stated that they had used computers prior to having them in their classroom. Overall, it would appear that the teachers are fairly well satisfied with the support that they have received and continue to receive in this area.

<u>School design</u>

Now, let's focus our attention on questionnaire items 39-44, which focus on the area of school design including the physical layout and organization of the classroom. In looking at Table 5, "School Design", some important information is brought to light. From analysis of the data in Table 1, it is obvious that teachers believe that the role of computers in the curriculum should support traditional uses such as: creating student worksheets or

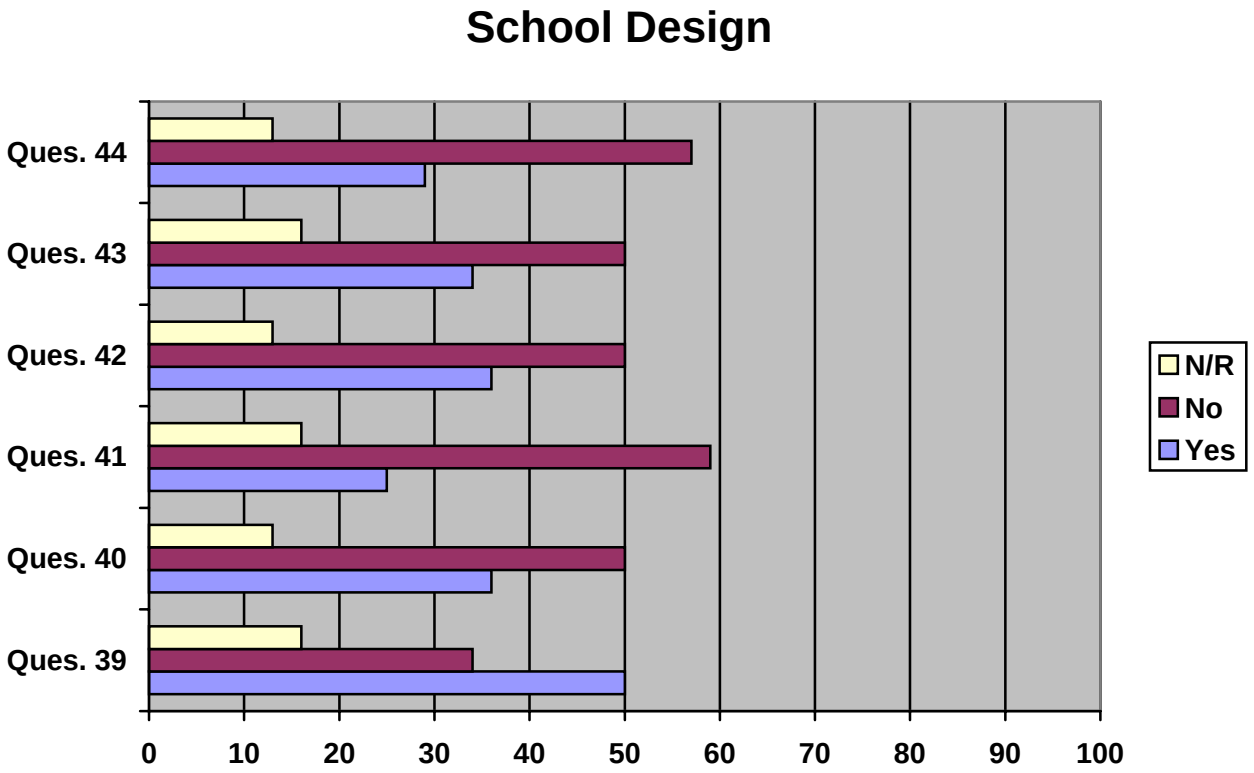

Table 5 **School Design** **(n = 44)**

39. Over the past five years the physical layout of your classroom has changed because of adding a computer or computers.

40. A computer station or lab area has been added to your classroom.

41. The computer area in your classroom has become a major focus area of your classroom.

42. The physical design of your classroom has changed the types of instructional activities that you use.

43. The changes in the physical layout of your classroom have led to more group learning activities.

44. Changes in the physical layout of your classroom have led to more individualized computer activities.

handouts; managing classroom tasks, i.e. grades, attendance, seating charts, etc.; using self-paced instruction; playing educational games; and instructing students in basic skills or facts. The information contained in Table 2 demonstrated that teachers also seem to believe in less traditional, more integrative tasks for computers including: researching information on the Internet; adding new, meaningful information to their lesson plans and dropping outdated lectures and activities; and for involving students in critical thinking/problem solving activities. And in support of these teacher beliefs, the data contained in Table 4 revealed that these high school teachers feel very strongly about the support that they receive in learning to use and integrate computers into their curriculum including: having an on-site technology support person; having a principal who definitely supports their use of technology in the classroom; and in the computer-related courses offered by DISD. Of course, the weak link in this area of support is that not all of the teachers have computers in their rooms, or, in some cases, they do not have computers that are capable of handling connections to the Internet, utilizing CD-ROMs, or handling basic e-mail (recall that only 45% of the teachers stated that a computer had been in their rooms for at least five years). The other area of analysis where we can begin to see a discrepancy is contained in Table 3, which looks at teachers' actual use of computers. But given the strength of the teacher beliefs presented in Tables 1 and 2 and in the support for the use and integration of technology in Table 4, we should expect that Table 5, "School Design", should reflect stronger evidence of change in this area. Unfortunately, in examining this data (refer to Table 5), it appears that not much change has been made in this area.

In answering the item (#39) that states that over the past five years the physical layout of your classroom has changed because of adding a computer or computers, only 50% of the teachers responding said YES. This is likely due to the fact that only 45% of the teachers reported having computers in their classrooms for the past five years. There is probably little point in changing the physical arrangement/layout of your classroom if there is not a definite need for computer stations, work areas, etc. to maximize the students' work with this technology. In response to the item (#40) that states a computer

station or lab area has been added to your classroom, only 36% of the teachers marked YES. Again, unless a computer is available in your classroom, you will not likely devote space for that item. A look at item #41, which states that the computer area in your classroom has become a major focus area, yielded only 25% of the teachers responding YES.

Items 42-44 really attempt to assess how changes to classroom design brought about by the inclusion of technology have impacted teachers' pedagogy, including types of instructional activities, group learning activities, and individualized computer activities within the classroom. As shown in Table 5, only 33% of the teachers reported using more group learning activities and only 29% reported using more individualized computer activities. I would offer that the data contained in Table 5, more than any of the data that has been examined thus far, speaks to the reality of what is occurring in this high school's classrooms with the inclusion of technology.

Curriculum changes due to technology inclusion

Now, let's turn more directly to the issue of curriculum change and examine the data collected from questionnaire items 46-54, which is detailed in Table 6, "Curriculum Changes Due to Technology Inclusion." Within these items, teachers were asked direct statements about their views of the changes that they have witnessed in their own curriculum and teaching methods due to the inclusion of technology.

Item #46 begins with a rather holistic assessment of computer integration within the classroom when it asks, "You are successful in how you use computer technology with your students." Somewhat surprisingly, 59% of the teachers responded YES. When they were asked about whether they had actually made changes to their course curriculum within the past five years, 79% of the teachers responded YES. I have spent some time puzzling over this particular item because of this fairly high percentage. I intended the statement to mean curriculum changes in regard to the integration of technology, and I'm not sure that all of the teachers responded with that exact meaning in mind. Since I interviewed only a random sample of teachers at this high school, there is no way for me to determine whether or not this question may truly have been ambiguous for some teachers.

Items 48 and 49 are particularly important when trying to assess the issue of curriculum change. In Chapter Two, I presented information from the Becker study (1994) in which he discussed exemplary computer using teachers (ECUT). One very important point about teachers classified as ECUT was that they had changed their coverage of curriculum topics more than other teachers did. Four times as many ECUT (47% versus 11%) reported that they introduced new topics in their course as a result of using computers. Five times as many (38% versus 7%) reported having de-emphasized or dropped certain topics in a class as a result of using computers (p. 312). This is important information if we are to believe that deep curriculum change results when teachers are flexible enough or empowered to drop existing content.

It is interesting how these high school teachers view their colleagues' teaching and any changes therein due to the inclusion of technology. Only 35% of the teachers stated that most of the teachers in their school had made changes in their teaching because of the inclusion of technology. This is especially interesting when we recall item 47, in which 79% of the teachers reported making changes in their own curriculum within the past five years. Thus, it seems that these teachers feel that they have personally made curriculum changes and they seem to feel fairly confident in how successfully they use computer technology with their own students (59%), but they do not believe that their colleagues have made similar changes overall. Even though the teachers reported this, 50% of them also stated that they had observed specific teaching activities or behaviors that made them think that other teachers have made changes in their teaching practices.

It seems important to note that the teachers feel that the level of student learning has increased since computers were introduced into the school (59% responded YES to this item). This information was supported in an interview with the Multimedia Web Master, who has been teaching this course since it began in the fall of 1998. She stated that she is trying "to get the kids beyond just being computer literate. I want them to not be afraid of the computer." In her course, she gets the students used to navigating the Web and to developing their own web page (authoring). This teacher, in discussing the level of student learning since the introduction of this technology course, stated that she believes that the level of learning has definitely increased. She laughed and stated how

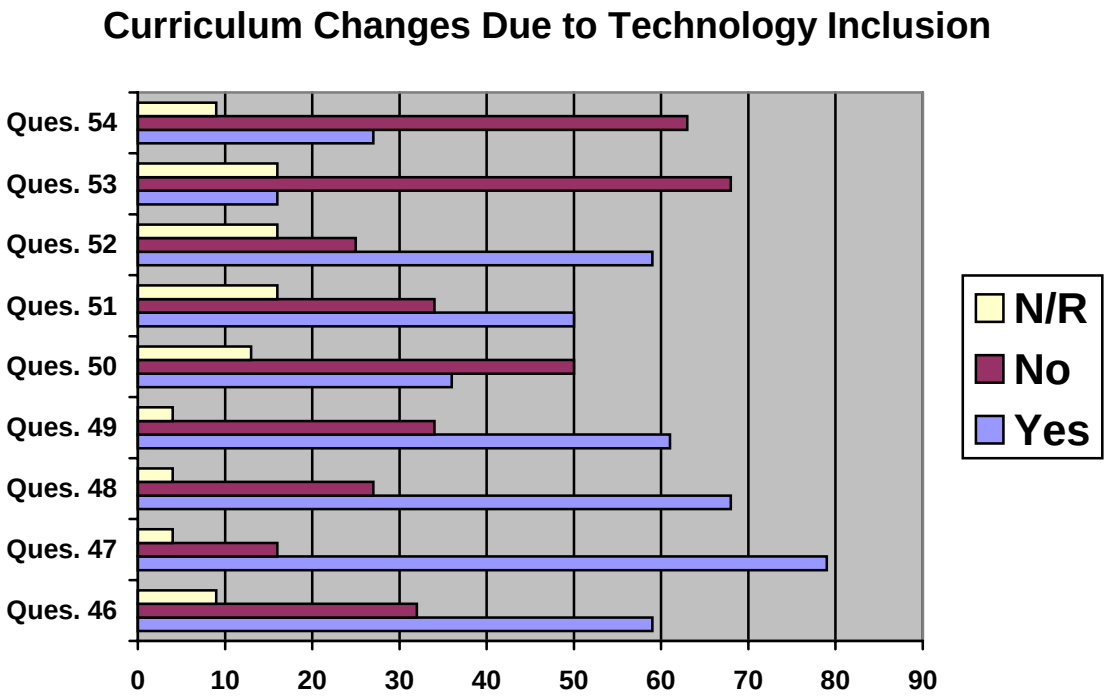

Table 6 Curriculum Changes Due to Technology Inclusion

(n = 44)

46. You are successful in how you use computer technology with your students.
47. You have made changes to your course curriculum within the past five years.
48. You have added information to your unit lesson plans in order to incorporate new activities using computers.
49. You have dropped information form your unit lesson plans in order to incorporate new activities using computers.
50. Most of the teachers in your school have made changes in their teaching because of the inclusion of technology.
51. You have observed teaching activities or behaviors that make you think that these teachers have made changes in their teaching practices.
52. The level of student learning has increased since computers were introduced into your school.
53. The level of student learning has not changed since computers were introduced into your school.
54. Overall, you use computer-related learning activities more than other teachers in your school.

for the first time this year, she is noticing students come into her lab and make comparisons to the other computer labs within the school. "They are actually comparing the labs, equipment, software, etc. It's great!" She also noted how many special education students actually thrive in the computer lab atmosphere to the point where they often help to teach applications or techniques to other students.

The teachers' responses to item 54 may not be too surprising. When asked if overall they use computer-related learning activities more than other teachers in their school, only 26% responded YES. It is not completely clear whether this is how they actually perceive this information or whether they simply replied with modesty. Recall that 59% stated that they were successful in how they use technology with their students and 79% said that they had, in fact, made changes to their curriculum over the past five years; whereas, only 35% felt that most of the teachers in their school had made changes in their teaching due to the integration of technology. Thus, one might conclude that these teachers would feel that they use more computer-related learning activities than others in the school, but that idea is not supported.

Change management issues

Now, I would like to examine the data contained in questionnaire items 55-59, which directly relate to change management theory and the idea that all members of an institution must share a common understanding of the goals and knowledge base of the institution if there is to be any real change to occur. Please refer to Table 7, "Change Management Issues," for a quick view of the data.

Let's begin the analysis of this data by looking at item 55, which asks the teachers to state if they helped in making the decision about what brand or type of computers to purchase. Only 22% of the teachers felt that they had any input in this area. This becomes apparent when you engage in extended conversations with some of the teachers. For example, the teacher of the Web Mastering class had a total of 28 computers (14 Macs and 14 PCs) and two printers (1 Mac and 1 PC). She seemed to be frustrated by this information so I asked why she had the even breakdown in types of computers. Within that type of lab situation, dealing with two completely different platforms could seem somewhat schizophrenic. She laughed and stated, "DISD wanted

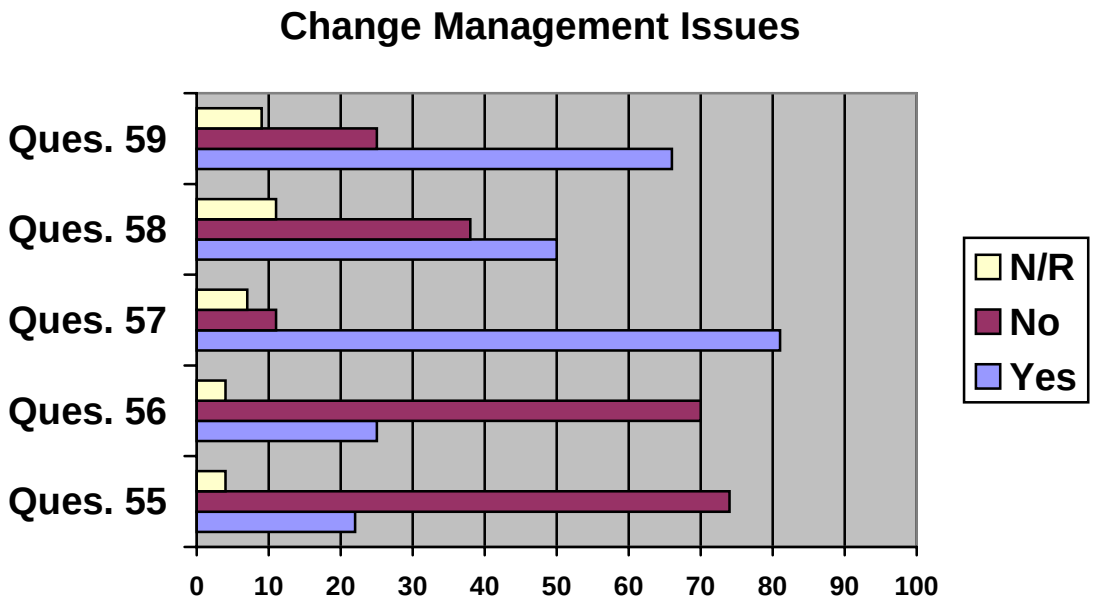

Table 7 Change Management Issues (n = 44)

55. You helped in making the decision about what brand or type of computers to purchase.

56. You made the decisions, or were involved in the decisions, about what types of software to purchase for your students.

57. You are committed to using computer technology with your students.

58. If your students from 5 – 10 years ago could see your course curriculum or lesson plans today, they would be surprised at what content you teach now and at how you cover content.

59. You are happy with the changes that you have made in what and how you teach because of your use of technology in the classroom.

the kids to know both platforms so here they are." This teacher's lab is located in the math and science annex, a short walk from the main building. The computers within the lab are not networked so only one computer is connected to each of the two printers. When students want to print anything, they have to physically remove their disk from the drive, walk across the room to the computer connected to the printer, insert their disk into the drive, and then print. Also, she stated that it is often difficult to get all 28 computers connected to the Internet at one time; typically, 14 of the computers can get connected. Compound all of this with the fact that she usually has classes larger than 28 pupils, and it is easy to see that she begins each class session operating from a deficit.

When asked about their input for the purchase of software for their classes, only 25% of the teachers stated that YES they had either made, or been involved in those decisions. This may be due to the fact that the District provides a list of software titles that they license and provide to teachers. They also suggest technology strategies using this software to target specific TAAS objectives. For example, an elementary teacher wanting to target TAAS reading areas such as using context clues, sequencing of events, describing story setting, summarizing what was read, etc. might try computer software such as: *KidPix/Claris Works* to record students' thoughts and feelings after reading a story. Then, the teacher could ask the students to summarize the story, describe the story setting, describe a character's personality, or analyze the author's point of view. DISD licenses software titles for elementary reading including: *My Own Stories, Bailey's Book House, Stanley's Sticker Stories, Storybook Weaver, Kidworks 2, Midnight Rescue* and *Reading SEARCH, Reading Maze, Interactive Reading Journey,* and *Reading Blaster 2000* (Teacher Technologist Program 1999-2000).

Again, the research in this area of change management suggests that each member of an organization must be part of the process working toward change. The teachers within this high school often seem to be left out of this decision-making process, but are expected to have positive results in integrating technology into their curriculum.

One really positive point in Table 7 is the percentage of teachers who feel that they are committed to using computer technology with their students (81%). That seems like a strong number of teachers who are willing to make whatever changes are necessary

to achieve this goal. Somewhat less positive is the number of teachers who report being happy with the changes that they have made in what and how they teach because of their use of technology in the classroom (65%).

Teachers' global satisfaction with their technology use

The last two items of the questionnaire are very holistic in nature. Item 60 asks about the teacher's overall feelings about how s/he currently uses computers with students. The response was made on a Likert-type scale with 5 = very happy, 4 = somewhat happy, 3 = no opinion, 2 = somewhat unhappy, and 1 = unhappy. For this item, 9% of the teachers reported that they were very happy with how they currently use computers with their students; 39% stated that they were somewhat happy; 27% had no opinion; 18% were somewhat unhappy; 2% were unhappy; and 4% made no response. Thus, we can see that almost half of the teachers (48%) feel relatively happy with their computer use in their classrooms.

Item 61 asked about the teachers' feelings about the specific changes that they had made in their teaching methods, course curriculum, and physical design of their classroom over the last five years. Again, using that Likert-type scale, 16% of the teachers described themselves as being very happy and 54% stated that they were somewhat happy. That is fully 70% of the teachers who feel relatively happy with any changes that they have made. None of the teachers reported feeling unhappy with any changes made and only 4% reported feeling somewhat unhappy. Twenty-four percent either had no opinion (20%) or made no response (4%).

Additional findings from the questionnaire

In addition to the seven main areas that I addressed from the questionnaire, there were other, more open-ended items, asked of the teachers. For example, item 31 asked the teachers to report how long they had personally used computers in any capacity. Four percent (2) of the teachers stated that they had never used computers personally in any capacity; 41% (18) had used computers for 1-5 years; 29% (13) had used computers for 6-10 years; 13% (6) for 11-15 years; and 4% (2) had personally used computers for 16-20 years. Only 7% (3) of the teachers did not respond to this item.

Item 32 asked the teachers to state how long they had used computers with their

students as part of course instruction. Nine percent (4) have never used computers with their students; 63% (28) have used computers with students for 1-5 years; and 7% (3) for 6-10 years. None of the teachers reported using computers with their students as part of their curriculum for more than 10 years. Twenty percent (9) of the teachers did not respond to this item.

The next item is one that is difficult to quantify in any meaningful way within this study, so I will simply report the numbers given. Statement 33 asked the teachers to report how many computers are currently in their classrooms. Twenty percent (9) of the teachers had none; 45% (20) had one computer; 16% (7) had two computers; 7% (3) had three computers; 2% (1) had four computers; 2% had five; 2% had six computers; and then the numbers changed drastically. Two percent (1) teacher reported having 24 computers in his/her classroom and 2% (1) reported having 28 computers. These teachers obviously teach a computer lab course. These numbers are probably accurate indications of the number of computers available within this high school. During our in-depth conversation, the principal stated that there were currently 200+ computers in the school.

Item 34 asked about the number of printers available in each teacher's classroom. Of those responding, 32% (14) had no printers; 43% (19) had one printer; 13% (6) had two printers; 4% (2) had three printers; 2% (1) had 4 printers; 2% (1) had 18 printers and 2% of the teachers did not respond to this item.

Item 35 asked whether the teacher's classroom was connected to the Internet. Surprisingly, 66% (29) responded that they were connected to the Internet and 27% (12) stated that they were not connected. Seven percent failed to respond to this item. This information would seem to contradict the information from the school technologist when he stated that the entire school had been wired for the Internet in 1998; however, I believe that several of the teachers, who do not have computers that actually can connect to the Internet, may not realize that their room has the Internet connections available.

Finally, item 37 asked about the percentage of class time that is spent with students using computers. Twenty percent (9) of the teachers reported that they spent zero class time with students using computers. Two percent stated that they spent 2% of

their instructional time in this way and 23% (10) stated that they spent 5% of their instructional time involved with computers. Sixteen percent (7) of the teachers spent 10% of their time in this way. The remainder of the percentages varied all the way to one person (2%) spending 100% of their instructional time with students using computers; obviously, this person was a computer lab instructor. Fully, 27 of the teachers (56%) spend 0-10% of their actual class time with students using computer activities in some fashion.

Phase two------investigation of school documents

In Chapter 3, I stated that I would examine school documents such as the school mission statement and long-range plans for technology as part of my research study. I believe that I have done this by carefully reading: The Texas Education Association's "Long-range Plan for Technology, 1996-2010"; the Dallas Independent School District's "Vision 2003: District Five-Year Plan"; the Dallas Public Schools Teacher Technologist Program 1999-2000 handbook (refer to Appendices I and J); a copy of the Campus Improvement Plan (technology) for 1998-99 (Appendix H); and several issues of the school newspaper (Appendix G), in order to gain a view of what the students of this high school had to say about technology issues. Throughout Chapter 4, I have discussed these various documents.

Phase three-----in-depth conversations

I knew that for this type of study, the actual words of the participants within the school community would be vital to understanding the whole picture. A researcher can get certain information from analyzing the answers obtained from questionnaires and from reading state, district, and school-level documents, but one never fully understands how a community functions until spending time with its members in a variety of contexts. That immersion has been the most exciting and enjoyable part of the research.

Teacher participants for these in-depth conversations were randomly selected. I did not go into the school with a predetermined list of teachers to interview. Instead, I started the interview process with the school's principal one Wednesday morning at 7 a.m. Our conversation concerning technology lasted approximately one to one and one-half hours, which is amazing considering his schedule. During that conversation, I did

not solicit the names of teachers to interview, but I did ask for an introduction to the school technologist. I felt that it was vital to interview this member of the school community. During the conversation with the school technologist, I was introduced to the school journalism teacher, and I asked him if he would consent to an interview. He did and during the course of our in-depth conversation, he suggested another teacher whom I might ask to speak with me. Three teachers were asked to participate in in-depth conversations because they were involved in hall monitoring and I could stop to ask about possible interview times or they were in their rooms during a free period and I simply stopped in and asked them about having a conversation with me. For each of these teachers, I had no idea of their involvement with the use of computers in their curriculum. One of those teachers did mention the multimedia/Web Mastering teacher, so I dropped by that teacher's classroom to ask about a possible conversation. In truth, teachers were not lining up to have in-depth conversations about their use of technology even though I had placed a memorandum (Appendix D) in their mailboxes and offered a $20 stipend to help cover the amount of time that they were involved in the conversations. Even though I did not get volunteers to come forward to offer to be interviewed, I have to state that every teacher whom I approached did agree to have an in-depth conversation with me about their use of technology.

I should probably note that I have not presented these conversations in the actual order that I conducted them. For one thing, I don't believe that actual order really matters in terms of the information that I obtained. Secondly, for the reader of this document, order of presentation does not change the important points that were made or exaggerate importance to any one teacher or course of study. I have simply tried to present what I heard and saw.

In all, I interviewed seven teachers, the school technologist, and the principal for this study. Each in-depth conversation lasted approximately one hour or more. In some cases, I stayed, by invitation, to observe a class work with the technology, and in some cases, I spent more than one day either interviewing the teacher or observing classes. Conversations were scheduled to fit the teachers' available times whether that was 7 a.m. or 4 p.m. on a Friday afternoon. During conversations, I took extensive field notes unless

a teacher asked for something to be off the record; then the pen was laid down. You will find snippets of some conversations interspersed throughout Chapter 4, especially as conversations applied to particular areas of the teacher questionnaire (Appendix A). For the purposes of this study, I will not provide complete transcripts of these conversations, for example, where teachers overlap with identical information, I will not repeat those ideas in each separate conversation.

Let me start this discussion with some of the important points from my interview with the school technologist. He is a full-time technologist at this high school, which is a rare situation since most DISD School Technologists are half-time technologists and half-time teachers. He has been the technologist at this school for seven years, but has been full-time only since Fall 1998 (refer to News Bytes, Sept./Oct. 1998, Appendix G). He informed me that the school currently has one half-time technologist in addition to himself.

The technology project in Texas began in 1994 through the Dartmouth Program. This technologist was one of a handful of teachers selected to attend a three week, intensive, 12-14 hours per day program held on the campus of Dartmouth College that summer. From participating in that program, he received a computer and a printer.

During our conversation, he talked with me about some exciting programs that either are about to begin at the school or will potentially be available there. Distance learning is a prominent program goal for DISD and this school will be receiving a Distance Learning Lab sometime in the year 2000. Grant money should provide for three fiber optics cables and three systems. Teachers will be able to teach on real-time to a different site or students will be able to participate in things such as college courses without leaving their high school campus. At least one math teacher and the radio/television teacher should be involved in this program when it is available. In our earlier conversation, the school principal stated, "_____ will be a pilot school for distance learning in the District."

The school technologist also spoke of a possible connection with the Cisco Router Program. This is a pilot program in which three or four schools will be involved with their students learning to set up and maintain computer networks. With this training, it

could be possible for students involved in the program to be hired immediately upon high school graduation. When we spoke on September 22nd, the details of this school's involvement, if any, had not been worked out.

The school was also getting ready to start a WhizKidz Program after school beginning on Monday, September 27, 1999, and continuing for eight weeks. This is a program for students who want to learn more about graphic design and using programs such as AutoCAD. It is meant to provide high-tech, multimedia training, life skills lessons, and a chance for the participating students to develop skills to help them earn money in the future. During an in-depth conversation with the school multimedia/ Web mastering teacher, I had the opportunity to meet the WhizKidz business mentor for this program, and I learned that approximately 10-15 students had applied and were accepted into this after-school program.

The technologist noted that this school currently has one projection screen and ten television programs where the computer can work through the television. He told me that one of the obvious problems facing the school is that the hardware hasn't kept up with the software. He stated that a major push within DISD is the integration of the curriculum with the technology, but he pointed out that in the classrooms with one computer, he is seeing about 5% of the curriculum being integrated with computers as compared to total integration of media such as television and video.

At the time of our conversation, he stated that there were 55 teachers within this high school who had computers, but did not have Internet access. He also stated that every classroom at the school has access to the Internet if they have a computer in their room. These statements seem contradictory at face value; however, this may make more sense as we move around the school and take a look at some of the computers in the teachers' rooms. For example, I earlier mentioned the science teacher who had the three older computers that used actual floppy disks. While this teacher had three computers in her room, she could not connect to the Internet, and she seemed to believe that her room was not wired for the Internet. The technologist stated that there are 75-80 teachers at this high school, and that each teacher has a computer, plus there are available donated computers that need to be refurbished. This information is in contradiction to my earlier

conversation with the principal. I asked, "How many computers are there per classroom?"

The principal replied, "Every teacher does not have a computer. Most math teachers, all the science teachers, and most core area teachers have computers at this time." He went on to explain that the school had received a USI Eisenhower Grant to work with the math and science teachers in obtaining computers.

In addition to the exciting programs that the school technologist talked with me about, the principal also discussed some technology initiatives at this high school. He was getting ready to take a team of six or so teachers to Southwestern Bell to learn more about distance learning and video conferencing. This is partly due to this school becoming a pilot school in the District for distance learning.

Also, he explained to me that the school had recently been awarded a $55,000 grant to develop a parent/student media center that will include five computer stations with training modules at each station so that parents can come into the school during the day to learn to use the Internet. They can work with their children at these stations or with a supervising teacher. He noted that these parent computer stations may also be open on Saturdays, and that he expects that this technology media station should open sometime this fall semester.

During the upcoming semester, the principal remarked that some technology goals at this high school included: upgrading their software packages and licenses; getting a grade book program school wide; networking so that teachers and counselors, etc. can get information on students school wide; and developing a school wide program for discipline management.

When I asked him how long computers had been integrated into his school, the principal remarked that the business education computer labs had opened last year and that the multimedia/Web Mastering lab had opened last year. He acknowledged that computers had been in the school for a number of years, but not modern, up-to-date equipment.

This information would be a good starting point to discuss some key points from my interview with the Industrial Technologist teacher. This teacher teaches the

Computer Graphics and *Engineering Graphics* courses. I believe that these classes are subsidized by the U. S. government. This teacher has been at this high school "on and off for four years" and he has worked in the business world. This is the first year for this computer lab, and the students have not been able to use the computers yet this year. Of course, that is because the wiring and hook-up was just completed on the day that we spoke. In this lab, there are 24 computers (PCs). There is one LaserJet scanner and one color graphics printer. All of the computers are networked to this printer. The teacher explained that this is a special printer that will allow students to print blueprints. The teacher has a computer on which he can work and display his work to the class via a television monitor. He will be teaching the students AutoCAD since DISD offers training in teaching this program. This teacher took this training from DISD and found it to be very helpful. The training is set up in an area with flexible times so that teachers can find the time to attend, and the people doing the training are also teachers within DISD.

I asked this teacher to discuss some possible activities that he might use with the students this year. He stated, " I may have them surfing on the Internet to find other architectural firms and graphics firms in order to look at their projects." He also mentioned using an on-line buddy system in which some architectural or graphics firms might share information with his students. He stated that DISD sets up some of these types of firms to come into the schools and talk with the students. There are four high schools within DISD that have this type of set up. He emphasized that this is not a Magnet program.

I asked about his goals for integrating technology within the next five years and he had some ready ideas. This teacher would like to see more corporate involvement in the schools because he believes that practical application of the skills that the students are learning is the key to success. He also pointed out the need for these types of courses and business mentors to address issues related to technology, such as, "How do you work with a group, but retain your individual identity?" or "What happens to social interaction with the use of technology."

In the future, this teacher believes that we will see smaller computers with greater

capability, perhaps with the classroom wall becoming the computer screen, or possibly the ability to project ideas. He believes that his classroom should reflect a corporate America setting, so new furniture is ordered. He states, "We have to get students accustomed to the business environment. Minority students need to see examples of people in business suits and ties and with the proper demeanor."

In the future, he hopes to involve the students in more advanced projects such as 3-D presentations; then building the projects (models) through accessories; and finally getting community involvement in the projects. This year his students will have opportunities for paid internships.

This teacher stated that he personally uses the Internet "quite extensively" and sometimes involves the students in this. He ended our conversation with the thought, "The technology use will stimulate me to try new things."

In contrast to the above scenario, the Auto Technology teacher has been at this high school for six years. In his classroom, he has access to one computer (PC) and it is used solely for the data program that provides repair specifications. His room is in a far off annex and it is not connected to the Internet. During our conversation, he quietly stated that he may get one new computer for his Small Engines class. He added that there would be other applications for computers in his classroom if he had access to the Internet. He did connect to the Internet at home for a period of three or four months, but he found that he did not have the time to learn how to use it, so he had it removed. During the time that he had the Internet service at home, he also purchased a digital camera. During our conversation, as we discussed his work with automobiles and the projects that the students are involved in, I asked whether he could use images taken with the digital camera and display them on the computer in his room. He thought that he could, so I suggested a possible activity to involve the camera and the computer; whereupon, he suggested that he could take a picture of a car before restoration and overlay images of what the car would look like as it passed through the various stages of work. Students could see the visualization of this process on the computer screen. He liked this idea (which he really thought of) and jotted it down in his notebook for future development.

The eleventh and twelfth grade environmental science teacher was sitting at her desk grading papers when I arrived to interview her. She quickly put them away and moved to a chair near the computer. She had received a new Compaq computer and color printer just three weeks before we spoke, and she was still feeling somewhat uncomfortable with it. She had "earned" the computer as part of a computer course that DISD offered over the summer. During the workshop, the instructor had taught PowerPoint, Word, and Excel, but the teacher explained, "I didn't really pay attention then." Now that she has her own computer in front of her in her classroom, she wants to learn how to use it. While I was there, we began to go to some Web sites that I thought that she might be able to use with her students, and I began to give her some pointers (through my limited knowledge) for navigating the Web. As you may have guessed, much of our interview time was spent working with the computer.

Two powerful factors are operating with this teacher in helping her become more comfortable with using and eventually integrating the technology into her classroom. First of all, she is located downstairs from a teacher who uses technology with two of his classes on a daily basis, and I have stopped by his classroom to chat and found her there seeking advice and suggestions. Secondly, she now feels a need to learn how to integrate this technology into her classes since she owns a computer. You may recall from the Becker study (1994) discussed in Chapter 2, that exemplary computer-using teachers were involved in environments that were more computer active. There were more computers in the school and a larger percentage of these computers had been purchased in the previous two years. While I know that this teacher is surrounded on her floor by teachers who have either no computer or really outdated models, she has a brand new computer and she is only one flight of stairs away from a teacher who is very computer active and willing to share his knowledge with others. Thus, she has a real chance of becoming a teacher who integrates technology within her classroom, but this is a process and will require sufficient time, practice, and support.

With the next teacher, I have already discussed some of the conversation that I had with her. The Multimedia/Web Mastering Teacher has taught this course for two years. Within her classroom, she has 28 computers: 14 Macs and 14 PCs. When asked

why she has this even split in computers using two separate platforms, she replied that DISD wanted students to know how to operate both systems. She has one printer for the Macs and one printer for the PCs and her room is not networked, so she has one of each type of computer connected to one printer, and all of the students must physically use one of those two computers when they want to print anything.

She sees her job as, "…getting the students used to navigating the Web and developing their own Web page (authoring). I try to get the kids beyond just computer literate. I want them to not be afraid of the computer." She believes that she has had some success in this area, and she remarked that student learning has definitely increased at this high school since students are becoming more exposed to computers. She stated that students now come into her room and make comparisons among the various computer labs within the school, the equipment, software, etc. I would agree that students are becoming more aware of not only these specific differences in hardware and software, but also in the overall need to incorporate technology into what they are learning. Refer to a recent editorial in the school newspaper (v4, n1, Oct. 1999), in which two students, Regena Robinson and La'Coya Cole discuss that teaching methods used in this school's classrooms need to change to meet the changing demands of our technological society. "In order to make it in today's society, teachers are going to have to move towards computers instead of typewriters and copy machines….We are a new generation. The same ways teachers taught our parents aren't necessarily going to work for us." (Appendix G)

Currently, students in the multimedia class and Web mastering class learn to use video digital cameras, and VCRs combined with computers, etc. to give presentations, and they do learn how to navigate the Internet and how to use authoring techniques to design their own Web page. They learn some things about HTML and they learn about copyright laws. All of the teachers who are actively integrating technology within their classrooms are discovering that this issue of copyright law and student plagiarism is a major one (an issue that English teachers, and others, have been dealing with for ages in using the standard research paper).

This teacher and I discussed some of the obvious snafu areas that one encounters

in the classroom when integrating technology. I have already discussed that her classes tend to be larger than 28 students, but she has only 28 computers. Students are learning on two different platforms so she has to be knowledgeable on both, and the computers are not networked so printing can, at times, be a nightmare. These are the more obvious problems. The issue of copyright and plagiarism is an important issue, as well as the fact that students sometimes get onto pornography Web sites. She explained that DISD installed a firewall to prevent the loading of pornography sites, but this firewall also prevents the class from downloading material that students sometimes need to acquire, and it often prevents updating of certain programs or features.

I asked this teacher about her goals for the class in the next five years. She stated that she would like to see more sections of these courses and more instructors to teach them. Also, she would like to see the development of a course to evaluate software. We then spent a little time brainstorming ways that she could get a fairly large amount of software into her students' hands with very low cost so that they could make effective software evaluations.

It was interesting and pleasing to me when I observed this teacher working with her class one day that she was having the students visit Web sites dealing with critical reading of information that they find on the Web. I have felt for a very long time that this was an important issue.

An interview with a ninth and tenth grade biology teacher was also interesting. This person has been teaching for 29 years. She teaches one AP class and the others are all general, mixed ability classes. She told me that she had one older computer from last year in her classroom and two new used computers, which she dubbed, "ancient PCs." I have to admit when I saw them a few days later, I told her that she really had sugar-coated the description of these computers (which were sitting unplugged on a table at the back of her classroom).

During our conversation, I asked her how long she had been using computers with her students and she replied, "Six or seven years." She went on to explain that the students do not use the computers in her classroom; instead, they use the Dallas Public Library computers or one of the labs within the high school. Usually, her students are

using computers only six weeks out of the school year and that is to research information for science fair projects. She often gives them an assignment sheet, which they take to a computer lab outside of class, pull the necessary information, and bring it back to class for discussion. She stated that many of her students do not have computers at home.

The one computer in her classroom that she does use is used by students to occasionally word process research projects; by her to keep track of grades, and for inventory of equipment within her classroom. She stated that the science department at the high school does have computer software, CD-ROMs, etc., but her computers are not capable of running it, and she does not have Internet access.

Despite the lack of technology in her classroom, this teacher was excited about the possibility of integrating her curriculum with technology. When I asked what activities she would like to have her students involved in with the computers, she suggested that they could do comparative studies and utilize other information from sources such as CD-ROMs or the Internet. This teacher had recently signed up to take a computer workshop offered by DISD, and at the end of the workshop, she will receive one brand new Compaq computer and one color printer for her classroom. She hopes that she may be connected to the Internet by Christmas.

The main thing that this veteran teacher left me with at the end of our conversation was, "There are not enough computers for all of the classrooms, and the ones that we do have need to be utilized more."

The conversation discussed above may be a nice segue into the Journalism teacher's thoughts concerning the integration of technology. This teacher also monitors and schedules the computer lab within the Magnet school. He informed me that this year, the lab was opened up for all of the teachers within the high school to use and only two teachers outside of the Magnet have signed up to use the lab with their students. Interestingly, one of the teachers was the Special Education teacher and her class.

The Journalism Department is part of the Magnet school. All of the students within this school must apply for admission. There are 92 slots within the three clusters of Radio/TV, Humanities, and Journalism. Sixty percent of the admission criterion is interest in the program, but grades are also an important factor. Students within the

Magnet are required to take all AP courses.

During the ninth grade, students create from scratch their own company, corporate logo, and stationery. As part of this project, they create and deliver a five-minute PowerPoint presentation. The journalism teacher does provide training in using PowerPoint within his classroom.

In the tenth grade, students are involved in learning regular news writing including the use of Internet sources. One issue that is discussed and taught is that with the advent of on-line newspapers and journals, research in this area shows that people tend to skip words that are too long. Thus, the journalism teacher has to adapt many of the conventions of writing that were taught some years ago in journalism classes. The widespread use of technology has changed many of the reading habits of Americans, and would-be journalists have to learn techniques and writing styles that will appeal to this audience. I hadn't really considered this aspect of technology in terms of the teaching of news writing, but it makes perfect sense, and it relates to one of my early research questions about the impact of technology on the types of communications processes used in a high school setting (refer to page 5 of this study).

The advanced journalism class is offered in eleventh grade. These students actually prepare the school newspaper as part of this class and must publish 72 pages per year. Students take the course *Issues in Media Theory*, which involves them in a great deal of reading, writing, and discussion. Students begin with reading Antigone, then move to Sartre's "Respectful Prostitute", Albee's "American Dream", and pieces written by Bill Moyers. These students complete a great deal of writing related to the news media. Also, students learn about photo journalism.

During the twelfth grade, students can continue with the school newspaper, and they take the course *Race/Multiculturalism in the Media.* There is actually less involvement with technology in this course than in the other grades, but six students can be selected to complete internships with the *Dallas Morning News*, during which they will be paid approximately $9 per hour.

The journalism teacher currently has eight computers and one laptop computer in his classroom, and these computers are networked with the Magnet computer lab. His

average class size is approximately 20 students. He left me with the thought, "Personality style and a teacher's willingness to try new things really have a major impact on his or her use of technology within the classroom."

The final teacher conversation that I will discuss is actually one with a teacher, whom I met back in May 1999 while I was sitting in the office waiting to speak with the principal. This teacher saw the stack of questionnaires and other materials on my lap and came over to introduce himself and to ask me what research I was involved in conducting. I explained what I was attempting to examine at his school, and he immediately began to tell me about an exciting project that he had completed that semester with his students. You can imagine that I wanted to write down everything that he was telling me and to ask him for an interview, but I couldn't ethically do that since I was there trying to gain access to that high school in order to conduct my research. After the principal had granted permission for my research to go ahead at this high school, and after the "Technology-Related Teacher Questionnaires" had been distributed into the teachers' mailboxes, his was one of the first questionnaires to be returned over the summer (I knew this because he had decided to write his e-mail address on the form.). Still, when I began to conduct the in-depth conversations this fall semester, I did not go to his classroom immediately to seek an interview. That was because I knew that he was doing some exciting things with technology in his classes, and because of that prior knowledge, I didn't want to in any way risk biasing my research. However, during the course of my visits to the school, we ran into one another again, and he recalled what I was doing and offered to do an interview. At that point, because the encounter occurred in a naturally unfolding way, I eagerly accepted his offer.

This teacher has been at this school for four years and began using technology with his classes in 1997, after being immersed in a technology workshop for three weeks that summer. From completion of the workshop, he received one computer and one printer for his classroom. Currently, he has five computers (PCs) and one laptop in his classroom, and one of the computers is connected to a 27-inch television monitor in the back of the classroom so that all of the students can view presentations from their seats. His computers are connected to the Internet so that he or his students can complete

research as needed.

This teacher is trying a grand experiment in the integration of technology within two of his classes this year. He is using what he refers to as the "paperless concept" in teaching his AP Biology II and AP Physics classes this year. He chose these classes because both are small enough to manage within this "paperless" concept. He has approximately 12 students in each class, and both classes are composed of juniors and seniors. Within this framework, students are given specific assignments each six weeks grading period that they research outside of the classroom.

For example, the physics students have been conducting research on the Boeing Company. Each student had to visit the Boeing web site and select an airplane that Boeing manufactures in order to learn more about it. Students then need to locate pictures of the plane, inside diagram views, and specification information, etc. from the Internet and copy the selected photos or text onto their floppy disks. They then bring those disks to school and load the data from their individual disks into their individual folders, which are located inside the AP Physics folder that is located on the desktop of the computers in this teacher's classroom. From there, the students select what pictures, film, or text, etc. that they want to use in creating a PowerPoint presentation on the topic. Most of this initial work is done outside of class where students may access home computers or the computers at the Dallas Public Library. In-class time is still primarily spent in hands-on activities, discussion, etc.

While this teacher does not specifically teach programs such as PowerPoint within his class, students do learn to handle these applications by doing the assigned projects. When they do work on these projects in the classroom, the teacher is there to give suggestions or technical help and other students are often able to assist one another.

Where these types of projects become totally integrated into the curriculum is when students begin to see real world applications for what they are learning in class. As part of this project, the teacher wrote and was awarded a grant through the National Science Foundation to take approximately 20 students to the Boeing Manufacturing Plant in Washington state this year. The students will spend a week at the plant being involved on a rotating basis in all aspects of this manufacturing process; for example, they may

spend one or two days in the advertising department, then move to public relations, or help with the actual process on the assembly floor. Students will be directly involved in learning how this type of company operates and they will be applying what they learned in their physics class and what they learned from their research on the Internet. Then, the students will create a PowerPoint presentation that demonstrates what they learned from this project.

This is not the first project of this magnitude that this teacher has completed. Last year he was awarded a grant that allowed approximately 20 students to go to the San Diego Zoo and work for a week with the zookeepers there. In a nutshell, the students learned many practical applications of what they had been learning in class (biology). They created PowerPoint presentations to demonstrate what had been learned and presented those to one another, and the students completed a certain number of volunteer hours at the Dallas Zoo in order to "pay" for their trips.

I should also explain that within these classes, students are given more traditional assignments such as textbook readings and questions to answer. The difference is that students must answer the questions in the form of a Word document and insert that document into their individual folders on the computer desktop. The teacher then grades the assignment by opening the folder to that document and reading it on-screen and writing any comments as a Word document with a grade, which is inserted into the folder where the student can come into the classroom, open the folder, and read the teacher's comments and see a grade. No paper exchanges hands.

Obviously, there have been some minor problems with this system since this is its first year of operation. Students sometimes forget to back up their disks, and data is not saved where they thought that they had placed it or it is not saved at all. Students have to be reminded regularly how to complete this process (eventually, through practice, they should become comfortable with this process of saving information). This issue becomes a problem area with grades. What should be done if a student says that they completed a project, but saved it improperly, and then has nothing to show for a grade? What about issues of plagiarism? Over and over during the days that I observed this classroom, the teacher reminded the students to give credit to their sources of information within their

PowerPoint presentations. Also, the question arises about the integration of speaking skills within the classroom, as students need to be able to discuss the presentations that they have prepared and what they have learned as a result of this process. I observed these students on the day that six weeks' grades were due into the office, and so I was allowed to view first hand all of these issues that the classroom teacher would face.

When I asked this teacher where he would like to go with activities that integrate technology with his curriculum, he stated that he would like to have the students involved in more web-based activities. He envisions teams of students (approximately four) creating their own web pages using programs such as FrontPage and attaching those web pages to the teacher's web page, which is attached to the school's web page. I asked why he felt that these types of activities were important for his students.

He stated, "It's important that you can read web pages and that you can build them. It gets students involved in obtaining and sharing information. They learn how to critically think by comparing examples of web pages. You start with small critical thinking steps and then move to larger ones." Also, he stated that he would like to use e-mail for teachers to talk with one another in the same school and to talk with teachers from other schools. This teacher truly believes that technology use and know-how will divide this nation into "haves" and "have nots" and the item at stake is knowledge.

While I spent considerable space describing the "paperless concept" classrooms, this teacher also has regular classes with larger numbers of students. He does not integrate technology in the same way within these classes. These students do get to use graphing calculators and distance/velocity equipment, etc. and they do get to put some of their data into the PowerPoint program.

I asked this teacher, "Are you overall satisfied with how you use technology in your classes?"

He responded, "I'm relatively well satisfied, but I wish that I knew more."

I then asked, "What would you want to change or do differently?"

Without hesitation, he answered, "I would like more computers in my classroom. I have two new ones coming. I would like to see the school networked so that the science and math annex could be networked with the main office."

This teacher left me with this issue, “How do we stimulate other teachers to use technology?” He explained that DISD offers great computer training programs, but it is often difficult to get teachers to attend these workshops even when they will receive a computer and printer at the end of the training.

Conclusion

Thus, in this study, I have examined teachers’ responses to questionnaire items, school, district and state-level documents that relate to the integration of technology into Texas classrooms, and in-depth conversations with individual teachers in order to attempt to answer the research questions posed on page 5.

CHAPTER FIVE

Summary and Discussion of Findings Related to the Five Research Questions and Directions for Future Research

This research study was designed to investigate five broad research questions that I set out in Chapter One. Those questions were:

(1) How do teachers view computer/information technology's role in their curriculum?

(2) What is the role of computers in curriculum change?

(3) Does extended work with computers change the type of communications processes used in a high school setting?

(4) How does work with computers impact or change (a) instructional practices, (b) overall school design, and (c) school organization?

(5) What is the role of change management theory in educational change?

Chapter Four presented the results of my data collection and analysis and this chapter will summarize and discuss the implications of those findings, and finally, I will make some suggestions for future research.

Summary of findings relating to the five research questions

Research question number one asked about teachers' views of technology's role in their curriculum. From information gathered during analysis of the "Technology-Related Teacher Questionnaire" and from in-depth conversations with teachers, it is clear that teachers do value traditional uses of computers in their curriculum. Teachers still believe that computers can be used to create worksheets or handouts for students in their classes and they believe that computers make great management tools. Almost all of the teachers that I talked with mentioned at some point that a school wide grade book program and discipline management program would be helpful. A few of the teachers were already using applications such as Excel to record their students' grades. And, according to the data compiled in Table 1 in Chapter Four, teachers still believe that computers are useful for self-paced instruction, educational games, and the instruction of basic skills and facts.

Yet, these teachers also seemed to hold less traditional views about how computers should be used. For example, these teachers tended to agree with the idea that the Internet should be used by students to gather research information. Also, a majority of the teachers in my study felt that computers could be used as a way to add new information to their lesson plans and as a way for students to use critical thinking skills and problem solving abilities. Over 80% of the teachers responding, felt that computers should be used with groups of students of varying abilities and skill levels. Interestingly, almost every item scored relatively high scores in terms of teachers' beliefs about the ways that computers should be used with students.

The real problem here is that what the teachers state that they believe to be the role of computers in their curriculum is not what is actually happening in the classroom. There are likely many reasons for this discrepancy, not the least of which would be access to up-to-date computers and an achieved level of comfort with using that technology. You may recall from Chapter Two, my discussion of Becker's study (1994) in which he discussed the characteristics and findings surrounding what he termed exemplary computer-using teachers (ECUT). It wasn't that all of these teachers were computer experts. They simply had a classroom environment in which computers played a prominent role in the students' learning experiences and the activities were designed to help the students develop higher order thinking capabilities and not just develop isolated skills. We might include in this category the teacher at this high school who created his "paperless concept" classes. The computers in those classrooms are just a fact of life for those students, part of their overall learning experience.

For now, those students in those two classes, may feel that this type of instruction is too different, and they may actually wish that they were in a more traditional classroom, but as more teachers at this high school begin to integrate technology into their classes, the students will gradually begin to realize what they are learning in that classroom versus one that does not integrate technology. Recall that the Web mastering teacher remarked about how her students are starting to make comparisons among computer labs, hardware, and software. As time goes on, students may become more savvy consumers and demand that teachers integrate technology into their classes in a

meaningful way. As the two students stated in the school newspaper editorial, "We are a new generation. The same ways teachers taught our parents aren't necessarily going to work for us." (v4, n1, October 1999)

Research question number two asked about the role of computers in curriculum change. From the in-depth conversations with the teachers and from observations of classroom interactions, it is obvious that computers do indeed have tremendous impact on curriculum. You may recall that for this study, curriculum change was defined as changes that teachers make in the content of what is taught. I stated that these changes might take the form of eliminating older, outdated information from their lesson plans, and may include the incorporation of materials and methods of instruction that seamlessly integrate technology. In every interview that I conducted, the teachers, even when they did not have a computer in their room, had ideas for activities with students that they would like to try. Every teacher seemed to be willing to learn how to use the technology with her students.

I can't help but think of the 11th and 12th grade environmental science teacher, who had her new computer and printer for only three weeks. During the workshop, she had not really paid attention to the instruction, and so she had not learned how to use all of the programs and components of her computer. However, once that computer was sitting in her room, in front of her students, this lack of knowledge of how to integrate the computer became a real concern. She said to me, "I want to be able to let them use the Internet to locate information about the things that we are studying, but I would really like to know about those things first before I let them try." This teacher is caught in that trap where she is afraid that her students may know more about using the computer than she does, and she may feel that she will lose some authority in the classroom if the students realize this. On the positive side, this teacher has the hardware and peripherals, has a desire to begin using this computer station with her students, and has strong support for taking risks and learning about the computer from the teacher upstairs, who uses the "paperless concept." This teacher has the possibility of eventually integrating her computer with her curriculum.

Research question number three asks whether extended work with computers

changes the type of communications processes used in a high school setting. Again, I think that the answer can be an overwhelming YES. In at least three of the classrooms that I visited, the topic of copyright laws and plagiarism came up. Students have become much more aware of the importance of this issue through the use of technology than they ever did during the course of writing standard research papers. It is interesting that this has remained a major issue, but it seems to be discussed in a wider variety of content areas due to the use of computers than it previously was.

At least two teachers discussed different points that they have to teach to students about how to write more effectively for an audience who will be looking at a computer screen or television monitor instead of reading a paper. Written material within a frame such as within a PowerPoint presentation must be short, concise, and be able to grab the audience's attention and hold it. Students have to learn to write so that they convey the point that they want to make with as few words as possible. Within a class such as news writing, students again have to learn to consider audience in a new way. How does the reading behavior of a group of people who are used to reading a computer monitor or Web page differ from an audience who will take the time to unfold a paper and leisurely read an entire article?

Another point to consider is that students must become more organized within a classroom that integrates technology. Everything that is worked on must be saved to disk or to desktop. Students may no longer have the excuse of saying that they forgot their paper at home because homework may be stored on a disk within the classroom. And this can also eliminate the problem of messy notebooks with papers falling out all over.

And, as one teacher brought up, "What happens to social interaction with the use of technology?" and I would offer the idea that we probably have to work more on interpersonal speaking skills with our students than ever before. Since text must be short and concise and often supported with pictures, movies, or music, we need for students to be able to accurately explain their thought processes, offer novel ideas, and defend those thoughts as others question them.

Another way that technology has impacted communications processes is with the

use of drawing programs. For example, where teachers might have once asked students to draw something like a flow chart or process map by hand, now, students can make use of auto shapes or the drawing pencil in the Word program.

The use of e-mail programs may change many types of communications within this school community. Teachers in the annex building will be able to e-mail teachers in the main building with questions or concerns. If the counselor needs a student's grades up to a particular date, s/he will be able to e-mail the classroom teacher, who in turn, will be able to copy the student's grades from a program like Excel and send those grades almost immediately to the counselor as an attachment. Parents, who have e-mail will be able to contact the teacher and ask for the student's grades or progress in class, and the teacher with the stroke of a few keys will be able to respond to this request. The teachers at this high school have only recently received e-mail capability (October 11, 1999), but they will likely grow to love the ease and speed of this communication medium.
And with the teachers using e-mail, they will likely ask the students to use e-mail as a form of communication.

It is clear that the teachers at this high school are in the process of "becoming" exemplary computer-using teachers, and as more teachers begin to take risks with using technology in inventive ways within their classrooms and begin to seamlessly integrate the technology into their curriculum, I believe that we will see other changes in the communications processes used in a high school setting. After all, some issues and changes tend to fall out naturally as we use a particular medium of communication.

The fourth question asks how work with computers impacts or changes (a) instructional practices, (b) overall school design, and (c) school organization. To answer this question, we may need to be very specific with how we define the term "work with computers." This could be anything from word processing a book report or research paper to browsing on the Internet to find sources of information for activities such as social studies or science fairs. Recall the one biology teacher who has had her students use computers for approximately six or seven years to research information for the science fair. She stated that this is usually a six-week project out of the school year. Even though this teacher has "used" computers in this way with her students for an

extended period of time, I don't think that this "work with computers" has changed any of her teaching practices. And the same thing holds true for the automotive technology teacher. He has had the one computer in his classroom for a few years, and the students use the data base in this computer for repair specifications. Even though we might say that this has been working with a computer for an extended period of time, basically, that "work" has made no difference in that teacher's pedagogy. So, a better question might be, "What types of teaching activities or practices with computers brings about resulting changes in teachers' pedagogy?"

School design, which I defined on page 15 as the physical layout of classrooms including: the types of student desks or tables provided; location and ease of access to computers, printers, and peripherals; etc., is another issue to consider within this study. For the most part, as I visited teachers' classrooms, I did not notice what would appear to be many changes made to the school design in order to accommodate computers or the work done with them. Probably the one exception would be the computer lab rooms, which had ordered tables to accommodate the rows of computers and all of the power cords and peripherals associated with them. Other than that, in classrooms with one computer, the computer was usually placed directly on or very near the teacher's desk. In classrooms with more than one computer, the computers were usually on tables running along one wall or on opposite sides of the room. Other than those differences in classroom layout, students' desks still seemed to predominately be placed in straight rows.

As far as changes to overall school organization, I would have to say that the biggest one is probably the change to block scheduling. This change certainly provides more instructional time for teachers who are working directly with technology. Of course, some changes to school organization and design will be made when the school receives its distance learning lab and when the new parent/student media center with five computer stations moves into place.

The fifth and final research question asks about the role of change management theory in educational change. You may recall that research is this area points out that each member of an organization must be part of the process of working toward change.

It would seem from analysis of the data taken from the teacher questionnaire and from personal conversations, that the teachers at this high school are not usually part of the decision making process. It was positive that over 80% of the teachers stated that they were committed to using computer technology with their students, but it was a little more sobering to see that only 65% of the teachers actually reported being happy with the changes that they have made in what and how they teach because of their use of technology in the classroom. This is not too surprising when we consider that only 25% of the teachers stated that they had had any input into the purchase of software for the school, and only 22% had any input into the selection and purchase of the computers that they had in their rooms.

Directions for future research

As I was working through the data with this study, I kept having questions, or occasionally flashes of insight, about questions that I should have asked or something else that I should have tried to examine. I don't know if those feelings will stop because, in being honest, I have to say that I truly loved conducting this research and it's an area for which I want to always know more. And, as I discovered over the late summer, the Center for Research on Information Technology and Organizations (CRITO) worked with various researchers in this field to put together several research reports funded by the program of Research on Education Policy and Practice at the National Science Foundation and the Office of Educational Research and Improvement, U.S. Department of Education. Report # 1 was written by Jay Becker and was entitled: Internet Use by Teachers: Conditions of Professional Use and Teacher-Directed Student Use (February 1999). Report # 2 was written by Ronald E. Anderson and Amy Ronnkvist and was called: The Presence of Computers in American Schools (June 1999). And there are at least two other reports due out over the next few months. These reports are meant to be state-of-the-art discussions of the picture of computer use in this nation. Obviously, I wish that I could have read them before writing my Prospectus. Anyway, my point in mentioning this is that the amount of data contained in these reports is staggering; yet, I believe that the preponderance of data that the researchers discuss is all from surveys.

From using a questionnaire in my own study and then following up with a random

sample of interviews and observations, I can honestly say that it is difficult to get a completely accurate picture of what is happening at a particular school with technology from just a survey or questionnaire. For example, ten teachers might state that they have computers in their classrooms, but when I actually visit, I discover that six of the computers are ancient and cannot be connected to the Internet and do not have CD-ROM drives, etc. Or, I might ask about the number of computers in their labs at that present time, but during an interview, discover that the school is getting a new lab with thirty computers next week.

So, one area of future research should revolve around individual school districts contracting with researchers, graduate students, or others to conduct this type of research at the individual schools within each district. That data could then be analyzed and compiled at the state level. I believe that it is very important that we know what is happening with the integration of technology within our public schools and the best way to do that is to find out what individual teachers are doing with technology in their classrooms.

Secondly, because of the nature of this type of research, I believe that we may need to rethink a new research design. It is difficult to be a silent observer or note taker in an environment in which technology is actively involved. When I observed the classroom of the teacher who uses the "paperless concept", I was able to move around the room and stand beside students as they worked on assignments, and they would ask me for help or suggestions with what they were doing, and if I didn't know, we tried to problem solve our way through the situation with what we both knew about the computers. This became a constructivist classroom in which these learners were constructing their own knowledge, and I was also a learner and a guide.

When I went to interview the environmental science teacher, she asked me for help with navigating the Internet. We spent a good deal of time interacting with a variety of Web sites whose addresses I could recall. My point is that this type of learning activity is not usually part of the researcher description.

When I stopped by to chat one evening with the teacher who has the two "paperless" classes, we spent at least half an hour trying to figure out why a film clip of

an airplane from one web site would not play when it was copied into a PowerPoint presentation. Again, we were trying hands-on ways to work out the problem that was there to solve and we were trying to use higher level thinking skills to work through our computer problem.

So, maybe a second suggestion for future research would be to examine in what ways the interaction of the researcher with the participants in the study may affect the variables being examined. It seems to me that trying to understand the level of computer integration within a classroom is a very different type of research activity from gathering other types of information, and the interactions of the participants to one another is also different. What type of research design would best support this type of study?

I believe that a third line of research should revolve around the issue of critical reading skills for using the Internet. What reading skills are students presently employing as they browse the Internet? What critical reading skills need to be developed and taught to these students? What would be the best way to teach these skills? How can we assess whether students then use those skills during browsing? What different reading skills are needed as students complete tasks/assignments for different classes? Again, I think that this is an area that has a great deal of potential for research.

A fourth area of research that I would like to see undertaken is an in-depth examination of exactly what communications processes are involved in a high school setting and exactly what changes occur in those processes with the extended use of computers? This research could focus more heavily on written communications and oral language.

A fifth line of inquiry might examine the role of personality and/or teaching philosophy in a teacher's willingness and ability to integrate technology into the classroom. Some more recent research (Becker, 1999) seems to be suggesting that teachers who have a more constructivist teaching philosophy are much more likely to actively involve students in meaningful computer activities (such as using the Internet) within their classrooms.

Another area of research that I would like to try would be to set up some teacher technology groups within a school that function in a similar way to a book group. A

small group (five or six) of teachers would meet once every two to three weeks to learn one new thing about using their computer, to share ideas for integrating technology, to ask questions or to get help from other members of the group, or to hear guest speakers. I would be interested in what changes, if any, would occur for each of these teachers in pedagogy, curriculum, or school design from involvement in this group.

Overall, finding out how teachers begin to truly integrate technology into their curriculum is an incredibly important issue for all of us. We do not want this country to become one of “haves” and “have nots” with technology being that great divide.

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Appendix A

Technology-Related Teacher Questionnaire

Technology-Related

Teacher Questionnaire

For the following statements circle the number that most closely fits what you believe about the role of computers in public schools.

	strongly agree	somewhat agree	no opinion	somewhat disagree	strongly disagree
1) computers used to teach basic facts or skills	5	4	3	2	1
2) computers used for self-paced instruction	5	4	3	2	1
3) computers used for group learning activities	5	4	3	2	1
4) computers used for critical thinking and problem solving	5	4	3	2	1
5) computers used with teams composed of students with differing abilities and levels	5	4	3	2	1
6) computers used to help students see issues from multiple perspectives	5	4	3	2	1
7) computers used to help students work on connections among various content areas such as math, music, and social studies	5	4	3	2	1
8) computers used as management tools for activities such as grades, attendance records, etc.	5	4	3	2	1
9) computers used for educational games	5	4	3	2	1
10) computers used for research gathering projects such as Internet sources	5	4	3	2	1
11) computers used as a reward when a student has done well in class	5	4	3	2	1
12) computers used as a way for teachers to eliminate older information from their lesson plans	5	4	3	2	1
13) computers used to add new information to a lesson plan	5	4	3	2	1
14) computers used as a way of working collaboratively with other teachers	5	4	3	2	1
15) computers used to create student worksheets or handouts	5	4	3	2	1

For the following statements circle the word (YES/NO) that most clearly fits what you believe about the support that you received in learning to integrate computers into your instruction. Please add additional clarifying information under the Comments column (for example, in item one if computers have been integrated into your school for the past 10 years, you could write "10 years").

16) Computers have been integrated into your school for over five years. YES NO

COMMENTS

17) At least one computer has been in your classroom for the past five years. YES NO

COMMENTS

18) Staff development has been ongoing for the past five years. YES NO

COMMENTS

19) Staff development was required for all teachers. YES NO

COMMENTS

20) Specific courses or classes dealing with technology were offered by the district. YES NO

COMMENTS

21) This training or staff development was helpful in learning how to integrate technology into your classroom. YES NO

COMMENTS

22) Your school has a full-time computer coordinator. YES NO

COMMENTS

23) Your school has access to a District-level computer coordinator YES NO

COMMENTS

24) Your faculty have access to an on-site staff support person. YES NO

COMMENTS

25) You began using computers on your own before they were introduced into your school. YES NO

COMMENTS

26) You began using computers after one, or more, was placed into your classroom. YES NO
COMMENTS

27) Your principal has been supportive and encouraging in helping you to integrate computers into your instruction. YES NO

COMMENTS

28) The principal has made it clear that s/he supports the use of technology. YES NO

COMMENTS

29) You have access to one, or more, computer labs in your school. YES NO

COMMENTS

30) Your fellow teachers have given support and expertise in integrating computers within your instructional area. YES NO

COMMENTS

For each of the following statements either write the short answer that completes the statement, or circle the response that best describes your instructional practices with computers.

31) How long (months, years, etc.) have you personally used computers in any capacity? _____

32) How long (months, years, etc.) have you used computers with your students as part of your course instruction?

---

33) How many computers do you currently have in your classroom? _____

34) How many printers do you currently have in your classroom? _____

35) Is your classroom connected to the Internet? YES NO

36) You have students use computers to:	ALWAYS	OFTEN	NO OPINION	SELDOM	NEVER
• Word process assignments	5	4	3	2	1
• Find research materials on the Internet	5	4	3	2	1
• Follow specific learning events such as NASA's Arctic exploration	5	4	3	2	1
• E-mail with students in other classrooms or other schools	5	4	3	2	1
• Complete group projects involving problem solving activities	5	4	3	2	1
• Use self-paced learning programs	5	4	3	2	1
• Play educational or other Games	5	4	3	2	1

	ALWAYS 5	OFTEN 4	NO OPINION 3	SELDOM 2	NEVER 1
• Complete collaborative projects with students of varying ability levels					
• Create unique presentations such as PowerPoint or multimedia	5	4	3	2	1

37) What percentage of class time is spent with students using computers? _____

---

38) What other types of learning activities do you use with the computer(s) in your classroom or in a computer lab? Please be specific.

For each of the following statements circle the word (YES or NO) that best describes the physical layout and/or organization of your classroom and school. Please add additional clarifying information under the COMMENTS column.

39) Over the past five years the physical layout of your classroom has changed because of adding a computer or computers. YES NO

COMMENTS

40) A computer station or lab area has been added to your classroom. YES NO

COMMENTS

41) The computer area in your classroom has become a major focus area of your class. YES NO

COMMENTS

42) The physical design of your classroom has changed the types of instructional activities that you use. YES NO

COMMENTS

43) The changes in the physical layout of your classroom have led to more group learning activities. YES NO

COMMENTS

44) Changes in the physical layout of your classroom have led to more individualized computer activities. YES NO

COMMENTS

45) In what ways has the physical layout of your classroom changed over the past five years, and how has it changed the way that you teach?

Circle the word (YES or NO) that best states your view of changes that have occurred in your curriculum or teaching methods due to the inclusion of computers into your classroom and school.

46) You are successful in how you use computer technology with your students. YES NO

COMMENTS

47) You have made changes to your course curriculum within the past five years. YES NO

COMMENTS

48) You have added information to your unit lesson plans in order to incorporate new activities using computers. YES NO

COMMENTS

49) You have dropped information from your unit lesson plans in order to incorporate new activities using computers. YES NO

COMMENTS

50) Most of the teachers in your school have made changes in their teaching because of the inclusion of technology. YES NO

COMMENTS

51) You have observed teaching activities or behaviors that make you think that these teachers have made changes in their teaching practices. YES NO

COMMENTS

52) The level of student learning has increased since computers were introduced into your school. YES NO

COMMENTS

53) The level of student learning has not changed since computers were incorporated into your school. YES NO

COMMENTS

54) Overall, you use computer-related learning activities more than other teachers in your school. YES NO

COMMENTS

55) You helped in making the decision about what brand or type of computers to purchase. YES NO

COMMENTS

56) You made the decisions, or were involved in the decisions, about what types of software to purchase for your students. YES NO

COMMENTS

57) You are committed to using computer technology with your students. YES NO

COMMENTS

58) If your students from 5-10 years ago could see your course curriculum or lesson plans today, they would be surprised at what content you teach now and at how you cover content. YES NO

COMMENTS

59) You are happy with the changes that you have made in what and how you teach because of your use of technology in the classroom. YES NO

COMMENTS

	very happy	somewhat happy	no opinion	somewhat unhappy	unhappy
60) Your feelings about how you currently use computers with your students	5	4	3	2	1
61) Your feelings about the changes that you have made in your teaching methods, the course curriculum, and the physical layout of your classroom over the last five years	5	4	3	2	1

Appendix B

Letter of Transmittal

APPROVED BY THE COLLEGE OF HUMAN RESOURCES & EDUCATION
DA[illegible]

Educational Theory & Practice
West Virginia University
College of Human Resources and Education
PO Box 6122
Morgantown WV 26506-6122

ER[illegible]

May 24, 1999

Dear Teacher,

Let me begin by thanking you for taking your time to read this cover letter. Attached you will find a copy of the "Technology-Related Teacher Questionnaire" and a self-addressed stamped envelope. I am asking you to take 10 – 15 minutes of your valuable time to complete this questionnaire. Mainly, you will be asked to circle a number 1-5 or words such as "yes" or "no", but you will also find space available for any comments that you wish to make for each item, and I encourage you to add any information that you can to clarify items.

The information gathered in this study will be used to complete my doctoral dissertation at West Virginia University, so you likely understand how much I appreciate your help. The overall goal of this research is to complete a case study of one urban high school's technological transformation process. Thus, I am looking at one school's inclusion of technology into its environment and subsequent changes to the curriculum, classroom design, school design, and teachers' pedagogy.

I asked your principal, Mr. [illegible]s, for permission to conduct research at [illegible] High School because of the reputation that you have earned for your efforts in creating a high-caliber learning environment in an inner-city school. I am very excited to begin working with all of you!

I should point out that your participation in this study is entirely voluntary; you do not have to respond to every item on the questionnaire; and any responses that you make will remain anonymous. It is very important to me that you understand that confidentiality will be maintained; any responses that you give to me either in written, verbal, or other format will be kept confidential. The final copy of my results will be made available for your perusal prior to publication. Also, a copy will be presented to the DISD Office of Institutional Research.

As an additional favor, I would ask (if you feel comfortable doing so) that you write your e-mail address on the back of your questionnaire before mailing, or contact me at my e-mail address listed below if you would be willing to participate in an interview.

Again, thank you for your participation in this study. I greatly appreciate all of your help.

Sincerely,

[redacted]

Diana L. Wisell
University of Texas at Arlington
drwiz@swbell.net
(817) 272-2515 (office) or (817) 652-2776 (home)

Appendix C

Letter from DISD Office of Institutional Research

Letter from the high school principal granting permission to conduct research at his school

Follow-up letter to the high school teachers

Dallas Public Schools

May 13, 1999

Ms. Diana L. Wisell
Box 19227
College of Education
University of Texas at Arlington
Arlington, TX 76019

Dear Ms. Wisell,

The research committee of the Dallas Public Schools has reviewed and approved your request to use one of our high schools as a case study of the changes that may occur as a result of incorporating technology into a school's environment. The committee decided that this is an interesting study and the findings may be useful to our schools.

Please understand that this approval does not require the principals or teachers of Dallas Public Schools to participate in your questionnaire. It remains completely at the discretion of the principals and teachers to choose to participate or not.

Please be sure that my office receives a copy of the report of findings of your research. Good luck on your study.

Sincerely,

Elvia Gomez, MS
Office of Institutional Research

Maintaining the Mark of Excellence

n High School and Humanities/Communications Magnet School

May 24, 1999

Dr. Ernie Goeres
Dean's Office
School of Education
West Virginia University
Morgan Town, West Virginia 26506

Dear Dr. Goeres:

Ms. Diana Wisell has been given permission to conduct her research at n High School, Dallas, Texas.

If additional information is needed, please feel free to contact me at (214) 565-

Regards,

Principal

t. Dallas, Texas 75215 (214)-5 (FAX) 214-565

UTA
THE UNIVERSITY OF TEXAS AT ARLINGTON

August 25, 1999

Dear Teacher,

Here we are at the beginning of a new school year and all of our lives have suddenly become more time compressed and tightly scheduled. You may recall that at the end of last year, I stopped by your school to leave a copy of my "*Technology-Related Teacher Questionnaire*" in your mailboxes. Unfortunately, the return rate for these questionnaires was very low with only about 15 of you responding; therefore, I am enclosing another copy of the questionnaire for your response.

I am asking that you please take 10 – 15 minutes of your valuable time to respond to each of the questionnaire items. Of course, you may choose not to answer any of the items or you may want to use the "Comments" section that follows each item to elaborate on any of your answers. I hope that you will complete my questionnaire because I truly believe that this is an important area of study for our students in Dallas, and I plan to share the results of my findings with you.

I will return to your school on Tuesday, August 31st to collect the completed questionnaires. I want to thank you in advance for your participation in my dissertation research, and I look forward to having the opportunity to talk with you about the use of technology in your classrooms and to observe some of the learning activities in your school.

You can reach me by telephone at (817) 652-2776 home or (817) 272-2515 office; or by e-mail at dwiz@uta.edu or drwiz@swbell.net if you have any questions or if you would be willing to be interviewed as part of this study.

Sincerely,

Diana L. Wisell
Assistant Professor of Reading
University of Texas at Arlington

Appendix D

Technology-Related Teacher Interview Memorandum

Teacher Interview Script

Technology-Related Teacher Interviews

Now that I have collected several questionnaires and begun the process of examining that data, it is time to glean additional data through the use of personal interviews. I am asking for a minimum of 15 teacher volunteers who would be willing to provide one (1) to one-and-one-half (1 ½) hours of your valuable time to answer some questions related to the use of technology within your classroom. In return, I am willing to compensate you with $20 for your interview because I know that your time is limited and precious.

1) Your name and/or identify would not be revealed within the research.
2) You do not have to answer any questions which you do not feel comfortable answering.
3) I will make every attempt to conduct the interviews at your convenience which includes after school, Saturdays or Sundays, other times as arranged, or as email correspondence.
4) You will be compensated with a one-time payment of $20 to cover the cost of your time and effort.

Please call me at (817) 272-2515 to arrange a time for your interview or email me at dwiz@uta.edu. I truly appreciate your help in the gathering of this research data and ultimately in the completion of my doctoral dissertation. I look forward to your call.

NOTE: If you have not completed the questionnaire that I left in your mailboxes, I would still appreciate your taking a few minutes to fill that out and return it. Thank you!

Script for Teacher Interviews

Good morning (afternoon, evening). Thank you so much for agreeing to participate in my research study. The goal of my research is to complete a case study of one urban high school's technological transformation process. Thus, I am looking at _____ High School's inclusion of technology into its environment and the subsequent changes to the curriculum, classroom design, school design, and teachers' pedagogy. I asked your principal for permission to conduct research at your school because of the reputation that you have earned for your efforts in creating a high-caliber learning environment in an inner-city school, and because I know that your school has some excellent goals for continuing to implement technology within your classrooms.

Before we begin our conversation this morning (afternoon, evening), I would like to remind you of several important points. First, your participation in this interview is entirely voluntary and you do not have to respond to every item that might be asked. Secondly, your responses will remain anonymous and be treated with the strictest confidentiality. Your employment status will in no way be affected by your refusing to participate in the study or by your deciding to withdraw from the study.

Again, let me thank you for your participation in this study. I have some questions that I will be using to guide us in this conversation, but as topics or issues arise naturally, I will deviate from the planned questions. Please feel free to ask for any clarifications of questions.

Diana L. Wisell

Appendix E

Teacher skill requirements and amount of time required
to reach each stage

Appendix E

SKILL STAGE	DESCRIPTION	PROFESSIONAL DEVELOPMENT NEEDED
ENTRY	Teacher struggles to cope with technology and new learning environment, or has no experience at all.	None
ADOPTION	Teacher moves from initial struggle to successful training and use of technology at a basic level. (e.g., can use drill-and-practice software).	30 hours
ADAPTATION	Teacher moves from basic use to discovery of potential in a variety of applications. Teacher has good operational knowledge of hardware and can perform basic troubleshooting.	45+ hours training, 3 months experience, Just-in-time support
APPROPRIATION	Teacher has mastery over the technology and can use it to accomplish a variety of instructional and classroom management goals. Teacher has strong knowledge of hardware, local-area networks, and wide-area networks.	60+ hours training, 2 years experience, Just-in-time support
INVENTION	Teacher actively develops entirely new learning skills that utilize technology as a flexible tool.	80+ hours training, 4-5 years experience, Just-in-time support
Sources: McKinsey & Company Inc.; U.S. Congress, Office of		

http://www.electronic-school.com/0697f2.html

Appendix F

Actions and recommendations for teaching and learning incorporating technology

Appendix F

TEACHING AND LEARNING

ACTIONS AND RECOMMENDATIONS

State

	Short-term 1997-98	Mid-term 1999-2002	Long-term 2003-2010
Actions by the Texas Education Agency			
TL.TEA.1-11/27			
.1 Develop and adopt Texas Essential Knowledge and Skills (TEKS)* that integrate technology into teaching and learning in all areas	→		
.2 Implement and update TEKS that integrate technology into teaching and learning		→	→
.3 Adopt instructional materials that integrate technology into the Texas Essential Knowledge and Skills		→	→
.4 Ensure that instructional materials are accessible by all students and educators	→	→	→
.5 Establish expectations for technology proficiencies by educators	→		
.6 Develop standards for measuring and reporting the extent to which educators meet the technology proficiencies		→	
.7 Update expectations for technology proficiencies by educators and revise standards for measurement and reporting			→
.8 Reflect the expectations for technology proficiencies by educators in teacher appraisal and in the Academic Excellence Indicator System (AEIS) through measuring, analyzing, and reporting results			→
.9 Establish expectations for technology proficiencies by students in kindergarten through grade 12, including computer-related skills that meet standards for each high school graduate by the year 2000 (TEC 32.001)	→		
.10 Update expectations for technology proficiencies by students			→
.11 Reflect the expectations for technology proficiencies by students in student assessment and in AEIS through measuring, analyzing, and reporting results		→	

*Texas Essential Knowledge and Skills (TEKS) are statements of knowledge and skills and of Performance Descriptions that, in accordance with state statute, will be adopted by the State Board of Education to replace the essential elements. Knowledge and Skills address what all students should know and be able to do. Performance Descriptions are explanations of how students can demonstrate the knowledge and skills they have acquired.

	Short-term 1997-98	Mid-term 1999-2002	Long-term 2003-2010
Actions by the Texas Education Agency (cont'd)			
TL.TEA.12-24/27			
.12 Provide support for distance learning and distributed learning* to equalize learning opportunities for students and educators	→	→	→
.13 Review and, if necessary, revise policies regarding student credit in distance and distributed learning courses		→	
.14 Develop and incorporate a standardized instructional planning format into the teacher technology system so that teachers can electronically share instructional approaches			→
.15 Encourage, coordinate, and support quality planning by school districts	→	→	→
.16 Initiate and implement partnerships with providers of instructional products and services to secure rights and cost efficiencies for Texas schools and to ensure Texas' participation in content development	→	→	→
.17 Provide educators access to use and contribute to an on-line consumers' guide to technology-based instructional materials	→	→	→
.18 Arrange for an external review of state education technology initiatives for expansion, maintenance, revision, or deletion, and make recommendations to the legislature		→	
.19 Identify, communicate, and reward best practices of technology integration into teaching and learning	→	→	→
.20 Continue to fund and foster innovative practices in the use of technology in teaching and learning	→	→	→
.21 Foster innovation in using technology to assess, document, and report student progress		→	→
.22 Continue to provide research and development for learning, staff development, community education, staffing, and organization of learning environments with technology	→	→	→
.23 Participate with the Texas Higher Education Coordinating Board in the evaluation of procedures for concurrent enrollment of high school students	→	→	→
.24 Coordinate provision of adult literacy services to adult learners with libraries and other providers		→	→

* Distributed learning is learning engaged in by students, educators, staff, community members, or others with the support of telecommunications technologies at a school, home, business, or another site.

State (cont'd)

	Short-term 1997-98	Mid-term 1999-2002	Long-term 2003-2010

Actions by the Texas Education Agency (cont'd)

TL.TEA.25-27

.25 Make pre-kindergarten through Grade 12 education available to the community through technology supported distributed learning →

.26 Establish and communicate expectations for parents' and communities' use of infrastructure for access to learning resources →

.27 Communicate policies and recommendations of the *Long-Range Plan for Technology, 1996-2010* →

Recommendations to State Board for Educator Certification

TL.SBEC.1

.1 Establish certification standards for technology proficiencies by educators in teaching and learning, instructional management, professional development, and administration →

Regional

Recommendations to Regional Education Service Centers

TL.RESC.1-8

.1 Establish and provide a menu of services for schools to support implementation of the *Long-Range Plan for Technology, 1996 - 2010* and of regional and local technology initiatives →

.2 Disseminate information and offer staff development on technology integration into the curriculum, including the Texas Essential Knowledge and Skills and expectations for technology proficiencies for educators and students →

.3 Distribute information and offer training related to the best practices for technology planning and use of technology in teaching and learning →

.4 Participate in partnerships to develop instructional materials and services →

.5 Provide to educators and students facilitated preview of learning resources, especially those provided through state licenses and adoptions →

.6 Assist schools in developing and implementing strategies to meet the Performance Descriptions in the TEKS →

.7 Offer technical assistance for technology planning →

.8 Disseminate information about regional industry needs for graduates' technology skills →

Local (cont'd)

	Short-term 1997-98	Mid-term 1999-2002	Long-term 2003-2010
Recommendations to Local Education Agencies			
TL.LEA.1-18			
.1 Develop strategies to meet Performance Descriptions for students in the TEKS and to establish technology proficiencies for educators	→		
.2 Increase students' technology proficiencies	→	→	→
.3 Increase educators' effectiveness in using technology	→	→	→
.4 Increase academic performance across the curriculum through technology	→	→	→
.5 Integrate technology into teaching and learning in all areas	→	→	→
.6 Integrate ongoing planning for technology into all classroom, campus, district, and community planning	→	→	→
.7 Ensure accessibility by all students to technology-based instruction and to adaptive/assistive devices, as appropriate	→	→	→
.8 Use student performance data and curriculum materials that are provided and managed electronically in instructional planning	→	→	→
.9 Pilot assessment of models for reporting the extent to which students meet the technology proficiencies in the TEKS		→	
.10 Incorporate technology use into the teacher appraisal system, where appropriate			→
.11 Assess and report the extent to which students meet technology proficiencies in the TEKS			→
.12 Incorporate expectations for educators' and students' technology proficiencies into local accountability systems			→
.13 Use distance learning and distributed learning for expanding curricular offerings and meeting the needs of homebound and other students	→	→	→
.14 Use distance learning to provide educational services and information about education to parents and other community members			→
.15 Provide access by staff and students to the best available electronic information resources in classrooms, libraries, and other appropriate sites	→	→	→
.16 Identify and communicate the best technology practices to the community	→	→	→
.17 Provide incentives for use of new effective models, tools, and resources for teaching and learning	→	→	→
.18 Provide parents and other community members access to the infrastructure for educational resources		→	→

Local (cont'd)

	Short-term 1997-98	Mid-term 1999-2002	Long-term 2003-2010
Recommendations to Communities			
TL.COM.1-3			
.1 Access existing and emerging networks for educational services and information		→	
.2 Participate in establishing and updating expectations for students' and educators' technology proficiencies and in developing effective reporting and communications systems		→	
.3 Participate in teaching and learning opportunities and in the use of other educational resources available through the telecommunications infrastructure			→

Higher Education

Recommendations to Institutions of Higher Education			
TL.IHE.1-7			
.1 Provide professional development to faculty engaged in educator preparation in integrating technology into teaching and learning		→	
.2 Demonstrate the best practices and models of technology integration into teaching and learning and make them available for viewing by schools		→	
.3 Expand collaboration between public schools and educator preparation entities		→	
.4 Participate in partnerships with schools to pursue grant opportunities		→	
.5 Participate in partnerships with the private sector and public entities to develop and provide instructional materials and services		→	
.6 Deliver professional development and degree programs for staff and dual credit for students through distance learning and distributed learning		→	
.7 Share library and information resources with schools and communities		→	

Private Sector

	Short-term 1997-98	Mid-term 1999-2002	Long-term 2003-2010
Recommendations to the Private Sector			
TL.PS.1-6			
.1 Collaborate with schools on establishing and updating expectations for technology proficiencies in the TEKS for students	→	→	→
.2 Collaborate with schools on establishing and updating expectations for technology proficiencies for educators	→	→	→
.3 Participate in partnerships to develop and provide products, materials, and services that ensure rights and cost efficiencies for schools and that ensure Texas' participation in content development	→	→	→
.4 Invite educators, students, and parents to experience technology's role in the workplace		→	→
.5 Provide technology-based work experience for educators and students through internships and other means		→	→
.6 Support communication of the policies and recommendations of the *Long-Range Plan for Technology, 1996 - 2010*	→	→	→

GLOSSARY

Distance learning is that in which some materials and/or participants are not local.

Distributed learning is learning engaged by students, educators, staff, community members or others with the support of telecommunications technologies at school, home, business, or other site.

Educators are broadly defined as professional staff at or affiliated with a public school or district, including teachers, administrators, curriculum coordinators, librarians, and others.

Intelligent agents are machine-based entities that can carry out simple instructions from a user.

Just-in-time professional development refers to professional development resources that are available on-call through access to formal instruction, experts on-line, intelligent agents, and other resources.

Texas Essential Knowledge and Skills (TEKS) are statements of knowledge and skills and of Performance Descriptions that, in accordance with state statute, will be adopted by the State Board of Education to replace the essential elements. Knowledge and Skills address what all students should know and be able to do. Performance Descriptions are explanations of how students can demonstrate the knowledge and skills they have acquired.

Virtual relationships or items (as in virtual communities) are based on interactions or objects or representations that are in digital rather than in physical form.

Workstation - (Educator) A computer with transmission, productivity, and presentation capabilities for use by educators in teaching, management, and other professional tasks; can be desktop and/or portable, at local discretion. (Student) A computer with a range of capabilities, depending on local priorities, for use by students in classroom, library, or home use.

Appendix G

School newspaper articles/editorials

Lantern

Humanities/Communications Magnet ... High School
...r, Dallas, Texas 75215 Vol. 4, No. 1, Oct 1999

Mr. Chamber's class plants flowers to beautify the campus

...s published monthly by the Humanities/Communications Magnet School, ... r, Dallas, Texas 75215. As members of the Texas Interscholastic League Press Conference, National High School Press Association and International Quill and Scroll the Lincoln Lantern staff strives to maintain the highest standards in scholastic journalism. We welcome comments from our readers. Letters to the editor may be hand delivered to room C-112 or mailed to the address above. Opinions expressed within are those of the editorial staff and do not necessarily represent those of the staff or administratio ... School or the Humanities/Communications Magnet School or the administration of the Dallas Public Schools.

Editors: Editor-in-Chief- Rachel White
Shakira White
Regena Robinson
Takesha Winn
Lakendra Thomas

Reporters:
Jeriane Chiles
Charlinda Thomas
Wendell Crowe
Tamara Fields
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Natasha Jones
Craig Rose
Shakeitha Thurston
Natalie Sandifer
LaCoya Cole
Anitha Daniels
Marcia Fore
Ashley Johnson
Melissa Malone
Chris Sibley
Janesha Wilson

Photographers:
Anthony Williams

...
Dean: Tanya Lindsey

Millennium challenging teachers and students

Regena Robinson and La'Coya Cole

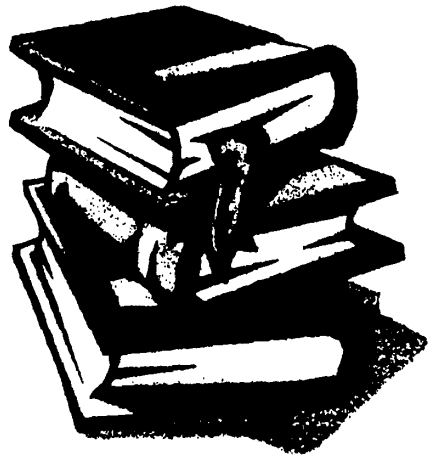
"Out with the old, in with the new." As we approach the new millenium, will some educators be left behind?

As enters into the year 2000, many changes have taken place. The senior class will be the last graduating class the late ' ". principled. The remaining underclassmen are enrolled under the leadership of ' ', an administrator from a younger viewpoint.

is proof that teachers and especially the administrators are getting younger. Since the faculty is getting younger then the old methods of teaching may be leaving. The old method was and is not considered a bad method, but it may not fit in today's society. Some of the teaching methods like fill in the blank and copy definitions are evolving into hands on projects. In order to make it in today's society, teachers are going to have to move towards computers instead of typewriters and copy machines.

As teachers get younger, more will come with concepts, ideas and techniques that reflect the generation of student's today. "This is how I've always done it" attitude is a tradition that may be replaced. Some teachers need a wake up call to up date their methods. We are a new generation. The same ways teachers taught our parents aren't necessarily going to work for us.

So moves into the next century, students and teachers are going to have to ask ourselves, "Are we being left behind?"



Does school need new teaching methods or do students need to be more focused?

Most students in class complain they don't learn anything in a class or at school that whole day. When that happens parents come to the school and get on the teachers, but is it their fault? A number of students don't go to class and some that do, don't pay attention.

When a teacher presents a student with work and says they are going to have a test all the student does is memorize the work and when the test is over they forget it. At the end of the six weeks when a test comes the student claims to not know the information, but if they would have learned it instead of memorizing what the teacher told them to learn, it would not have resulted in a failing grade.

Students need to pay more attention and stop blaming the teacher for what they don't know.

Lantern

Humanities/Communications Magnet [illegible] High School
[illegible]llas, Texas 75215 Vol. 3, No. 1 Sept/Oct 1998

NEWS BYTES

Principal reports that the new block scheduling has run almost without a hitch. Students have adapted easier than most teachers who have not previously worked with this type schedule.

Mr. has just about completed hooking up to the Internet all rooms that have computers—including the computer labs. Students will no longer be allowed in the labs without teacher supervision. Mr. a full time teacher technologist this year.

www. .com

✖ Rachel White

The Internet was introduced to the computer lab on October 12.

Upon receiving the Internet, all the computers in the school were up graded to Office 97, a windows program, last semester.

All schools in the Dallas Independent School District are receiving the Internet. High schools and junior high schools will get on-line this school year and elementary schools will get connected later this school year.

Funding for the Internet was approved two years ago, but because of more evaluation for the transaction, the process was postponed until this year.

"Originally, this was a three year project. We are actually ahead because we did the wire connections ourselves," said Mr computer technician.

Mr. expressed that another reason why other schools did not get connected as soon as we did was because they had to wait for the D.I.S.D. technicians to fix the wiring required for the transactions.

"It's about time we actually get some technology based equipment. Now all we need is a class for it," said Latisha Bryant.

Latisha Bryant thinks that these advancements are much needed in our school but does not see how it will be beneficiary if the students do not know how to use the equipment.

" It's a good advancement in technology and it was greatly needed and anticipated," said Hamiton Sneed.

It is expected that this project will be totally complete by the spring of 1999 for all the schools in D.I.S.D.

Appendix H

Sample Copy
of
Campus Improvement Plan for Technology
1998-1999

NEEDS (List needs and critical data documenting needs)	CONCEPTS/CONTENT/STRATEGIES (Itemize specific actions designed to address needs. Where extra resources are needed, specify these. List pertinent dates when essential to the strategy.)	DOCUMENTATION/EVALUATION (Assess available proof that strategies were completed
1. ID Program	1. Buy ID Program and Printer Have all English classes come to the auditorium for ID photos. Allow one week to shoot and return IDs Order supplies for the IDs and Printer	DOCUMENTATION 1. Completion of ID Project All Person within , ' 's facility have IDs
2. Office/Tardy/TAAS database/TAAS Programs for computers	2. Build *Access 97* database for main office to keep track of teachers Build a database to keep track of tardiness Build a database that helps track the TAAS results, procure TAAS Software Acquire an Alpha List from the administration building	2. Completion of database Distribution of database Install TAAS Software located for the labs
3. Internet access in classrooms and labs	3. Connect room drop for the network and set up rooms and labs with the Internet	3 All teachers have Internet connections All labs have Internet connections
4. Training for Teachers • Office Suite 97 • Windows/and other software • Use of printers and scanners • Use of the Internet • Use of C109 Lab with classes	4. Organize classes in C109 lab to instruct teachers. Classes will be held after school and during school. One-on-one training will be conducted in room C111 • Uses of scanners/printers/video/Internet will be available to all teachers after training in labs and in C111 • Instruction on proper use of the internet will be given to teachers • Instruction will be given in classrooms to teachers and students as needed • Software training of all kinds will be given. • Information sharing: • Legal Licenses /Internet protocol/Student proper use of computers and the Internet /District policies	4 Class schedule and attendance Number of participants Expanded use of computer by class participant as observed by teacher technologist
5. Training for Students • Installation software • Small repair • Internet • Computer maintenance within teachers' classes	5. Students will be taken from a few classes to get instruction about software installation/ small repair/ Internet protocol and computer upkeep. These students will return to their class to help instruct their teachers and classmates within their classes. This instruction will be ongoing and expanding this year and next. The students will become part of a student core of technologists within the building.	5 Student will demonstrate ability after training in computers to help classroom teachers with computers
6. Technology Acquisitions in 1998-99	6. Assist in coordinating ordering of technology **Signatures:** **Appraiser**_____ **Appraisee** _____ **Date** _____	6. Technology equipment acquired **CAMPUS DISCIPLINE MANAGEMENT PLAN WAS IMPLEMENTED**_____ FINAL EVALUATION **Meets expectation** _____ **Less than expectation** _____

Comments:

Signatures (Final Evaluations)

Appraiser _____
Appraisee _____
Date _____
Campus _____

Note: Senate Bill 1, enacted in 1995, mandates that teacher appraisal information be confidential and not subject to the Open Records Act of Texas. Accordingly, all participants are cautioned to treat information regarding appraisals as confidential in nature.

Dallas Public Schools

9-22-27
12.500-8093-97-E
SC-03-017385

Appendix I

Checklist for Selection and Evaluation of Teacher Technologists

Teacher Technologist
Checklist for Selection and Evaluation
Minimum Expectations and Proficiencies

Selection Criteria: Your campus Teacher Technologist should:

- ☐ be a classroom teacher with three years of teaching experience.
- ☐ be experienced in working cooperatively with teachers and administrators.
- ☐ be able to demonstrate effective communication skills, oral and written.
- ☐ be able to fulfill the expectations on **a daily basis** for one full school year.
- ☐ thoroughly understand and apply the District Technology Benchmarks and the State Technology Applications TEKS appropriate for the grade level.
- ☐ have two years experience in using computers with students in the classroom.
- ☐ have experience with using computer network systems.
- ☐ be able to use a Macintosh computer with an operating system of 7+ (Elementary only).
- ☐ be able to use the Digicard system (Elementary - only where applicable).
- ☐ be able to use the Windows 95 operating system (Secondary only).

Observable Behaviors: Your campus Teacher Technologist should be:

- ☐ working with teachers and students to **integrate** technology into their content activities.
- ☐ providing technical assistance to help solve software and hardware problems.
- ☐ conducting campus training, if asked.
- ☐ providing input on technology activities for the Campus Improvement Plan.
- ☐ maintaining campus database of software licenses.
- ☐ serving as the liaison between the campus and the Technical Assistance Center (TAC).
- ☐ using the Internet and assisting teachers in using its resources and information with students.
- ☐ performing additional duties as assigned by principal and/or requested by supervisor.
- ☐ thoroughly familiar with all information contained in the Teacher Technologist Program Guidelines (Red Book).
- ☐ providing documentation of technical assistance, curriculum integration activities, and software database in appropriate formats.
- ☐ attending training as specified in the Minimum Expectations and Proficiencies pages of the Red Book.

Appendix J

Historical Document

DISD Teacher Technologist Training Summary

Teacher Technologist Training Summary

Spring 1993 The Teacher Technologist Plan was implemented in the Spring and an introductory session was held to describe the district's long-range plan for technology. Each of the 200 Teacher Technologists received an additional 20 hours of training during the spring semester. Two classes (8 hours each) included an introduction of hardware, operating systems and troubleshooting hints. A final 4 hour session stressed shut down procedures.

1993-94 Five classes (System 7, *ClarisWorks* Word Processing - Levels 1 & 2, ClarisWorks Database- Levels 1 & 2) were offered to elementary Teacher Technologists between November 1993 and January, 1994. System 7, word processing, and data base were also taught in later sessions. In the spring, 28 classes were offered district-wide. Six of those were strictly for Teacher Technologists. Those classes were: Troubleshooting Hardware – Mac and PC: Troubleshooting Software – Mac, and Software Selection Tools. The remaining twenty-two classes were taught by Teacher Technologists and Instructional Technology Applications staff.

1994-95 Twenty-nine classes were offered district-wide. Six of these classes were strictly for Teacher Technologists. These classes were *ClarisWorks* Word Processing, database, and desktop publishing, *Microsoft Works* word processing, *ICLAS*, and *Kid Pix*. The remaining twenty-three classes were taught by Teacher Technologists and Instructional Technology Applications staff. In the Spring 150 classes were offered districtwide. Over a hundred of these classes were taught by the Teacher Technologists. Special sessions for the Teacher Technologists were held on "Traveling the Information Highway" (Internet), Guide to Installation and Use of "*SAM*" and "*Norton's AntiVirus*," *MECC Utilities*, and library automation.

1995-96 Over 150 workshops were offered districtwide – general technology topics and the Alpha Core Curriculum CD. Teacher Technologists received 3 hours of training on the Alpha Core Curriculum CD and then shared that knowledge with the teachers on their campuses. They were also asked to select 8 hours of various "train the trainers" workshops to help them develop their campus activities. In the Spring, 130 workshops were offered districtwide. Teacher Technologists were asked to perform 6 hours of campus-level training to at least 10 different teachers with a minimum of a one-hour block of time and then submit a documentation package which included agenda, sign in sheets and scan sheets. Level 2 Proficiency Awards were given to Techs who fulfilled minimum expectations for the year and developed a curriculum integration guide.

1996-97 Districtwide technology workshops were offered on general topics and the Beta Core Curriculum CD. Teacher Technologists received 3 hours of training on the Beta Core Curriculum CD. They were also asked to take 3 hours of HyperStudio training and 3 hours of troubleshooting hardware and software and then give 3 hours of campus level training. In the Spring, Districtwide technology workshops were presented by Teacher Technologists and conducted at campus sites, as well as the computer labs at Nolan Estes Plaza. Teacher Techs were asked to take 3 hours and give 3 hours of training on their campuses. At the Spring meeting at Townview Magnet Center, Techs who had been in the program for 5 years were recognized with special shirts and certificates.

1997-98 Districtwide technology workshops were held at four field sites (Bethune Elementary, E.D. Walker, Bryan Adams High School, and Ray Elementary) and Nolan Estes Plaza. A total of 141 classes were held in general technology topics. In addition, campus teams were trained in Web Page Design and then received a copy of *Claris Web Page* or *Front Page*. Over 500 first grade teachers were trained for 30 hours in technology support of reading and math. Over 200 third grade teachers were trained in tech support of reading in the Spring. Over 100 Algebra I teachers were trained in the Spring. Teacher Techs were given flexibility throughout the year to give or receive 9 hours of training each semester. Experienced Techs could go outside the district to receive training.

1998-99 Districtwide technology workshops were held at four field sites (Bethune Elementary, E.D. Walker, Skyline Center, and Chavez Learning Center) and Nolan Estes Plaza. A total of 136 classes were held in general technology topics. Over 500 second grade teachers were trained for 18 hours in technology support of reading and math. Over 200 third grade teachers were trained in tech support of reading. Over 100 Math 7 and Math 8 teachers were trained. Teacher Techs were given flexibility throughout the year to give or receive 9 hours of training each semester. New Techs received special training on troubleshooting. Curriculum integration and technical assistance logs were required. A special technical certification program was designed through outside training vendors to provide a variety of technical classes from computer and peripheral troubleshooting to Novell 4.0.

vita

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Education:

West Virginia University, Morgantown, WV 26506
Ed.D. in Reading and English Education, December 1999
MA in Reading, August, 1991
Bethany College, Bethany, WV
BA in English, May 1978

Teaching:

University of Texas at Arlington, Arlington, TX
Aug. 1999 –present **Assistant Professor of Reading**
Aug. 1998 – May 1999 Visiting Professor

Fall 1999
Reading 4343, *Reading and Writing Across the Curriculum* (field-based course)
Reading 5325, *Issues in Literacy*
Reading 5390, *Literacy Assessment and Instruction* (taught in Dallas at Marshall Elementary School)

Sum I '99
Reading 5325, *Issues in Literacy*
Reading 5350, *Literacy Assessment*(Clinical Reading)
Reading 4343, *Reading and Writing Across the Curriculum* (field-based course)

Fall 1998
Reading 5390, *Literacy Assessment and Instruction* (2 sections) taught in Dallas
Reading 5325, *Issues in Literacy*

Spr 1999
Reading 5390, *Literacy Assessment and Instruction* (2 sections) taught in Dallas
Reading 4343, *Reading and Writing Across the Curriculum* (field-based course)
HEED 1302, *University Success*

West Virginia University, Morgantown, WV 26506
Adjunct professor

Sum 1998
Reading 327, *Developing Reading Interests*
Graduate Teaching Assistant

Spr. 1998
Reading 222, *Reading in the Content Areas* (2 sections)

Fall 1997
Reading 222, *Reading in the Content Areas (2 sections)*

Spr 1997
Reading 222, *Reading in the Content Areas* (2sections)

Fall 1996
Reading 222, *Reading in the Content Areas* (3sections)

Spr 1996	Reading 222, *Reading in the Content Areas* (3 sections)
Fall 1995	Reading 222, *Reading in the Content Areas* (3 sections)
Spr. 1995	Reading 222, *Reading in the Content Areas* (2 sections) C & I 225, *Approaches to Teaching Literature*
Fall 1994	C & I 120/Reading 221, *Elementary Education Methods & Developmental Reading* C & I 124, *Language Arts Instruction in the Secondary Schools*
Spr. 1994	C & I 7, *Introduction to Education* Reading 222, *Reading in the Content Areas* • supervision of elementary student teachers • assisted with supervision of the Reading Clinic at West Virginia University
Fall 1993	Reading 222, *Reading in the Content Areas* • directed observation for C & I 120/Reading 221
Spr 1993	Reading 330, *Teaching the Language Arts* (Off-campus) • directed observation for C & I 120/Reading 221
Fall 1992	C & I 7, *Introduction to Education* • directed observation for C & I 120/Reading 221 • adjunct faculty for the English Department at WVU---taught English 2, *Composition and*Rhetoric
Spr 1992	C & I 225, *Approaches to Teaching Literature* (team taught with Dr. Jeanne Gerlach) Orientation 1, *Developing College Study Skills* C & I 280 C, *Speed-reading Workshop*
Fall 1991	Orientation 1, *Developing College Study Skills*
Spr. 1991	Orientation 1, *Developing College Study Skills* C & I 280 C, *Speed-reading Workshop*
Fall 1990	tutored individual college students at the WVU Reading Lab

1997-98 Reading tutor--- I contracted with individual clients to assess and work with their children in developing reading skills.

1996-98 Substitute teacher---I worked for the Marion County Board of Education in West Virginia on days when I was not teaching at WVU.

1985-90 North Central (WV) Opportunities Industrialization Center, Inc., (OIC), Fairmont, WV 26554, Thelma Ford, Director
Title: GED/Basic Education Instructor

1984-85	Barbour County Schools, Philip Barbour High School, Route 250 South, Philippi, WV Title: English Teacher
1981-84	West Virginia Northern Community College, 15th & Jacob St., Hazel Atlas Building, Wheeling, WV 26003, Wayne Hughes, Director of the JTPA Program Title: Lab Assistant

Related Professional Experience:

Aug. 1999	Two-week summer institute at the Bronx Zoo in New York City to work with science educators, administrators and informal science institutes to train in how to teach middle school children using inquiry-based science methods (Project T.R.I.P.S. funded by the NSF)
Aug. 1999	Conducted a teacher education in-service session at the Dallas Zoo (readability formulas for assessing in-house curriculum materials and specific reading strategies)
Spring 1999	Nominated for the Provost's Teaching Award
Fall 1998-Spr.1999	UTA Gateway Program Task Force
Dec. 1998	Read-aloud presentation to a fourth grade class at Metro Christian Academy
Feb. 1999	Presentation to fourth grade class at Metro Christian Academy
Feb. 1999	Reviewer for program proposals for the American Association of Teaching and Curriculum (AATC) Conference, Oct. 1999

Professional Affiliations:

- UTA Student Reading Association
- National Council of Teachers of English (NCTE)
- Doctoral Student Assembly of NCTE
- International Assembly of NCTE
- Women in Literature & Life Assembly (WILLA)
- Assembly on Computers in Education (ACE)

Publications:

Rinehart, S.D., Gerlach, J.M., Wisell, D.L., & Welker, W.A., (Summer 1998). Would I like to read this book?: Eighth graders' use of book cover clues to help choose recreational reading. Reading Research and Instruction, 37 (4), 263-279.

Rinehart, S.D., Gerlach, J.M. & Wisell, D.L. (1994). Choosing a book: Are bob summaries helpful? Reading Psychology: An International Quarterly, 15, 139-153.

Workshops Presented:

"Developing College Notetaking and Reading Techniques", Training and Development, West Virginia University August 18th & 25th, 1994 and August 17th & 31st, 1995

Conference Presentations:

"Planning Our Futures Together" presented to the Student Doctoral Assembly at the National Council of Teachers of English 88th Annual Convention in Nashville, Tennessee, November 19-24, 1998.

"*A Literary Map of West Virginia Writers and Storytellers*" presented at the West Virginia English Language Arts Council (WVELAC) Annual Meeting in Morgantown, West Virginia, April 30, 1994.

"*Mapping Living West Virginia Authors---Mountain Themes, Lifestyles, Roots, Culture, and Creative Writing"* presented at the Goldenrod Conference in Morgantown, West Virginia, October 14, 1994.

"*Creative Ways to Teach Adolescent Literature"* presented at the Women and Creativity: Changing Lives Conference held at West Virginia University, November 11-13, 1994.

"*Choosing A Book: Are BOB Summaries Helpful?* a small group session at the *"Coming of Age in an Age of Change"* two day workshop at the Assembly on Literature for Adolescents (ALAN) of NCTE in Orlando, Florida, November 16-17, 1994.