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IMPLICATIONS OF CHANGE THEORY FOR PLANNING

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IMPLICATIONS OF CHANGE THEORY FOR PLANNING USES OF INSTRUCTIONAL TECHNOLOGY

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By

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ABSTRACT

IMPLICATIONS OF CHANGE THEORY FOR PLANNING USES OF INSTRUCTIONAL TECHNOLOGY

By

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As technology use in schools increases, the need for sound planning methods becomes more urgent. The central premise of this study is that planning should include a deliberate connection to change theory. The purposes of this study were to identify components of change theory that could potentially improve the process of planning the use of instructional technology and to test the validity of those components in a large, urban school district.

This study was completed in three stages. Stage one created a model for planning and used it to create investigation components.

Stage two tested the validity of those components using four approaches:

1. District planning documents were studied to see which processes could be explained in relation to change theory.

2. Survey responses of teachers were compared to see if agreement with change theory would vary according to levels of training and involvement in planning.

3. Interview responses of teachers were listed to see how they matched with change theory and to see if they could provide practical insight into applying change theory to the planning process.

4. Results from the first three approaches were combined to see if they could provide recommendations for successful planning processes.

All components under Support Learning Outcomes and some under each of the other major groupings were evidenced in district documents. The surveys indicated that people closer to the planning process and people with more training were more in agreement with change theory than people less involved in planning and training. Interview responses matched many of the investigation components and provided suggestions for improving the planning process.

The combined results from the analyses of documents, surveys and interviews were consistently in support of the investigation components under Support Learning Outcomes but were mixed under the other major groupings.

Stage three produced a recommendation for each component validated in interview responses and excerpts from district planning documents. Further recommendations were based on results pertaining to the level of involvement in training and the planning process.

This study produced 39 general recommendations for improving the planning process and a set of specific recommendations for the school district involved in the study.

To my family, Judy, Adam, Erin, and Sarah, for their patience, love and support.

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CHAPTER I

INTRODUCTION

In the past 10 to 15 years, technology has transformed business and industry; and with more and more pressure to improve education, it has been proposed that the use of technology is now the last hope for real educational reform. Schools throughout the country are grappling with the problem of how to change education, and most see technology as part of the solution, but the use of technology brings its own set of problems. Can we support educational reform efforts and use technology to make real changes in the learning environment? How do we integrate technology into the curriculum? Can we address individual needs and support active learning and knowledge construction? Can we provide students with real-world skills? How do we train teachers? Can we establish standards that will be acceptable throughout a school district? How do we evaluate our use of technology and plan for future implementations? Most importantly, how can we answer these questions in an organized manner and establish buy-in and support from personnel throughout a school district?

Jane David (1991) has suggested that the needed reform of education and the success of technology in schools are interdependent. The needed changes in instruction can only take

place if assisted by technology, and technology can only be productive for education if changes in the educational delivery system accompany its use. Planning for the use of technology must not cover just what is used but how it can change the learning environment. Furthermore, neither educational reform nor the use of educational technology will be successful unless they are guided by a systematic, theory-based approach to planning.

> Today's technology offers powerful tools for transforming what we do, what our organizations look like, and even how we think about the world. As technology pervades all aspects of our lives, it will inevitably do so in schools as well. But whether significant changes in teaching and learning will accompany the spread of technology in schools remains an open question. (David, 1991, p. 38)

Educators have a real challenge in planning the appropriate uses of the available technologies. Much thought must go into how the technology will be used and how instruction will be affected by it. ". . . Technology is not likely to have a qualitative impact on education unless it is deeply integrated into the purposes and activities of the classroom." (Sheingold, 1991, p 20)

The Educational Technology: NEA Special Committee Report (1988) recommended careful and deliberate planning that will improve learning and teaching by focusing on student needs and how technology can be used to address those needs. Blair (1991) recommended that technology plans should be strategically oriented with a vision for the future. Sheingold, David, Collins, Ahearn and many others have suggested that effective use of technology will

happen if, and only if, it is accompanied by real changes in teaching practices. Sheingold (1991) suggested that we must treat students as active learners; cultivate their abilities to think; and provide opportunities for them to ask questions, solve problems, construct knowledge and apply what they learn.

Statement of the Problem

School planners have few models or guidelines to follow. The use of technology is relatively new to education. Dealing with the changes necessary for proper implementation of technology or even dealing with the changes brought about by using technology requires skills that educators haven't needed in the past. All school districts encounter some obstacles in planning the use of instructional technology, but large, urban school districts have complex mixes of them and bureaucratic systems that make it very difficult to make changes. School district personnel generally are not prepared to plan for change. Each time a plan is developed, much time is spent planning how to plan.

Districts are generally willing to share their plans, but plans are not easily ported from one district to another without becoming just shopping lists. What is needed is a systematic process for planning that will allow district personnel to tailor plans to fit their unique needs and provide them with a method of coping with problems as they arise.

Many schools have developed plans for purchasing technology equipment without attempting to change the learning environment. If technology is to promote improvements that the reform movement

has called for, it must bring changes with it. But making changes is a difficult task in large, urban school districts, especially since there are few guidelines for technology planning that will facilitate the change envisioned by reformers.

Purpose of the Study

This study was undertaken to provide guidelines for a systematic theory-based approach to planning for technology change in education. One purpose of this study was to identify components of change theory that could potentially improve the process of planning the use of instructional technology. A second purpose was to test the validity of those components in a large, urban school district.

Testing the validity of the components involved using four different approaches, with each seeking evidence of process and behavior consistent with change theory.

1. One approach identified methods used in a large, urban school district by studying district planning documents to see which existing processes could be explained in relation to the components of change theory.
2. A second approach compared survey responses of people with varying levels of training and involvement in the planning process to see if their agreement with components of change theory would vary according to their training and levels of involvement in planning.
3. A third approach mapped the investigation components onto the listed interview responses of people with training and

involvement in the planning process to see if they could provide practical insight into applying change theory to the planning process.

4. The final approach mapped the investigation components onto the combined results from studying district documents, surveys of varying groups, and interviews in an effort to derive recommendations for successful planning processes.

Importance of the Study

Campoy (1992) suggested that though schools are embracing the use of technology, many educators and the general public are very naive about the role of technology in schools and how it should be implemented. Most school districts have accepted the idea that they must develop some type of technology plan, but they have few guidelines to follow. Many of their plans end up lacking vision of how the technology will be implemented in the learning environment.

School personnel are attempting to find a method of planning the use of instructional technology and many suggestions made for successful use of technology are in agreement with tenets of change theory. Therefore, it appears that a thoughtful planning attempt should have a clear connection to change theory. This study was initiated to identify components of change theory that offer the possibility of improving the process of planning the use of instructional technology. The results of this study could provide guidelines and a model for uses of educational technology that large, urban school districts are seeking.

Stages of the Study

There are three stages to this study that are depicted graphically in figure 1.

Stage 1

In the first stage, in response to the problem of a lack of guidelines for planning, research question 1 was formulated to guide a search of research literature. It was undertaken to find recommendations from change theory that could be used to create a model for planning the use of instructional technology.

Research Question 1

What **components of change theory** can potentially improve the process of planning the use of technology and educational reform?

Investigation components.

The investigation components are principles and procedures related to planning the use of instructional technology that were derived from an examination of change theory and related research literature. The investigation components include four major groupings:

I Support Learning Outcomes

II Active Leadership

III Collaborative Planning

IV Plan for Change

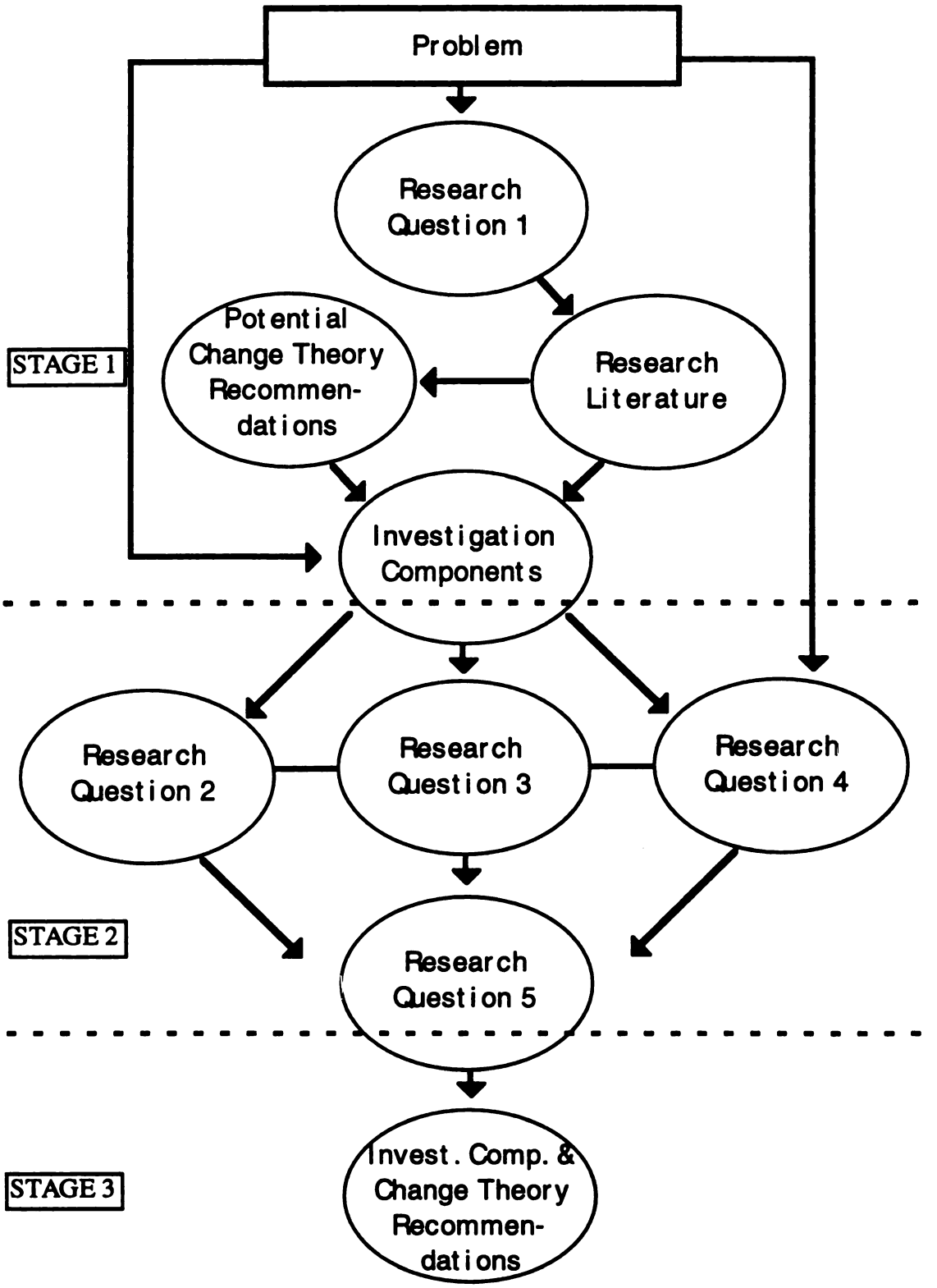

Figure 1: Stages of the Study

Each of the major groupings or components are broken down into subcomponents labeled A, B, C, . . . The components are listed in detail in The Summary of Investigation Components in chapter 3.

Stage 2

The second stage addressed four research questions formulated to examine the planning in a large, urban school district to develop some guidelines for planning. Research questions two, three, and four were addressed by mapping the investigation components onto information from the district documents, surveys, and interviews respectively. Research question five was addressed by comparing results from those questions to each other and the investigation components.

Research Question 2

What elements of **district planning documents** reveal evidence of the application of change theory to the planning process?

> Example: A statement in Special Issues from the Superintendent, ". . . the use of technology in our classrooms is essential for our students as we strive to prepare them for success in a highly technological and information-based society." supports change theory as presented in investigation component ID, "Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data."

Research Question 3

Do **survey responses** indicate that people close to the planning process are more in agreement with change theory than are people who are not so close to the planning process, and do the survey responses indicate that people with more training are more in agreement with change theory than are people who have had less training?

Survey questions.

The survey questions were constructed to match the investigation components identified in response to research question 1. A set of three questions in the form of statements were formulated to correspond to each of the 13 subcomponents labeled A, B, C, . . . (Two sets each were formulated for five of the subcomponents. Thus, a total of 54 questions were created.) Each set included a general statement, a school statement, and a personal statement. For example, Questions IIB1, IIB2, and IIB3 were derived from The Investigation Components in II. Active Leadership, B Standards and spreading innovations. Question IIB3, "I have had access to technology training and courseware/software that is appropriate for my needs." is a statement about the "personal" investigation component, that is, whether the investigation component has been put into practice in a manner that affects the respondent personally. A high score in response to IIB3 indicates that the respondent has found evidence of the results of that investigation component that affect him/her personally. A copy of the survey is included in Appendix B.

Hypotheses.

Each survey statement was matched with one hypothesis below. For example, Statement IA1, "Planning must address student needs and how teachers can address those needs with technology.", was matched with hypothesis $H_0$1. In an attempt to help answer research question 3, this statement was used to see if members of the Technology Planning Group who are closer to the planning process than the other teachers would respond with different scores than members of the School Planning Group or the Classroom of Tomorrow Group. This statement was also used to see if teachers in training level 3, who had more training than the others, would respond with different scores than members of training level 2 and training level 1. In either case, a higher score would indicate more agreement with this component of change theory.

$H_0$1: There are no significant differences among the responses of teachers to "IA1 Planning must address student needs and how teachers can address those needs with technology." when the teachers are classified by planning group or by training level.

$H_0$2: There are no significant differences among the responses of teachers to "IA2 In our school, teachers and staff are addressing student needs with technology." when the teachers are classified by planning group or by training level.

$H_0$3: There are no significant differences among the responses of teachers to "IA3 I am currently addressing student needs with technology in my classroom." when the teachers are classified by planning group or by training level.

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Groups.

Each teacher responding to the survey was a member of one of three groups. The Technology Planning Group (TCH) was comprised of 35 teachers involved in the technology panels. They were the group most involved in the district planning process. The School Group (SCH) was comprised of 35 teachers from Northeast Middle and Southeast Academic Center. These teachers were from schools involved in the planning process, but each individual was not necessarily as involved as the teachers in the TCH Group. The Classroom of Tomorrow Group (COT) was comprised of 34 teachers who had received computers from the state in October, 1990. They had no formal involvement in the planning process.

Training Level.

Each teacher responding to the surveys was also a member of one of three training levels. Training level 3 (trng3) included 26 teachers who had been involved in 45 hours or more of technology training. Training level 2 (trng2) included 31 teachers who had been involved in 15 to 30 hours of technology training and training level one (trng1) included 47 people who had been involved in no formal technology training.

Research Question 4

Do **interview responses** reveal evidence of the application of change theory to the planning process?

For example, the interview response, "We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers." supports change theory as presented in investigation component IIA2, "Implementation must focus on teachers."

Interview questions.

The interview questions were constructed to provide additional information related to the investigation components. They were open ended questions designed to provide respondents with an opportunity to express their opinions about the planning process. A copy of the questions is included in Appendix C.

Research Question 5

How are the results of examining **the planning documents, the surveys and the interviews** related to each other with respect to the investigation components, and are there factors other than the investigation components which make the planning process more understandable?

Combined results.

Research question 5 was addressed by comparing and contrasting the results from the documents, surveys and interviews. For example, if documents give evidence that district planning is aligned with change theory with respect to Support Learning Outcomes, do survey results suggest that all teachers are equally in agreement with change theory in supporting learning outcomes or

does this depend upon their levels of involvement in planning and their participation in training? Do the interview responses suggest that the people chosen to interview agree that district plans with respect to Support Learning Outcomes have been put into practice and do they have suggestions that would support, disagree with, or go beyond district document plans? The results of the documents, surveys and interviews were listed in a matrix in Chapter 5 to make it easier to make comparisons.

Stage 3

The final stage involved using the answers to question 5 and the investigation components to make recommendations for the planning process. The investigation components that were validated in responding to research question 5 were included in the recommendations in Chapter 6.

Limitations

Participant Observation Study

The researcher was the Manager of Instructional Technology for Grand Rapids Public Schools, the location of the study. He had been very involved in the planning process and the preparation of some of the district documents used in the study. Therefore, his involvement may have affected some of the results.

Nonrandom Groups

There was no random assignment to groups. The Technology Planning Group was comprised of individuals who had been previously selected to perform a task; it included everyone who had been in that group. The School group consisted of people from two schools, and the Classroom of Tomorrow group was a random selection from the 160 people who had received computers from the state. A random assignment would have made it very difficult to give the groups the varying levels of involvement in planning that was naturally in these groups.

Non-uniform Group Sizes

The Planning groups were similar in size (TCH-35, SCH-35, COT-34), but the training levels were not (trng3-26, trng2-31, trng1-47). The size of the planning groups were relatively similar by the selection process, but the training levels were based on the experience of the individuals involved. The main result of this grouping was to produce conservative results by training level.

Generalizability of the Findings

To make conclusions about the results based on the groups and training levels involved, a more controlled study should be done, but the recommendations for technology planning based on change theory should be a good starting point for any large, urban school district.

CHAPTER II

REVIEW OF LITERATURE

The focus of this review is on the force for instructional change, obstacles to change, methods for achieving change, planning, and the change process as they are related to the use of technology in education.

The first section, Force for Instructional Change, presents demands for changes in education that have come from a variety of sources. It suggests that the reform of education and the productive use of technology in education can not happen independently. The productive use of technology will only happen if it is integrated into the curriculum to intentionally change the learning environment, and the reform of education can not happen without the use of technology.

The second section, Obstacles to Change, presents reasons that many change efforts have failed to produce the intended results in the past. It suggests that some efforts have involved improper implementation or were given little support. The use of technology has not included comprehensive plans for integrating technology into the curriculum or making school improvement.

The third section, Methods for Achieving Change, presents the criteria for promoting educational change. It proposes collaborative

planning for integration of technology into the curriculum, adequate staff development, evaluation, resources, and consensus building.

The fourth section, Planning, suggests that planning must include input from implementers and that each technology must be accompanied by a method for integrating it into the curriculum. The planning must include school-based planning with a method of monitoring at the district level. Planning is to focus on student and teacher needs through consensus building and should be guided by inspirational themes.

The fifth section, The Change Process, presents implications for planning derived from the Rand Study, educational change models, and current educational change research. It suggests visioning, collaborative planning, and training and support. Beyond rational planning models, it presents a need for consensus building, cultivating ownership, changing teacher beliefs and practices, and actively planning for problem resolution.

Forces for Instructional Change

"Americans will remember 1983. During that year, deep public concern about the nation's future created a tidal wave of school reform which promises to renew American Education." (The Nation Responds, 1984, p. 11) The Task Force call for an educational system that allows each student to learn in the way and the pace best suited to him or her is quite an order. It is a call not for a few changes in the system but a complete overhaul of the system. Asking for individual mastery for students and efficiency in the

delivery system is a reasonable request, but it is not one that can easily be fulfilled.

Preparation for the Work Force

People have pointed out that there have been many times in the past that the time for change was at hand, but nothing of significance happened. Lewis J. Perelman (1987) explained that we have a much more drastic situation now, because everything is happening around us, but it is not happening in education. He suggested that schools must change or be doomed to antiquity in the next ten years. He sees technology as necessary to make schools more effective. Much of Perelman's change is based on the role of teachers, the use of technology, and changing of the delivery system.

The crisis in American education has been based on the gap between the demands of the work force and the preparation for them. The presence of technology in the world has magnified the challenges for schools in such a way that technology is necessary for the education system to survive. If we are to prepare students for the changing work force, we must prepare them to access and process information. Workers must be capable of using technology in collaborative work groups for problem solving, communicating, etc., but they will only be capable of applying the appropriate skills in the work environment if they experience them on a regular basis. Schools must serve diverse populations and adjust to the evolving work force while facilitating individual mastery of a rapidly growing body of knowledge. Pressure is on to change the instructional delivery system and tools are available.

Allan Collins (1991) suggested that as the computer takes on a bigger and bigger role in the rest of society, it has to eventually play a major role in education. He proposed that in the next century, educated people will have to learn and think in a computational environment. Because schools do not currently emphasize those abilities, it is time for a major change in the function of schools.

> Curriculum and instruction must change from an emphasis on isolated facts, skills, and coverage to a focus on integrated content, on the application of skills, and on the development of conceptual understanding. Teaching must change from dispensing information and rewarding right answers to creating activities that engage students' minds and present complex problems with multiple solutions. (David, 1991, p. 39)

Wide spread use of technology in business and industry has paved the way for its use in schools. Ten years ago, there was some question about whether technology belonged in education and many people worried that it might change the role of teachers. Today, it is widely accepted that technology belongs in education and it must change the role of teachers. Teachers are to become facilitators who support and assist students in constructing knowledge. Karen Sheingold (1991) referred to "active learning and adventurous teaching" as a vision of what education should be. She stated that word processing and graphing can help organize material for students and that videodisc technology can expose students to real world situations that can promote problem-solving. Communication technologies can promote collaboration among students and a wider educational community. Textbooks can not compete with the

technology that is available today unless teachers "force" their use. Teachers must learn to adapt to an educational environment that is entirely different than what they learned in or began teaching in. For a teacher/administrator population substantially in the last one third of their careers, this is a drastic change, one that requires new methods of staff development.

The whole method of delivery must change if we are to prepare students for the changing work force, but technology purchases alone will not change schools. Karen Sheingold (1991) suggested that technology in schools must be linked directly to improving learning and it must be totally integrated into classroom practices, but this requires some major changes for all people involved.

Technology in American schools is way behind technology in American society. "Telephones and typewriters, films and videotapes, computers and optical data storage have scarcely affected the operations of the schools, while they have transformed the operations of most businesses." (Mecklenburger, 1990, p. 106) In Educating Americans for the 21st Century (1983), it was stated, "Modern information technologies offer a tremendous potential for improving education and could revolutionize the education process." (p. 51) "Schools are meant to prepare students for the adult world, and the computer is a basic tool of everyday problem solving in many fields. We are surrounded by computer applications that should by now have found their way into school curricula." (McKenzie, 1987, p. 46)

Fey and Good (1985) suggested that the technology available today offers a chance to teach new topics and to develop new

approaches to old topics. They see technology as both the means for change and the reason for change. According to Jeremy Kilpatrick (1985), "few people realize that computer science is changing the shape of mathematics as a discipline and consequently will affect the mathematics taught in schools and colleges" (p. 22) The student will need a better understanding of the structure of math and how to harness the power of the computer to do the bulk of the computations that have burdened mathematicians in the past. Kilpatrick suggests that the world around us is dominated by statistics and that college students will be expected to gather and interpret statistics. High school can only prepare students for this if they are handling real statistics. The use of computers will allow them to manipulate realistic data. They should be capable of running statistical tests and graphically representing results that compete with the work of professional statisticians.

Improving the Learning Environment

According to Roy Pea (1987), computers are not just speeding up calculations and making life easier. They have the potential to promote mathematical thinking in ways not possible in the past. They can free the human mind of menial calculations and provide time for discovery and planning. In pondering the aspects of mathematical thinking that cognitive technologies can uncover, Pea suggested that conclusions made in the past about levels of development and mathematical abilities were restricted to the use of pencil and paper.

> The dynamic and interactive media provided by computer software make gaining an intuitive understanding (traditionally the province of the professional mathematician) of the interrelationships among graphic, equational, and pictorial representations more accessible to the software user. Doors to mathematical thinking are opened, and more people may wander in. (Pea, 1987, p. 96)

The important contributions to be made by computers are not easily measured. It is easy to research the effects of drill and practice software, but software that helps promote thinking affects too many variables to be covered easily. Pea (1987) spoke of "transcendent functions" that promote mathematical thinking that covers the math domain and is not restricted to a particular subject. This fits in with what people have talked about for years, the integration of curriculum areas and changing student-teacher relationships.

(David, 1991) sees the use of technology as a means of improving the learning environment.

> Students turn to one another for answers to questions; teachers, who may feel threatened at first, end up turning to students; no one knows everything. Suddenly, expert knowledge is spread around, and the teacher is no longer the sole authority in the classroom. Collaboration among students and between students and teachers occurs naturally. (p. 78)

Gwen Solomon (1992) also sees technology as a means of altering instruction from the situation in which teachers deliver

information to passive students to one where teachers are facilitators and students discover learning for themselves.

> Technology allows shifts in thinking - from making mistakes to revising, from memorizing facts to manipulating information, from struggling alone to working collaboratively. New tools allow students to pursue interdisciplinary learning and to look at information in new ways. They provide hands-on activities, enable students to create real products that demonstrate knowledge and ability, and emphasize the process of learning. (pp. 327 & 328)

Teachers can use technology effectively and the technology does not have to dictate the curriculum. If teachers know what their students should learn, they can use software that supports the curriculum, and they can facilitate real learning. Solomon used National Geographic Kids Network as a good example of technology supporting hands-on science. Students collect and test water samples and compare results with students across the country and consult with business and government scientists about their work. Videodisc and CD-ROM resources offer great potential in research that allows students to work with information to produce original presentations that involve processing skills that are not cultivated in the normal classroom. Students and educators can collect and share data, text and images on thousands of topics and create an exciting learning environment if they have access to appropriate technology and they are prepared to use it. "In a nation committed to educational equity for all students, the distribution of opportunities for electronic learning is crucial." (Mecklenburger, 1990, p. 108)

Allan Collins (1991) suggests that early successes of computers in schools have been with Integrated Learning Systems (ILSs) and drill and practice type software. ILSs consist of a set of curriculum software packaged with a management system. The management system records the progress of students and provides individualized lessons by directing the students through a sequence of lessons determined by individual mastery of objectives. ILSs and drill and practice type software have been successful because they fit nicely into the curriculum without making changes to it, but that will change. It is the use of computers as tools that will eventually penetrate schools because it is inevitable that school use of computers will adapt to the way they are used in society. The tool use of computers does fit nicely with current instruction. Word processing is a natural for the writing process; spreadsheets work well in math; and data bases are made for gathering, sorting and analyzing data that can be useful in many areas. As teachers and students become familiar with these tools, they will help transform the learning environment, but there is a need for a method of speeding up the change process involved.

"The presence of technology not only provides an opportunity for change; it also symbolizes that change. New technologies are one of the most visible and obvious manifestations of the way the world has changed and continues to change." (David, 1991, p. 78) Educational institutions must adapt to these changes, but none of it will happen automatically. Students need the opportunity to use computers in their work just as adults do. "Technology can help change the nature of teaching and learning, but only if teachers

understand it, accept it, and use it well." (Callister & Dunne, 1992, p. 329)

Hannafin & Savenye (1993) stated that the role of the teacher changes in using technology in the classroom only when responsibility is shifted to the learner. Teachers have a choice to make. They can maintain complete control with drill and practice type activities, or they can modify their role by relinquishing control to students with open-ended problem solving activities. Hannafin suggested that the Jasper Woodbury videodisc stories are a good example of realistic problem solving activities. In them, students must gather information and solve problems. They are allowed to view the footage as often as necessary to gather the needed information, and they must develop their own strategies to solve the problem. This type of technology can be very helpful in setting up student-controlled environments that truly alter the student-teacher relationship. Uneasiness over this new relationship may be misinterpreted as resistance to the use of technology, but it really is more a matter of pedagogy and the center of control. Some basic technological skills may be needed, but they must be accompanied by some sound teaching strategies and a willingness to modify the teacher's role. Callister & Dunne (1992) stated, "Teachers whose first commitment is to pedagogical, not technical considerations will be able to use computers to enhance their teaching and their students' learning. All effective uses of classroom computer technology must be based on a trust of teachers." (p. 326)

Tools and simulations allow students to take control of part of their learning environments. "To the degree computers support students' autonomous learning - and it is the goal of most educational software designers to provide such support - the particular pedagogical approach of teachers will be less decisive in determining how students learn." (Collins, 1991, p. 32) Collins stated further that the powerful uses of computers in education may be in simulation, reflection and video, but that the tool uses of computers are necessary to do work, so their usefulness for students and teachers should become quite obvious. The other functions will follow after computers are being used extensively.

For some teachers, technology may be the last hope for the revitalization that they need to continue a meaningful career. "If teaching becomes neither terribly interesting nor exciting to many teachers, can one expect them to make learning interesting or exciting to children?" (Sarason, 1971, pp. 166 & 167) There is no longer much question of whether technology belongs in schools. It's a question of how it can be acquired, how it can best be used and how it will change the educational environment.

Summary

Technology is responsible for massive changes in business and industry, but it has not accomplished much in education. As a result, the gap between the demands of the work force and the preparation in schools has widened. Over the past ten years, many people have asked for educational reform, and the cry has recently become more urgent. It is obvious that educational reform is needed and that

technology must be used more productively in schools, and it has been suggested that neither can happen without the other. Sheingold, David and others have suggested that technology is needed to improve the learning environment, but it can do this only if teachers change. Teachers are to become facilitators who create activities that engage students' minds and assist students in constructing knowledge and taking responsibility for their own learning. Therefore, planning the use of technology must be driven by an intention to improve the learning environment by changing the roles of teachers and students.

Obstacles to Change

In the 60s, many educational innovations were developed and introduced. In the early 70s, many implementations failed because they were adopted improperly (possibly chosen for the sake of change) or were given no long term support. (Fullan & Stiegelbauer, 1991) In the late 70s and early 80s, a number of individual innovations experienced some success, but since 1983, there have been a number of calls for more comprehensive reforms.

Seymour Sarason (1993) pointed out that a severe detriment to reform has been a lack of understanding between administrators and teachers.

> From the standpoint of teachers the problem is not the numbers of administrators but their inability or unwillingness to understand and to be responsive to the perceived needs of teachers. From the standpoint of administrators the problem is the inability or unwillingness of teachers to change their

practices, to be responsive to new ways of thinking. Teachers see themselves as objects of change and blame, and administrators see themselves as frustrated agents of change. (p. 261)

Lack of Technology Integration

Some people have suggested that technology is necessary to bring about change in schools, but more equipment alone does not accomplish much. Many schools and classrooms are using computers to some degree, but most school personnel are not proficient users. "Most educators have not yet comprehended the range of technology's possibilities and implications for instruction." (Ahearn, 1991, p. 3)

Historically, schools have tried new technologies and eventually have discarded them. According to Ahearn, the introduction of computers and related technology is no different because the new technology has been added to the existing classroom as a special product. It has been used as a supplementary device, not a standard tool. It must be used to change the role of the teacher and the structure of the education system.

> Teachers have reached out to adopt approaches such as cooperative learning, writing as a process, and integrated projects to involve students in a more active role in their learning. . . . However the effect of these innovations has been superficial because there has been no structural change to accommodate the explosion of information and the need for greater skill at solving problems and reasoning. (Ahearn, 1991, p. 7)

Charles Mojkowski (1989) suggested that the majority of educators and technology advocates have not yet implemented a strategy to transform education by using technology. He stated further that many uses of technology do in fact help entrench education in the very instructional practices that they should allow us to escape from.

In a study of the use of computers in primary schools, Kell & Others (1990) concluded that there is not much evidence that computers by themselves acted as catalysts for change in classroom instruction. Teachers used computers to support their normal teaching styles and approaches. In many cases, they simply transferred their traditional methods of instruction to a new medium.

One approach to integrating technology into the curriculum has been offered by vendors of Integrated Learning Systems (ILSs). ILSs are packages of computer programs with a management component that allows them to provide individualized instruction to students in a variety of subject areas. Though ILSs do offer some potential in individualizing instruction, their use fits in with traditional curriculum goals, schedules, etc. and may interfere with real restructuring attempts. They have preset content and, many times, are tied to particular textbooks which have static content. ILSs allow teachers to begin using technology without much knowledge about the technology or new teaching strategies, and it allows them to proceed without interaction with other teachers. Therefore, though ILSs appear to be an appropriate use of technology which

should support restructuring, they may stand in the way of teachers who wish to change their methods of teaching. (Newman, 1992)

Many schools attempt curriculum improvement and a technology curriculum as two separate ventures. "Indeed, we have observed many exemplary applications to technology that exist at the periphery of mainstream curriculum improvement efforts. The lack of alliances between the two efforts results in piecemeal and episodic integration efforts." (Mojkowski, 1989, p. 11)

Insufficient Planning

Society has been affected greatly by the use of computing technologies, but educational practices have not changed drastically. ". . . few technological innovations have had any real or lasting impact on the public schools and the obstacles confronting computer-based instruction are uncannily familiar." (Dalton, 1989, p. 20)

Wayne Blair (1991) indicated that the 1990 monitoring report from the National Governor's Association had shown that radical changes in the use of technology have taken place in American schools, but the changes have not brought about the transformation of schools that had been hoped for. Most school districts do not use technology to expand and diversify, and technology has not been integrated into instruction in most classrooms. "There is little evidence that educational technology plans utilize the potential of technology to transform and/or restructure education." (Blair, 1991, p. 8)

> 'Education' is the 'technology' of education - productive innovation in any component almost invariably requires modification of the entire system. The common practice of trying to simply add-on technology to education while actively prohibiting transformation of the rest of the system's social infrastructure is just what has made much of the technological experimentation in education fruitless. (Perelman, 1987, p. 33)

According to Thomas Gillman (1989), schools have been responding to the pressure to use computers in school at a time when many teachers lack knowledge of their potential and the experience necessary to use them properly.

In Technology Planning for Improving Schools (1989), it was stated that educators are not impacting student learning as they have intended, even with substantial increases in hardware and software available. It appears that their failure is not due to imperfections in hardware and software but to the lack of a comprehensive plan for linking technology applications to school improvement. Schools have failed to use technology to transform learning outcomes and teaching and learning. "Numerous reports of technology use in schools have found the lack of adequate planning and the lack of plans to be major contributors to these unrealized expectations." (p. 1) Many technology plans specify hardware and software without any emphasis on how the equipment is to be used to transform the learning environment. Strategies for changing curriculum and instruction through technology are not developed.

> Without such a strategic approach, technology applications, even whole 'technology curriculums,' have been developed on the periphery of mainstream school and curriculum improvement. Many of these technology curriculums are unrelated to the content area curriculums which they purport to serve. The lack of coordination between the two results in piecemeal and episodic integration efforts. (p. 1)

Wenifort Washington (1990) suggested that planning for technology innovations is difficult because planned change is a relatively new idea in education. He mentioned a study by the National School Boards Association (1985) that had reported that 85% of computer innovations in schools were unplanned.

Summary

Many attempts at reforming education have failed and there have been a variety of reasons. Some implementations were adopted improperly or were given no long term support. Many schools have used technology without proper training of staff. Computers have been used as supplementary devices and have not been integrated into the curriculum as a standard tool. Schools are failing to impact learning because they have no comprehensive plan for linking technology to school improvement. Strategies for changing curriculum and instruction through technology are not being developed.

Methods for Achieving Change

Restructuring with Technology

Thomas Guskey (1990) stated that most improvement programs implement one strategy at a time with the hope that teachers will keep adding the new methods and figure out how to use them all to help students. He suggested that all strategies that are being used should share common goals so they are all integrated. School leaders must keep looking at the whole picture as momentum builds with the growing numbers pushing for reforms. School personnel, politicians, parents and even students are supporting reform that will change the system and prepare students for the 21st century. "If these commitments can be sustained, technology will come to play a powerful role in transforming teaching and learning. Together, restructuring and the new technologies are a far more powerful force for change than either would be alone." (David, 1991, p. 38)

"The incorporation of new technologies into elementary and secondary education must be initiated through reconceptualizations of curriculum and instruction. Expecting the technology alone to catalyze the transformation is unreasonable and not substantiated by experience." (Mojkowski, 1989, p. 2) School personnel must have a vision of how technology will restructure their learning environment before it can happen.

Restructuring seeks to transform the current education system into one capable of providing students with the kinds of skills they need in today's world and the world of tomorrow. This

> means not simply improving what schools already do, but changing school practice fundamentally. (David, 1991, p. 38)

According to Gillman (1989), schools are not designed to handle spontaneous change. As the rest of the world is exposed to technological advances at an ever increasing rate, schools will have to find a way to respond more quickly to our changing social requirements. Schools will certainly continue to increase the use of technology, but whether they will ever realize its potential is a big question.

> The requirements for fully exploiting this technology are such that the schools find themselves constantly challenged to foster curricular change. This is an uncomfortable situation for many professionals, but change and the constant need to adapt are evidently givens of the age in which we live. (p. 13)

Using the Concerns Based Adoption Model (CBAM), Hall & Hord (1987) emphasized that educational change is "a process, not an event" and that any efforts at promoting educational change must monitor the perspective of the participants and have concern for the human change that must accompany any innovation. Karen Sheingold (1991) suggested that the real changes necessary in education are dependent upon three movements happening simultaneously. We must treat students as active learners; cultivate their abilities to think; and provide opportunities for them to ask questions, solve problems, construct knowledge and apply what they learn. We must restructure schools to provide this type of learning environment and we must integrate the use of technology into all subject areas to support active learners.

The real world can be brought to students through VCRs, CDs and videodiscs. Students can use word processing, data bases and spreadsheets to organize and process information. They can use simulations and on-line communications to support collaborations. These provide many opportunities for small group or independent work. They also suggest that the role of the teacher will have to change. Allan Collins (1991) suggests that, though the role of teachers will naturally change over time as computers become more pervasive in schools and the teaching force becomes more proficient with them, we should be looking for ways to speed up the process.

Bechtelheimer and Tamashiro (1987) presented survey results that suggested that training teachers in specific content applications in computer use can not only improve performance in those applications, but it can make real changes in teaching styles. They described two courses that they thought really made a difference with teachers. One of the courses was set up to examine instructional strategies which were made for effective and practical lessons in specific subjects involving computers, and the other involved ways of using software in various elementary areas. The approach was to use the software the way it should be used in the classroom. Modeling and role-playing were used extensively with a constant effort at making connections to ways that all individuals involved could use the software in their classrooms. The authors' conclusions from surveys of the teachers involved were that the courses made a big difference in personal and professional growth. They described their results as the "teacher renewal" that is hoped for in inservice programs. Jane David (1991) described

technology as a symbol of change. Its use in education represents the way the world is changing and it communicates many of the ideas that underlie restructuring. "Thus the introduction of technology can lead to changes in teaching and learning that are consistent with the goals of restructuring." (p. 78)

Integrating into the Curriculum

"Unfortunately, the promise that new technologies will enhance learning has yet to be realized." (Bagley & Hunter, 1992, p. 23) Computer programming, computer literacy and computer drills and tutorials have not really changed education. The emphasis now must be on integrating the use of technology into the curriculum.

John See (1991) presented a list of characteristics of successful integration efforts:

- a vision for the future
- a plan for integrating technology into the content areas
- ownership and commitment by the teachers
- support from the school board, administration, and community
- appropriate staff development opportunities
- availability of hardware, software, support personnel, and related resources

Michael Berger (1975) suggested that there are three main components to educational change and that they must function together. They are planning, implementation and evaluation. "A direct correlation seems to exist between the extent of planning and the degree of success eventually achieved." (p. 151) It is in the

planning stage that all stakeholders are identified and mutual trust is established. Increasing the number of people with a vested interest in the innovation (preferably volunteers) will improve the chances for a successful implementation. This must be followed by extensive training for all personnel involved. They need to learn strategies and techniques, and they must also be educated on the value of the innovation and how to make the best use of it. Training and feedback must continue until the innovation becomes a permanent part of the system. Formative evaluation should take place throughout the change process and eventually summative evaluation should be done to assess the extent of success or failure realized by the innovation.

Restructuring of schools and "teacher renewal" will only take place if a sound planning process is in place. There are many decisions to be made about which types of technology can be appropriately integrated into the curriculum, how they can be successfully implemented, what training and level of support is necessary and how the funding can be arranged.

Summary

All initiatives within a district must share common goals. The use of technology must be planned with curriculum and instruction with emphasis on restructuring the learning environment to provide students the skills needed in our changing world. We must integrate technology into all subject areas; treat students as active learners; and provide them with opportunities to solve problems, construct knowledge and apply what they learn. To do this, we must have a

vision for the future; a plan for integrating technology into the content areas; ownership and commitment from teachers; adequate support and training; and availability of resources, all encompassed in a sound planning process.

Planning

"Change or growth in education without goals and planning is no longer justified." (Eiben & Milliren, 1976, p. 109)

> While educational technology experts applaud the inclusion and expansion of technology in school programs, they are cautious about how this technology is being planned and implemented. Many educators, as well as members of the general community, are naive about the ramifications of technology implementation, and proceed without a clear understanding of both the role of technology in schools and what are reasonable expectations. (Campoy, 1992, p. 17)

Comprehensive Planning

Jamieson McKenzie (1987) suggested that during the 1960s and 1970s, there was a premium on change for change's sake, but that the Information Age demands a better approach. "Districts can create solidly innovative programs by placing planning high on the agenda while supporting the efforts of champions and using tests that match planned outcomes." (p. 21) The desired changes must be envisioned, and a picture must be drawn for all people involved in the instructional process.

> Educational planning intends to create a better future for individuals, groups, organizations, and society. Planning identifies where to go, why to go there, and provides the basic criteria for determining if and when you have arrived. Poor planning will take you to unwanted and unintended destinations, possibly ones even worse than those currently being reached. Planning should ask and answer important questions about purpose. (Kaufman & Herman, 1991, p. 4)

> While valuable ideas about educational change may emanate elsewhere, the specific educational changes to be made and the strategies to be used to bring them about in a particular school district need to be developed locally. In short, they need to be tailor-made for the particular community in question. (Kent, 1979, p. 240)

John See (1991) stated that flexibility is a key element of any educational plan and that there are no plans that will work for all schools. "A successful technology integration effort for one school district may serve as a model for another district, but the process of developing the plan, with input from those who will implement the plan, is essential for success." (p. 38)

> What is needed in every change effort is a tailor-made strategy designed to resolve a particular problem or issue in a way pertinent to the district's specific educational setting and political milieu. Such a strategy for change should consist of diagnosis, definition, initiation, implementation, monitoring of instructional and support environments, monitoring of

> instructional effects, and provisions for stabilizing the program within the district over time. (Kent, 1979, p. 257)

Louis & Miles (1990) did five in-depth case studies of high schools that were improving in Boston, New York, New Jersey, Cleveland, and Los Angeles. They stated, "Our study suggests very strongly that the presence of good planning helps to determine whether urban schools actually change for the better." (p. 190)

All participants must be made aware of the technology and its potential, and they must be directed through a process that will encourage change. Each new technology that is proposed must bring with it a method of integrating it into the curriculum, expected outcomes, necessary support and training and implementation and evaluation procedures. None of these things are automatic. They need to be well thought out with respect for the stages of development of individual participants as they are involved in the change process.

Williamson & Johnston (1991) suggested that school-based planning is important in every district change effort because the teachers and administrators of the buildings are the real implementers of any change effort. He also stated that the school-based planning must be monitored at the district level to ensure that quality and district standards are being met. This can create a perception among building staffs that the district office is dictating to them. Therefore, it is important that school personnel are given the responsibility of developing plans and that monitoring efforts do not limit their decision-making capabilities. This requires a collaborative effort and extra support during implementation.

Special attention must be given to the needs of individuals. They will be devoting extra time and effort to planning and may have doubts about accomplishing new goals without giving up old ones. A process must be created that will provide a variety of staff development opportunities. It will be necessary to develop skills needed for implementation while recognizing that individuals will approach the innovation with different skill levels and learning styles.

Leadership

Special emphasis must be placed on ensuring that school administrators receive the necessary support and training because they will be instrumental in leading change efforts, supporting teachers and providing a vision for the school.

Teachers need the ability to decide for themselves how technology should be used in instruction. "STS (sociotechnical systems) theorists have found that basic systemic innovations or transformations depend on communication networks among participants, rather than on top-down or center-to-periphery processes." (Perelman, 1988, p. 24).

On the other hand, ". . . administrative leadership and authority is vital to successful innovation" (Baldridge, 1975, p.158) Decentralization may encourage innovation, but innovations are more likely to spread in an organization if there is centralized responsibility for developing and supporting innovations. Administrators and department chairs are important communication links in the change process. The results of a survey of Ohio schools

done by Wenifort Washington (1990) indicated a strong relationship between administrative support and computer program effectiveness. It also suggested that there is a relationship between computer program effectiveness and the use of computers in work by administrators and teachers.

Focus on Teachers and Students

Educational technology plans should be strategically oriented to avoid being entrenched in a mechanistic, linear process. (Blair, 1991) They should involve long range planning because a vision of the future is necessary to determine present directions. Educational Technology: NEA Special Committee Report (1988) stated a belief that careful and deliberate planning can constructively advance the uses of technology to improve learning and teaching. It emphasized that the planning should focus not on hardware and software, but on student needs and how teachers can address those needs with the use of technology. It recommended that resources should not be limited to hardware. They should include staff development, software and research into curriculum integration and development. They also recommended that all schools should develop and implement a plan that would provide a computer and adequate software on the desk of every teacher by 1991.

Wood & Smellie (1990) stated that three conditions are necessary for technology to effectively change educational environments: 1) good advance planning, 2) appropriate and extensive inservice training and 3) easily accessible high quality courseware/software. They also emphasized that technology use is

to be curriculum driven. "Technology is not just equipment, but instead a systematic process for designing effective learning experiences." (p. 12)

Planning Models

Louis & Miles (1990) suggested four types of planning models: Long-range Planning, "Muddling Through", Strategic Planning, and Evolutionary Planning.

They described Long-range Planning or "The Blueprint Model" as a rational process that involves analyzing performance problems and setting measurable goals annually and long-range, with an exhaustive search for alternative ways of meeting the goals and a detailed plan for implementing the alternatives. They suggested that humans are not capable of ideal planning, but effective leaders should attempt to approximate the approach of the rational planner. A shortcoming of this model is that much of the planning is done at the district level and it may alienate building personnel who are not a part of the planning process.

What they call "Muddling Through" is an incremental strategy that involves making decisions only when they can not be avoided and allowing the decisions to be made at the lowest possible levels. Advantages to incremental planning are that it promotes decentralized control and allows ideas to be tried out on a small scale before committing to a large group, it may be the only alternative because long-range planning is unrealistic, and it allows more creativity. However, it is not sufficient to handle major changes especially when facing outside pressures.

Strategic planning is intended to place an organization in a position that will allow them to respond quickly to environmental pressures. It uses key administrators to realign missions and goals, and it stresses a unified understanding of what the organization should be. It is generally limited to five years or less, and decisions are made by intuition rather than quantitative analysis. Traditional planning methods are used to carry out the mission defined by the strategic plan. According to McCune (1988),

> Strategic planning is a process or series of steps that move an educational organization through:
>
> 1. understanding the external forces or changes relevant to it;
> 2. assessing its organizational capacity;
> 3. developing a vision of its preferred future as well as a strategic direction to follow to achieve that vision;
> 4. developing goals and plans that will move it from where it is to where it wants to be;
> 5. implementing the plans it has developed; and;
> 6. reviewing progress, solving problems, and reviewing plans.

Louis and Miles (1990) stated that strategic planning is good in some organizations, but it may not always be effective in closely regulated organizations like schools.

Evolutionary Planning refers to a compromise. It suggests that an organization should make efforts to gain consensus on direction, plan strategies to get there and use decentralized experimentation to make use of individual creativity. It emphasizes that it is

possible to have a well-defined mission and still have flexibility in redefining strategies to carry out the mission. Louis and Miles stated that their studies suggest that the evolutionary model is the best model for making major changes in schools.

Evolutionary planning departs from most other descriptions of planning in three significant ways:

- The first premise of evolutionary planning is act - then plan.
- The second premise is pay less attention to missions and goals and more to inspirational themes to guide the change process.
- The third premise is that evolutionary change requires reflection on the relationship between action and improvement, including the careful effort to renew staff commitment to both. (Louis & Miles, 1990, p. 215)

They stated further that no matter what they looked at in their study, it pointed to the fact that consensus and good planning helped move schools toward improved teaching effectiveness. The process of planning and its effect on commitment were more important than the planning steps or the quality of the plan.

Summary

The process of developing a plan with input from implementers is essential for success. Each new technology must bring with it a method of integrating it into the curriculum, expected outcomes, necessary support and training, and implementation and evaluation

procedures. School-based planning is important because the people in the schools will be the implementers, but school-based planning must be monitored at the district level to ensure that quality and standards are being met. This requires a collaborative effort and extra support during implementation. A variety of staff development opportunities should be offered and special attention should be paid to the needs of administrators. Teachers must be allowed to use some creativity, but centralized responsibility for developing and supporting innovations is necessary if innovations are to spread. Planning should focus on student needs and how teachers can address those needs. It should be curriculum driven and every effort should be made to gain consensus on direction. The change process should be guided by inspirational themes rather than goals and objectives, and staff commitment should be continuously cultivated.

The Change Process

"Directed change or planned change, is caused by outsiders who, on their own or as representatives of change agencies, intentionally seek to introduce new ideas in order to achieve goals they have defined." (Rogers & Shoemaker, 1971, p. 38)

Rand Study

The Rand Change Agent study identified four factors crucial to successful implementation and continuation of local change efforts: institutional motivation, project implementation strategies, institutional leadership, and teacher characteristics. (McLaughlin &

Marsh, 1990) Teacher commitment had the most consistently positive relationship to project outcomes, and teacher commitment appeared to be influenced by motivation of district managers, project planning strategies and the scope of the change project. It is obvious that a project can experience continued success in a school district only if the superintendent is behind the effort, and administrative support should be visible at the start of the project. Of the planning strategies observed, it was found that a collaborative planning style is essential for long term success. This entails involvement of teachers and administrators in all steps from initial planning through implementation. As for the scope of the change project, teachers tend to become more committed to complex and ambitious projects. It appears that they are motivated by educational promise and the opportunity for professional growth. Project implementation strategies were also important influences on change efforts. It was found that skill-specific training improved short-term, project implementation and student gains, but teacher change and continuation of project methods were only evident when staff support activities were used. Staff support activities can help individualize skill-specific training, but more importantly, they can help teachers understand and apply strategies beyond the initial training. They also help to clarify goals of the change project and implications of strategies for classroom practices. Another important implementation strategy is including teachers in making project decisions. In the Rand study, "the strong, positive effect of teacher participation on the percentage of project goals achieved suggests that teacher inputs can significantly

improve implementation." (p. 221) They are close enough to the operation to give valuable input, and their involvement in decisions gives them a sense of ownership. In general, projects that combined teacher participation with organizational support were most able to implement long term change projects.

Diffusion-adoption Model

"An innovation is an idea, object, or practice perceived as new by an individual or individuals, which is intended to bring about improvement in relation to desired objectives, which is fundamental in nature and which is planned and deliberate." (Nicholls, 1983, p. 4)

Rogers (1983) described five stages in the diffusion and adoption of innovations: knowledge of the innovation, persuasion about the utility of the innovation, a decision to adopt or reject the innovation, the actual implementation of the innovation, and confirmation or reinforcement for its continued utilization. Many change agents have attended to the stages of adoption of computers and related technologies in schools, but most people are still not satisfied with the impact of technology on education. It appears that diffusion is only part of the picture.

> Diffusion is essentially a special type of communication concerned with the spread of messages that are new ideas. A certain degree of risk is usually associated with the reception of innovations, and this leads to somewhat different behaviors on the part of the individual than if he were receiving routine ideas. (Rogers & Shoemaker, 1971, p. 39)

Rogers described the diffusion process as passing a new idea from someone who is aware of the idea to someone not yet aware of it by using a communication channel that connects the two individuals. If the idea must be accompanied by persuasion, the communication will have to use an interpersonal channel to provide two-way communication.

Rogers advanced the Diffusion-Adoption Model to explain the manner in which innovations are spread or communicated. The adoption or rejection of the innovation is assumed to be made by the individuals using the innovation, but the actual decision to accept or reject the innovation can be made by individuals, a group of teachers or a central authority figure. Many decisions come from central authority and outside pressure. In this manner, the innovation comes across as a burden forced on users.

Havelock & Havelock (1973) grouped all innovation strategies in education under three major types: Problem-Solving (P-S); Social Interaction (S-I); and Research, Development and Diffusion (RD & D).

Change can be viewed as a problem-solving process with innovation as part of that process. In the problem-solving process, one begins with a need which is translated into a problem statement and a diagnosis and then begins to look for a solution or innovation. That in turn, is adapted or adopted and evaluated. Change agents are responsible for helping an individual or group through this process. Generally, they must at least follow these five guidelines: The user's need is the basis for all interaction. Assessing user need is an important part of the process. Outside change agents should be non-directive and not play the role of "expert". Resources within the

client system should be fully utilized when possible. Strongest user commitment and long-term survival comes from support of user initiative and innovation.

Change can also be viewed as a Research-Development-and-Diffusion Process. This process involves research and development and packaging of a complete plan that is to be accepted and used in its entirety by a passive user.

A third view of change is a Process of Social Interaction. It emphasizes the manner in which innovations are diffused throughout a social system.

Havelock has suggested "Linkage", which combines the best of the first three strategies, as a fourth view of the change process. It starts with a focus on the user as a problem-solver, but emphasizes the importance of bringing outside resources to help in the internal problem-solving process and stresses that the user must be connected to those resources. The change agent must be able to simulate the internal process to have sufficient empathy and understanding. With the outside resource, the user establishes a reciprocal relationship that allows the outside resource person to work through the needs and search process with the user and gradually bring the user to an understanding of the research process. The change agent and clients must have a collaborative relationship with linkage throughout internal communication systems. The resource person should have contact with other outside resources and establish a line of communication for the user.

Havelock stated that a large body of empirical research supports five generalizations about the diffusion process: (1) that

individuals belong to social networks that influence their adoption behaviors; (2) that a person's position in the network can predict his/her rate of acceptance of new ideas; (3) that informal contacts influence the rate of acceptance and adoption; (4) that group membership is a good predictor, and (5) that the rate of diffusion follows a predictable path. Havelock also listed the stages of a planned change:

1. Building a relationship
2. Diagnosis
3. Acquiring resources (build a permanent capacity for resource acquisition)
4. Choosing the solution
5. Gaining acceptance (individuals, groups, communication, flexibility)
6. Stabilizing the innovation and generating self-renewal (include disengagement)

Lippitt (1979) listed seven indications of effective consultation. The first suggested that clients should come to consultants voluntarily. "Sensitive consultants, if they sense that the potential clients treat them with distrust, openly explore the possibility of a voluntary tryout period." (p. 259) The second says that the client system must be clearly defined. Everyone involved should know whether the consultant is working with an individual, a group or the entire staff. The third states that the consultant and client must have a clear understanding of each other's expectations, commitments, goals, etc. The fourth says that the client must attempt to transfer some of his resources and talents to internal

staff so the changes will become a permanent part of the system. The fifth says that the consultant must work closely with clients in difficult times through to permanency rather than just supporting them with advice at start up time. The sixth suggests that the consultant should introduce procedures to monitor how well he is attending to the needs of the client. The seventh suggests that the consultant should help the client identify steps toward a goal and define how one can recognize when the steps have been reached. He should also suggest what action should be taken to recognize accomplishments along the way.

> A key ingredient in facilitating diffusion of any innovation is the presence of a credible change agent. The most significant role of the change agent is to act as an interface between the adopters of the innovation and those with a vested interest in seeing the change occur: the stakeholders. . . . the change agent must advocate for and empathize with the clients or adopters. (Dalton, 1989, p. 24)

There are many different people applying pressure, and many of them have their own agendas and are not really interested in the welfare of all involved.

Leadership

Research on the variables affecting the diffusion of teaching practices has shown a high correlation between the acceptance of new teaching practices and the perception of the principal's support of those teaching practices. It also suggests that the principal is capable of creating an atmosphere where the entire staff supports

innovation and that a principal who publicly supports creative teachers is more likely to have teachers that are innovative. (Chesler, Schmuck, & Lippitt, 1975)

According to Hall & Hord (1987), it doesn't have to be the principal who facilitates change. It can be anyone who assists other individuals in developing the abilities and confidence necessary to use a particular innovation. They prefer to use "change facilitator" rather than "change agent" to emphasize the act of facilitating rather than the power-yielding sound of the word "agent", but any description of what a change agent does must encompass the idea of facilitating to accomplish the work of a change agent.

> It is precisely because cut-and-dried rules do not exist that leadership of high quality is needed if an organizational change effort is to succeed. What is required are administrators who can give leadership to the following tasks: identifying basic problems of their schools, determining their contributing factors, selecting or developing innovations that are 'on target,' designing and implementing efficient and effective change strategies, incorporating the innovation into their organization, and assessing their effects. Once the decision to introduce an innovation is made, the tailor-made strategy these officials develop to implement it needs to reflect a hard-headed assessment of the matrix of forces in and outside of their schools that could block the innovation at different stages of the change process. (Gross, 1979, p. 42)

"The problem facing administrators today is not how to purchase computers, but how to manage implementation of computer

innovations for faster adoption and diffusion into the school organization." (Washington, 1990, p. 1) The rate of adoption of an innovation is affected by how it is perceived by the intended users with respect to: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability and (5) observability. (Rogers & Shoemaker, 1971)

Rogers indicated that the most important ingredient in the success of the change process is continuous contact among the clients and the change agent.

The results of a case study seeking causes of failure of an implementation attempt suggests that there are five assumptions necessary for successful implementations. Members of the organization must have a clear understanding of the innovation. They must be capable of carrying out the innovation. They must have necessary tools and resources readily available to them. The organizational structure must be compatible with the innovation. Most importantly, the staff must be willing to expend the time and effort required for implementation. (Gross, Giacquinta, & Bernstein, 1975)

Human Side of Change

Yale sociologist Rosabeth Moss Kanter in an interesting article entitled "Managing the Human Side of Change" listed several reasons why people resist change. Heading her list is the loss of control. The way people handle change depends upon whether they feel in control of it or not. "Ownership" is vital in getting commitment to action, Kanter says. (Spina, 1988, pp. 19 & 20)

"According to Kanter, a second reason why people resist change is excess uncertainty." (p. 22) "Another reason why people resist technological change is the surprise factor. As Kanter describes, individuals generally do not take well to decisions and changes which are suddenly sprung upon them." (p. 23) "People also resist technological change because of what Kanter terms the "difference" phenomenon. To successfully introduce change we must try to reduce the "differences" inherent in the change, leaving intact as many residual habits and routines as possible." (p. 24) "A very telling resistance factor is the loss of face. As Kanter states, ". . . if accepting a change means admitting that the way things were done in the past was wrong, people are certain to resist. No one likes losing face or feeling embarrassed in front of their peers." (p. 25)

(Ayers, 1992) stated that failure of reform movements are practically guaranteed when outside packages are fitted into existing structures, when inservices are forced upon passive teachers, when the package is one-size-fits-all and when classroom change is presented as "teacher-proof". He suggested that participants in successful school improvements are visible and accountable to one another. They do not passively accept a change. They accomplish change by working together as partners and allies. They take an active part in defining and solving their own problems. They all become change agents, taking responsibility for the environment they live in.

> People outside of teaching cannot empower teachers, and yet teacher empowerment is essential to the meaningful

> restructuring of schools and to the reforming of education. Teacher empowerment is a condition of reform, and it is teachers themselves who must choose to rethink and revive teaching. (p. 25)

Change can catch an individual by surprise and even frighten him and cause him to raise his defenses. "When one experiences a feeling of an unusual degree of stress or he is fearful for his own security, he may have little time or concern for the problems of others." (Heichberger, 1976, p. 112) Change can come unexpectedly with no preparation, and it can cause some serious problems. This is what happens when the authorities above decide to make changes in schools. A much better scenario is created when people are made members of the team, are allowed to express needs, participate in decisions and have a chance to experience some ownership. "Teachers must be convinced that the change is worth the risk and that by becoming involved in the change process, the outcome can be controlled and the threat of the unknown diminished. It is important to include the individual in the process." (Heichberger, 1976, p. 116)

Heichberger suggested that to humanize the change process, we must have the ability to anticipate and plan for the impact of change on the school. Proper planning creates better control. There are many aspects to planning that school systems must be aware of if they are to control change. They must use a systems approach to planning. The school system must develop a philosophy of education and set long and short range goals. They must prioritize their goals, assess the resources of the district and look at the objectives in the light of present resources and ability to acquire the necessary

resources. They must develop strategies to reach their goals. They must implement their strategies and continually evaluate and revise them.

> It can be argued that innovations can achieve long-term support and demonstrate their effectiveness only if they are systematically evaluated. . . . The progress of changes should constantly be monitored, and the feedback should continuously influence the decision-making process. (Baldridge, 1975, p. 164)

Dale Mann (1978) suggested that change-agent attempts of the 60s were based on an influence model which suggested that the people involved would have to be influenced or convinced to abandon one set of goals for another. Included in this action was the assumption that the goals and pedagogy being replaced were inferior to their replacements. This created a power struggle between change projects and sites and usually meant that when projects were implemented they were modified by the site. The effect was that projects that were "adapted" had little effect.

ORC, LOC and ELOC Models

According to Gross (1979), the Overcoming Resistance to Change (ORC) Model suggests that the secret to success in implementing educational change is contained in the ability to overcome resistance just prior to or at the introduction of the innovation. The resistance can be minimized by including participants in the planning and early implementation.

> As a consequence of their involvement, it is assumed that members will tend to view the innovation as self-imposed, and thereby become committed to it since it is perceived as a shared decision. In short, power-equalization involves two key ideas: first, management must allow subordinates to participate in change decisions and, second, subordinates will thereby be induced to accept and implement new behavior patterns. (Gross, 1979, p. 32)

The Leadership-Obstacle Course (LOC) Theory extends the ORC model to deal with problems that arise throughout the implementation and incorporation stages of change efforts. Where the ORC model infers that the ability to overcome resistance in the initiation stages determines entirely whether the change will be incorporated or rejected, the LOC model suggests that leadership is necessary beyond initiation and all through the implementation process. It emphasizes the importance of paying attention to staff resistance in the initiation stages, but it stresses that obstacles will likely pop up during the implementation stage and management must identify them and deal with them as they arise. It suggests that staff must have a clear understanding of the innovation and that their level of understanding must be monitored. Their training needs must be assessed and met. Supplies and equipment must be available to support the change effort. Modifications to the existing organization may be necessary to prevent impediments to change. It suggests that resistance to change must be identified and dealt with in all stages of the innovation. (Gross, 1979)

Change

Gross & Herriott (1979) suggested that the LOC model overlooked some important variables in the change process. An Elaborated Leadership Obstacle Course (ELOC) model was designed to extend the LOC model to address those variables. It stresses exploratory activities and strategic planning at the beginning of the change efforts and the importance of identifying major obstacles that are likely to impede change efforts during the implementation stage. It stresses the relationships among stages and the need for monitoring mechanisms at each stage of the change process. It suggests that management must be prepared to handle politics as well as staff resistance at each step of the process.

Changing Teachers and the System

Innovation for the improvement of educational systems (1986) presented tips and guides for educational innovators:

1. Educational innovations must be public matters so the implementers will experience "ownership".
2. School leaders must be involved in change efforts at all stages, and training must be available for school personnel throughout the process.
3. The change agent must communicate well and be a good listener to establish a good rapport, and he must lead or collaborate with others in solving problems that arise in implementation of the innovation.

Hall & Hord (1987) suggested that schools can not improve unless teachers change. This can be accomplished only if improved practices and procedures are available whether they are developed,

adopted or adapted. Any improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes. Therefore, understanding teachers and their concerns about teaching should be a top priority for school principals and other change facilitators. "When a concerns-based approach is used, change facilitators work in concert with teachers to address their emerging and evolving needs. In this way, not only is change viewed as a process, but the personal side of change as experienced by teachers is taken into account." (p. 17)

Fullan & Stiegelbauer (1991) suggest that there are three essential aspects or dimensions of change that must occur in practice to provide a chance of affecting outcomes. They are: (1) the possible use of new or revised materials or equipment), (2) the possible use of new teaching approaches, (3) the possible alteration of beliefs.

> There are three critical lessons to be learned. First, change is multi-dimensional and can vary accordingly within the same person as well as within groups. Second, there are some deep changes at stake, once we realize that people's basic conceptions of education and skills are involved - that is, their occupational identity, their sense of competence, and their self-concept. The need and difficulty for individuals to develop a sense of meaning about change is manifest. Third, compounding the second lesson is the fact that change consists of a sophisticated and none-too-clear dynamic interrelationship of the three dimensions of change. (pp. 40 & 41)

There is not much value in attempting to accomplish one dimension without the other two. Providing a set of materials and resources does not assure any changes in teaching approach or style, and planning and decisions about future teaching practices are dependent upon a well defined belief system. Therefore, to accomplish planned outcomes, it is necessary to make changes in resources, teaching style and beliefs. (Fullan & Stiegelbauer, 1991)

If changes in teaching practices and beliefs are to be made, staff development and support is essential not only in preparation for implementation but throughout implementation. "Experience indicates that staff development programs succeed when they are designed to empower employees to become active participants in molding new sociotechnical systems." (Perelman, 1988, p. 24)

> Learning by doing, concrete role models, meeting with resource consultants and fellow implementers, practice of the behavior, and the fits and starts of cumulative, ambivalent, gradual self-confidence all constitute a process of coming to see the meaning of change more clearly. . . . Research on implementation has demonstrated beyond a shadow of a doubt that these processes of sustained interaction and staff development are crucial regardless of what the change is concerned with. (Fullan & Stiegelbauer, 1991, pp. 85 & 86)

When trying new, complicated things, problems are inevitable. Therefore, mechanisms for feedback must be established to monitor how an implementation is going, and the information gathered must direct future modifications, training, etc. "Innovations that have

been succeeding have been doing so because they combine good ideas with good implementation decision and support systems." (p. 112)

Fullan & Stiegelbauer stated some assumptions about change: (1) Change requires interaction with implementers and will include some transformation or continual development. (2) Each individual involved will have to experience a process of clarification to define individual meaning. (3) Conflict and disagreement are to be expected, and their will naturally be an implementation dip in early stages. (4) People will need pressure to change, but they also need an opportunity to react to change, interact with each other and to obtain assistance. (5) Persistence is essential because effective change takes time and it occurs developmentally. (6) Lack of implementation is not always caused by resistance. It can be a combination of value rejection, lack of resources, or insufficient time lapsed. (7) No change happens all at once. Improvement should be sought by gradually increasing the number of people affected. (8) It is necessary to have a plan to guide the implementation using the above assumptions. (9) Decisions can not be based completely on knowledge of the change process. Some will be driven by politics, sound facts, intuition, and so on. (10) In implementing particular innovations, attention should be paid to how it is changing the entire institution.

"Change is a highly personal experience - each and every one of the teachers who will be affected by change must have the opportunity to work through this experience in a way in which the rewards at least equal the cost." (Fullan & Stiegelbauer, 1991, p.

127) They stated that teachers generally use four criteria to decide whether to expend energy in implementing a particular change:

1. Does the change have potential for satisfying a perceived need? Can it realistically deliver what it offers? Will students be interested? Will they learn?
2. Is the teacher's new role well defined?
3. What will implementation cost the teacher in terms of time, energy and conflicting priorities, and what will the teacher gain personally in skill and competence?
4. How rewarding will the experience be in terms of interaction with peers or others?

Teachers will be willing to try something new if other teachers speak highly of it, but it is their own success that will keep them going. Early in implementation, they must perceive a good benefit/cost ratio.

"With thousands of pieces of software available and with hardware constantly changing, teachers are anxious to learn from one another and to share experiences and knowledge." (David, 1991, p. 78) Social contact is very important in implementing change. Besides the skill training, teachers need a chance to interact with one another to discuss the meaning of change, how it fits with their beliefs, and what should be modified. "Significant educational change consists of changes in beliefs, teaching style, and materials, which can come about only through a process of personal development in a social context." (Fullan & Stiegelbauer, 1991, p. 132)

> In successful school change, people actively define and then solve their own problems. Instead of reinforcing passivity and powerlessness, the change process itself is designed to develop agency and efficacy (the sense of oneself as an active agent able to create change). A guiding theme is that people with the problems are also the people most needed to craft solutions. The process is important, and it leads to an action plan for school people. (Ayers, 1992, p. 23)

"Change is needed because many teachers are frustrated, bored and burnt out. Good change processes that foster sustained professional development over one's career and lead to student benefits may be one of the few sources of revitalization and satisfaction left for teachers." (Fullan & Stiegelbauer, 1991, p. 131)

Watts & Castle (1992) stated that six years of studying the change process in the Mastery Learning and National Center sites has provided evidence that the first step in school transformation is teacher development. As teachers discover what they are capable of doing, they develop a feeling of professionalism and collegiality that creates a culture conducive to change.

"Instructional change can only proceed with a corresponding change in beliefs about instruction and learning. Teachers' beliefs may be best modified while they are in the thick of change, taking risks and facing uncertainty." (Dwyer, Ringstaff, & Sandholtz, 1991, p. 52)

Dwyer, Ringstaff, & Sandholtz described the transition of Apple Classrooms of Tomorrow (ACOT) teachers from Adoption to Invention over time. Most teachers began with the belief that

technology would make their jobs easier and more efficient. They had no idea that it would change their approaches to teaching or alter their beliefs. The change they encountered was a move from curriculum-centered instruction to child-centered instruction, from individual tasks to collaborative tasks, and from passive learning to active learning. Each of these changes created a conflict for teachers between their traditional approaches to teaching and their emerging beliefs about teaching and learning. "In fact, learning about technology is a lifelong process, because the technology continues to change." (David, 1991, p. 78)

Environment for Educational Change

Fullan & Miles (1992) listed seven orientations that are necessary for successful educational change efforts:

1. **Change is learning - loaded with uncertainty.** It takes time for people to absorb the meaning of change efforts, and "the implementation dip" or early difficulty in implementations can be expected. People will experience real ownership only through learning. In a successful change process, the sense of ownership will grow throughout implementation as participants begin to understand and become good at something new. "Thus conditions that support learning must be part and parcel of any change effort." (p. 749)
2. **Change is a journey, not a blueprint.** Blueprints for change do not exist because rational planning models don't work. The evolutionary planning process presented

by Louis & Miles (1990) is a better alternative. It is based on the assumption that no specific plan can be functional for any length of time because the environment is constantly changing. "The organization can cycle back and forth between efforts to gain normative consensus about what it may become, to plan strategies for getting there, and to carry out decentralized incremental experimentation that harnesses the creativity of all members to the change effort." (p. 193) A shared vision is important, but even that must be continually rethought and reshaped.

3. **Problems are our friends**. It is better to expect them and deal with them than to pretend they don't exist. Louis & Miles (1990) found in their study of urban schools that schools successful in change projects did not have fewer problems than other schools, but they did have a better method of coping with them. Schools must have a shared vision and a coordinating committee or steering group to help track problems and devise coping methods.

4. **Change is resource-hungry**. Change requires resources in many areas. Resources are needed for training, materials, space and release time. It is necessary to find creative ways to match needs with resources such as using schedule changes, local trainers, coordinating committees, etc.

5. **Change requires the power to manage it.** Change projects must be monitored closely and all participants must be kept informed of progress so problems can be identified and solutions can be started quickly. The management of change is best accomplished by groups consisting of a mix of teachers, administrators, parents, students, etc., and the group must have a good understanding of the extent of their power.
6. **Change is systemic.** Reform must deal with curriculum, teaching and learning, community, student-support systems, etc. simultaneously and work on cultural issues by emphasizing collaborative work and continual improvement.
7. **All large scale change is implemented locally.** Change is accomplished only through the efforts of teachers, parents, local administrators and students. To accomplish this, it is important that all involved are very knowledgeable of the change process.

Summary

The Rand Change Agent Study highlighted the importance of teacher commitment and emphasized the influence of administrative leadership. It suggested that the success of projects is dependent upon visible support from the superintendent and other administrative leaders from the start. It also pointed out that collaborative planning that encourages teacher input and provides organizational support from the beginning and throughout

implementation is essential for long term success.

Understanding and attending to the stages of adoption described in the Diffusion-Adoption model advanced by Rogers is important, but there are many other facets of change that must be addressed as well. Havelock's "Linkage" stressed the importance of having outside resources to assist in planning and implementation. Internal or external consultants must be credible change facilitators. Members of the organization must understand the innovation being implemented and have the ability and necessary resources to carry it out. More importantly, they must be willing to expend the energy necessary to accomplish change. Strategies for overcoming resistance must be developed and "ownership" must be continuously cultivated by encouraging participants to take an active part in defining and solving problems.

Improvement of schools is dependent upon changing what teachers and students do. Fullan & Stiegelbauer suggested three aspects of change that must happen to affect outcomes: (1) the possible use of new or revised materials or equipment), (2) the possible use of new teaching approaches, (3) the possible alteration of beliefs. This requires a variety of staff development opportunities because changes in beliefs and practices will only take place if training and support are adequate before and throughout implementation. "Real ownership" will only occur if participants have an opportunity to learn, interact with each other, discuss the meaning of change and react to and modify the changes they are experiencing. Also, creative methods of providing resources will be necessary to provide equipment, training, release time, etc.

The planning process must develop a vision that is shared among participants. To cope with the inevitable problems that will arise, it is important to have a steering committee that can develop methods of dealing with the problems and maintaining focus on the shared vision. Some knowledge of the change process will be necessary so participants can collaborate and work on continual improvement.

CHAPTER III

IMPLICATIONS FOR SCHOOLS & INVESTIGATION COMPONENTS

Implications for Schools

In Educating Americans for the 21st Century (1983), it was suggested that technology offered great potential for improving education. Lewis J. Perelman (1987) stated that schools must change and that technology is necessary to make schools more effective. Pea (1987), Fey and Good (1985), Kilpatrick (1985), McKenzie (1987) and others suggested that the technology that is pervading the rest of the world provides potential for new topics and new methods that can promote higher level thinking in schools.

Yet, technology has not changed schools at the rate that many people have expected. Mecklenburger (1990) stated that technology has had little effect on schools while it has transformed the rest of the world. Collins (1991) suggested that the computer has to eventually play a major role in education. He proposed that students will have to learn and think in a computational environment. Sheingold (1991), David (1991) and Solomon (1992) have suggested that technology is needed to improve the learning environment, but it can do this only if teachers change. Callister & Dunne (1992) caution against improper uses and emphasize the importance of pedagogically sound applications of technology. They all agree that

teachers are to become facilitators who create activities that engage students' minds and assist students in constructing knowledge and taking responsibility for their own learning. Therefore, planning the use of technology must be driven by an intention to improve the learning environment by changing the roles of teachers and students.

Blair (1991) stated that technology planning has historically failed to use the potential of technology to restructure education. According to Gillman (1989), schools are not designed to handle spontaneous change, and they must find a way to respond more quickly to our changing social requirements. Perelman (1987) explained that technology had not produced results in education because it was being used as an "add-on" and that it was intentionally being used in a way that would not alter the system at a time when successful uses of technology should be aimed at transforming the entire system. David (1991) agreed that it is not enough to improve what schools do. We must change school practice fundamentally to provide students with the kinds of skills needed in the worlds of today and tomorrow. She suggested that the use of technology can lead to changes in teaching and learning that are consistent with the goals of restructuring.

Sheingold (1991) suggested that the real changes necessary in education are dependent upon three movements happening simultaneously. We must treat students as active learners, cultivate their abilities to think and provide opportunities for them to ask questions, solve problems, construct knowledge and apply what they learn. Collins (1991) stated that though the role of

teachers will naturally change over time as computers become more pervasive in schools and the teaching force becomes more proficient with them, we should be looking for ways to speed up the process.

The use of technology must be planned with curriculum and instruction with emphasis on restructuring the learning environment to provide students the skills needed in our changing world. We must integrate technology into all subject areas, treat students as active learners, and provide them with opportunities to solve problems, construct knowledge and apply what they learn. For successful integration efforts, See (1991) suggested that we must have a vision for the future, a plan for integrating technology into the content areas, ownership and commitment from teachers, adequate support and training, and availability of resources. Berger (1975) stated that there are three main components of educational change that must function together. They are planning, implementation and evaluation. It is in the planning stage that all stakeholders are identified and mutual trust is established. Increasing the number of people with a vested interest in the innovation (preferably volunteers) will improve the chances for a successful implementation. This must be followed by extensive training, feedback and evaluation. Wood & Smellie (1990) listed the conditions for educational change as good advance planning, extensive training and high quality courseware/software. They also emphasized that technology use is to be curriculum driven with a systematic process for designing learning experiences.

Studies by Louis & Miles (1990) suggested that the presence of good planning helps to determine whether urban schools actually

change for the better. Williamson & Johnston (1991) suggested that school-based planning is important in every district change effort and that it must be monitored at the district level to ensure that quality and district standards are being met. This requires a collaborative effort and extra support during implementation. Teachers must be allowed to use some creativity, but centralized responsibility for developing and supporting innovations is necessary if innovations are to spread. Planning should focus on student needs and how teachers can address those needs.

The Rand Change Agent Study, as described by McLaughlin & Marsh (1990), suggested that the success of projects is dependent upon teacher commitment which is very much influenced by visible support from the superintendent and other administrative leaders from the start. Chesler, Schmuck, & Lippitt (1975) suggested that principals who support creative teachers are more likely to have teachers that are innovative. The Rand study also pointed out that collaborative planning that encourages teacher input and provides organizational support from the beginning and throughout implementation is essential for long term success. Members of the organization must understand the innovation being implemented and have the ability and necessary resources to carry it out. More importantly, they must be willing to expend the energy necessary to accomplish change.

Hall & Hord (1987) suggested that schools can not improve unless teachers change. This can be accomplished only if improved practices and procedures are available, whether they are developed, adopted or adapted. Fullan & Stiegelbauer (1991) suggested three

aspects of change that must happen to affect outcomes: (1) the possible use of new or revised materials or equipment), (2) the possible use of new teaching approaches, (3) the possible alteration of beliefs. Dwyer, Ringstaff, & Sandholtz (1991) concurred that instructional change can only happen with changes in beliefs about instruction and learning. This requires a variety of staff development opportunities because changes in beliefs and practices will only take place if training and support are adequate before and throughout implementation. Dwyer, Ringstaff, & Sandholtz suggested that beliefs are best modified while teachers are involved in changes, risks and uncertainty. "Real ownership" will only occur if participants have an opportunity to learn, interact with each other, discuss the meaning of change and react to and modify the changes they are experiencing. (David, 1991) (Fullan & Stiegelbauer, 1991)

Every effort should be made to gain consensus on direction, and staff commitment should be continually cultivated. Louis & Miles (1990) stated that the process of planning and its effect on commitment were more important than the resulting plan. The planning process must create a shared vision that is constantly discussed, updated and reshaped. A steering committee must be formed to deal with problems and maintain focus on the shared vision. To do this, continual monitoring and feedback to all participants will be necessary to encourage collaboration and continuous improvement. It will also be necessary for all involved to be knowledgeable of the change process.

Summary of Investigation Components

In an effort to create a model for planning the use of instructional technology, the researcher listed thoughts and recommendations from the literature on change theory as they relate to the use of technology and reforming education. Each component of change theory that appeared to apply to the planning process was summarized into a statement and included in a list of potential change theory recommendations. That list was then consolidated and organized according to types of recommendations and reworked into an outline form to produce the investigation components which provide a framework for this study. Following are the Investigation Components:

I. Support Learning Outcomes

A Planning must address student needs and how teachers can address those needs with technology.

B Technology must be curriculum driven.

C Technology must support active learning and constructing knowledge.

D Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.

E A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.

II. Active Leadership

A Lead by involvement.

1. School personnel must have the responsibility of planning and making decisions and they must place planning high on the agenda.

2. Implementation must focus on teachers.

3. The superintendent and administrative support must be visible at the start.

4. Local resources should be utilized when possible.

5. Principals and district administrators must publicly support creative teachers.

6. Leadership is necessary all through the implementation process.

7. School leaders must be involved in change efforts at all stages.

8. The change agent must communicate well and be a good listener to establish a good rapport and he must lead or collaborate with others in solving problems that arise in implementation of the innovation.

B Standards and spreading innovations

1. Good advance planning must include extensive inservice training and high quality courseware/software.

2. School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards.

3. To spread innovations, they must have centralized development and support.

4. Constant feedback is needed to recognize and attend to the stages of adoption that participants go through in the adoption process.

5. Members of the organization must have a clear understanding of the innovation, be capable of carrying it out and have necessary tools and resources readily available.

C Evaluation

1. Formative and summative evaluation procedures should be established to monitor how well the needs of students and staff are being met, using tests that match planned outcomes.

2. Mechanisms for feedback must be established to monitor how an implementation is going and the data gathered must direct future modifications, training, etc.

3. Milestones should be identified so steps toward a goal can be measured and actions to celebrate accomplishments should be planned.

III. Collaborative Planning

A Vision and Ownership

1. Consensus, the process of planning and its effect on commitment are more important than the products of planning.

2. Change advocates should down play mission and goals and emphasize inspirational themes to guide the change process.

3. All action must be tied to improvement and staff commitment must be continuously cultivated.

4. Educational innovations must be public matters so the implementers will experience "ownership".

5. A vision for the future must be drawn and shared to promote a large cadre of people with a vested interest in the innovation.

6. Each teacher must have an opportunity to work through the experience in a way in which the rewards at least equal the cost.

7. Teachers become more committed to complex and ambitious projects, but they must be convinced that the change is worth the risk.

8. Teachers need a chance to interact with each other to discuss the meaning of change.

9. People must actively define and solve their own problems. They must develop a sense of agency and efficacy.

10. A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change and they must be exposed to conditions that support learning.

B Collaboration and support

1. Collaborative planning is essential and it must be accompanied by extra support during implementation.

2. Long term success is dependent upon teacher participation and organizational support.

3. Schools must receive support from the school board, administration, and community and they must have access to hardware, software, support personnel, and related resources.

4. Strategies should be developed locally with input from teachers.

5. User's need is basis for all interaction.

6. Participants in successful school improvement efforts are visible and accountable to one another and take an active part in solving problems.

7. Change facilitators must work in concert with teachers to address their emerging and evolving needs.

8. Resistance can be minimized by including participants in the planning and early implementation.

IV Plan for Change

A Link technology to educational change

1. Technology applications must be linked to school improvement.

2. All use of technology must be linked to improving learning by changing what teachers and students do and what they do with technology should be dependent upon technology.

3. Accompanying each technology introduced must be a vision of how it is to be used and how it will change the learning environment.

4. School personnel must have a vision of how technology will restructure the learning environment.

5. Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes.

6. Instructional change can only proceed with changes in beliefs about instruction and learning.

7. Three aspects or dimensions of change must occur: use of new or revised materials or equipment; use of new teaching approaches; alteration of beliefs.

B Training

1. The first step in school transformation is teacher development.

2. Individual needs must be addressed through a variety of staff development opportunities.

3. Each technology must be accompanied by training, modeling, and support.

4. Training, feedback and extra support must continue throughout implementation until innovation is stabilized and permanent.

5. Special emphasis must be placed on training and support for administrators.

C Strategies

1. Address Havelock's stages of a planned change:
    1. Building a relationship
    2. Diagnosis
    3. Acquiring resources (build a permanent capacity for resource acquisition)
    4. Choosing the solution
    5. Gaining acceptance (individuals, groups, communication, flexibility)
    6. Stabilizing the innovation and generating self-renewal (include disengagement)

2. Following the evolutionary planning process, we should cycle back and forth between efforts to gain normative consensus about the intended learning environment, plan strategies for getting there, and carry out decentralized incremental experimentation to promote creativity.

3. Schools must have a coordinating committee or steering group to help track problems and devise coping methods.

4. Resources are needed for training, materials, space and release time. It is necessary to find creative ways to match needs with resources such as using schedule changes, local trainers, coordinating committees, etc.

5. Change projects must be monitored closely and all participants kept informed of progress so problems can be identified and solutions can be started quickly. The management of change is best accomplished by groups consisting of a mix of teachers, administrators, parents, students, etc. and the group must have a good understanding of the extent of their power.

6. Reform must deal with curriculum, teaching and learning, community, student support systems, etc. simultaneously and work on cultural issues by emphasizing collaborative work and continuous improvement.

7. To accomplish change, it is important that teachers, parents, local administrators and students are very knowledgeable of the change process.

8. Implementation must focus on teachers - make their job dependent upon technology and give them full support.

CHAPTER IV

METHODOLOGY FOR THE STUDY

Technology has not fulfilled its promises in education, and one of the reasons appears to be a lack of proper planning. The problem addressed in this study is that there are few models or guidelines for technology planners to follow. Planners need a process that will help them establish a vision, train staff and integrate technology into the curriculum.

The purpose of this study was to identify components of change theory that could potentially improve the process of planning the use of instructional technology and to test the validity of those components in a large, urban school district.

Testing the validity of the components involved using four different approaches, with each seeking evidence of process and behavior consistent with change theory.

1. One approach identified methods used in Grand Rapids Public Schools (GRPS) by studying district planning documents to see which existing processes could be explained in relation to the components of change theory. The purpose of this approach was to validate investigation components that are practical and doable. Connections with processes described in district documents demonstrate that particular

components have been implemented in one large urban school district and that it is feasible to use them at other sites.

2. A second approach compared survey responses of teachers in GRPS with varying levels of training and involvement in the planning process to see if their agreement with components of change theory would vary according to their training and levels of involvement in planning. The purpose of this approach was to see if teachers more involved in training and planning would exhibit different perspectives than those not so involved. If so, the results could be used directly in recommendations concerning planning and training.
3. A third approach mapped the investigation components onto the listed interview responses of teachers in GRPS with training and involvement in the planning process to see if they could provide practical insight into applying change theory to the planning process. The purpose of this approach was to validate components that are important to teachers. This is necessary because only the components that are important to teachers are likely to be fully implemented.
4. The final approach mapped the investigation components onto the combined results from studying district documents, surveys of varying groups, and interviews in an effort to derive recommendations for successful planning processes. The purpose of this approach was to make it easy to compare and contrast the results of each of the three preceding approaches and to validate and restate investigation

components as recommendations based on the combined results.

This study used a case study program evaluation methodology. The primary methods of the study were descriptive. It was broken into stages to make it more manageable.

Stages of the Study

There are three stages to this study that are depicted graphically in figure 2.

Stage 1

In the first stage, in response to the problem of a lack of guidelines for planning, research question 1 was formulated to guide a search of research literature. It was undertaken to find recommendations from change theory that could be used to create a model for planning the use of instructional technology.

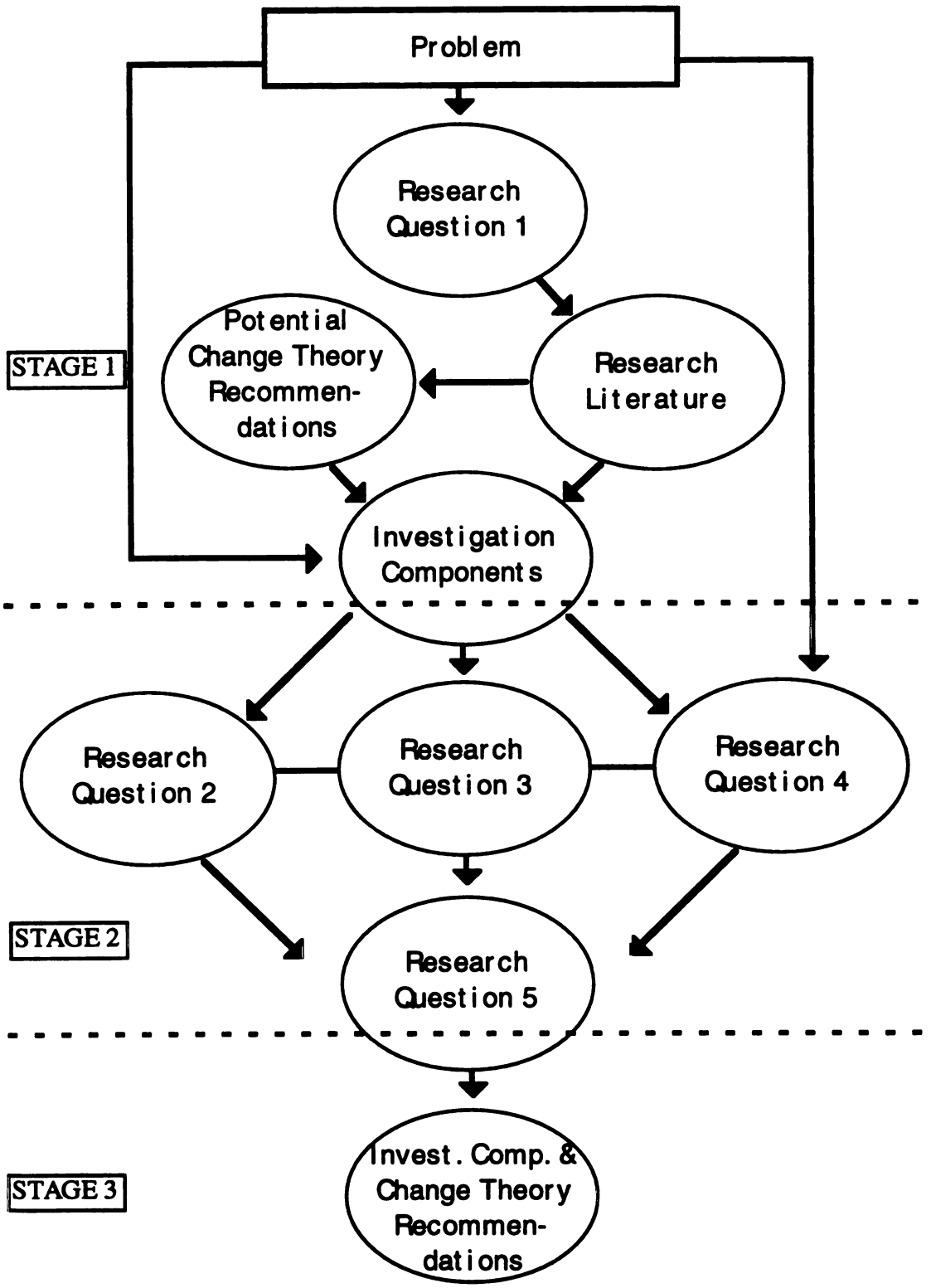

Figure 2: Stages of the Study

Research Question 1

What **components of change theory** can potentially improve the process of planning the use of technology and educational reform?

Investigation components.

The investigation components are principals and procedures related to planning the use of instructional technology that were derived from an examination of change theory and related research literature in response to research question 1. Each component of change theory that appeared to apply to the planning process was summarized into a statement and included in a list of potential change theory recommendations. That list was then consolidated and organized according to types of recommendations and reworked into an outline form to produce the investigation components which provide a framework for this study. They were the basis for constructing data gathering instruments and for examining the data gathered in the study. The investigation components include four major groupings:

I Support Learning Outcomes

II Active Leadership

III Collaborative Planning

IV Plan for Change

Each of the major groupings or components are broken down into subcomponents labeled A, B, C, . . . The components are listed in detail in the Summary of Investigation Components in chapter 3.

Stage 2

The second stage addressed four research questions formulated to examine the planning in a large, urban school district to develop some guidelines for planning. Research questions two, three, and four were addressed by mapping the investigation components onto information from the district documents, surveys, and interviews respectively. Research question five was addressed by comparing results from those questions to each other and the investigation components.

Research Question 2

What elements of **district planning documents** reveal evidence of the application of change theory to the planning process?

> Example: A statement in Special Issues from the Superintendent, ". . . the use of technology in our classrooms is essential for our students as we strive to prepare them for success in a highly technological and information-based society."

District planning documents.

Excerpts from planning documents were gathered as evidence that a particular investigation component was being addressed. This evidence was later used along with the interview responses to validate the investigation components that offer potential to the planning process and to form recommendations for planning.

Research Question 3

Do **survey responses** indicate that people close to the planning process are more in agreement with change theory than are people who are not so close to the planning process, and do the survey responses indicate that people with more training are more in agreement with change theory than are people who have had less training?

Survey questions.

The survey questions were constructed to match the investigation components identified in response to research question 1. A set of three questions in the form of statements were formulated to correspond to each of the 13 subcomponents labeled A, B, C, . . . (Two sets each were formulated for five of the subcomponents. Thus, a total of 54 questions were created.) Each set included a general statement, a school statement, and a personal statement. For example, Questions IIB1, IIB2, and IIB3 were derived from The Investigation Components in II. Active Leadership, B Standards and spreading innovations. Question IIB3, "I have had access to technology training and courseware/software that is appropriate for my needs." is a statement about the "personal" investigation component, that is, whether the investigation component has been put into practice in a manner that affects the respondent personally. A high score in response to IIB3 indicates that the respondent has found evidence of the results of that investigation component that affect him/her personally. A copy of the survey is included in Appendix B.

Hypotheses.

There were 54 survey statements designed to address research question 3. Each survey statement was matched with one hypothesis below. For example, Statement IA1, "Planning must address student needs and how teachers can address those needs with technology.", was matched with hypothesis $H_0$1. In an attempt to help answer research question 3, this statement was used to see if members of the Technology Planning Group who are closer to the planning process than the other teachers would respond with different scores than members of the School Planning Group or the Classroom of Tomorrow Group. This statement was also used to see if teachers in training level 3, who had more training than the others, would respond with different scores than members of training level 2 and training level 1. In either case, a higher score would indicate more agreement with this component of change theory.

Statement IA2, "In our school, teachers and staff are addressing student needs with technology.", was matched with hypothesis $H_0$2 and statement IA3, "I am currently addressing student needs with technology in my classroom.", was matched with hypothesis $H_0$3, etc. In each case, higher scores by a particular group when separated by planning group or by training level would indicate more agreement with the corresponding change theory component.

$H_0$1: There are no significant differences among the responses of teachers to "IA1 Planning must address student needs and how teachers can address those needs with technology." when the teachers are classified by planning group or by training level.

H_02: There are no significant differences among the responses of teachers to "IA2 In our school, teachers and staff are addressing student needs with technology." when the teachers are classified by planning group or by training level.

H_03: There are no significant differences among the responses of teachers to "IA3 I am currently addressing student needs with technology in my classroom." when the teachers are classified by planning group or by training level.

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H_052: There are no significant differences among the responses of teachers to "IVC1 Schools must have a coordinating committee or steering group to help plan the use of technology and acquiring resources, track problems and devise solutions to problems." when the teachers are classified by group or by training level.

H_053: There are no significant differences among the responses of teachers to "IVC2 Our school uses a Building Improvement Team or an equivalent planning committee to plan the use of technology, acquire resources, track problems and devise solutions to problems." when the teachers are classified by group or by training level.

H_054: There are no significant differences among the responses of teachers to "IVC3 I am involved in planning the use of technology for my building and the district." when the teachers are classified by group or by training level.

Groups.

Each teacher responding to the survey was a member of one of three groups. The Technology Planning Group (TCH) was comprised of 35 teachers involved in the technology panels. They were the group most involved in the district planning process. The School Group (SCH) was comprised of 35 teachers from Northeast Middle and Southeast Academic Center. These teachers were from schools involved in the planning process, but each individual was not necessarily as involved as the teachers in the TCH Group. The Classroom of Tomorrow Group (COT) was comprised of 34 teachers who had received computers from the state in October, 1990. They had no formal involvement in the planning process.

Training Level.

Each teacher responding to the surveys was also a member of one of three training levels. Training level 3 (trng3) included 26 teachers who had been involved in 45 hours or more of technology training. Training level 2 (trng2) included 31 teachers who had been involved in 15 to 30 hours of technology training and training level one (trng1) included 47 people who had been involved in no formal technology training.

Research Question 4

Do **interview responses** reveal evidence of the application of change theory to the planning process?

For example, the interview response, "We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers." supports change theory as presented in investigation component IIA2, "Implementation must focus on teachers."

Interview questions.

The interview questions were constructed to provide additional information related to the investigation components. They were open ended questions designed to provide respondents with an opportunity to express their opinions about the planning process. A copy of the questions is included in Appendix C.

Interview responses.

The interview responses were gathered to provide evidence of the use of, or potential for implementing, a particular investigation component. This evidence was later used along with the evidence from the district documents to validate the investigation components that offer potential to the planning process and to form recommendations for planning.

Research Question 5

How are the results of examining **the planning documents, the surveys and the interviews** related to each other with respect to the investigation components, and are there factors other than the investigation components which make the planning process more understandable?

Combined results.

Research question 5 was addressed by comparing and contrasting the results from the documents, surveys and interviews. For example, if documents give evidence that district planning is aligned with change theory with respect to Support Learning Outcomes, do survey results suggest that all teachers are equally in agreement with change theory in supporting learning outcomes or does this depend upon their levels of involvement in planning and their participation in training? Do the interview responses suggest that the people chosen to interview agree that district plans with respect to Support Learning Outcomes have been put into practice and do they have suggestions that would support, disagree with, or go beyond district document plans? The results of the documents, surveys and interviews were listed in a matrix in Chapter 5 to make it easier to make comparisons.

Stage 3

The final stage involved using the answers to question 5 and the investigation components to make recommendations for the planning process. The investigation components that were validated in responding to research question 5 were included in the recommendations in Chapter 6.

Research Questions

The following questions were formulated to guide this study:

STAGE 1

1. What **components of change theory** can potentially improve the process of planning the use of technology and educational reform?

STAGE 2

2. What elements of **district planning documents** reveal evidence of the application of change theory to the planning process?
3. Do **survey responses** indicate that people close to the planning process are more in agreement with change theory than are people who are not so close to the planning process, and do the survey responses indicate that people with more training are more in agreement with change theory than are people who have had less training?
4. Do **interview responses** reveal evidence of the application of change theory to the planning process?
5. How are the results of examining **the planning documents, the surveys and the interviews** related to each other with respect to the investigation components, and are there factors other than the investigation components which make the planning process more understandable?

Data Collection

Investigation Components

A search of research literature was undertaken to find recommendations from change theory that could be used to create a model for planning the use of instructional technology. A list of potential change theory recommendations were consolidated and organized into an outline form to produce the investigation components used in this study. The investigation components were used to test the planning process of Grand Rapids Public Schools (GRPS). They formed the basis for constructing the survey and interview questions, and they were used as a framework for examining the district documents, surveys and interviews.

Subjects

Technology Planning Group

The Technology Planning Group (TCH) was comprised of 35 members of the Language Arts and Math Technology Panels. These groups were in the process of planning to align technology use with content area outcomes. They were more involved in district planning than some people in the first group and possibly not as involved in implementation in their own classrooms. 35 of the 40 teachers asked voluntarily completed surveys.

School Group

The School Group (SCH) consisted of 35 teachers from Northeast Middle School and Southeast Academic Center. Northeast is a middle school that has been used as a training site for four years. As a result, the district technology manager has been very involved in planning at Northeast, and he has been able to provide extra support to the teachers at Northeast. Southeast is an elementary school with which he has worked for two years. He planned a computer lab with their building improvement team, set up training and provided support to begin implementation. Surveys were sent to all the teachers at the two schools. 12 of the 17 teachers at Southeast Academic and 23 of the 37 teachers at Northeast Middle School voluntarily completed surveys.

Classroom of Tomorrow Group

The Classroom of Tomorrow Group (COT) is a group of 34 teachers drawn from the 160 teachers in GRPS who received Classroom of Tomorrow computers in October, 1990. Each COT teacher has had access to a computer in his/her classroom, but the COT teachers have not been involved in training or planning as a group. 55 names were drawn randomly from the 160 teachers and 34 of them voluntarily completed surveys.

Data Sources and Instruments

District documents

The documents studied include The GRPS Strategic Plan, The Instructional Technology Plan, the Superintendent's Special Issues, and the Instructional Technology Steering Committee Minutes. The Instructional Technology Steering Committee includes a summary of interviews of district and community people and feedback from the Deputy Superintendent. The locations of all the documents are referenced in Appendix G.

Surveys

A set of questions were formulated for a survey of a sample of district personnel. The questions were designed to determine whether district planning procedures as perceived by participants involved in the planning process are in alignment with the Investigation Components.

The survey, included in Appendix B, was designed to gather both quantitative and qualitative data. Each question was written as a statement accompanied by a rating of Strongly Agree, Agree, Somewhat Agree, Disagree, and Strongly Disagree to provide quantitative data. The questions were in groups of three. The first of each three questions was a general statement about change theory and planning for the use of technology. The second question was focused on the school or building and the third question focused on the participant personally. The statements listed were numbered to correspond with the items in the Summary of Investigation

Components. In each section, statements A1, A2, and A3 correspond to Investigation Component A. B1, B2, and B3 correspond to Investigation Component B and so on. A1 is a general statement to indicate whether the individual agrees with the Investigation Component. A2 is to indicate whether the Investigation Component results intended have been realized in the respondent's school. A3 is to see if the results have been accomplished personally by the respondent in his/her classroom. A2 & A3 are followed by a space to explain the answers and provide qualitative data in the form of open ended responses.

In the cases where the numbers include A4, A5 & A6 (or B4, B5, & B6, etc.), it is because there are two sets of statements for the lettered Investigation Component. A4 is a second general statement. A5 is a second statement that addresses the respondent's school and A6 is a second statement that addresses the respondent's classroom.

Interview questions

A set of questions were formulated to provide some structure to interviews of a sample of teachers. The interview questions, included in Appendix C, were designed to provide respondents an opportunity to express their opinions about the planning process that is being used or should be used in their school district. Like the survey questions, the interview questions are directly related to the investigation components, but they are open ended to encourage participants to candidly give their perspectives of the planning process and provide information beyond the scope of the survey questions.

Methods

Involving all personnel in visioning, planning, training and consensus building is an ambitious goal, but it is not easily accomplished in a large school district. Many planning activities are aimed at representative groups with hopes of establishing "buy-in" of all personnel through the representatives. Successful use of this strategy is dependent upon a comprehensive plan. In this study, the researcher identified components of change theory related to educational reform and to achieving success with technology. He used those components to address unanswered questions regarding planning and the lack of guidelines by comparing them to data gathered from a large, urban school district which is attempting a systematic approach to planning. The data included district planning documents, surveys and interviews.

Investigation Components

In stage 1 of this study, research question #1 guided the researcher in addressing the problem of a lack of guidelines for school technology planners. He searched the literature looking for elements of change theory that could be used to create a model for planning the use of instructional technology. He compiled a list of research documents that contained tenets of change theory that appeared to pertain to planning the use of instructional technology. He then went through each document and listed key ideas in the form of statements or potential recommendations for the planning process. That list was then consolidated and organized according to

types of recommendations and reworked into an outline form to produce the investigation components which provide a framework for this study. In stage 2 of the study, the investigation components provided the standard for studying the district documents, teacher surveys and interview responses as guided by research questions 2, 3, and 4. The investigation components were listed in the first column of a matrix used to display and compare evidence of agreement or disagreement among the investigation components, district documents, surveys and interviews. That matrix is displayed in chapter 5.

District documents

In response to research question #2, existing district documents were examined to identify all relevant elements of change theory. The researcher identified all the district documents that had recorded technology planning efforts and used the investigation components to analyze them. He used the list of investigation components in the matrix mentioned above. As he studied each document, he went down the list of investigation components looking for evidence of each component. As each match with an investigation component was identified, that section of the document was reproduced in the matrix across from the investigation component. Segments of district documents that matched more than one of the components were listed across from each component they matched. To prevent the column of document excerpts from becoming too lengthy, abbreviated versions of some of some of them were used in the matrix which appears in chapter 5.

The full text of the document excerpts are in Appendix F and a list of the actual documents and their locations can be found in Appendix G.

Surveys

A survey of a sample of district personnel was used to answer questions not answered thoroughly by district documents. The surveys were used to compare perspectives of people with varying levels of involvement in training and planning at the building level and at the district level. Surveys were sent to the three groups of teachers mentioned under subjects earlier in this chapter. A copy of the consent form can be found in Appendix A, and the survey form can be found in Appendix B. The questions on the survey were responded to with Strongly Agree, Agree, Somewhat Agree, Disagree, and Strongly Disagree. The responses were coded 5 through 1 respectively.

Each respondent was labeled to identify three pieces of information: three groups comprised of Technology Group (TCH), School Group (SCH) and Classroom of Tomorrow Group (COT); three levels of training comprised of 45 hrs. or more of training (TR3), 15 to 30 hrs. of training (TR2), and no formal technology training (TR1); and the individual member of that combination (P1, P2, . . .). For example, TCHTR2P3 would represent the third person of the Technology Group with level 2 training. A matrix was created with a row for each of the 104 respondents. Each row contained 55 variables. The first variable was the respondent label and the others were the coding for the 54 questions of the survey.

Interviews

A group of 22 teachers were interviewed as a follow up to the surveys. The participants chosen for the interviews were the people from the Technology Group and the School Group who were also at training level 3 (45 hrs. or more of technology training). These particular people were chosen for the interviews because they appeared to be in closest agreement with the survey statements based on change theory, (In the analysis of the surveys, many questions produced a significant difference by planning group, training level, or both.) and the researcher believed that they would have the most to say about planning technology.

The researcher conducted interviews in a non-formal setting. He used a list of six questions that had been prepared in advance to give some structure to the interviews, but the questions were designed to provide respondents an opportunity to candidly express their opinions about the planning process. The interview questions, listed in Appendix C, were directly related to the investigation components, but they were open-ended to encourage participants to provide information beyond the scope of the survey questions. Respondents were encouraged to speak freely about what has been done or what should be done in the future. Their responses were recorded and paraphrased into numbered responses. A matrix was created that listed the participants with a variable for each numbered response that indicated whether they gave some variation of that particular response. A summary of the interview responses can be found in Appendix D. Following each response is a number in parentheses that indicates how many of the 22 respondents made

some variation of that response, and that is followed by the numbers of the investigation components that are closely related to that response.

Analyses

Investigation Components

The investigation components were used as a point of reference. Because the investigation components represent the tenets of change theory that the researcher was intending to identify in his analysis, they were used as a framework for analyzing the district documents. They were also used to analyze and compare surveys and interview responses of teachers from a variety of perspectives to see if their ideas are in line with district processes and the investigation components.

District Documents

The district documents were analyzed to identify evidence of the application of change theory in planning the use of technology. The investigation components were used as a check list. Each document was held up against the investigation components. The document was studied, looking for each of the investigation components. An occurrence of a planning procedure that appeared connected to change theory was noted and matched with the investigation component that it supports. This provided a descriptive count of content that was listed so the observer could see how each excerpt relates to the investigation components and

get a feel for the frequency of occurrence in the documents. In chapter 5, is a matrix that was used to classify the results.

Surveys

The surveys were analyzed to compare perspectives of people with varying levels of training and involvement in the planning process at the building level and at the district level. An initial attempt was made at using clustering techniques to link similarities in perceptions among groups with specific variables in common. Some grouping was evident when the participants were viewed as members of the Technology Panels, Schools, and COT. Some grouping was also evident when the participants were viewed as three groups according to the amount of training they had completed. To provide a tally of the results, it was necessary to use a conventionally recognized method. The researcher used a two factor analysis of variance to test whether there were significant differences in the responses to each question by planning group, training level and their interactions. Post hoc tests were then done on the ones that were significant to test for significant differences among the individual planning groups and training levels. For all statistical analyses conducted in this study, a 0.10 alpha level was the criterion for significance. The results of the ANOVA and post hoc tests are reported in Chapter 5.

Interviews

The participants chosen for the interviews were the people from the Technology Group and the School Group who were also at

training level 3. They were used to explain how and why some aspects of district planning are or are not working and to suggest some potential alternatives.

The 22 interviewees were asked six questions. (A copy of the interview questions is included in Appendix C.) Their responses were recorded on tape and paraphrased into specific, numbered responses. A matrix was created that listed the participants and a variable for each potential response. Across from each participant, the variable for each response was coded with a 1 for a given response and a 0 if the response was not given.

All of the teachers gave several responses and they shared many of the same ideas. The responses were categorized into 39 themes or groups of responses. The themes were then matched with the investigation components extracted from the Literature on Change Theory. The reason for this was to identify which investigation components were supported by several responses and to identify which investigation components were not supported at all. The complete list of themes and the specific responses included in the themes are listed in Appendix D. A number in parentheses after each theme indicates how many of the 22 people interviewed gave some response consistent with that particular theme. The Roman numerals and letters next to the parentheses indicate the investigation components that have been identified as closely related to that particular theme. A list of the investigation components not mentioned in the interviews can be found in Appendix E. In chapter 5, the matrix that started with the

investigation components is used to display the results from the district documents, the surveys and the interviews.

CHAPTER V
RESULTS OF ANALYSES

This chapter contains the results of the analyses of the data collected in this study. The study involved the development of investigation components which provide potential for improving the process of planning the use of instructional technology. The investigation components were grouped into four main sections: I. Support Learning Outcomes, II. Active Leadership, III. Collaborative Planning and IV. Plan for Change. Under the four main sections were 13 subcomponents labeled A, B, C, . . . with some of them broken down further. The data gathered within the study was examined in terms of the main sections and subcomponents of the investigation components. A variety of data was gathered from planning documents, surveys and interviews within Grand Rapids Public Schools (GRPS) to test the validity of the investigation components. Testing the validity of those components involved using four different approaches. One approach identified methods used in GRPS by studying district planning documents to see which existing processes could be explained in relation to the components of change theory. A second approach compared survey responses of people with varying levels of training and involvement in the planning process to see if their agreement with components of change theory would vary according to their training and levels of involvement in

planning. A third approach mapped the investigation components onto the listed interview responses of people with training and involvement in the planning process to see if they could provide practical insight into applying change theory to the planning process. The final approach mapped the investigation components onto the combined results from studying district documents, surveys of varying groups and interviews, in an effort to derive recommendations for successful planning processes.

This chapter is divided into two parts. The first part presents the results of the hypothesis testing of the survey responses. The survey results are presented first because they provide quantitative results that are helpful in interpreting the results from the documents and interviews. The survey response results are displayed in four tables with a separate table for each of the four main sections of the investigation components: I. Support Learning Outcomes, II. Active Leadership, III. Collaborative Planning, and IV. Plan for Change. Each of the four tables is followed by a summary and interpretations section, with a general summary and interpretations section following the fourth table and summary. The second part of this chapter presents the combined results of the analysis of the district documents, the surveys and the interviews in a matrix with the investigation components, summaries and interpretations. These results are again presented in tables according to the four main sections of the investigation components with summaries and interpretations following each section and a general summary and interpretations section at the end.

Survey Responses

A copy of the survey form is included in Appendix B. The survey form follows the framework of the investigation components. There are four main sections: I. Support Learning Outcomes, II. Active Leadership, III. Collaborative Planning and IV. Plan for Change. Under the four main sections are questions that correspond to each of the 13 subcomponents labeled A, B, C, . . . A set of three questions in the form of statements were formulated to correspond to each of the lettered subcomponents. (Two sets each were formulated for five of the subcomponents.) Each group of three questions contained a general statement which referred to whether the respondent agreed with the investigation component, a statement that referred to whether the investigation component results intended had been realized in the respondent's school and a statement to see if the results had been accomplished personally by the respondent in his/her classroom.

Each teacher responding to the surveys was a member of one of three planning groups. The Technology Planning Group (TCH) was comprised of 35 teachers involved in the technology panels. They were the group most involved in the district planning process. The School Group (SCH) was comprised of 35 teachers from Northeast Middle and Southeast Academic Center. These teachers were from schools involved in the planning process, but each individual was not necessarily as involved as the teachers in the TCH Group. The Classroom of Tomorrow Group (COT) was comprised of 34 teachers who had received computers from the state in October, 1990. They had no formal involvement in the planning process. Each teacher was

also a member of one of three training levels. Training level 3 (trng3) included 26 teachers who had been involved in 45 hours or more of technology training. Training level 2 (trng2) included 31 teachers who had been involved in 15 to 30 hours of technology training, and training level one (trng1) included 47 people who had been involved in no formal technology training.

The respondents indicated their levels of agreement with the statements by replying with strongly agree, agree, somewhat agree, disagree or strongly disagree. The responses were coded 5 through 1 respectively. (A higher number represents more agreement.) A two factor analysis of variance was used to test whether there were significant differences in the responses to each question by planning group, training level and their interactions. Post hoc tests were then done on the ones that were significant to test for significant differences among the individual planning groups and training levels. Tables 1 through 4 display the results of the ANOVA and post hoc tests.

Reflecting the investigation components and the surveys, the four tables represent the four main sections: I. Support Learning Outcomes, II. Active Leadership, III. Collaborative Planning and IV. Plan for Change. Under each section, the questions are numbered as they appear in the survey, and they are presented with a column for the ANOVA results. The alpha level of significance used was 0.10. The mean scores have been included with the significant tests to provide an aid to interpretation. If no significant difference was found by planning group, by training level or by trng*group, the ANOVA column contains the words "not significant" with the overall

mean response for that question immediately below it. If a significant difference was found by planning group, the ANOVA column contains the words "by group", the mean scores for each of the three planning groups and the probability of that combination of scores. If a significant difference was found by training level, the ANOVA column contains the words "by trng", the mean scores for each of the three training levels and the probability of that combination of scores. If a significant difference was found for the interaction of planning group and training level, the ANOVA column contains the words "by trng*group" and is followed by the probability of that occurrence. In each case where there was a significant difference, post hoc tests were also done. For example, if there was a significant difference by group, then post hoc tests were done to compare the three groups to each other. If they produced any significant differences, entries to that affect appeared in the columns labeled "post hoc test".

Following each table is a brief summary and interpretation of the results presented in that section. Following the summary for Table 4 is a general summary and interpretation for the combination of the four sections. All significant results were also listed in the matrix that appears in the second part of this chapter so the results could be compared to the district documents and the interviews and be included in the combined results.

I. Support Learning Outcomes

The following table, Table 1, presents each survey question under the category Support Learning Outcomes with the corresponding results from the ANOVA tests and post hoc tests. For example, under "I C Technology must support active learning and constructing knowledge", IC1, the general statement, and IC2, the school statement, produced no significant differences when tested by planning group, training level and their interactions. This is indicated in the TWOWAY ANOVA column by the words "not significant" followed by the mean responses for the questions.

On the other hand, "IC3 I use technology in my classes to support active learning and constructing knowledge." indicates in the TWOWAY ANOVA column that a significant difference was produced by training level. The mean responses for training levels 3, 2 and 1 were 4.000, 3.452 and 3.234 respectively and the probability of the differences was 0.016. In the post hoc columns, it is indicated that post hoc tests by training level produced significant differences between training level 3 and training level 1 and between training level 3 and training level 2 with the listed probabilities.

Table 1: Survey results - I. Support Learning Outcomes

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
I A	**Planning must address student needs and how teachers can address those needs with technology.**				
	IA1	Planning must address student needs and how teachers can address those needs with technology.	not significant overall - 4.53		
	IA2	In our school, teachers and staff are addressing student needs with technology.	not significant overall - 3.16		
	IA3	I am currently addressing student needs with technology in my classroom.	by group TCH-3.571 SCH-3.657 COT-3.000 Probability: 0.073	TCH > COT Probability: 0.071	
I B	**Technology must be curriculum driven.**				
	IB1	Technology must be curriculum driven.	not significant overall - 3.97		
	IB2	In our school, technology is being used in the content areas.	not significant overall - 3.11		
	IB3	I currently use technology in the content areas.	not significant overall - 3.41		
I C	**Technology must support active learning and constructing knowledge.**				
	IC1	Technology must support active learning and constructing knowledge.	not significant overall - 4.41		
	IC2	Technology in our school supports active learning and constructing knowledge.	not significant overall - 3.37		
	IC3	I use technology in my classes to support active learning and constructing knowledge.	by trng trng3-4.000 trng2-3.452 trng1-3.234 Probability: 0.016	trng3 > trng1 Probability: 0.013	trng3 > trng2 Probability: 0.058

Table 1: Survey results - I. Support Learning Outcomes
Continued

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
I D	**Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.**				
	ID1	Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.	by group TCH-4.857 SCH-4.600 COT-4.529 Probability: 0.053	TCH > SCH Probability: 0.056	
	ID2	Students in our school are learning real-world skills such as acquiring and processing information and analyzing and interpreting data.	not significant overall - 3.23		
	ID3	Students in my classes are learning real-world skills such as acquiring and processing information and analyzing and interpreting data.	by trng trng3-3.885 trng2-3.194 trng1-3.234 Probability: 0.041	trng3 > trng2 Probability: 0.032	

Table 1: Survey results - I. Support Learning Outcomes
continued

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
I E	**A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.**				
	IE1	A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.	by group TCH-4.514 SCH-3.971 COT-4.059 Probability: 0.049	TCH > SCH Probability: 0.040	
	IE2	In our school, some methods of instruction are dependent upon the use of technology.	by trng trng3-3.615 trng2-3.097 trng1-3.078 Probability: 0.016	trng3 > trng1 Probability: 0.047	trng3 > trng2 Probability: 0.013
			by trng*group Probability: 0.066	TCHtr3 > COTtr1 Probability: 0.084	TCHtr3 > COTtr2 Probability: 0.068
				COTtr3 > COTtr1 Probability: 0.063	COTtr3 > COTtr2 Probability: 0.038
				TCHtr1 > COTtr1 Probability: 0.038	
	IE3	In my classes, some lessons are dependent upon the use of technology.	not significant overall - 3.15		

Support Learning Outcomes Summary

From the survey responses, it appears that the people in the TCH group and the SCH group, who were more involved in the planning process than the COT group, were more convinced that student needs were being addressed in their classrooms, and the TCH teachers were more in agreement with the importance of providing real-world skills to students than the other teachers were. They felt stronger than the other teachers about the need for a plan to integrate technology into the curriculum. Also, the individuals who have had more training than the other teachers appear to perceive more evidence of active learning and constructing knowledge happening in their classrooms than do teachers with less training. They felt that they were actually providing real-world opportunities in their classrooms, and they felt stronger about instruction in their building being dependent upon technology than people with less training did. It appears that the combination of being involved in planning and participating in training has given some teachers a better vision of how to do what they believe in or it simply makes them more confident that the techniques they are using are pedagogically sound.

II. Active Leadership

The following table, Table 2, presents each survey question under the category Active Leadership with the corresponding results from the ANOVA tests and post hoc tests. For example, under "II C Evaluation", IIC1, the general statement, and IIC2, the school statement, each produced significant differences by training level and their post hoc tests by training level each produced significant differences between training level 3 and training level 1. IIC3, the personal statement, also produced significant differences by training level, but its post hoc tests by training level produced significant differences between training level 3 and training level 1 and between training level 3 and training level 2.

Table 2: Survey results - II. Active Leadership

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
II A	**Lead by involvement**				
	Planning and decision making by school personnel				
	IIA1	School personnel must have the responsibility of planning and making decisions and place them high on the agenda.	not significant overall - 4.33		
	IIA2	In our school, teachers are involved in planning and making decisions.	not significant overall - 3.49		
	IIA3	I personally am involved in planning and making decisions.	not significant overall - 3.61		
	Recognition and support				
	IIA4	The superintendent, central admin and principals must publicly support creative teachers.	not significant overall - 4.66		
	IIA5	Our school has received recognition and/or support for creative ideas in the use of technology.	not significant overall - 2.8		
	IIA6	I have received recognition and/or support for the use of technology in our school.	by trng trng3-3.154 trng2-2.452 trng1-2.364 Probability: 0.004	trng3 > trng1 Probability: 0.004	trng3 > trng2 Probability: 0.009
II B	**Standards and spreading innovations**				
	Extensive inservice and high quality software				
	IIB1	Good advance planning must include extensive inservice training and high quality courseware/software.	not significant overall - 4.64		
	IIB2	Teachers in our school have had access to appropriate technology training and high quality courseware/software.	by trng trng3-4.038 trng2-3.419 trng1-2.987 Probability: 0.001	trng3 > trng1 Probability: 0.002	trng2 > trng1 Probability: 0.029
	IIB3	I have had access to technology training and courseware/software that is appropriate for my needs.	by trng trng3-4.231 trng2-3.710 trng1-3.468 Probability: 0.039	trng3 > trng1 Probability: 0.066	
			by group TCH-3.971 SCH-3.857 COT-3.118 Prob: 0.016	TCH > COT Probability: 0.017	

Table 2: Survey results - II. Active Leadership
Continued

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
Assistance and direction in planning					
	IIB4	School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards.	by group TCH-3.829 SCH-3.514 COT-3.206 Probability: 0.066	TCH > COT Probability: 0.077	
	IIB5	In our efforts at planning the use of technology in our building, we have received assistance and direction to ensure quality and district standards.	by trng trng3-4.038 trng2-3.129 trng1-2.753 Probability: 0.004	trng3 > trng1 Probability: 0.003	trng3 > trng2 Probability: 0.055
	IIB6	I have personally received assistance in planning the use of technology to assure quality and consistency with district standards.	by trng trng3-3.731 trng2-2.677 trng1-2.506 Probability: 0.032	trng3 > trng1 Probability: 0.028	trng3 > trng2 Probability: 0.077
			by group TCH-3.029 SCH-3.229 COT-2.206 Probability: 0.073	TCH > COT Probability: 0.065	
II C	**Evaluation**				
	IIC1	Mechanisms for feedback must be established to monitor how the use of technology and training is going and the data gathered must direct future modifications, training, etc.	by trng trng3-4.231 trng2-4.161 trng1-3.896 Probability: 0.023	trng3 > trng1 Probability: 0.034	
	IIC2	The personnel in our building have had an opportunity to give feedback on the use of technology and training.	by trng trng3-3.308 trng2-2.839 trng1-2.571 Probability: 0.047	trng3 > trng1 Probability: 0.049	
	IIC3	I have had an opportunity to give feedback on the use of technology and training and I feel that my feedback will be used.	by trng trng3-3.885 trng2-2.806 trng1-2.558 Probability: 0.000	trng3 > trng1 Probability: 0.000	trng3 > trng2 Probability: 0.002

Active Leadership Summary

From the surveys, it appeared that all teachers felt that being involved in planning and making decisions is important, but they and others in their buildings are not involved enough. The lack of a defined effort at leading, collaborating and providing support and recognition was recognized by the teachers. The people who had received more training must have been recognized in their buildings because they have more to offer than the other teachers, but even they recognized that other people in their buildings are not being recognized as they should be. Though most of the teachers believed in good software and training, the people more involved in planning and training felt more strongly about the value of the software and training available in their schools and classrooms. The people involved in planning and training felt that they had received assistance in planning that aligned them with district standards. Also, the teachers who have had more training are either more aware of the need for evaluation than the other teachers, or they are more confident that their feedback will be used constructively.

III. Collaborative Planning

The following table, Table 3, presents each survey question under the category Collaborative Planning with the corresponding results from the ANOVA tests and post hoc tests. For example, under "Suitable pace and support", IIIA4, the general statement, and IIIA5, the school statement, produced no significant differences when tested by planning group, training level and their interactions. This is indicated in the TWOWAY ANOVA column by the words "not significant" followed by the mean responses for the questions.

On the other hand, "IIIA6 In our school, I have had an opportunity to adopt technology at a pace that is suitable for me and I have been involved in a good learning environment." indicates in the TWOWAY ANOVA column that a significant difference was produced by training level. The mean responses for training levels 3, 2 and 1 were 4.038, 3.387 and 3.104 respectively, and the probability of the differences was 0.029. In the post hoc columns, it is indicated that post hoc tests by training level produced significant differences between training level 3 and training level 1 with a probability of 0.022.

Table 3: Survey results - III. Collaborative Planning

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
III A Vision and Ownership					
	Opportunity for interaction and discussion				
	IIIA1	Teachers need a chance to interact with each other to discuss how the use of technology can change the learning environment.	not significant overall - 4.44		
	IIIA2	Training and the use of technology in our building has provided a chance for teachers to interact with each other and to discuss changes in the learning environment.	not significant overall - 2.67		
	IIIA3	Training and the use of technology in our building has provided a chance for me to interact with others and to discuss the meaning of change for me.	by trng trng3-3.577 trng2-2.645 trng1-2.532 Probability: 0.063	trng3 > trng1 Probability: 0.050	
	Suitable pace and support				
	IIIA4	A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change and they must be exposed to conditions that support learning.	not significant overall - 4.45		
	IIIA5	In our school, personnel have been given a chance to adopt technology at a pace that is suitable for them and they have had support for learning new ideas.	not significant overall - 3.06		
	IIIA6	In our school, I have had an opportunity to adopt technology at a pace that is suitable for me and I have been involved in a good learning environment.	by trng trng3-4.038 trng2-3.387 trng1-3.104 Probability: 0.029	trng3 > trng1 Probability: 0.022	

Table 3: Survey results - III. Collaborative Planning Continued

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
III B Collaboration and support					
	Collaborative planning and support				
	IIIB1	Collaborative planning is essential and it must be accompanied by extra support during implementation.	not significant overall - 4.35		
	IIIB2	In our school, planning for the use of technology is done collaboratively by our staff and central office personnel and we can expect extra support when we begin to use the technology.	not significant overall - 2.48		
	IIIB3	I have been involved in planning the use of technology in our building and support from central office staff has been available to assist us when we have begun to use the technology.	by group trng3-2.943 trng2-2.800 trng1-2.206 Probability: 0.075	TCH > COT Probability: 0.063	
	Access to hardware, software and other resources				
	IIIB4	Schools must receive support from the school board, administration, and community and they must have access to hardware, software, support personnel, and related resources.	not significant overall - 4.71		
	IIIB5	Our school has experienced support from the school board, administration, and community and our teachers have access to hardware, software, support personnel, and related resources.	by trng trng3-3.231 trng2-3.161 trng1-2.766 Probability: 0.060	trng2 > trng1 Probability: 0.088	
	IIIB6	My classroom has been affected by support from the school board, administration, and community and I have access to hardware, software, support personnel, and related resources.	not significant overall - 2.78		

Collaborative Planning summary

In the survey responses, most of the teachers had similar opinions about the importance of teachers interacting and discussing the meaning of change and the need for conditions that support learning and allow them to adopt technology at a suitable pace. Only the teachers involved in training felt that they personally had had an appropriate opportunity to participate. The teachers who had had more training also felt more strongly than the other teachers that resources were available at their individual schools. The TCH members, who were closer to the planning process, felt more strongly than the other teachers that they were personally involved in collaborative planning and were receiving central support.

IV. Plan for Change

The following table, Table 4, presents each survey question under the category Plan for Change with the corresponding results from the ANOVA tests and post hoc tests. For example, under "Vision", IVA1, the general statement, and IVA2, the school statement, produced no significant differences when tested by planning group, training level and their interactions. This is indicated in the TWOWAY ANOVA column by the words "not significant" followed by the mean responses for the questions.

On the other hand, "IVA3 I know how technology should be used and I have used it to change the learning environment in my classroom." indicates in the TWOWAY ANOVA column that a significant difference was produced by training level. The mean responses for training levels 3, 2 and 1 were 3.731, 3.258 and 3.104 respectively, and the probability of the differences was 0.062. In the post hoc column, it is indicated that post hoc tests by training level produced significant differences between training level 3 and training level 1 with a probability of 0.051.

Table 4: Survey results - IV. Plan for Change

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
IV A Link technology to educational change					
	Vision				
	IVA1	Accompanying each technology introduced must be a vision of how it is to be used and how it will change the learning environment.	not significant overall - 4.41		
	IVA2	The teachers in our building have a vision of how technology is to be used and how it should change the learning environment.	not significant overall - 2.76		
	IVA3	I know how technology should be used and I have used it to change the learning environment in my classroom.	by trng trng3-3.731 trng2-3.258 trng1-3.104 Probability: 0.062	trng3 > trng1 Probability: 0.051	
	Affect student achievement				
	IVA4	Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes.	by group TCH-4.629 SCH-4.257 COT-4.265 Probability: 0.063	TCH > SCH Probability:	0.056
			by trng*group Probability: 0.064	TCHtrng3 > COTtrng2 Probability: 0.031	
	IVA5	In our school, the use of technology has a positive effect on student achievement and other desired outcomes.	by group TCH-3.571 SCH-3.800 COT-3.206 Probability: 0.044	SCH > COT Probability: 0.035	
	IVA6	In my classroom, the use of technology has had a positive effect on student achievement and other desired outcomes.	not significant overall - 3.53		
IV B Training					
	IVB1	Each technology must be accompanied by training, modeling, and support.	by group TCH-4.686 SCH-4.229 COT-4.618 Probability: 0.008	TCH > SCH Probability: 0.006	

Table 4: Survey results - IV. Plan for Change
Continued

	#	Survey Question	TWOWAY ANOVA	post hoc test	post hoc test
	IVB2	Teachers in our school have had adequate opportunities for training, modeling, and support.	by trng trng3-3.462 trng2-3.194 trng1-2.792 Probability: 0.015	trng3 > trng1 Probability: 0.022	trng2 > trng1 Probability: 0.086
	IVB3	I have participated in provided training and I feel that modeling and support are available when I need them.	by trng trng3-3.923 trng2-3.742 trng1-3.130 Probability: 0.000	trng3 > trng1 Probability: 0.000	trng2 > trng1 Probability: 0.003
			by trng*group Probability: 0.024	TCHtr3 > COTtr1 Prob: 0.000	TCHtr3 > SCHtr1 Prob: 0.069
				TCHtr3 > TCHtr1 Prob: 0.006	TCHtr3 > COTtr2 Prob: 0.033
				SCHtr3 > COTtr1 Prob: 0.024	SCHtr2 > COTtr1 Prob: 0.000
				SCHtr2 > SCHtr1 Prob: 0.068	SCHtr2 > TCHtr1 Prob: 0.002
				SCHtr2 > COTtr2 Prob: 0.025	
IV C	**Strategies**				
	IVC1	Schools must have a coordinating committee or steering group to help plan the use of technology and acquiring resources, track problems and devise solutions to problems.	not significant overall - 4.11		
	IVC2	Our school uses a Building Improvement Team or an equivalent planning committee to plan the use of technology, acquire resources, track problems and devise solutions to problems.	by trng*group Probability: 0.073		
	IVC3	I am involved in planning the use of technology for my building and the district.	by group TCH-3.457 SCH-2.629 COT-2.147 Prob: 0.000	TCH > SCH Probability: 0.004	TCH > COT Probability: 0.001

Plan for Change summary

In the survey responses, it appears that teachers in groups that are closer to the planning process feel that the use of technology has a positive effect on student achievement and other desired outcomes in their school buildings, but they don't necessarily see those effects in their own classrooms. They feel stronger about the need for training accompanying technology, and the teachers who have participated in training feel stronger about the need for training, modeling and support than the teachers who have not participated in the training. The TCH group was more involved in planning both at the building and district level than the others, but most of the teachers had some feelings about the importance of a coordinating group.

Survey Summary

In general, the survey responses confirmed that the people closer to the planning process are more in agreement with change theory than the people who are not so close to the planning process, and the people with more training are more in agreement with change theory than are people who have had less training.

Members of the TCH group, the group closest to the planning process, were more convinced that student needs were being addressed in their classrooms, and they were more in agreement with the importance of providing real-world skills to students than the other teachers were. They felt stronger about the need to integrate technology into the curriculum. They felt more strongly than the other teachers that they were personally involved in

collaborative planning and were receiving central support. It appeared that they felt more strongly that the use of technology has a positive effect on student achievement and other desired outcomes in their school buildings, even if they didn't see those effects in their own classrooms.

The people closer to the planning process felt stronger about the need for training accompanying technology, and the teachers who had participated in training felt stronger about the need for training, modeling and support than the teachers who had not participated in the training. The individuals who had had more training perceived more evidence of active learning and constructing knowledge happening in their classrooms than did teachers with less training. They felt that they were actually providing real-world opportunities in their classrooms, and they felt stronger about instruction in their buildings being dependent upon technology than people with less training did.

It appears that the combination of being involved in planning and participating in training has given some teachers a better vision of how to do what they believe in or it simply makes them more confident that the techniques they are using are pedagogically sound. The people more involved in planning and training felt more strongly about the value of the software and training available in their schools and classrooms, and they felt that they had received assistance in planning that aligned them with district standards. They felt more strongly that resources were available to them and they were more confident that their feedback would be used constructively.

IMPLICATIONS OF CHANGE THEORY FOR PLANNING USES OF INSTRUCTIONAL TECHNOLOGY

VOLUME II

By

Mathew B. Burns

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Counseling, Educational Psychology
and Special Education

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District Documents, Surveys and Interviews Combined

This study involved the development of investigation components and testing their validity. Testing their validity required the researcher to look at the district documents, surveys and interviews simultaneously and analyze them with reference to the investigation components. A matrix that included the investigation components, the district documents, surveys and interviews was created to facilitate this analysis. Looking at all of them together makes it easier to combine their results and make interpretations and recommendations. The matrix displays excerpts from the district documents, test results from the surveys and responses from the interviews. The first column is a listing of the investigation components. Across from each component, are the results from each of the analyses that match with that particular investigation component. In the district documents column, are excerpts from district documents (if they exist) that provide evidence that the district planning process is in alignment with that particular investigation component. In the survey column, are the results of the TWOWAY ANOVA tests, contrasting the levels of training and the levels of involvement in the planning process with respect to the three questions that match that investigation component. (One or two sets of three questions were defined for each major investigation component.) In the interviews column, are responses from the interviews that provide evidence of ideas that are in agreement with the investigation component.

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The matrix is presented in four tables, one for each of the main sections of the investigation components: I. Support Learning Outcomes, II. Active Leadership, III. Collaborative Planning and IV. Plan for Change. Immediately following the table for each section is a summary of the results from that section, an explanation of how those pieces of information fit together, a table used to validate investigation components and the researcher's interpretation of what they convey for planning.

I. Support Learning Outcomes

Table 5 presents the results of the study of the district documents, surveys and interviews with respect to the first major section of the investigation components, I. Support Learning Outcomes. The first column lists the investigation components that address supporting learning outcomes. (The investigation components are listed in the same format here as in the list of investigation components in chapter 3 and in the survey results earlier in this chapter.) Across from each investigation component are the results that pertain to that particular component. In the second column, are excerpts from district documents that refer to the importance of using technology to support learning outcomes. In the third column, are the results of the ANOVA tests contrasting the levels of training and the levels of involvement in the planning process as presented in the first part of this chapter. Each teacher responding to the surveys was a member of one of three planning groups. The Technology Planning Group (TCH) was the group most involved in the district planning process. The School Group (SCH)

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was comprised of teachers from schools somewhat involved in the planning process. The Classroom of Tomorrow Group (COT) had no formal involvement in the planning process. Each teacher was also a member of one of three training levels. Training level 3 (trng3) had been involved in 45 hours or more of technology training. Training level 2 (trng2) had been involved in 15 to 30 hours of technology training and training level one (trng1) had been involved in no formal technology training. The mean scores have been included with the significant tests to provide an aid to interpretation. If "not significant" is listed, the overall mean response is listed below it. If a significant difference was found by planning group, the mean scores for each of the three planning groups and the probability of that combination of scores are listed. If a significant difference was found by training level, the mean scores for each of the three training levels and the probability of that combination of scores are listed. In the last column, are the interview responses that made reference to Support Learning Outcomes. The number of people sharing that response is displayed in parentheses after the response.

Following Table 5 are summaries, implications, interpretations and recommendations based on the combined results of the district documents, surveys and interviews with respect to Support Learning Outcomes.

Table 5: I. Support Learning Outcomes - Combined Results

Investigation Components	*District Documents (Full text is in Appendix H)*	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response

Table 5: I. Support Learning Outcomes - Combined Results

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
A Planning must address student needs and how teachers can address those needs with technology.	Instructional Technology Plan A Vision for Technology: . . . learning outcomes. . . higher order thinking . . . individual paces . . . portfolios . . . "individual educational plan" Technology Planning Beliefs . . . primary focus on learner outcomes. Curriculum And Staff Development . . . staff development . . . Curriculum area specific technology use . . . Primary Area Listings 1. Language Arts - Mastery of Writing Outcomes . . . IT Steering Committee minutes Goals & Objectives - district interviews: . . . independent and cooperative learning . . . Special Issues from the Superintendent, IT in our schools: reference IT Plan	IA1 General - not significant overall - 4.53 IA2 School - not significant overall - 3.16 IA3 I am currently addressing student needs with technology in my classroom. Personal - by group TCH-3.571 SCH-3.657 COT-3.000 Probability: .073 < 0.10 post hoc TCH > COT Probability: .071 < 0.10	Technology helps support individualized instruction. (2) Technology can make a big difference for special needs students. (1)

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews responses made

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
B Technology must be curriculum driven.	Instructional Technology Plan Exec Summary, Outcomes: . . . accomplishment of outcomes . . . A Series of Policy Actions C. Establish Curriculum Technology Panels . . . software and hardware policy . . . defined curriculum outcomes. . . Primary Area Listings: 1. Language Arts . . . PROTOTYPE School Completion Technology Application Outcomes . . . student accomplishment of curriculum outcomes . . . IT Steering Committee minutes Success Factors - district interviews: . . . consistent with educ. objectives IT Steering Committee minutes Feedback - Deputy Superintendent: . . . stress the use of curricular areas. . . . Special Issues from the Superintendent, IT in our schools: reference IT Plan	IB1 General - not significant overall - 3.97 IB2 School - not significant overall - 3.11 IB3 Personal - not significant overall - 3.41	Lots of technology is available and it can easily be integrated into math, language arts, music, etc. (13) Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) Laserdiscs and other presentation devices add significantly to all subjects. (6)

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
C Technology must support active learning and constructing knowledge.	Instructional Technology Plan A Vision for Technology: . . . student-designed . . . cooperative learning . . . Primary Area Listings: . . . Interactive programs . . . simulations . . . IT Steering Committee minutes Goals & Objectives - district interviews: . . . problem solving, critical thinking, team building, and decision-making . . . Special Issues from the Superintendent, IT in our schools: . . . focusing on goal setting and problem solving . . . simulated "real life" situations.	IC1 General - not significant overall - 4.41 IC2 School - not significant overall - 3.37 IC3 I use technology in my classes to support active learning and constructing knowledge. Personal - by trng trng3-4.000 trng2-3.452 trng1-3.234 Probability: .016 < 0.10 post hoc trng3 > trng1 Probability: .013 < 0.10 trng3 > trng2 Probability: .058 < 0.10	Technology can promote critical thinking, cooperative learning, etc. (11) Technology can support constructing knowledge through simulation and problem solving. (5) In music, math, language arts, etc. there are many opportunities for active learning and constructing knowledge. (5)

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	*District Documents (Full text is in Appendix H)*	**Survey Twoway ANOVA**	**Interviews responses made**

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
D Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.	Instructional Technology Plan A Vision for Technology: . . . research; communicate personally with other persons, classrooms, or schools; carry out individual or multi-school simulations; experience enrichment activities . . . Primary Area Listings: . . . Access data sources outside classroom . . . experimentation . . . data collection and reporting, . . . PROTOTYPE School Completion Technology Application Outcomes: . . . access, analyze, apply, & report information. . . IT Steering Committee minutes Goals & Objectives - district interviews: . . . real world applications. . . gather data, make conjectures, inferences . . . Special Issues from the Superintendent, IT in our schools: . . . productive members of an information-based society . . . sophisticated research capabilities . . .	ID1 Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data. General - by group TCH-4.857 SCH-4.600 COT-4.529 Probability: .053 < 0.10 post hoc TCH > SCH Probability: .056 < 0.10 ID2 School - not significant overall - 3.23 ID3 Students in my classes are learning real-world skills such as acquiring and processing information and analyzing and interpreting data. Personal - by trng trng3-3.885 trng2-3.194 trng1-3.234 Probability: .041 < 0.10 post hoc trng3 > trng2 Probability: .032 < 0.10	The use of technology itself is a real world skill. (14) Simulations allow students to look at real situations and practice decision making. (8) Students can gather data and analyze it using spreadsheets, data bases, calculators, etc. (7) Electronic CDs and on-line services expose students to process of doing research and gathering information. (6) Languages, culture and a vision of the real world are available through CD and laserdisc. (4)

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
E A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.	Instructional Technology Plan Primary Area Listings: . . . science simulations, basic experimentation using data gathering devices . . . data collection . . . communications technology for group collaboration . . . Special Issues from the Superintendent, IT in our schools: prepare them for success in a highly technological and information-based society.	IE1 A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction. General - by group TCH-4.514 SCH-3.971 COT-4.059 Probability: .049 < 0.10 post hoc TCH 4.514> SCH 3.971 Probability: .040 < 0.10 IE2 In our school, some methods of instruction are dependent upon the use of technology. School - by trng trng3-3.615 trng2-3.097 trng1-3.078 Probability: .016 < 0.10 post hoc trng3 > trng1 Probability: .047 < 0.10 trng3 > trng2 Probability: .013 < 0.10	Teachers need to see software possibilities and how it can be used pedagogically. (14) Lots of technology is available and it can easily be integrated into math, language arts, music, etc. (13) Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) If technology is used regularly it will be natural. (5) We should use the "Service Team" to promote using technology with effective instruction, good teaching practices, etc. (3) Technology works well in supporting Inter-disciplinary themes. (2)

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews

Table 5: I. Support Learning Outcomes - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		School - by trng*group Probability: .066 < 0.10 post hoc - see chap 4 IE3 Personal -not significant overall - 3.15	

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I. Support Learning Outcomes: Discussion of Combined Results

A. Planning must address student needs and how teachers can address those needs with technology.

Among the district documents, the Technology Plan and the goals and objectives listed in the Steering Committee minutes and derived from the previous district interviews, both point out that the primary use of technology is to meet student needs. The Technology Plan expresses a belief that planning technology must focus on learner outcomes, higher order thinking, individual plans, etc. The district plans are clearly intended to address student needs and how teachers can address those needs.

The ANOVA tests of the survey responses produced no significant differences among groups and training levels for the general and school statements, but they did produce a significant difference by group for the personal statement. The post hoc tests displayed a significant difference between the TCH and COT groups. This indicates that though the groups responded similarly to the general and school statements, the TCH group, which was more involved in planning, was more convinced that student needs were being addressed in their classrooms. It suggests that perhaps extra involvement in planning is necessary for teachers if they are to truly address student needs.

The interview responses included only three statements specifically about meeting student needs, but many of the statements classified as meeting other components were indirectly aimed at meeting student needs.

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B. Technology must be curriculum driven.

In the district documents, the IT Plan, the IT Steering Committee minutes and feedback and the Special Issues from the Superintendent provide several pieces of evidence supporting curriculum driven technology. They recommend the use of curriculum technology panels, defined curriculum outcomes, and so on.

The survey responses showed no significant differences for the general, school or personal statements. This indicates that, though most of the teachers felt that technology should be curriculum driven, they were not convinced that technology was being fully used in the content areas in their buildings and classrooms.

The responses to the interviews included 32 statements consistent with the district planning about integrating technology into the curriculum. They gave specific curriculum uses of technology and suggested working to tie technology to outcomes. Suggestions were made for using "effective instruction" principles and good teaching practices to expose teachers to how technology can be integrated into curriculum areas. It was pointed out that teachers need to see software possibilities and how they can be used in instruction. It was also suggested that the technology panels should be used to match technology with defined outcomes and that results must be well communicated.

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C. Technology must support active learning and constructing knowledge.

Active learning and constructing knowledge are supported in district documents in the IT Plan, the IT Steering Committee minutes and the Special Issues from the Superintendent. They list cooperative learning, simulations, problem solving, critical thinking, team building and many other constructive activities. Also, the Plan states that teachers must be trained to meet student needs with technology, and the Steering Committee minutes point out that technology must be used to support a variety of learning styles.

In the surveys, there were no significant differences in the general and school statements, but there were significant differences in the responses to the personal statement. The ANOVA test displayed a significant difference by training level, and the post hoc tests provided significant differences between training level 3 and training level 1 and between level 3 and level 2. It appears that, regardless which group a person is in, the individuals with more training appear to perceive more evidence of active learning and constructing knowledge happening in their classrooms than do teachers with less training.

There were 21 interview responses that suggest that the teachers interviewed truly feel that technology can support active learning and constructing knowledge. It is also evident that their ideas are in line with what was presented in the district documents.

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D. Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.

Among the district documents, several references to providing students with real-world skills were found in the IT Plan, Steering Committee minutes and Special Issues from the Superintendent. They make reference to research, communication, gathering data, analyzing, making conjectures, inferences, and so on.

In the survey responses to the general statement, there were significant differences by group; the post hoc tests showed a significant difference between the TCH and SCH groups. There were no significant differences among the responses to the school statement, but there were significant differences among the responses to the personal statements by training level. The post hoc tests displayed a significant difference between training levels two and three. These results may indicate that the group closer to the district planning is more in agreement with the importance of providing real-world skills to students, but the people with the most training felt that they were actually providing those opportunities in their classrooms.

The interview responses from the TCH and SCH members with more training included 39 statements about simulations, calculators, spreadsheets, etc. that provide the kinds of skills presented in the district documents and this investigation component. With their additional training and involvement in planning, they feel confident that they know how to present real-world skills.

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E. A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.

Among the district documents, the IT Plan listed several areas that will integrate technology into the content areas. It listed each area of the curriculum with a number of technology components that will be used on a regular basis. The Special Issues from the Superintendent stressed the importance of technology in the curriculum to prepare students for a highly technological and information-based society.

In the surveys, the responses to the general statement produced a significant difference by group with a significant difference between the TCH and SCH in the post hoc tests. The responses to the school statement produced a significant difference by training, with level 3 significantly greater than level 2 and level 1 in the post hoc tests and a significant difference for trng*group, but the personal statement produced no significant difference. From these results, it would appear that the TCH group felt stronger about the need for a plan to integrate technology into the curriculum than the SCH group did. This could have been caused by their closer involvement in district planning or it could be that they were chosen for this group because they felt this way. On the other hand, the differences in the responses to the school statement clearly indicate that, with no regard to group, the people with more training felt stronger about instruction in their building being dependent upon technology than people with less training felt about it.

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The teachers interviewed, TCH and SCH teachers with more training, made 50 statements that supported the idea of integrating technology and making it an important component of instruction and they produced a variety of suggestions.

I. Support Learning Outcomes: Summary

District Documents

The district documents are clearly aligned with every investigation component aimed at Support of Learning Outcomes. The Technology Plan and the Steering Committee minutes point out that the primary use of technology is to meet student needs. The Technology Plan expresses a belief that planning technology must focus on learner outcomes and that teachers must be trained to meet student needs with technology. The technology plan and the Steering Committee minutes both suggest strongly that technology is to be curriculum driven and that it should support a variety of learning styles. It must support active learning and constructing knowledge, and students must be exposed to the skills needed in the work place. The Technology Plan lists several ideas that are aimed at using technology in all areas.

Surveys

From the survey responses, it appears that the TCH group who were quite involved in the planning process were more convinced that student needs were being addressed in their classrooms and they were more in agreement with the importance of providing real-

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world skills to students than the other teachers were. They felt stronger than the other teachers about the need for a plan to integrate technology into the curriculum. Also, the individuals who have had more training than the other teachers appear to perceive more evidence of active learning and constructing knowledge happening in their classrooms than do teachers with less training. They felt that they were actually providing real-world opportunities in their classrooms, and they felt stronger about instruction in their buildings being dependent upon technology than people with less training did. It appears that the combination of being involved in planning and participating in training has given some teachers a better vision of how to do what they believe in or it simply makes them more confident that the techniques they are using are pedagogically sound.

Interviews

The responses of the interviewees were very much in line with the investigation components extracted from the literature on change theory. Suggestions were made for using "effective instruction" principles and good teaching practices to expose teachers to how technology can be integrated into curriculum areas. It was pointed out that teachers need to see software possibilities and how they can be used in instruction. It was also suggested that the technology panels should be used to match technology with defined outcomes and that results must be well communicated. They suggested spreadsheets, data bases, calculators, simulations, electronic CDs, on-line services, etc. as technologies that students

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must use to learn to live in today's world. They stated that appropriate technologies are available and that technology panels should match the technologies to the curriculum. Though not specific about what can be done, they all suggested that potential for active learning and constructing knowledge exists in using technology.

Combined Results

In total, the district documents, surveys and interviews consistently supported the investigation components under Support Learning Outcomes. The documents gave evidence that district planning, on paper at least, is aligned with change theory with respect to Support Learning Outcomes. The survey results suggest that teachers who are included in the planning process and who take advantage of technology training are more likely to be in agreement with change theory in supporting learning outcomes than those who are not involved in both planning and training. The interviews showed that the people from the TCH and SCH groups with higher levels of training had the perception that the investigation components concerning supporting learning outcomes had been put into action in their schools and especially in their classrooms. They gave many specific suggestions about how technology can be used to support learning outcomes. Their statements were very much in agreement with the content presented in the district documents.

Before making recommendations based on the findings of this study with respect to Support Learning Outcomes, some criteria had to be set as the basis for validating investigation components.

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Table 6 was created to validate the investigation components that have been documented in Grand Rapids Public Schools (GRPS) and have been endorsed by a number of teachers in their interview responses. Each investigation component was assigned five points for each excerpt from district documents that was aligned with that component and one point for each interview response that was aligned with that component. Each component that accumulated 20 or more points is considered validated and included in the recommendations. The survey results are not included in Table 6 because the surveys primarily provide information about the effects of training and involvement in the planning process. Recommendations from them are included in each section after the recommendations based on the validation process.

Table 6: I. Support Learning Outcomes - Validation

	Document (5 each)	Interview (1 each)	TOTAL	Validate
I Support Learning Outcomes				
A Planning must address student needs and how teachers can address those needs with technology.	30	3	33	Yes
B Technology must be curriculum driven.	35	32	67	Yes
C Technology must support active learning and constructing knowledge.	20	21	41	Yes
D Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.	25	39	64	Yes
E A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.	10	50	60	Yes

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I. Support Learning Outcomes: Implications, Interpretations and Recommendations

The district documents and the interview responses were clearly in alignment with the investigation components, and for each component, the combined total of points was well over the pre-assigned 20 points for validation. Therefore, the investigation components as stated in this section should be included in guidelines for successful planning for the use of instructional technology. The following recommendations should be followed to support learning outcomes:

1. Planning must address student needs and how teachers can address those needs with technology.
2. Technology must be curriculum driven.
3. Technology must support active learning and constructing knowledge.
4. Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.
5. A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.

In the surveys, the mean response for each of the general statements was high enough (3.97 or greater) to indicate agreement with the investigation components. Where there were significant differences in any of the statements, the teachers with more involvement in planning and training were more in agreement with the investigation components than were the other teachers. These

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results attest to the validity of the investigation components concerning supporting learning outcomes, and they suggest that increasing teacher involvement in planning and training may increase their agreement with tenets of change theory that are concerned with supporting learning outcomes. Therefore, two further recommendations to support learning outcomes should be followed:

6. To address student needs and integrate technology into the curriculum, teachers must be thoroughly involved in the planning process.
7. Adequate training must be provided for teachers, and extraordinary means should be taken to encourage their involvement in designing and delivering training.

II. Active Leadership

Table 7 presents the results of the study of the district documents, surveys and interviews with respect to the second major section of the investigation components, II. Active Leadership. The first column lists the investigation components that address supporting active leadership. (The investigation components are listed in the same format here as in the list of investigation components in chapter 3 and in the survey results earlier in this chapter.) Across from each investigation component are the results that pertain to that particular component. In the second column, are excerpts from district documents that refer to the importance of active leadership. In the third column, are the results of the ANOVA tests contrasting the levels of training and the levels of

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involvement in the planning process as presented in the first part of this chapter. Each teacher responding to the surveys was a member of one of three planning groups. The Technology Planning Group (TCH) was the group most involved in the district planning process. The School Group (SCH) was comprised of teachers from schools somewhat involved in the planning process. The Classroom of Tomorrow Group (COT) had no formal involvement in the planning process. Each teacher was also a member of one of three training levels. Training level 3 (trng3) had been involved in 45 hours or more of technology training. Training level 2 (trng2) had been involved in 15 to 30 hours of technology training, and training level one (trng1) had been involved in no formal technology training. The mean scores have been included with the significant tests to provide an aid to interpretation. If "not significant" is listed, the overall mean response is listed below it. If a significant difference was found by planning group, the mean scores for each of the three planning groups and the probability of that combination of scores are listed. If a significant difference was found by training level, the mean scores for each of the three training levels and the probability of that combination of scores are listed. In the last column, are the interview responses that made reference to Active Leadership.

Following Table 7 are summaries, implications, interpretations and recommendations based on the combined results of the district documents, surveys and interviews with respect to Active Leadership.

Table 7: II. Active Leadership - Combined Results

Investigation Components	*District Documents (Full text is in Appendix H)*	Survey Twoway ANOVA	Interviews responses made

Table 7: II. Active Leadership - Combined Results

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
A Lead by Involvement			
1. School personnel must have the responsibility of planning and making decisions and they must place planning high on the agenda.	Instructional Technology Plan A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area.	IIA1 General - not significant overall - 4.33 IIA2 School - not significant overall - 3.49 IIA3 Personal - not significant overall - 3.61	Planning must be done in each building and each group and must be consistent with district planning.(12) The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5) We must provide opportunities for all to give input for planning. (5)
2. Implementation must focus on teachers.	Instructional Technology Plan A Vision for Technology: 5. Teachers will function as facilitators . . . monitoring student progress and verifying mastery. Managing large amounts of student information . . . store presentations for students . . . involved in ongoing training . . . Record keeping, security, information dissemination, parent communications, inventory, testing, lesson delivery . . . Instructional Technology Plan: . . . computing workstation for every teacher . . . formal sequence of staff development and training . . .		We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) Teachers need to see software possibilities and how it can be used pedagogically. (14) We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10) Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher needs. (8)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	*District Documents (Full text is in Appendix H)*	Survey Twoway ANOVA	Interviews responses made

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
			Students can use technology for calculations and time-consuming tasks; teachers must make connections to life. (5)
3. The superintendent and administrative support must be visible at the start	IT Steering Committee minutes Success Factors - district interviews: r. Board and executive staff support		There are a few teachers working above and beyond the call of duty. They should be at least thanked for what they are doing. Much recognition should come from building principals. They can focus attention on them within the building. (7)
4. Local resources should be utilized when possible.			We should use "train the trainer" or Comp Ed teachers to provide at least one trainer in each building. (7) We can use high school teachers to present technology use to elementary teachers and encourage visitations. (2)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	*District Documents (Full text is in Appendix H)*	**Survey Twoway ANOVA**	**Interviews responses made**

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
5. Principals and district administrators must publicly support creative teachers.		IIA4 General - not significant overall - 4.66 IIA5 School - not significant overall - 2.8 IIA6 I have received recognition and/or support for the use of technology in our school. Personal - by trng trng3-3.154 trng2-2.452 trng1-2.364 Probability: .004 < 0.10 post hoc trng3 > trng1 probability: .004 < 0.10 trng3 > trng2 probability: .009 < 0.10	We can give recognition by publishing a list of champions or highlighting individuals who are doing well and are willing to help others. (10) There are a few teachers working above and beyond the call of duty. They should be at least thanked for what they are doing. Much recognition should come from building principals. They can focus attention on them within the building. (7)
6. Leadership is necessary all through the implementation process.			Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews responses made

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
			We should use the "Service Team" to promote using technology with effective instruction, good teaching practices, etc. (3)
7. School leaders must be involved in change efforts at all stages.			The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5)
8. The change agent must communicate well and be a good listener to establish a good rapport and he must lead or collaborate with others in solving problems that arise in implementation of the innovation.			We must provide opportunities for all to give input for planning. (5)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	*District Documents (Full text is in Appendix H)*	**Survey Twoway ANOVA**	**Interviews responses made**

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
B Standards and spreading innovations			
1. Good advance planning must include extensive inservice training and high quality courseware/ software.	Instructional Technology Plan Technology Planning Beliefs: . . . acquire technology only after an appropriate plan for staff development and training has been approved as well. GRPS Strategic Plan, Strategy No. 6 Action Plan No. 5: "3. Provide ongoing inservice training for all building staff as needed in the use of available technology and materials." Instructional Technology Plan Curriculum And Staff Development: An extensive technology staff development program . . . IT Steering Committee minutes Success Factors - district interviews: I. On site training	IIB1 General - not significant overall - 4.64 IIB2 Teachers in our school have had access to appropriate technology training and high quality courseware/software. School - by trng trng3-4.038 trng2-3.419 trng1-2.987 Probability: .001 < 0.10 post hoc trng3 > trng1 Probability: .002 < 0.10 trng2 > trng1 Probability: .029 < 0.10 IIB3 I have had access to technology training and courseware/software that is appropriate for my needs. Personal - by trng trng3-4.231 trng2-3.710 trng1-3.468 Probability: .039 < 0.10 post hoc trng3 > trng1 Probability: .066 < 0.10	Training must be aimed at specific groups, subjects & activities. (19) Teachers need to see software possibilities and how it can be used pedagogically. (14) We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) Training should include peer coaching, sharing & team teaching. (11) We should use meeting days, BIT days or district-wide inservice days for training. (10) We should use the "Service Team" to promote using technology with effective instruction, good teaching practices, etc. (3)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews responses made

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		Personal - by group TCH-3.971 SCH-3.857 COT-3.118 Probability: .016 < 0.10 post hoc TCH > COT Probability: .017 < 0.10	
2. School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards.	GRPS Strategic Plan, Strategy No. 6 Action Plan No. 5: "1. Establish optimal standards for educational technology and materials for the school system with annual review for updating if necessary. Instructional Technology Plan A Series of Policy Actions: I. Adopt a District software and hardware policy . . . IT Steering Committee minutes Issues and Concerns - district interviews: b. Standardization of hardware and software	IIB4 School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards. General - by group TCH-3.829 SCH-3.514 COT-3.206 Probability: .066 < 0.10 post hoc TCH > COT Probability: .077 < 0.10 IIB5 In our efforts at planning the use of technology in our building, we have received assistance and direction to ensure quality and district standards. School - by trng trng3-4.038 trng2-3.129	Planning must be done for each building and each group and it must be consistent with district planning. (12) We must have district standards for hardware and software and defined outcomes. (10)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		trng1-2.753 Probability: .004 < 0.10 post hoc trng3 > trng1 Probability: .003 < 0.10 trng3 4.038 > trng2 3.129 Probability: .055 < 0.10 IIB6 I have personally received assistance in planning the use of technology to assure quality and consistency with district standards. Personal - by trng trng3-3.731 trng2-2.677 trng1-2.506 Probability: .032 < 0.10 post hoc trng3 > trng1 Probability: .028 < 0.10 trng3 > trng2 Probability: .077 < 0.10 Personal - by group TCH-3.029 SCH-3.229 COT-2.206 Probability: .073 < 0.10 post hoc TCH > COT Probability: .065 < 0.10	

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
3. To spread innovations, they must have centralized development and support	GRPS Strategic Plan, Strategy No. 6 Action Plan No. 5: . . . phased implementation plan . . . Instructional Technology Plan A Series of Policy Actions: . . .Technology Panels. . . District software and hardware policy . . .		Planning must be done for each building and each group and it must be consistent with district planning. (12)
4. Constant feedback is needed to recognize and attend to the stages of adoption that participants go through in the adoption process.			We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10) Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher needs. (8) Planning must be communicated, feedback must be encouraged, and evaluations must be used. (4)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA	Interviews responses made

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
5. Members of the organization must have a clear understanding of the innovation, be capable of carrying it out and have necessary tools and resources readily available.	Instructional Technology Plan A Series of Policy Actions: . . . one student computer workstation for every six students. . . comprehensive integrated communications . . . workstation for every teacher. . . a teaching and learning support system . . .		Teachers must have adequate resources. (19) Teachers need to see software possibilities and how it can be used pedagogically. (14)
C Evaluation			
1. Formative and summative evaluation procedures should be established to monitor how well the needs of students and staff are being met, using tests that match planned outcomes.	IT Steering Committee minutes Feedback - Deputy Superintendent: 7. We need an evaluation component . . . If we state that the plan will be continuously updated, we must state how this will be accomplished.		Planning must be communicated, feedback must be encouraged, and evaluations must be used. (4)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	*District Documents (Full text is in Appendix H)*	**Survey** Twoway ANOVA	**Interviews** responses were

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
2. Mechanisms for feedback must be established to monitor how an implementation is going and the data gathered must direct future modifications, training, etc.		IIC1 Mechanisms for feedback must be established to monitor how the use of technology and training is going and the data gathered must direct future modifications, training, etc. General - by trng trng3-4.231 trng2-4.161 trng1-3.896 Probability: .023 < 0.10 post hoc trng3 > trng1 Probability: .034 < 0.10 IIC2 The personnel in our building have had an opportunity to give feedback on the use of technology and training. School - by trng trng3-3.308 trng2-2.839 trng1-2.571 Probability: .047 < 0.10 post hoc trng3 > trng1 Probability: .049 < 0.10	We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10) Planning must be communicated, feedback must be encouraged, and evaluations must be used. (4)

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	*District Documents (Full text is in Appendix H)*	*Survey Twoway ANOVA*	*Interviews responses made*

Table 7: II. Active Leadership - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		IIC3 I have had an opportunity to give feedback on the use of technology and training and I feel that my feedback will be used. Personal - by trng trng3-3.885 trng2-2.806 trng1-2.558 Probability: .000 < 0.10 post hoc trng3 > trng1 Probability: .000 < 0.10 trng3 > trng2 Probability: .002 < 0.10	
3. Milestones should be identified so steps toward a goal can be measured and actions to celebrate accomplishments should be planned.			There are a few teachers working above and beyond the call of duty. They should be at least thanked for what they are doing. Much recognition should come from building principals. They can focus attention on them within the building. (7)

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II. Active Leadership: Discussion of Combined Results

A. Lead by involvement

The district documents displayed evidence of school personnel taking responsibility for planning and focusing implementation on the teachers. The plan described technology panels of teachers who would be responsible for designing methods of instruction and assessing the effective use of technology. It also described the involvement of teachers in all aspects of using technology in instruction and recommended that they be given adequate resources and training to support their work. The Steering Committee minutes made reference to Board and executive staff support, but no point was made about the visibility of superintendent and central administrative staff, using local resources, public support and recognition of creative teachers by principals, leadership through the implementation process, school leaders being involved in change efforts, or anything that pertains to change agents communicating, collaborating and leading.

In the surveys, none of the statements about school personnel planning and making decisions produced a significant difference. This probably indicates that all the teachers felt that being involved in planning and making decisions is important, but that they and others in their buildings are not involved enough. Concerning the statements about giving support and recognition, there were no significant differences for the general and school statements, but there were significant differences in the personal statement by training, and the post hoc tests showed that training level 3 was

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significantly different than level 1 and level 2. It would appear that the lack of a defined effort at leading, collaborating and providing support and recognition was recognized by the teachers. The people who have received more training must have been recognized in their buildings, because they have more to offer than the other teachers, but even they recognized that other people in their buildings are not being recognized as they should be.

In the interview responses, the TCH and SCH teachers with more training had a lot to offer. They seemed to be aware of the areas where leadership was lacking, and they gave specific suggestions. They stated that planning consistent with district planning should be done for each building and that the principal must take some responsibility for implementation. They suggested that all personnel must have an opportunity to give input into the planning process and that teachers must be given training, support and recognition.

B. Standards and spreading innovations

Among the district documents, the Instructional Technology (IT) Plan, the Strategic Plan and the Steering Committee minutes provide evidence of alignment with the components under standards and spreading innovations. They advocate good advance planning, extensive inservice, quality hardware and software and school-based planning, monitored at the district level and requiring constant feedback. Several references were made to planning appropriate training before purchasing technology, and to setting district standards and providing adequate resources.

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The survey responses produced no significant differences for the general statement about appropriate software and training, but there were significant differences in the school and personal statements. The school statement produced a significant difference by training, and the post hoc tests showed that training levels 3 and 2 were each significantly different than training level 1. Also, the personal statement produced a significant difference by training, with a post hoc test that showed that training level 3 was significantly different than level 1. It produced a significant difference by group and a post hoc test that showed TCH as significantly different than COT. This indicates that though most of the teachers believed in good software and training, the people more involved in planning and training and probably more aware of what is offered felt more strongly about the value of the software and training available in their schools and classrooms. The survey responses to the statements about school-based planning and district standards produced similar results. The people in the TCH group felt more strongly about the need for school-based planning with monitoring at the district level, and the people with the most training felt that they had received assistance in their buildings. To the personal statement, the responses indicated that teachers who were closer to district planning or who had been involved in more training felt that they had personally received assistance in planning that aligned them with district standards.

The interview responses included several statements about exposing teachers to software possibilities and providing a variety of training opportunities geared toward matching learning outcomes

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and tailored to the individual needs of teachers. They suggested on-site training, peer coaching and the use of Service Teams. They mentioned site-based planning consistent with district standards and lots of communication and feedback.

C. Evaluation

The IT Steering Committee minutes feedback from the deputy superintendent made mention of an evaluation component, but nothing was found anywhere else in the district documents. There was no mention of formative and summative evaluation, mechanisms for feedback or establishing milestones.

The survey responses about providing opportunities for feedback produced significant differences by training on all 3 statements. This indicates either that the teachers who have had more training are more aware of the need for evaluation than the other teachers or that they are more confident that their feedback will be used constructively.

The interview responses included a number of statements about the importance of communication, obtaining feedback and giving recognition to innovative teachers. The recognition of the need for evaluation by the teachers with more training and these interview responses are in contrast to the lack of inclusion in the district planning documents. This perhaps points out that the teachers involved in planning and training have ideas about what is necessary for successful use of technology that may go beyond any formal plans that are made for them.

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II. Active Leadership: Summary

District Documents

The district documents displayed evidence of school personnel taking responsibility for planning and focusing implementation on the teachers. The documents described a need for good advance planning, extensive inservice, quality hardware and software and school-based planning monitored at the district level with constant feedback and executive staff support. Several references were made to planning appropriate training before purchasing technology and to setting district standards. Mention was made of an evaluation component, but there was no mention of formative and summative evaluation, mechanisms for feedback or establishing milestones. No point was made about the visibility of the superintendent and central administrative staff; using local resources; public support and recognition of creative teachers by principals; leadership through the implementation process; school leaders being involved in change efforts; or anything that pertains to change agents communicating, collaborating and leading.

Surveys

From the surveys, it appeared that all teachers felt that being involved in planning and making decisions is important, but that they and others in their buildings are not involved enough. The lack of a defined effort at leading, collaborating and providing support and recognition was recognized by the teachers. The people who have received more training must have been recognized in their buildings

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because they have more to offer than the other teachers, but even they recognized that other people in their buildings are not being recognized as they should be. Though most of the teachers believed in good software and training, the people more involved in planning and training felt more strongly about the value of the software and training available in their schools and classrooms. The people involved in planning and training felt that they had received assistance in planning that aligned them with district standards. Also, the teachers who have had more training are either more aware of the need for evaluation than the other teachers or they are more confident that their feedback will be used constructively.

Interviews

The interviews suggested that teachers need to see software possibilities and how they can be used. Software must be matched to defined outcomes, and recommendations must be well communicated. Implementation is to focus on teachers with exposure to technology, opportunities to preview software and on-site training and support for the use of technology. Teachers must be motivated to improve and have a clear understanding of the innovation. Planning is to be done at each building and be monitored at the district level. The Interviewees supported the idea of constant feedback and attending to the stages of adoption that participants are going through, and they emphasized the importance of leadership all through implementation. They supported the idea that district leaders, especially the principals, must provide public support and give recognition to innovative teachers.

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Though many responses were given that were directly connected to change theory, there were some investigation components that drew very few responses. Not much was said about visible administrative support, local resources or change agents. Spreading innovations with centralized development and support was only supported by planning in each building being consistent with district planning. Evaluation in all forms was only slightly connected to a few responses. Though some mention was made about showing appreciation for people that are making accomplishments, there were no references to milestones or any formal method of tracking progress.

Combined Results

In considering Active Leadership, the district documents are not consistent with the surveys and interviews. The documents mention support as success factors, but they do not mention specifically any activities that must be used to provide support. On the other hand, the interviewees were aware of the areas where leadership was lacking, and they gave specific suggestions. They recommended building level planning and principal involvement in implementation. They recommended training, support, recognition and opportunities for input into the planning process. They included several statements about exposing teachers to software possibilities and providing a variety of training opportunities geared toward matching learning outcomes and tailored to the individual needs of teachers. They suggested on-site training, peer coaching, communication, feedback and giving recognition to innovative

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teachers. The survey responses produced some significant differences that set apart the teachers closer to the planning process and the teachers with more training. These teachers (who provided the interview responses) were more aware of a need for involving school personnel in planning and decision making and a need for extensive training, district standards, etc. than their colleagues. The recognition of the need for evaluation by the teachers with more training and these interview responses are in contrast to the lack of inclusion in the district planning documents.

Before making recommendations based on the findings of this study with respect to Active Leadership, some criteria had to be set as the basis for validating investigation components. Table 8 was created to validate the investigation components that have been documented in Grand Rapids Public Schools (GRPS) and have been endorsed by a number of teachers in their interview responses. Each investigation component was assigned five points for each excerpt from district documents that was aligned with that component and one point for each interview response that was aligned with that component. Each component that accumulated 20 or more points is considered validated and included in the recommendations. The survey results are not included in Table 8 because the surveys primarily provide information about the effects of training and involvement in the planning process. Recommendations from them are included in each section after the recommendations based on the validation process.

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Table 8: II. Active Leadership - Validation

	Document (5 each)	Interview (1 each)	TOTAL	Validate
II. Active Leadership				
A Lead by involvement				
A1. School personnel must have the responsibility of planning and making decisions and they must place planning high on the agenda.	5	22	27	Yes
A2. Implementation must focus on teachers.	10	51	61	Yes
A3. The superintendent and administrative support must be visible at the start	5	7	12	No
A4. Local resources should be utilized when possible.	0	9	9	No
A5. Principals and district administrators must publicly support creative teachers.	0	17	17	No
A6. Leadership is necessary all through the implementation process.	0	21	21	Yes
A7. School leaders must be involved in change efforts at all stages.	0	5	5	No
A8. The change agent must communicate well and be a good listener to establish a good rapport and he must lead or collaborate with others in solving problems that arise in implementation of the innovation.	0	5	5	No
B Standards and spreading innovations				
B1. Good advance planning must include extensive inservice training and high quality courseware/ software.	20	84	104	Yes
B2. School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards.	15	22	37	Yes
B3. To spread innovations, they must have centralized development and support	10	12	22	Yes
B4. Constant feedback is needed to recognize and attend to the stages of adoption that participants go through in the adoption process.	0	36	36	Yes
B5. Members of the organization must have a clear understanding of the innovation, be capable of carrying it out and have necessary tools and resources readily available.	5	33	38	Yes

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Table 8: II. Active Leadership - Validation
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	Document (5 each)	Interview (1 each)	TOTAL	Validate
C Evaluation				
C1. Formative and summative evaluation procedures should be established to monitor how well the needs of students and staff are being met, using tests that match planned outcomes.	5	4	9	No
C2. Mechanisms for feedback must be established to monitor how an implementation is going and the data gathered must direct future modifications, training, etc.	0	14	14	No
C3. Milestones should be identified so steps toward a goal can be measured and actions to celebrate accomplishments should be planned.	0	7	7	No

II. Active Leadership: Implications, Interpretations and Recommendations

It appears that the district planning, as depicted in the district documents, suggests an awareness of change theory but addresses it only subtly. The involved teachers who were interviewed do not speak directly about tenets of change theory, but they have a working knowledge of it without labels. It appears that the interviewees expressed ideas consistent with change theory that pertained to "active leadership" that was relatively close to them, that is, anything that pertains to teachers and principals and direct support and training. They did not express many ideas that have to do with general change theory concepts, local resources and the work of change agents. This is probably because they have had no formal training in change theory and their knowledge of it is based

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on their immediate contacts. From their personal experiences with using technology, partaking in training and doing some planning, they have a good working knowledge of many change theory ideas that work. They understand how aspects of change theory affect them, but they are not concerned or are not aware that there is a need for a systemic long-term approach to change, including evaluation and stabilization of the innovations introduced.

The district documents addressed each of the main investigation components under Active Leadership in some form. That is, they addressed: lead by involvement, standards and spreading innovations and evaluation, but they failed to address a number of the subcomponents. The interviews, on the other hand, addressed all of them to some degree. Using the cutoff of 20 points, all subcomponents of Standards and Spreading Innovations were validated and three of the eight subcomponents on Lead by Involvement were included, but none of the subcomponents on Evaluation were validated. Nonetheless, the investigation components that accumulated 20 or more points should be validated and included in guidelines for successful planning for the use of instructional technology. The following recommendations should be followed to support active leadership:

1. School personnel must have the responsibility of planning and making decisions and they must place planning high on the agenda.
2. Implementation must focus on teachers.
3. Leadership is necessary all through the implementation process.

4. Good advance planning must include extensive inservice training and high quality courseware/software.
5. School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards.
6. To spread innovations, they must have centralized development and support.
7. Constant feedback is needed to recognize and attend to the stages of adoption that participants go through in the adoption process.
8. Members of the organization must have a clear understanding of the innovation, be capable of carrying it out and have necessary tools and resources readily available.

In the surveys, the mean response for each of the general statements that produced no significant differences was high (4.33 or greater), which indicates general agreement with the investigation components. Where there were significant differences in any of the statements, the teachers with more involvement in planning and training were more in agreement with the investigation components than were the other teachers. These results attest to the validity of the investigation components concerning active leadership, and they suggest that increasing teacher involvement in planning and training may increase their agreement with tenets of change theory that are concerned with active leadership.

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Therefore, two further recommendations to support learning outcomes should be followed:

9. Teachers must be allowed to participate in decision making and they should be recognized for their accomplishments and be encouraged to become leaders.
10. Evaluation processes that solicit input from teachers should be used routinely.

Perhaps a reconciliation of the teachers and district planning would require bringing change theory into the open. This would require that administrators be more public about what they're trying to accomplish. Teachers would need to see what change theory practices have to offer and how they can be affected by activities beyond their classrooms and buildings.

III. Collaborative planning

The results of the study of the district documents, surveys and interviews with respect to the investigation components which address using Collaborative Planning are displayed in Table 9. This table is concerned with the third major section of the investigation components. The first column lists the investigation components that address supporting collaborative planning. (The investigation components are listed in the same format here as in the list of investigation components in chapter 3 and in the survey results earlier in this chapter.) Across from each investigation component are the results that pertain to that particular component. In the second column, are excerpts from district documents that refer to the importance of collaborative planning. In the third column, are

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the results of the ANOVA tests contrasting the levels of training and the levels of involvement in the planning process as presented in the first part of this chapter. Each teacher responding to the surveys was a member of one of three planning groups. The Technology Planning Group (TCH) was the group most involved in the district planning process. The School Group (SCH) was comprised of teachers from schools somewhat involved in the planning process. The Classroom of Tomorrow Group (COT) had no formal involvement in the planning process. Each teacher was also a member of one of three training levels. Training level 3 (trng3) had been involved in 45 hours or more of technology training. Training level 2 (trng2) had been involved in 15 to 30 hours of technology training, and training level one (trng1) had been involved in no formal technology training. The mean scores have been included with the significant tests to provide an aid to interpretation. If "not significant" is listed, the overall mean response is listed below it. If a significant difference was found by planning group, the mean scores for each of the three planning groups and the probability of that combination of scores are listed. If a significant difference was found by training level, the mean scores for each of the three training levels and the probability of that combination of scores are listed. In the last column, are the interview responses that made reference to Collaborative Planning.

Following Table 9 are summaries, implications, interpretations and recommendations based on the combined results of the district documents, surveys and interviews with respect to Collaborative Planning.

Table 9: III. Collaborative Planning - Combined results

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
A. Kindergarten			

Table 9: III. Collaborative Planning - Combined results

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
A Vision and Ownership			
1. Consensus, the process of planning and its effect on commitment are more important than the products of planning.			Planning must be done for each building and each group and it must be con-sistent with district planning. (12) We must develop a sense of community with E-Mail, user groups, etc. (6) We must provide opportunities for all to give input for planning. (5) Planning must be communicated, feedback must be encouraged, and evaluations must be used. (4)
2. Change advocates should down play mission and goals and emphasize inspirational themes to guide the change process.			
3. All action must be tied to improvement and staff commitment must be continuously cultivated.	IT Steering Committee minutes Feedback - Deputy Superintendent: 6. We must be involved in Continuous Quality Improvement. We must establish appropriate outcomes related to curriculum.		We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10)

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
			There are a few teachers working above and beyond the call of duty. They should be at least thanked for what they are doing. Much recognition should come from building principals. They can focus attention on them within the building. (7)
4. Educational innovations must be public matters so the implementers will experience "ownership".	IT Steering Committee minutes Success Factors - district interviews: j. PR with staff, stress benefits and convenience m. Visible successes		We can give recognition by publishing a list of champions or highlighting individuals who are doing well and are willing to help others. (10) We must develop a sense of community with E-Mail, user groups, etc. (6)
5. A vision for the future must be drawn and shared to promote a large cadre of people with a vested interest in the innovation.	IT Steering Committee minutes Feedback - Deputy Superintendent 3. We must paint a picture of how our process will work and articulate how results of curriculum panels will be integrated into the classroom.		Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10)

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
6. Each teacher			

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
6. Each teacher must have an opportunity to work through the experience in a way in which the rewards at least equal the cost.	IT Steering Committee minutes Success Factors - district interviews: c. Training within teacher comfort zone d. Equipment available for teacher practice n. Preview center for hardware and software		We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) Release time is needed for previewing software and training. (3)
7. Teachers become more committed to complex and ambitious projects, but they must be convinced that the change is worth the risk.			
8. Teachers need a chance to interact with each other to discuss the meaning of change.		IIIA1 General - not significant overall - 4.44 IIIA2 School - not significant overall - 2.67 IIIA3 Training and the use of technology in our building has provided a chance for me to interact with others and to discuss	Training should include peer coaching, sharing & team teaching. (11) We can give recognition by publishing a list of champions or highlighting individuals who are doing well and are willing to help others. (10) We must develop a sense of community with E-Mail, user groups, etc. (6)

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		the meaning of change for me. Personal - by trng trng3-3.577 trng2-2.645 trng1-2.532 Probability: .063 < 0.10 post hoc trng3 > trng1 Probability: .050 < 0.10	
9. People must actively define and solve their own problems. They must develop a sense of agency and efficacy.			Technology panels should be used to match software with defined outcomes and results should be well communicated. (13)
10. A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change and they		IIIA4 General - not significant overall - 4.45 IIIA5 School - not significant overall - 3.06 IIIA6 In our school, I have had an opportunity to adopt technology at a pace that is suitable for me and I have been involved in a good learning environment.	Teachers are motivated by making progress with students; they need support and resources. (20) Teachers need to see software possibilities and how it can be used pedagogically. (14) We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10)

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
must be exposed			

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
must be exposed to conditions that support learning		Personal - by trng trng3-4.038 trng2-3.387 trng1-3.104 Probability: .029 < 0.10 post hoc trng3 > trng1 Probability: .022 < 0.10	
B Collaboration and support			
1. Collaborative planning is essential and it must be accompanied by extra support during implementation.	IT Steering Committee minutes Success Factors - district interviews: s. A TEAM effort at all levels of staff	IIIB1 General - not significant overall - 4.35 IIIB2 School - not significant overall - 2.48 IIIB3 I have been involved in planning the use of technology in our building and support from central office staff has been available to assist us when we have begun to use the technology. Personal - by group trng3-2.943 trng2-2.800 trng1-2.206 Probability: .075 < 0.10 post hoc TCH 2.943 > COT 2.206 Probability: .063 < 0.10	We must provide opportunities for all to give input for planning. (5) Planning must be communicated, feedback must be encouraged, and evaluations must be used. (4)

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
2. Long term success is dependent upon			Technology support must be

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
2. Long term success is dependent upon teacher participation and organizational support.			Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher needs. (8)
3. Schools must receive support from the school board, administration, and community and they must have access to hardware, software, support personnel, and related resources.	IT Steering Committee minutes Success Factors - district interviews: r. Board and executive staff support GRPS Strategic Plan, Strategy No. 6, Action Plan No. 5 Objective: "To provide equitable gender fair, anti-bias, multi-cultural and developmentally appropriate educational materials and technology to support each student's educational plan.	IIIB4 General - not significant overall - 4.71 IIIB5 Our school has experienced support from the school board, administration, and community and our teachers have access to hardware, software, support personnel, and related resources. School - by trng trng3-3.231 trng2-3.161 trng1-2.766 Probability: .060 < 0.10 post hoc trng2 > trng1 Probability: .088 < 0.10 IIIB6 Personal - not significant overall - 2.78	Teachers are motivated by making progress with students; they need support and resources. (20) Teachers must have adequate resources. (19)

Table 9: III. Collaborative Planning - Combined Results

continued

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
4. Strategies should be developed locally with input from teachers.			Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) Planning must be done for each building and each group and it must be con-sistent with district planning. (12) We must provide opportunities for all to give input for planning. (5)
5. User's need is basis for all interaction.			Training must be aimed at specific groups, subjects & activities. (19) We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10) Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher needs. (8)

Table 9: III. Collaborative Planning - Combined Results

continued

	Interviews

Table 9: III. Collaborative Planning - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
6. Participants in successful school improvement efforts are visible and accountable to one another and take an active part in solving problems.			Training should include peer coaching, sharing & team teaching. (11) We can give recognition by publishing a list of champions or highlighting individuals who are doing well and are willing to help others. (10) We must develop a sense of community with E-Mail, user groups, etc. (6)
7. Change facilitators must work in concert with teachers to address their emerging and evolving needs.			Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher needs. (8)
8. Resistance can be minimized by including participants in the planning and early implementation.			We must provide opportunities for all to give input for planning. (5)

III. Collaborative Planning: Discussion of Combined Results

A. Vision and Ownership

The district documents, through the IT Steering Committee minutes, made some reference to tying all actions to improvement by using CQI, directing attention to visible successes, painting a picture of how technology is to be integrated into the curriculum and providing teachers with training within their zones of comfort, but many ideas included in the investigation components were not addressed. Nothing was mentioned about the importance of building consensus, the use of inspirational themes, cultivating staff commitment, making educational innovations public matters, encouraging teachers to take risks or providing them with opportunities to interact with each other. Nothing was mentioned about empowering teachers to solve their own problems or providing them with a learning environment that would allow them to understand the meaning of change.

In the survey responses to the statements about using training and the use of technology to provide an opportunity for teachers to interact and discuss the meaning of change, there were no significant differences in the general and school statements, but there were significant differences in the personal statements by training. The post hoc tests displayed significant differences between training level 3 and training level 1. This implies that though the teachers had similar opinions about the importance of teachers interacting and discussing the meaning of change and the need for conditions that support learning and allow them to adopt

technology at a suitable pace, only the teachers involved in training felt that they personally had had an appropriate opportunity.

In the interview responses, a number of suggestions were made that matched with the investigation components. They stated that teachers need to be exposed to technology and be encouraged and motivated. They must have on-site training aimed at specific groups and activities. Training must meet the individual needs of teachers in a non-threatening atmosphere, and teachers must be assured that increased support and attention to their individual needs will follow. The idea of ownership only developing as people improve over time, have a chance to absorb the meaning of change, and are exposed to conditions that augment learning was supported by 44 responses. They stated that teachers are motivated by progress with students, they need support and resources and they need to see software possibilities. They gave 27 responses that supported the importance of the process of planning, consensus and commitment. They suggested that planning must be done for each building, it must be consistent with district planning and it must be well communicated throughout the district. In support of the idea of teachers needing a chance to interact with each other to discuss the meaning of change, there were 27 responses. There were 23 responses supporting the sharing of a vision that would promote a large cadre of people with a vested interest. They stated that the technology panels should match software with defined outcomes and communicate the results. Supporting the idea of each teacher having an opportunity to work through the experience in a way in which the rewards at least equal the cost, there were 17 responses. The

participants suggested that release time must be provided for previewing software and attending training. There were 17 responses supporting the idea that all action must be tied to improvement and staff commitment must be continuously cultivated. They stated that feedback must be encouraged, teachers must be recognized for their accomplishments and attention must be focused on them within their buildings. For making educational innovations public matters, there were 16 responses. Along with the suggestion of developing a sense of community through E-Mail, was the idea of publishing a list of champions and encouraging knowledgeable people to help others. The interviewees expressed many ideas consistent with "collaborative planning", but their comments again were limited to activities that affect them directly. The only components not covered were the ones that referred to what change advocates should do (such as "down play mission and goals and emphasize inspirational themes") or the ones that encouraged teachers to take risks when involved in change and encouraged them to actively define and solve their own problems.

B. Collaboration and Support

Under collaboration and support, the district documents included in the IT Steering Committee listed success factors as having a team effort and board and executive staff support. The strategic plan called for providing appropriate educational materials and technology to support each student's educational plan. Not much more was mentioned about collaborative planning or providing resources and support from the board, administration and

community. No specific change theory recommendations about collaboration and support were made. Missing was mention of long term success being dependent upon teacher participation and organizational support, implementation strategies being developed locally with input from teachers, user's need being the basis for all interaction, participants being visible and accountable to others, change facilitators working with teachers to address evolving needs and resistance being minimized by including participants in the planning and early implementation.

The survey responses showed no significant differences for the general statement and the school statement concerned with using collaborative planning with central support. The personal statement produced a significant difference by group, and the post hoc tests displayed a significant difference between the TCH and COT groups. These results indicate that, though most of the teachers were in agreement that collaborative planning is important and it is not happening fully in their schools, the TCH members felt more strongly that they were personally involved in collaborative planning and were receiving central support. The survey responses showed no significant differences for the general statement and the personal statement concerned with access to hardware, software, support personnel & related resources, but they did show a significant difference for the school statement by training level. The post hoc tests displayed a significant difference between level 2 and level 1. This indicates that though the teachers were in general agreement about the importance of resources and they didn't feel that they personally had any advantage, the ones with more

training felt more strongly that resources were available at their schools.

The interview responses produced specific suggestions for all components in this area. There were 51 responses supporting the idea that the user's need is the basis for all interaction. There were 39 responses that supported that schools must be supported by the school board, administration and community and that they must have access to hardware, software and support personnel. They stated again that teachers are motivated by success with students, but they need adequate resources and support, if they are to accomplish anything. They suggested that training should include peer coaching, sharing and team teaching. District personnel should publish lists of champions who are willing to share their expertise, and they should promote a sense of community through user groups, e-mail, etc. There were 27 responses supporting the idea that participants must be visible and accountable to one another and take an active part in solving problems. They included a request for peer coaching, sharing and team teaching and publishing a list of people willing to share their experiences. They did not mention directly that collaborative planning is essential or that long term success is dependent upon teacher participation and organizational support. Nor did they mention that change facilitators must work in concert with teachers to address their needs or that resistance can be minimized by including participants in planning and early implementation. Their concerns are primarily for things that are connected to them as individuals or for others in similar circumstances. They expressed no real concern for the system or whole district.

III. Collaborative Planning: Summary

District Documents

Some general statements related to change theory appear in district documents, but few specific activities are suggested. The IT Steering Committee minutes listed under success factors, a team effort, board and executive staff support, and a need for visible successes and public relations with staff. The strategic plan called for materials and technology to support students' educational plans. The Deputy Superintendent's feedback suggested that planners must work on outcomes related to curriculum and be involved in "Continuous Quality Improvement" and paint a picture of how the results of curriculum panels will integrate technology into the classroom. The Steering Committee minutes made reference to training within the zone of comfort for teachers and establishing a preview center for hardware and software, but not much else was mentioned about "Collaborative Planning". No recommendations about collaboration and support or teacher participation were made. Nothing was mentioned about implementation strategies being developed locally, participants being visible and accountable to others and change facilitators working with teachers to address needs. Nothing was mentioned about consensus, establishing commitment or using inspirational themes to guide the change process. No reference was made to convincing teachers to take risks or providing a chance for teachers to interact and discuss the meaning of change. Nothing was suggested about allowing people to solve their own problems or exposing them to conditions that

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support learning. Missing was any mention about teacher participation with organizational support, strategies being developed with teacher input, visibility and accountability, or working with change agents to address evolving needs.

Surveys

In the survey responses, most of the teachers had similar opinions about the importance of teachers interacting and discussing the meaning of change and the need for conditions that support learning and allow them to adopt technology at a suitable pace, but only the teachers involved in training felt that they personally had had an appropriate opportunity to participate. The teachers who had had more training also felt more strongly than the other teachers that resources were available at their individual schools. The TCH members, who were closer to the planning process, felt more strongly than the other teachers that they were personally involved in collaborative planning and were receiving central support.

Interviews

The respondents stated that teachers need to be encouraged and motivated and have training that meets their individual needs. They stated that teachers are motivated by progress with students, they must be supported by the school board, administration and community, and they must have access to hardware, software and support personnel. They suggested that planning consistent with district planning must be done for each building and be communicated throughout the district. They stated that the

technology panels should match software with defined outcomes and communicate the results and they suggested that release time should be provided for previewing software and attending training. They suggested that training should include peer coaching, sharing and team teaching and a sense of community should be promoted through user groups, e-mail, etc. They said leaders must encourage feedback, recognize teachers for their accomplishments and encourage knowledgeable people to help others. They expressed many ideas consistent with "collaborative planning", but their comments again were limited to activities that affect them directly. They said nothing about what change advocates should do and they did not specifically state that collaborative planning is essential.

Combined Results

Under Collaborative Planning, the combined results were inconsistent. The district documents listed some success factors, but provided no specific techniques for collaborative planning, establishing commitment, etc. The survey responses suggested that the TCH members and the teachers with more training were significantly different than the COT group and the teachers without training and the interviews provided many suggestions. They expressed a belief in many things not mentioned in district documents. They suggested that planning consistent with district planning must be done for each building and be communicated throughout the district. They suggested promoting a sense of community through user groups, e-mail, etc. They said

administrators must encourage feedback, recognize teachers for their accomplishments and encourage knowledgeable people to help others. These suggestions were quite a contrast to the lack of mention in the district documents. The surveys pointed out that the TCH and SCH people who had had more training than the others were different than the others and more in tune with the investigation components. This helps explain why they were able to produce so many interview responses that were in agreement with the investigation components.

Before making recommendations based on the findings of this study with respect to Collaborative Planning, some criteria had to be set as the basis for validating investigation components. Table 10 was created to validate the investigation components that have been documented in GRPS and have been endorsed by a number of teachers in their interview responses. Each investigation component was assigned five points for each excerpt from district documents that was aligned with that component and one point for each interview response that was aligned with that component. Each component that accumulated 20 or more points is considered validated and included in the recommendations. The survey results are not included in Table 10, because the surveys primarily provide information about the value of training and involvement in the planning process. Recommendations from the surveys are included in this section after the recommendations based on the validation process.

Table 10: III. Collaborative Planning - Validation

	Document (5 each)	Interview (1 each)	TOTAL	Validate
III. Collaborative Planning				
A Vision and ownership				
A1. Consensus, the process of planning and its effect on commitment are more important than the products of planning.	0	27	27	Yes
A2. Change advocates should down play mission and goals and emphasize inspirational themes to guide the change process.	0	0	0	No
A3. All action must be tied to improvement and staff commitment must be continuously cultivated.	5	17	22	Yes
A4. Educational innovations must be public matters so the implementers will experience "ownership".	5	16	21	Yes
A5. A vision for the future must be drawn and shared to promote a large cadre of people with a vested interest in the innovation.	5	23	28	Yes
A6. Each teacher must have an opportunity to work through the experience in a way in which the rewards at least equal the cost.	5	17	22	Yes
A7. Teachers become more committed to complex and ambitious projects, but they must be convinced that the change is worth the risk.	0	0	0	No
A8. Teachers need a chance to interact with each other to discuss the meaning of change.	0	27	27	Yes
A9. People must actively define and solve their own problems. They must develop a sense of agency and efficacy.	0	13	13	No
A10. A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change and they must be exposed to conditions that support learning	0	44	44	Yes

Table 10: III. Collaborative Planning - Validation
Continued

	Document (5 each)	Interview (1 each)	TOTAL	Validate
B Collaboration and support				
B1. Collaborative planning is essential and it must be accompanied by extra support during implementation.	5	9	14	No
B2. Long term success is dependent upon teacher participation and organizational support.	0	8	8	No
B3. Schools must receive support from the school board, administration, and community and they must have access to hardware, software, support personnel, and related resources.	10	39	49	Yes
B4. Strategies should be developed locally with input from teachers.	0	30	30	Yes
B5. User's need is basis for all interaction.	0	51	51	Yes
B6. Participants in successful school improvement efforts are visible and accountable to one another and take an active part in solving problems.	0	27	27	Yes
B7. Change facilitators must work in concert with teachers to address their emerging and evolving needs.	0	8	8	No
B8. Resistance can be minimized by including participants in the planning and early implementation.	0	5	5	No

III. Collaborative Planning: Implications, Interpretation and Recommendations

The district documents were quite weak in the section on collaborative planning. They addressed only four of the 10 subcomponents under IIIA Vision and Ownership and two of the eight subcomponents under IIIB Collaboration and Support, but the interview responses suggest that the teachers interviewed are quite knowledgeable of most of the ideas included in the investigation components concerned with collaborative planning. The interviews

did address most of the subcomponents of this section in some form. Using the 20 point cutoff, seven of the 10 subcomponents under "IIIA Vision and Ownership" and four of the eight subcomponents under "IIIB Collaboration and Support" were validated. The investigation components that accumulated 20 or more points under Collaborative Planning should be validated and included in recommendations for successful planning for the use of instructional technology. Therefore, the investigation components as stated in this section should be included in guidelines for successful planning for the use of instructional technology. The following recommendations should be followed to support collaborative planning:

1. Consensus, the process of planning and its effect on commitment are more important than the products of planning.
2. All action must be tied to improvement, and staff commitment must be continuously cultivated.
3. Educational innovations must be public matters so the implementers will experience "ownership".
4. A vision for the future must be drawn and shared to promote a large cadre of people with a vested interest in the innovation.
5. Each teacher must have an opportunity to work through the experience in a way in which the rewards at least equal the cost.
6. Teachers need a chance to interact with each other to discuss the meaning of change.

7. A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change, and they must be exposed to conditions that support learning.
8. Schools must receive support from the school board, administration and community, and they must have access to hardware, software, support personnel and related resources.
9. Strategies should be developed locally with input from teachers.
10. User's need is basis for all interaction.
11. Participants in successful school improvement efforts are visible and accountable to one another and take an active part in solving problems.

In the surveys, the mean response for each of the general statements was high (4.35 or greater) which indicates general agreement with the investigation components. The personal statements about a chance to interact with others and discuss the meaning of change and an opportunity to adopt technology at a suitable pace in a good learning environment each produced significant differences by training level. The personal statement about involvement in planning and experiencing support from central office staff produced a significant difference by group, and the school statement about experiencing support and having access to resources produced a significant difference by training. The cause of this could be that by being involved and understanding the technology, these teachers know what to ask for or that they have

earned enough respect that they are given what they want, or it could be that their involvement makes them a little more open-minded and less critical of others. Nonetheless, these results suggest that increasing teacher involvement in planning and training may increase their agreement with change theory that is concerned with collaborative planning. This simply reinforces the need for a chance to interact and to adopt change at a suitable pace and to involve teachers in planning and training.

Involving all the teachers in planning is no easy task, but as knowledgeable as they are about what needs to be done, it seems that the only chance for success is dependent upon collaborating with them. Therefore, two further recommendations to support collaborative planning should be followed:

12. All teachers must be given a chance to interact with other staff members in non-threatening, planning and training sessions.
13. Teachers currently involved in planning and training must be encouraged to interact with other staff members and lead them into becoming active participants.

IV. Plan for Change

The results of the study of the district documents, surveys and interviews with respect to the investigation components which address Plan for Change are displayed in Table 11. This table is concerned with the fourth major section of the investigation components, IV. Plan for Change. The first column lists the investigation components. (They are listed in the same format here

as in the list of investigation components in chapter 3 and in the survey results earlier in this chapter.) Across from each investigation component, are the results that pertain to that particular component. In the second column, are excerpts from district documents that refer to the importance of planning for change. Each teacher responding to the surveys was a member of one of three planning groups. The Technology Planning Group (TCH) was the group most involved in the district planning process. The School Group (SCH) was comprised of teachers from schools somewhat involved in the planning process. The Classroom of Tomorrow Group (COT) had no formal involvement in the planning process. Each teacher was also a member of one of three training levels. Training level 3 (trng3) had been involved in 45 hours or more of technology training. Training level 2 (trng2) had been involved in 15 to 30 hours of technology training and training level one (trng1) had been involved in no formal technology training. In the third column, are the results of the ANOVA tests contrasting the levels of training and the levels of involvement in the planning process as presented in the first part of this chapter. The mean scores have been included with the significant tests to provide an aid to interpretation. If "not significant" is listed, the overall mean response is listed below it. If a significant difference was found by planning group, the mean scores for each of the three planning groups and the probability of that combination of scores are listed. If a significant difference was found by training level, the mean scores for each of the three training levels and the probability of that combination of scores are

listed. In the last column, are the interview responses that made reference to Plan for Change.

Following Table 11, are summaries, implications, interpretations and recommendations based on the combined results of the district documents, surveys and interviews with respect to Plan for Change.

Table 11: IV. Plan for Change - Combined results

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
A Link technology to educational change			
1. Technology applications must be linked to school improvement.			We should use the "Service Team" to promote using technology with effective instruction, good teaching practices, etc. (3)
2. All use of technology must be linked to improving learning by changing what teachers and students do and what they do with technology should be dependent upon technology.			The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5)
3. Accompanying each technology introduced must be a vision of how it is to be used and how it will change the learning environment.		IVA1 General - not significant overall - 4.41 IVA2 School - not significant overall - 2.76 IVA3 I know how technology should be used and I have used it to change the learning	Training must be aimed at specific groups, subjects & activities. (19) Teachers need to see software possibilities and how it can be used pedagogically. (14)

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		environment in my classroom. Personal - by trng trng3-3.731 trng2-3.258 trng1-3.10 Probability: .062 < 0.10 post hoc trng3 > trng1 Probability: .051 < 0.10	
4. School personnel must have a vision of how technology will restructure the learning environment.	IT Steering Committee minutes Feedback - Deputy Superintendent: . . . We must show how we intend to do it and this should be in the implementation or meat of the plan . . .		Teachers need to see software possibilities and how it can be used pedagogically. (14)
5. Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes.		IVA4 Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes. General - by group TCH-4.629 SCH-4.257 COT-4.265 Probability: .063 < 0.10 post hoc TCH > SCH Probability: .056 < 0.10	Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) We must have district standards for hardware and software and defined outcomes. (10) We should use the "Service Team" to promote using technology with effective instruction, good teaching practices, etc. (3)

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		General - by trng*group Probability: .064 < 0.10 post hoc TCHtrng3 > COTtrng2 Probability: .031 < 0.10 IVA5 In our school, the use of technology has a positive effect on student achievement and other desired outcomes. School - by group TCH-3.571 SCH-3.800 COT-3.206 Probability: .044 < 0.10 post hoc SCH > COT Probability: .035 < 0.10 IVA6 Personal - not significant overall - 3.53	
6. Instructional change can only proceed with changes in beliefs about instruction and learning.			

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
7. Three aspects or dimensions of change must occur: use of new or revised materials or equipment; use of new teaching approaches; alteration of beliefs.			
B Training			
1. The first step in school transformation is teacher development.	Instructional Technology Plan Curriculum And Staff Development 3. Staff development will be offered on new technology being considered by the curriculum area panels and the computer committee.		Teachers need to see software possibilities and how it can be used pedagogically. (14) Training should include peer coaching, sharing & team teaching. (11) We should use "train the trainer" or Comp Ed teachers to provide at least one trainer in each building. (7)
2. Individual needs must be addressed through a variety of staff development	Instructional Technology Plan Curriculum And Staff Development: . . . a variety of staff development vehicles . . . Planned workshops and seminars . . . Special purpose		Training must be aimed at specific groups,subjects & activities.(19) We must do on-site training and provide a practical, comfortable setting that meets individual

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
opportunities.	training . . . IT Steering Committee minutes Success Factors - district interviews: c. Training within teacher comfort zone d. Equipment available for teacher practice		needs of teachers. (14) We should use meeting days, BIT days or district-wide inservice days for training. (10) We can use high school teachers to present technology use to elementary teachers and encourage visitations. (2)
3. Each technology must be accompanied by training, modeling, and support.	Instructional Technology Plan Curriculum And Staff Development: 2. Each newly introduced technology application will be supported by custom implementation training. IT Steering Committee minutes Success Factors - district interviews q. Adequate technology staffing/support	IVB1 Each technology must be accompanied by training, modeling, and support. General - by group TCH-4.686 SCH-4.229 COT-4.618 Probability: .008 < 0.10 post hoc TCH > SCH Probability: .006 < 0.10 IVB2 Teachers in our school have had adequate opportunities for training, modeling, and support. School - by trng trng3-3.462 trng2-3.194 trng1-2.792 Probability: .015 < 0.10 post hoc	Teachers are motivated by making progress with students; they need support and resources. (20) Training should include peer coaching, sharing & team teaching. (11) We should use "train the trainer" or Comp Ed teachers to provide at least one trainer in each building. (7) We can use high school teachers to present technology use to elementary teachers and encourage visitations. (2)

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
		trng3 > trng1 Probability: .022 < 0.10 trng2 > trng1 Probability: .086 < 0.10 IVB3 I have participated in provided training and I feel that modeling and support are available when I need them. Personal - by trng trng3-3.923 trng2-3.742 trng1-3.130 Probability: .000 < 0.10 post hoc trng3 > trng1 Probability: .000 < 0.10 trng2 > trng1 Probability: .003 < 0.10 Personal - by trng*group Probability: .024 < 0.10 post hoc - see chap 4	
4. Training, feedback and extra support must continue throughout implementation until innovation is stabilized and permanent.	Instructional Technology Plan Curriculum And Staff Development 1. Ongoing technology training will be available in the District . . . GRPS Strategic Plan, Strategy No. 6 Action Plan No. 5: "3. Provide ongoing inservice training for all building staff as		We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
	needed . . .		needs. (8) A place for previewing software, trying things out and getting help whenever it is needed would be very beneficial. (4)
5. Special emphasis must be placed on training and support for administrators.	Curriculum And Staff Development: . . . application of computing for teachers, administrators . . . 4. Basic knowledge and skill required by administrative and supervisory staff . . .		The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5)
C Strategies			
1. Address Havelock's stages of a planned change: 1.Building a relationship 2.Diagnosis 3.Acquiring resources (build a permanent capacity for resource acquisition)			

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
4.Choosing the solution 5.Gaining acceptance (individuals, groups, communication, flexibility) 6.Stabilizing the innovation and generating self-renewal (include disengagement)			
2. Following the evolutionary planning process, we should cycle back and forth between efforts to gain normative consensus about the intended learning environment, plan strategies for getting there, and carry out decentralized			

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
incremental experimentation to promote creativity.			
3. Schools must have a coordinating committee or steering group to help track problems and devise coping methods.	Instructional Technology Plan A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area. D. Approve a long term District "Computer Technology Advisory Committee."	IVC1 General - not significant overall - 4.11 IVC2 Our school uses a Building Improvement Team or an equivalent planning committee to plan the use of technology, acquire resources, track problems and devise solutions to problems. School - by trng*group Probability: .073 < 0.10 IVC3 I am involved in planning the use of technology for my building and the district. Personal - by group TCH-3.457 SCH-2.629 COT-2.147 Probability: .000 < 0.10 post hoc TCH > SCH Probability: .004 < 0.10 TCH > COT Probability: .001 < 0.10	Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) Planning must be done for each building and each group and it must be consistent with district planning. (12)

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
4. Resources are needed for training, materials, space and release time. It is necessary to find creative ways to match needs with resources such as using schedule changes, local trainers, coordinating committees, etc.	IT Steering Committee minutes Issues and Concerns - district interviews g. Training, release time and incentives		We should use "train the trainer" or Comp Ed teachers to provide at least one trainer in each building. (7)
5. Change projects must be monitored closely and all participants kept informed of progress so problems can be identified and solutions can be started quickly. The management of change is best accomplished by	Instructional Technology Plan A Series of Policy Actions D. Approve a long term District "Computer Technology Advisory Committee."		

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
groups consisting of a mix of teachers, administrators, parents, students, etc. and the group must have an understanding of the extent of their power.			
6. Reform must deal with curriculum, teaching and learning, community, student support systems, etc. simultaneously and work on cultural issues by emphasizing collaborative work and continuous improvement.			
7. To accomplish change, it is important that teachers, parents,			

Table 11: IV. Plan for Change - Combined Results

continued

Investigation Components	District Documents (Full text is in Appendix H)	Survey Twoway ANOVA test results	Interviews responses made # individuals sharing response
local administrators and students are knowledgeable of the change process.			
8. Implementation must focus on teachers - make their job dependent upon technology and give them full support.			Teachers need to see software possibilities and how it can be used pedagogically. (14) We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10) Technology support must increase, lab time must be available to teachers and attention must be paid to teacher needs. (8) The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5) A place for previewing software, trying things out and getting help whenever it is needed would be very beneficial. (4)

IV. Plan fo

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IV. Plan for Change: Discussion of Combined Results

A. Link technology to educational change

The district documents, through the IT Steering Committee minutes, suggested displaying a vision and how it will affect the learning environment, but nothing was mentioned about technology being linked to school improvement, changing the role of teachers and students and defining the way the learning environment is to change. Nothing was mentioned about the fact that improvements in teacher practices are to affect student outcomes, that instructional change can only happen when accompanied by changes in beliefs or that three dimensions of change must occur to produce real changes in the learning environment.

In the survey responses to the general and school statements about having a vision of how technology is to be used and how it will change the learning environment, there were no significant differences, but in the personal statement, there was a significant difference by training, and the post hoc tests produced a significant difference between training level 3 and training level 1. It appears that most of the teachers agree that each technology must be accompanied by a vision of how it is to be used and how it will change the learning environment. They also feel that teachers in their particular buildings do not have this vision, but the teachers with more training feel more strongly than the other teachers that they do know how to use technology and that they have used it to change the learning environment in their classrooms. In the responses about affecting student achievement and other desired

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outcomes, the general statement produced a significant difference by group and trng*group, and the post hoc tests showed a significant difference between TCH and SCH. The school statement produced a significant difference by group, and the post hoc tests showed a significant difference between SCH and COT, but the personal statement produced no significant difference. These results suggest that teachers in groups that are closer to the planning process tend to feel that the use of technology has a positive effect on student achievement and other desired outcomes in their school buildings, but they don't necessarily see those effects in their own classrooms.

The interviews provided a number of specific suggestions about linking technology to educational change, such as promoting the use of technology with "effective instruction" and "good teaching practices", providing teachers with a vision of how software is to be used appropriately and using technology panels to align technology use with educational outcomes. They gave 33 responses that supported accompanying each technology with a vision of how it is used and how it will change the learning environment. They suggested that teachers must see software possibilities and how it can be used pedagogically and that they require training specific to groups, subjects and activities. There were 26 responses related to improvements affecting student achievement and other desired outcomes. Included, was a reference to the technology panels for matching software with defined outcomes, district standards and use of the "Service Team" to combine the use of technology with effective instruction and good

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teaching practices. Though many responses were given that were directly connected to "Plan for Change", there were some investigation components that drew very few responses. Some mention was made about using the "Service Team" to connect to effective instruction, and all responses about preparing for the use of technology could be interpreted as being connected to school improvement. But not many responses were specifically about school improvement. The concern was more about preparing individual teachers to cope with the use of technology. Not much was mentioned about changing what teachers do, though much of it would have to happen if teachers really did learn to use technology effectively. Some responses mentioned that teachers need to see software possibilities, but there was no talk of actually restructuring the learning environment. Though attitudes about using technology indicated that some of the respondents had perhaps changed their beliefs about instruction and learning, they didn't profess any awareness that a change in beliefs was necessary for instructional change to occur. Therefore, instead of supporting the idea that three aspects of change must occur, (use of new or revised materials or equipment, use of new teaching approaches and alteration of beliefs) the interviewees spoke mainly of providing technology, training and support.

B. Training

In the district documents through the IT Plan and the Steering Committee minutes, training is addressed in some manner that matches each item listed under training in the Investigation

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Components. Staff development is to be offered for every new technology that is proposed. A variety of seminars and workshops are to be used on a regular basis and training is to be customized to fit into the zone of comfort for teachers involved.

In the survey responses, there was a significant difference by group for the general statement, and the post hoc tests showed a significant difference between TCH and SCH. There was also a significant difference by training for the school statement with post hoc tests showing a significant difference between level 3 and level 1, and between level 2 and level 1. There was also a significant difference by training in the responses to the personal statement, and post hoc tests showed a significant difference between level 3 and level 1, and between level 2 and level 1. This indicates that teachers from the TCH group, who were closer to the planning process, felt stronger about the need for training accompanying technology, and that the teachers who have participated in training felt stronger about the availability of training, modeling and support than the teachers who had not participated in the training.

The interview responses affirmed the importance of training, and they offered many specific suggestions as to the type of training, resources and methods of accomplishing them. There were 45 responses that supported that individual needs must be addressed through a variety of staff development opportunities. They stated that training must be aimed at specific groups, subjects or activities. The district should do on-site training and provide for individual needs of teachers. The respondents also stated that high

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school teachers should be used to present possibilities to elementary teachers and administrators should encourage the use of visitation days and make use of BIT days, meeting days and district-wide inservices. They supported the idea that each technology must be accompanied by training, modeling and support with 40 responses. They stated that teachers need support and resources and that schools should use team teaching, peer coaching, "train the trainer" and visitation days. They supported the idea that training, feedback and extra support must continue throughout implementation. They stated that schools must do on-site training, increase support, give teachers an opportunity to preview software, provide lab time and attend to needs of teachers. Principals must take a leadership role in implementing technology, and teachers must take part in training and be given opportunities for previewing software and obtaining help whenever it would be beneficial. There were 32 responses that agreed that the first step in school transformation is teacher development. They included the fact that teachers need to see software possibilities and how they can be used in instruction, that training should include peer coaching, sharing and team teaching and that schools must provide at least one trainer in each building. They talked about the importance of principals taking some responsibility, but no mention was made about the importance of training and support for administrators. They suggested peer coaching, sharing, team teaching and 'train the trainer" activities that could be done on meeting days, BIT days, and inservice days. They proposed on-site training, open lab times and opportunities for

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previewing software, and they suggested strongly that the principal must be involved.

C. Strategies

The IT Plan proposed using Curriculum Area Instructional Technology Panels to guide and assess the use of technology in the content areas and a long term "Computer Technology Advisory Committee" to handle major issues. They would be used to track problems, devise coping methods and monitor the progress of implementations. Nothing was mentioned about developing strategies to address Havelock's stages of a planned change or developing methods of gaining normative consensus about the intended learning environment. Nothing was mentioned about working with reform movements to establish a cooperative effort or educating teachers, parents, students and administrators about the change process and how it is involved in any implementation of technology. The IT Steering Committee minutes made reference to a concern about release time, incentives and other resources needed to support large scale training efforts, but no provisions for such were outlined in district documents.

The survey responses produced no significant difference in the general statement concerning the fact that each school should have a coordinating or steering group to help plan the use of technology, but they did produce a significant difference by trng*group for the school statement. They also produced a significant difference by group for the personal statement, with post hoc tests presenting a significant difference between TCH and SCH and between TCH and

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COT. This can be easily explained by the fact that most of the teachers had some feelings about the importance of a coordinating group, but the TCH people responded more strongly than the others because they were more involved in planning at the building level and at the district level.

The interview responses provided suggestions about using the technology panels for the district coordinating committee and doing some planning at the building level, and they gave several suggestions about focusing the implementation on teachers and providing support for them. With 41 responses, they supported the idea that implementation must focus on teachers. They suggested that teachers must see software possibilities, be exposed to technology, be motivated to improve and be encouraged to give feedback. Technology support must be improved and leaders must pay attention to teacher needs. The idea of schools having a coordinating committee or steering group to help track problems and devise coping methods was supported by 25 responses suggesting technology panels and building planning that is consistent with district planning. They talked about providing teachers with comfortable settings for training and support, but no knowledge of stages of a planned change or stages of acceptance or adoption were mentioned. Nothing was mentioned about continuously working on consensus. They expressed concerns for the needed resources, but the only suggestion to supply resources was to use "train the trainer" or Comp Ed teachers to provide at least one trainer in each building. Nothing was mentioned about monitoring the change process or simultaneously dealing with curriculum, teaching and

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learning, community, student support systems, etc. Nothing was mentioned about addressing Havelock's stages of a planned change or about developing methods of gaining normative consensus about the intended learning environment. And nothing was mentioned about coordinating reform movements, managing change or developing knowledge about the change process.

IV. Plan for Change: Summary

District Documents

The documents suggested that leaders must display a vision and how it will affect the learning environment, but nothing was mentioned about linking technology to school improvement, changing the role of teachers and students and defining the way the learning environment is to change. It was not mentioned that improving teacher practices should affect student outcomes, that instructional change requires changes in beliefs or that three dimensions of change must occur to produce real changes in the learning environment. On the other hand, training is addressed in some manner that matches each item listed under training in the Investigation Components. Staff development is to accompany every new technology proposed, and training is to be customized to fit into the zone of comfort for teachers involved. Curriculum Area Panels are to guide the use of technology in the content areas, and an advisory committee is to handle major issues, but nothing was mentioned about strategies to address stages of a planned change. Nothing was suggested about methods of gaining normative

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consensus, working with reform movements to establish a cooperative effort, or educating personnel about the change process and how it is involved in using technology. Reference was made to a concern about release time, incentives and other resources needed to support large scale training efforts, but no provisions for such were outlined in district documents.

Surveys

In the survey responses, it appears that teachers in groups that are closer to the planning process feel that the use of technology has a positive effect on student achievement and other desired outcomes in their school buildings, but they don't necessarily see those effects in their own classrooms. They feel stronger about the need for training accompanying technology, and the teachers who have participated in training feel stronger about the need for training, modeling and support than the teachers who have not participated in the training. The people from the TCH group were more involved in planning at the building level and at the district level than the others were, but most of the teachers had some feelings about the importance of a coordinating group.

Interviews

The respondents gave many answers directly connected to "plan for change". They stated that training must be aimed at specific groups, subjects or activities, with on-site training to provide for individual needs of teachers. They encouraged the use of team teaching, peer coaching, "train the trainer", visitation days,

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BIT days, meeting days and district-wide inservices for training. They suggested that implementation must focus on teachers and that teachers must see software possibilities and how they are used pedagogically, be motivated to improve and be encouraged to give feedback. Each technology must be accompanied by a vision of how it is used and how it will change the learning environment, and it must include training, modeling and support throughout implementation. Principals must take a leadership role in implementing technology. Software must be matched with defined outcomes and district standards, and the use of technology must be combined with effective instruction and good teaching practices.

Though many responses were directly connected to "Plan for Change", there were some investigation components that drew very few responses. Not many responses were specifically about school improvement. The concern was more about preparing individual teachers to use technology, with no thought to changing what teachers do or to restructuring the learning environment. Nothing was mentioned about the idea that three aspects of change must occur (use of new or revised materials or equipment, use of new teaching approaches and an alteration of beliefs). Nothing was mentioned about the importance of training and support for administrators. Nothing was mentioned about the stages of a planned change or stages of acceptance or adoption or the need for continuously working on consensus. Nothing was mentioned about monitoring the change process or simultaneously dealing with curriculum, teaching and learning, community, student support

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systems, etc. A complete list of the components not mentioned in the interviews can be found in Appendix E.

Combined Results

Consistent with the district documents, the interviewees presented suggestions that matched with every idea presented under training in the Investigation Components. They also agreed on the need for a vision of how technology is to restructure the learning environment, the need for a coordinating committee and the necessity of finding creative measures to provide resources for training. They were also consistent with the district documents in the fact that no mention was made about addressing Havelock's stages of a planned change, developing methods of gaining normative consensus about the intended learning environment, coordinating reform movements or developing knowledge about the change process. The district documents presented a long-term, computer advisory committee as the group responsible for managing change, but no interview responses mentioned managing change. On the other hand, the interviews did support linking technology to school improvement and linking technology to improving learning. They supported tying improvements in instruction to affecting student achievement and focusing implementation on teachers. There were four sets of survey questions about planning for change. The questions about having a vision for changing the learning environment provided a significant difference in the personal statement by training. This suggests that teachers with more training believed they knew how technology should be used, and they

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had used it to change the learning environment as the interview responses suggested they should be able to do. On the question about affecting student achievement, the general and school statements showed that groups closer to the planning process believe that student achievement should be affected and that, perhaps it is in their schools, but they are not personally satisfied with the progress. On training, modelling and support, it appears that the group closest to the planning process expressed stronger agreement to the general statement of need, but the teachers with more training felt stronger about the fact that they had actually received the training, modelling and support. On the need for a coordinating committee, it appears that the people closest to the planning process feel that they are really involved with a coordinating committee.

Before making recommendations based on the findings of this study with respect to Plan for Change, some criteria had to be set as the basis for validating investigation components. Table 12 was created to validate the investigation components that have been documented in GRPS and have been endorsed by a number of teachers in their interview responses. Each investigation component was assigned five points for each excerpt from district documents that was aligned with that component and one point for each interview response that was aligned with that component. Each component that accumulated 20 or more points is considered validated and included in the recommendations. The survey results are not included in Table 12, because the surveys primarily provide information about the value of training and involvement in the

planning process. Recommendations from the surveys are included in this section after the recommendations based on the validation process.

Table 12: IV. Plan for Change - Validation

	Document (5 each)	Interview (1 each)	TOTAL	Validate
IV. Plan for Change				
A Link technology to educational change				
A1. Technology applications must be linked to school improvement.	0	3	3	No
A2. All use of technology must be linked to improving learning by changing what teachers and students do and what they do with technology should be dependent upon technology.	0	5	5	No
A3. Accompanying each technology introduced must be a vision of how it is to be used and how it will change the learning environment.	0	33	33	Yes
A4. School personnel must have a vision of how technology will restructure the learning environment.	5	14	19	No
A5. Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes.	0	26	26	Yes
A6. Instructional change can only proceed with changes in beliefs about instruction and learning.	0	0	0	No
A7. Three aspects or dimensions of change must occur: use of new or revised materials or equipment; use of new teaching approaches; alteration of beliefs.	0	0	0	No
B Training				
B1. The first step in school transformation is teacher development.	1	32	33	Yes
B2. Individual needs must be addressed through a variety of staff development opportunities.	10	45	55	Yes
B3. Each technology must be accompanied by training, modeling, and support.	10	40	50	Yes
B4. Training, feedback and extra support must continue throughout implementation until innovation is stabilized and permanent	10	26	36	Yes
B5. Special emphasis must be placed on training and support for administrators.	5	5	10	No

Table 12: IV. Plan for Change - Validation
Continued

	Document (5 each)	Interview (1 each)	TOTAL	Validate
C Strategies				
C1. Address Havelock's stages of a planned change:	0	0	0	No
C2. Following the evolutionary planning process, we should cycle back and forth between efforts to gain normative consensus about the intended learning environment, plan strategies for getting there, . . .	0	0	0	No
C3. Schools must have a coordinating committee or steering group to help track problems and devise coping methods.	5	25	30	Yes
C4. Resources are needed for training, materials, space and release time. It is necessary to find creative ways to match needs with resources such as using schedule changes, local trainers, coordinating committees, etc.	5	7	12	No
C5. Change projects must be monitored closely and all participants kept informed of progress so problems can be identified and solutions can be started quickly. The management of change is best accomplished, . . .	5	0	5	No
C6. Reform must deal with curriculum, teaching and learning, community, student support systems, etc. simultaneously and work on cultural issues by emphasizing collaborative work and continuous improvement.	0	0	0	No
C7. To accomplish change, it is important that teachers, parents, local administrators and students are very knowledgeable of the change process.	0	0	0	No
C8. Implementation must focus on teachers - make their job dependent upon technology and give them full support.	0	41	41	Yes

IV. Plan for Change: Implications, Interpretation and Recommendations

Under Plan for Change, the combined results were mixed. From the validity table above, only two out of seven subcomponents under "IVA Link technology to educational change" accumulated 20 or more

points. Only two out of eight subcomponents under "IVA Strategies" produced 20 or more points, but four out of five from "IVB Training" produced over 20 points. Both the interviews and the district documents addressed, in some form, every subcomponent of "IVB Training", and they agreed on the need for a coordinating committee. Also, the survey responses suggested that teachers who were more involved in training and planning were more in agreement with the statements about training and a coordinating committee than the other teachers. On the other hand, neither the interviews nor the district documents presented anything about addressing Havelock's stages of a planned change, developing methods of gaining normative consensus about the intended learning environment, coordinating reform movements, or developing knowledge about the change process. There were also a number of investigation subcomponents under "IVA Link technology to educational change" and "IVC Strategies" that were not mentioned in the interview responses. This is probably due to the fact that many of the ideas are based on knowledge of the change process. The teachers have had no formal training on change theory. Though they would not necessarily disagree with the concepts, they are not aware that change theory would apply directly to their uses of technology. Therefore, the number of subcomponents validated for now is limited, but the ones validated should be included in the recommendations for successful planning for the use of instructional technology.

The following recommendations should be followed to support planning for change:

1. Accompanying each technology introduced, must be a vision of how it is to be used and how it will change the learning environment.
2. Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes.
3. The first step in school transformation is teacher development.
4. Individual needs must be addressed through a variety of staff development opportunities.
5. Each technology must be accompanied by training, modeling, and support.
6. Training, feedback and extra support must continue throughout implementation until innovation is stabilized and permanent.
7. Schools must have a coordinating committee or steering group to help track problems and devise coping methods.
8. Implementation must focus on teachers - make their job dependent upon technology and give them full support.

From the surveys, it appears that teachers involved in planning and training value the use of instructional technology and they understand the need for adequate training. On the other hand, teachers who have not been involved do not appreciate the value of using technology and they don't appreciate opportunities for

training. Therefore, three further recommendations to support planning for change should be followed:

9. Staff meetings, open houses, inservices, etc. should be used to increase teacher awareness of technologies available for staff use.
10. Expert users of instructional technology should be identified as mentors and they should be given some free time to work with beginners.
11. All teachers should be given an opportunity to work with a mentor or to team with another user.

CHAPTER VI

INTERPRETATIONS AND RECOMMENDATIONS

Most school districts are involved in planning the use of instructional technology, but school planners have few models or guidelines to follow. The lack of guidelines for planning is especially daunting for large, urban school districts, because they have bureaucratic systems that make it very difficult to make changes. The purpose of this study was to identify components of change theory that could potentially improve the process of planning the use of instructional technology and to test the validity of those components in a large, urban school district. The investigation components identified are listed in Chapter 3. Testing the validity of those components involved studying district documents, conducting surveys and doing interviews. The data collected and the results of the analyses are presented in chapter 5.

This chapter presents interpretations and recommendations based on the results of the analyses of the data collected. There are three parts to this chapter. The first part of the chapter, titled "Interpretations" presents interpretations of the results of the analyses from chapter 5. Interpretations are presented separately for each of the four main sections of the investigation components: I. Support Learning Outcomes, II. Active Leadership, III. Collaborative Planning and IV. Plan for Change.

The second part of this chapter, "Recommendations", presents recommendations based on the investigation components validated in this study. The recommendations are also presented separately for each of the four main sections of the investigation components.

The third part of this chapter, "Suggestions for Grand Rapids Public Schools", discusses the planning steps used in Grand Rapids Public Schools (GRPS) and makes some suggestions to improve that process.

The fourth part of this chapter, "Conclusion", summarizes this study and boils the recommendations down to five main points.

Interpretations

I. Support Learning Outcomes

The documents and the interviews are in agreement that the primary use of technology is to meet student needs, and planning technology must focus on learner outcomes. Technology must be used to support a variety of learning styles, and it must be curriculum driven. It must support active learning and constructing knowledge, and students must be exposed to the skills needed in the work place.

The survey results suggest that teachers involved in the planning process and technology training are more likely to be in agreement with change theory with respect to technology supporting learning outcomes than those who are not involved in both planning and training. The teachers interviewed had the perception that the investigation components concerning supporting learning outcomes

had been put into action in their schools and especially in their classrooms. They gave many specific suggestions about how technology can be used to support learning outcomes. Their statements were very much in agreement with the content presented in the district documents.

It appears from the results of this study that Grand Rapids Public Schools have a good start toward supporting learning outcomes with instructional technology. All of the investigation components supporting learning outcomes have been validated by interview responses and district documents. Also, the teachers who have had training and a chance to be involved in planning appear to be more in agreement with the validated components than do the other teachers. It appears that involvement in planning and training makes some teachers more confident that the techniques they are using are pedagogically sound. This suggests that training and a chance to be involved in planning may be what is necessary to motivate the rest of the staff in the district.

II. Active Leadership

The documents displayed evidence of school personnel taking responsibility for planning and focusing implementation on the teachers. They described a need for good advance planning, extensive inservice, quality hardware and software and school-based planning, monitored at the district level with constant feedback and executive staff support. Reference was made to a need for visible successes and public relations with staff. It was suggested that schools should concentrate on providing training and

support and meeting individual needs of teachers and administrators. Training should be within the zone of comfort for teachers and the school district should establish a preview center for hardware and software. Curriculum panels were proposed as the group that would handle much of the planning and dealing with implementation problems.

The interviewees were aware of the areas where leadership was lacking, and they gave specific suggestions. They recommended building level planning and principal involvement in implementation. They recommended training, support, recognition, and opportunities for input into the planning process. They talked about exposing teachers to software possibilities and a variety of training opportunities. They suggested on-site training, peer coaching, communication, feedback, and giving recognition to innovative teachers. The survey responses showed that the teachers closer to the planning process and the teachers with more training were different than the other teachers. The teachers more involved in planning and training felt more strongly about the value of the software and training available in their schools and classrooms, and they felt that they had received assistance in planning that aligned them with district standards. They also felt that their input was valuable and would be used constructively. Also, it appears that teachers closer to the planning process feel that the use of technology has a positive effect on student achievement and other desired outcomes in their school buildings, even if they don't see those effects in their own classrooms. The interviewees were more aware of a need for involving school personnel in planning and

decision making and a need for extensive training, district standards, evaluations, etc. than their colleagues.

It appears again in this area that training and involvement in planning must be attempted for all staff. This could help align the staff more with change theory, but more importantly, staff involvement in planning could fill some of the gaps between recommendations by the involved teachers and what is evidenced in district documents.

III. Collaborative Planning

The interviews produced many ideas not mentioned in district documents. The results suggested that planning consistent with district planning must be done for each building and be communicated throughout the district. The interviewees suggested promoting a sense of community through user groups, e-mail, etc. They encouraged feedback, recognition of teacher accomplishments and mentoring. The surveys pointed out that the TCH and SCH teachers who had had more training were more in tune with the investigation components than were the other teachers.

It appears that GRPS is really lacking in collaborative planning. Following the suggestions made in the interviews would make a good start. It also appears that being more involved in planning and training may make teachers place more value in planning and the training offered.

IV. Plan for Change

The district documents and the interviews produced suggestions that matched every idea presented under training in the Investigation Components. Staff development is to accompany every new technology proposed and training is to be customized to fit into the zone of comfort for teachers involved. The district must display its vision and how it will affect the learning environment. Technology must be linked to school improvement, affect student achievement and focus implementation on teachers. Teachers with more training believed they knew how technology should be used, and they believed that they had used it to change the learning environment. It appeared that the group closest to the planning process felt stronger about a need for training, modelling and support, but the teachers with more training acknowledged that the appropriate support was available.

It appears that more training and involvement in planning is greatly needed in GRPS.

Recommendations

In each of the four main sections that follow, recommendations are made that are based on the validated investigation components and the survey results. The recommendations are numbered 1, 2, 3, . . . Each number is followed by the investigation number (IC#) in parentheses after it. If a particular recommendation is based on an investigation component, the investigation component is stated, followed by its number from the original list in Chapter 3. If the recommendation was made to

address a concern highlighted in the survey responses, it is followed by "survey responses" in parentheses. In each case, the recommendation is followed by a brief explanation.

I. Support Learning Outcomes

The district documents and the interview responses were clearly in alignment with the five investigation components under Support Learning Outcomes. And the survey responses highlighted the importance of involving teachers in planning and training. Therefore, the five investigation component statements and two more that address planning and training were included in the guidelines for successful planning for the use of instructional technology. The following recommendations should be followed to support learning outcomes:

1. Planning must address student needs and how teachers can address those needs with technology. (IC# I A)

The district plan must define a process that will perpetually identify student needs, describe how they can be addressed, and develop the staff training necessary to address them. The process should involve some teachers directly and make provisions for all teachers to give input and share in the results. This could be separate committees for each level or for each curriculum area. All groups (elementary, middle school, high school, special education, community education) must be represented. Using release time or compensation for extra time must be arranged so groups can meet consistently.

2. Technology must be curriculum driven. (IC# I B)

Everything that is done through the process above should be aligned with district outcomes, proficiencies, and other initiatives that are in progress within the district. This could be started by creating a grid with columns for outcomes, proficiencies, textbooks, technology related activities, etc. This work should involve the same groups of teachers as above. Correlations should be made among technology activities and outcomes, proficiencies, etc. Every use of technology must have a purpose.

3. Technology must support active learning and constructing knowledge. (IC# I C)

In matching technology to outcomes, proficiencies, etc., an effort must be made to find technologies with an emphasis on interactive and constructive activities. Each activity must be an appropriate use of technology and be matched properly to learning outcomes.

4. Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data. (IC# I D)

A list of appropriate real world skills that involve processing information and analyzing and interpreting data should be included in the technologies that are matched to outcomes, proficiencies, etc. Each skill must be used in a real application with an obvious transferal to its real-world purpose.

5. A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction. (IC# I E)

Technology applications should be coordinated with effective schools, mastery learning, and other district initiatives aimed at improving the learning environment. In each place where there is a good match of technology with outcomes, proficiencies, etc., an effort should be made to design lessons that are enhanced by the technology in a manner that improves the learning environment beyond what could be done without the technology. The technology and the learning environment must be tightly woven so neither becomes isolated.

6. To address student needs and integrate technology into the curriculum, teachers must be thoroughly involved in the planning process. (survey responses)

The survey responses suggested that more involvement in planning may make teachers feel stronger about the need to address student needs and integrate technology into the curriculum. If district leaders want teachers to address student needs and integrate technology into the curriculum, it is important that teachers feel strongly about these ideas.

7. Adequate training must be provided for teachers, and extraordinary means should be taken to encourage their

involvement in designing and delivering training. (survey responses)

The survey responses suggested that teachers who had had more training felt more strongly that they were capable of using technology to support active learning and constructing knowledge. They also felt more strongly that their students were learning real-world skills.

II. Active Leadership

The district documents addressed the main investigation components: "lead by involvement", "standards and spreading innovations", and "evaluation". The interviews, on the other hand, addressed all of the subcomponents of each of them to some degree. From their personal experiences with using technology, partaking in training and doing some planning, the interview respondents have a good working knowledge of many change theory ideas that work. The survey responses also suggested that teacher involvement in planning and training may have an affect on perceptions about active leadership. Therefore, along with the validated investigation components in this area are two extras that address planning and training. They were included in the guidelines for successful planning for the use of instructional technology. The following recommendations should be followed to support active leadership:

1. School personnel must have the responsibility of planning and making decisions and they must place planning high on the agenda. (IC# II A1)

The planning process can be facilitated by outsiders, but the planning and decision making must be done by school personnel. District planning can be done by a small number of people, but it must include people who represent all personnel in the district and who have the ability to communicate and make decisions. Key stakeholders must be involved to establish ownership and planning should be a continuous process. In each building, planning should be done that follows parameters set out by district plans. The process should be guided by someone involved in the district planning, but it must include all building personnel in some form. A change agent for each building should work closely with the building principal and central office people.

2. Implementation must focus on teachers. (IC# II A2)

Planning must address concerns of teachers, their levels of ability, and their needs for training, support and resources. Each teacher needs to know what is expected of him, how he can gain training and support and how he can provide feedback to the planning process.

3. Leadership is necessary all through the implementation process. (IC# II A6)

If the superintendent and central office staff are not extremely involved in the details of the planning process, they must at least be very visible in the implementation phase. Every major initiative (mastery learning, effective schools, MEAP preparation) should provide an opportunity for central office staff to endorse the

use of appropriate technology. The principal must take some responsibility for implementing technology and improving the learning environment by changing what teachers do. Teachers must be taught and encouraged to change their teaching styles with the use of technology.

4. Good advance planning must include extensive inservice training and high quality courseware/software. (IC# II B1)

Appropriate software should be chosen to support major areas of instruction (i.e. the writing process), and training should be designed such that every teacher will have an opportunity to see how to use the technology effectively in instruction.

5. School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards. (IC# II B2)

Standards should be set at the district level. Appropriate technologies should be matched with the educational objectives that they intend to support. Planning teams should produce lists of recommended software, training, etc. Then site-based planning can follow the standards and choose technologies from the recommended lists.

6. To spread innovations, they must have centralized development and support. (IC# II B3)

The central office staff must take the responsibility of establishing standards, making recommendations, developing training, and providing support.

7. Constant feedback is needed to recognize and attend to the stages of adoption that participants go through in the adoption process. (IC# II B4)

An effort must be made to recognize and attend to the stages of adoption that personnel in each building are going through.

8. Members of the organization must have a clear understanding of the innovation, be capable of carrying it out and have necessary tools and resources readily available. (IC# II B5)

Teachers must have opportunities to see good uses of technology and they must have the resources necessary to implement technology properly.

9. Teachers must be allowed to participate in decision making and they should be recognized for their accomplishments and be encouraged to become leaders. (survey responses)

The survey responses suggested that teachers with more involvement in planning and training were more in agreement with tenets of change theory than the other teachers were. They expressed more agreement with school-based planning monitored at the district level, receiving assistance in planning, etc.

10. Evaluation processes that solicit input from teachers should be used routinely. (survey responses)

The survey responses suggested that teachers who have had more training felt more strongly than the others that they were given opportunities for feedback and that their feedback was important. (In GRPS, many of the opportunities for feedback were included with training opportunities.)

III. Collaborative Planning

The interviews produced many ideas not mentioned in district documents under collaborative planning. They suggested that planning consistent with district planning must be done for each building and be communicated throughout the district. The school district should promote a sense of community through user groups, e-mail, etc. Leaders must encourage feedback, recognize teachers for their accomplishments and encourage knowledgeable people to help others. The teachers with more training felt stronger about the need for a chance to interact with others and discuss the meaning of change. They felt that they had been given an opportunity to adopt technology at a suitable pace in a good learning environment, and they felt that they had access to resources. The teachers more involved in planning felt that they had experienced support from central office staff. These results reinforce the need for a chance to interact, to adopt change at a suitable pace and to involve teachers in planning and training.

Involving all the teachers in planning is no easy task, but as knowledgeable as they are about what needs to be done, it seems

that the only chance for success is dependent upon collaborating with them. Therefore, along with the validated investigation components, one further recommendation that addresses planning and training was included. The following recommendations should be followed to support collaborative planning:

1. Consensus, the process of planning and its effect on commitment are more important than the products of planning. (IC# III A1)

Planning must be done at each building. Though it is to be consistent with district planning, the process of planning and consensus building are important.

2. All action must be tied to improvement and staff commitment must be continuously cultivated. (IC# III A3)

We must expose teachers to technology, encourage them to improve, and continuously cultivate commitment. Teachers need to see new things. They need constant encouragement and motivation especially from the principal.

3. Educational innovations must be public matters so the implementers will experience "ownership". (IC# III A4)

Teachers must be exposed to the work of others. The school district must develop a sense of community by establishing channels of communication through newsletters, E-Mail, etc.

4. A vision for the future must be drawn and shared to promote a large cadre of people with a vested interest in the innovation. (IC# III A5)

We must paint a picture of how technology is to be used. Everyone must have the vision and communicate freely about it.

5. Each teacher must have an opportunity to work through the experience in a way in which the rewards at least equal the cost. (IC# III A6)

A variety of training opportunities, workshops and demonstrations must be available so teachers have a chance to work within their comfort zones. Training on demand should be established so teachers can have on-site training, tutoring or whatever is needed.

6. Teachers need a chance to interact with each other to discuss the meaning of change. (IC# III A8)

On-site training, work shops and user groups should be created, and teachers should be constantly encouraged to communicate and work together.

7. A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change and they must be exposed to conditions that support learning. (IC# III A10)

In each building, the entire staff should be allowed to give input into the planning process and they should be given extra training and support when they begin implementation.

8. Schools must receive support from the school board, administration, and community and they must have access to hardware, software, support personnel, and related resources. (IC# III B3)

Support and additional resources are the best reward for a job well done.

9. Strategies should be developed locally with input from teachers. (IC# III B4)

At the district level, correlations should be done among the district initiatives, outcomes, proficiencies, etc. and technology resources. Then implementation strategies should be developed by a group of teachers for the district and fine tuned at each building. If outside resources are necessary at the start, methods such as train the trainer should be used so eventually local people will be able to maintain the processes over time. Someone in each building must be trained to manage the technology facilities in the building and to train the staff to use the equipment.

10. User's need is basis for all interaction. (IC# III B5)

Everything should be aimed at meeting needs of students and teachers.

11. Participants in successful school improvement efforts are visible and accountable to one another and take an active part in solving problems. (IC# III B6)

Teachers must interact with one another. Training, peer coaching, user groups and anything else that can bring teachers together with a common purpose will help.

12. All teachers must be given a chance to interact with other staff members in non-threatening, planning and training sessions. (survey responses)

The survey responses suggest that teachers more involved in training feel more strongly that they have had an opportunity to adapt technology at a suitable pace and that they have been involved in a good learning environment. Though generally teachers felt that they were not involved enough in planning and that support was lacking, the teachers more involved in training felt more strongly that they had had a chance to be involved in planning and that support was available to them.

IV. Plan for Change

The interviews and the district documents addressed every subcomponent concerned with training, and they agreed on the need for a coordinating committee. They also agreed on the need for a vision of how technology is to restructure the learning environment and the necessity of finding creative measures to provide resources for training. They supported tying improvements in instruction to affecting student achievement and focusing implementation on

teachers. The teachers with more training believed they knew how technology should be used, and they felt that they had used it to change the learning environment. On training, modelling and support, it appears that the group closest to the planning process expressed stronger agreement with the general statement of need, but the teachers with more training felt stronger about the fact that they had actually received the training, modelling and support. From the surveys, it appears that teachers involved in planning and training value the use of instructional technology, and they understand the need for adequate training. On the other hand, teachers who have not been involved do not appreciate the value of using technology and they don't appreciate opportunities for training. Therefore, along with the validated investigation components, two additional recommendations that address planning and training were included. The following recommendations should be followed to support planning for change:

1. Accompanying each technology introduced, must be a vision of how it is to be used and how it will change the learning environment. (IC# IV A3)

The district planning committees should be drawing a picture of the vision of how each new technology is to be used and how it will change the learning environment and they must communicate it to all personnel. The vision that is presented should not be broad. It should show specifically what is intended to be done and how it is to be done.

2. Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes. (IC# IV A5)

All instructional resources and teacher training should be aimed at affecting student outcomes or improving the learning environment. Where possible, technology training should be incorporated with training for other changes in instructional strategies.

3. The first step in school transformation is teacher development. (IC# IV B1)

When new technology is introduced at a building, training which includes new instructional strategies and teaching materials should occur and provide an opportunity for an exchange of ideas that may lead to an alteration of beliefs.

4. Individual needs must be addressed through a variety of staff development opportunities. (IC# IV B2)

A variety of training opportunities must be available to satisfy needs of individuals at different levels of understanding.

5. Each technology must be accompanied by training, modeling, and support. (IC# IV B3)

Training opportunities must be accompanied by modeling and follow up support. After the initial enthusiasm wears off, teachers need help applying what they have learned.

6. Training, feedback and extra support must continue throughout implementation until innovation is stabilized and permanent. (IC# IV B4)

Extra support must continue at each building until the staff is comfortable enough with the technology to troubleshoot and solve their own problems.

7. Schools must have a coordinating committee or steering group to help track problems and devise coping methods. (IC# IV C3)

An implementation committee made up of teachers and people with some decision making power should meet regularly to monitor problem areas and work on solutions. They must establish good lines of communication so problems can be solved quickly.

8. Implementation must focus on teachers - make their job dependent upon technology and give them full support. (IC# IV C8)

Teachers are the most important piece in the use of technology in schools. Their jobs must eventually be dependent upon technology and they must have full support. (If dependency is established without full support, mutiny is possible.)

9. Staff meetings, open houses, inservices, etc. should be used to increase teacher awareness of technologies available for staff use. (survey responses)

The survey responses suggest that teachers who have had more training feel more strongly that they know how technology should be

used and that they have used it to change the learning environment in their classrooms.

10. Expert users of instructional technology should be identified as mentors, and they should be given some free time to work with beginners. (survey responses)

It is important that timid teachers are given extra support so they can experience the confidence expressed by teachers who have had more training.

The most obvious result of this study is that it points out that all teachers must have opportunities to participate in planning and training. It appears that it is possible to have representative groups work on district level planning, but they can not work in isolation. They must communicate their results and provide opportunities for all teachers to give input. At the building level, all teachers should be involved in planning and training. Deciding how teachers are to be involved in planning and training and how ideas are to spread throughout the district can be assisted greatly by using some change theory concepts. Therefore, using the recommendations based on the investigation components validated in this study should improve the results from planning the use of instructional technology.

Suggestions for Grand Rapids Public Schools

Studying the technology planning in Grand Rapids Public Schools (GRPS) has led the researcher to believe that the GRPS planners did a number of things correctly. Yet, they have exhibited

limited success because they have omitted or only partially applied some of the concepts of change theory. Much could be gained by simply listening to the teachers in the district. Consensus building and planning for each building, as suggested by the interview responses, would make a good start. The suggestion of building a sense of community with E-Mail, user groups, etc. is worth looking at and much more gathering of input and communicating and public planning is needed. Also, the results of the surveys suggest that more effort should go into training and involving teachers in the planning process. Involving more teachers in the planning process may not only lead to better plans. It may improve the outlook of teachers and give them a more positive approach to the learning environment.

The process used to develop a technology plan in GRPS was a good one, but it took too much time and it was missing some important parts. Most of the missing parts were related to time and a process that would guarantee that the plan was properly implemented. Much time was spent gathering information from staff, planning in isolation and getting approval within the district heirarchy. The time would have been better spent in a collaborative planning mode. Much of the plan should have focused on implementation and establishing coping mechanisms to deal with problems as they arise. Timelines and milestones should have been established so people could be kept informed about progress. Consensus building should have been started early and worked on constantly to build momentum and avoid restarting stalled implementations.

A list of steps used in GRPS planning is included in Appendix H. The list has been enhanced to make a more complete list of planning steps and to reflect what should have been done differently in Grand Rapids. Each step in the appendix that includes something that was either missing or done incorrectly in GRPS is explained below. The number in parentheses after each explanation refers to the number in the appendix of the step that is being explained.

Timelines were too general. Specific milestones should have been identified ahead of time and a real effort made to accomplish them on time. A plan without implementation is no plan. (3)

An inventory was started and not updated properly. An inventory of equipment, including make, model, value, age, etc. is very important in planning for a large district. A process must be in place to enter equipment to the inventory when it arrives in the district. (7)

Reports tend to stop at the committee level. They must be public. (9 & 11)

Some discussions were started, but they ended without resolution. Inequities should be resolved in planning. (12)

No detail was included in plans so details caused delays. It is better to define what general resources are needed ahead of time than to cause delays looking for solutions when it is time for implementation. (13d)

Forming new committees and initiatives that were not planned cause more time delays. Lay the framework for planning details and include them in the timelines. (13e)

Individual buildings asked for direction or started their own plans before district plans could provide parameters and direction. A template or guidelines should be provided, but building plans must follow the district plan and be aligned with it. (13f & 14)

No firm commitments were made. Realistic timelines and resource acquisitions should not be separated from any presentation. (15)

Many delays resulted from having no firm timelines. Implement the plan and stick to timelines. (17)

Building plans were not addressed until they started appearing. Follow up planning must be done for each building. (18)

Resources are always tight. Sources for resources, teaching strategies, training and support must be planned. (19)

Turnover and lack of local talent is a problem. Someone must be identified and trained if necessary. This change agent can be the principal or a teacher working closely with the principal, but the principal must lead the change movement. (20)

Some method of identifying and recognizing accomplishments must be established. (21)

Progress is too slow. Panels are previewing software, making recommendations, etc., but it all takes time. A process for evaluating software, designing training, etc. must be identified put in place as early as possible. (22)

No formal means of evaluation has been established. It must be done and teachers must have regular opportunities to give feedback. (23)

Conclusion

It has been suggested that effective use of technology is necessary to reform education. David (1991) and Sheingold (1991) stated that we must make fundamental changes to the learning environment. Hall and Hord (1987) suggested that schools can not improve unless teachers change. Dwyer, Ringstaff and Sandholtz (1991) proposed that instructional change can only happen with changes in beliefs about instruction and learning. This frames the coordinating and supporting of technology use as a monumental task which requires a systematic planning process.

The purpose of this study was to identify components of change theory that could potentially improve the process of planning uses of instructional technology and to test the validity of those components. The study produced 59 investigation components. 32 of them were validated as doable and important to teachers, and they resulted in 39 recommendations.

Though the recommendations give specific detail that must be addressed, the general theme of the recommendations can be captured in five points:

1. Planning must be a continuous process. A formal planning document should initiate and guide the process, but planning must continue throughout implementation.
2. Teacher input must be sought and used to define how to best meet student needs, train staff, etc., and there must be an established method of feedback and evaluation.
3. A variety of training and support opportunities must be offered continuously with an attempt at matching

training and support to individual zones of comfort, using on-site training when possible.

4. Building-level planning, consistent with district planning must be used. A committee at each building should solve local problems and work within district standards and parameters.
5. Open communication must be encouraged through telecommunications, user groups, training sessions, etc. Recognition should be given to innovators, and successes should be made visible to staff throughout the district.

APPENDICES

APPENDIX A

SURVEY CONSENT FORM

Survey Consent Form

Teacher Informed Consent for participation in research on planning the use of instructional technology

The purpose of this study is to examine processes or influences related to successful planning and implementation of instructional technology. Your participation will involve responding to the attached survey and possibly being involved in a follow up interview.

Survey: Your participation is voluntary, but your cooperation would be very helpful. In this survey, you will be asked to express your agreement or disagreement with a number of statements that relate to the preparation for and implementation of technology in schools, your building, and your classroom. You will also be given an opportunity to explain your answers. Though the questions are not of a sensitive nature, all responses will be considered confidential and no names or schools will be included in any subsequent reports.

Interview: Based on your survey responses, you may be contacted in the future to participate in a follow up interview. Again, the questions will not be of a sensitive nature, but all responses will be considered confidential and no names or schools will be included in any subsequent reports. The purpose of the interview will be for you to further clarify some answers or perhaps to explain what variables beyond the context of the questions may be responsible for successes, failures, or expectations at your site or in your classroom. (Your home telephone number is necessary, in case I need to contact you over the summer.)

If you desire further information, please call Matt Burns at 2493.

Consent to Participate in this Research

I have read the above statements and I consent to participate in this study. I understand that I am free to withdraw my consent and discontinue my participation at any time.

Signature	**work phone**	**home phone**

APPENDIX B

SURVEY

Survey

I Support learning outcomes — Circle appropriate response

A1	Planning must address student needs and how teachers can address those needs with technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
A2	In our school, teachers and staff are addressing student needs with technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A3	I am currently addressing student needs with technology in my classroom.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B1	Technology must be curriculum driven.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
B2	In our school, technology is being used in the content areas.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B3	I currently use technology in the content areas.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

Circle appropriate response

C1	Technology must support active learning and constructing knowledge.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
C2	Technology in our school supports active learning and constructing knowledge.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

C3	I use technology in my classes to support active learning and constructing knowledge.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

D1	Students must be provided with the kinds of skills needed in today's world and tomorrow such as acquiring and processing information and analyzing and interpreting data.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
D2	Students in our school are learning real-world skills such as acquiring and processing information and analyzing and interpreting data.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

Circle appropriate response

D3	Students in my classes are learning real-world skills such as acquiring and processing information and analyzing and interpreting data.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	

Explain:

_____

_____

E1	A plan must be created for integrating technology into the content areas such that technology becomes a necessary component of instruction.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	
E2	In our school, some methods of instruction are dependent upon the use of technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	

Explain:

_____

_____

E3	In my classes, some lessons are dependent upon the use of technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	

Explain:

_____

_____

II Active leadership

Circle appropriate response

A1	School personnel must have the responsibility of planning and making decisions and place them high on the agenda.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
A2	In our school, teachers are involved in planning and making decisions.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A3	I personally am involved in planning and making decisions.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A4	The superintendent, central admin and principals must publicly support creative teachers.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
A5	Our school has received recognition and/or support for creative ideas in the use of technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A6	I have received recognition and/or support for the use of technology in our school.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

Circle appropriate response

B1	Good advance planning must include extensive inservice training and high quality courseware/software.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	
B2	Teachers in our school have had access to appropriate technology training and high quality courseware/software.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	

Explain:

_____

_____

B3	I have had access to technology training and courseware/software that is appropriate for my needs.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	

Explain:

_____

_____

B4	School based planning should be encouraged, but it must be monitored at the district level to ensure quality and district standards.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	
B5	In our efforts at planning the use of technology in our building, we have received assistance and direction to ensure quality and district standards.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree	

Explain:

_____

_____

Circle appropriate response

B6	I have personally received assistance in planning the use of technology to assure quality and consistency with district standards.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

C1	Mechanisms for feedback must be established to monitor how the use of technology and training is going and the data gathered must direct future modifications, training, etc.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
C2	The personnel in our building have had an opportunity to give feedback on the use of technology and training.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

C3	I have had an opportunity to give feedback on the use of technology and training and I feel that my feedback will be used.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

III Collaborative Planning

Circle appropriate response

A1	Teachers need a chance to interact with each other to discuss how the use of technology can change the learning environment.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
A2	Training and the use of technology in our building has provided a chance for teachers to interact with each other and to discuss changes in the learning environment.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A3	Training and the use of technology in our building has provided a chance for me to interact with others and to discuss the meaning of change for me.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A4	A sense of ownership will only grow as participants begin to understand and become good at something new. It takes time for people to absorb the meaning of change and they must be exposed to conditions that support learning.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Circle appropriate response

A5	In our school, personnel have been given a chance to adopt technology at a pace that is suitable for them and they have had support for learning new ideas.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A6	In our school, I have had an opportunity to adopt technology at a pace that is suitable for me and I have been involved in a good learning environment.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B1	Collaborative planning is essential and it must be accompanied by extra support during implementation.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
B2	In our school, planning for the use of technology is done collaboratively by our staff and central office personnel and we can expect extra support when we begin to use the technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

Circle appropriate response

B3	I have been involved in planning the use of technology in our building and support from central office staff has been available to assist us when we have begun to use the technology.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B4	Schools must receive support from the school board, administration, and community and they must have access to hardware, software, support personnel, and related resources.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
B5	Our school has experienced support from the school board, administration, and community and our teachers have access to hardware, software, support personnel, and related resources.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B6	My classroom has been affected by support from the school board, administration, and community and I have access to hardware, software, support personnel, and related resources.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

IV Plan for Change

Circle appropriate response

A1	Accompanying each technology introduced must be a vision of how it is to be used and how it will change the learning environment.	Strongly Agree	Somewhat Agree	Disagree	Strongly Disagree
A2	The teachers in our building have a vision of how technology is to be used and how it should change the learning environment.	Strongly Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A3	I know how technology should be used and I have used it to change the learning environment in my classroom.	Strongly Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

A4	Improvements in teacher practices or instructional resources should affect student achievement and other desired outcomes.	Strongly Agree	Somewhat Agree	Disagree	Strongly Disagree
A5	In our school, the use of technology has a positive effect on student achievement and other desired outcomes.	Strongly Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

Circle appropriate response

A6	In my classroom, the use of technology has had a positive effect on student achievement and other desired outcomes.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B1	Each technology must be accompanied by training, modeling, and support.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
B2	Teachers in our school have had adequate opportunities for training, modeling, and support.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

B3	I have participated in provided training and I feel that modeling and support are available when I need them.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

Circle appropriate response

C1	Schools must have a coordinating committee or steering group to help plan the use of technology and acquiring resources, track problems and devise solutions to problems.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree
C2	Our school uses a Building Improvement Team or an equivalent planning committee to plan the use of technology, acquire resources, track problems and devise solutions to problems.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

C3	I am involved in planning the use of technology for my building and the district.	Strongly Agree	Agree	Somewhat Agree	Disagree	Strongly Disagree

Explain:

_____

_____

APPENDIX C

INTERVIEW QUESTIONS

Interview Questions

1. How can we integrate the use of technology into the content areas and make it a natural component of the learning process?

2. How can we support active learning and constructing knowledge?

3. How can we expose students to real world skills such as acquiring and processing information and analyzing and interpreting data?

4. How can we provide support and recognition for teachers using technology?

5. How can we provide appropriate training and modeling for teachers?

6. How can we plan for the use of technology to best meet the needs of students throughout the district?

APPENDIX D

INTERVIEW RESPONSES

Interview Responses

The numbered items listed below are each a brief description of a theme that a group of responses had in common. The number in parentheses after each theme indicates how many of the 22 people interviewed gave some response consistent with that particular theme. The numbers that appear after the parentheses refer to the item or items from the Summary of Investigation Components (extracted from the Literature on Change Theory) that are closely linked to the theme presented. Immediately below each numbered item are the paraphrased answers that were included in that theme. If there is nothing below a theme, it indicates that the theme is made up of just that one paraphrased response.

1. **Teachers are motivated by making progress with students; they need support and resources. (20) IIIA10, IIIB3, IVB3**

   Recognition is not necessary. Sometimes it does more harm than good. Support and resources are a better motivator. Good teachers are self-motivated. They should be rewarded with new ideas and more resources that can be used immediately. Real recognition comes from impressing students and seeing them improve.

2. **Training must be aimed at specific groups, subjects & activities. (19) IIB1, IIIB5, IVA3, IVB2**

   Training should be specific to subject areas. We need more people that work directly with people in buildings to set up training for specific small groups. Specific skills or activities should be developed to show teachers what can be

done with one computer in a classroom using LCD or other concrete usages.

3. **Teachers must have adequate resources. (19) IIB5, IIIB3, IVA7, IVC1, IVC4**

Teachers are capable of using technology appropriately and they will be receptive to training if the resources are available. Teachers need access to a full lab for full class instruction and a few stations in the classroom for follow up. They must have LCD panels, graphing calculators, etc. and the resources must be readily available. Teachers must be provided with a big variety of programs with a number of levels so individual needs can be met. Technology can be integrated into instruction if both hardware & software are available.

Training must be accompanied by availability of equipment for personal use so teachers can absorb what is taught. Teachers need computers in their classrooms so they can spend the time needed to apply what is learned in training classes. They are willing to put in extra time if the resources are accessible.

Special education classes have a special need for classroom computers because it's not possible to work with the whole group in the lab without someone to work with students that have problems.

4. **Teachers need to see software possibilities and how it can be used pedagogically. (14) IE, IIA2, IIB1, IIB5, IIIA1, IIIA10, IIIB7, IVA3, IVA7**

Teachers need to see software possibilities and more importantly they need suggestions on how it can be used pedagogically. One program can be a game with no connections in one classroom and it can have a real purpose and foster higher level thinking in another.

5. **We must do on-site training and provide a practical, comfortable setting that meets individual needs of teachers. (14) IIB4, IIIA6, IVB2, IVB4**

To really get all people involved, we must do on-site training. It should be aimed at comfort, be practical, and provide helpful hints. Teachers need to be given practical things that will help them administratively first.

We should offer some 2 hr sampler type classes to get people interested. The first classes should be quick grabbers, followed by a schedule of practical things, using Record Breaker software, graphing calculator with display panel, etc.

Make-it Take-it sessions can be offered to inspire teachers. Classes or inservices should show teachers what to do and allow the teachers to leave class with products to take with them.

6. **The use of technology itself is a real world skill. (14) ID**

7. **Lots of technology is available and it can easily be integrated into math, language arts, music, etc. (13) IB, IE**

Language Arts software is available that encourages the use of process writing in all subjects and interactive software is great in language classes because it gives students a chance to apply the language in a controlled environment.

Math is a natural place to integrate the use of spreadsheet, data base, charting, etc. We just need to identify the tasks to be done and develop lessons that utilize the capabilities and get away from crude paper and pencil exercises.

In music class, keyboards, synthesizers, etc. are a natural part of learning to play, write music, test, etc.

8. **Technology panels should be used to match software with defined outcomes and results should be well communicated. (13) IB, IE, IIA6, IIB1, IIIA5, IIIA9, IIIB4, IVA5, IVC3, IVC5**

   District planning should be done through technology panels and rely on department heads in each building as a channel of communication. A real effort must be made to have representatives report back to their buildings.

   Software that is matched with curriculum outcomes must be identified and made easily accessible to teachers. The technology panels should provide a list of recommended software so teachers don't have to search for it and planning should include how the technology is to be applied specifically in math, language arts, etc.

9. **Planning must be done for each building and each group and it must be consistent with district planning. (12) IIA1, IIA8, IIB2, IIB3, IIIB4, IIIB8, IVC3, IVC5**

   Planning for each building must be done in some form. There must be at least one person in each building that is responsible for planning and communicating plans to that building. The buildings must be directed to develop an action plan or timeline and be consistently monitored to implement any plans that are developed for the district.

   Including special education teachers in technology panels is not enough. A panel strictly for special education is needed. This would not only give them a chance for input but would give them a chance to interact with one another and build on ideas from one another.

10. **Technology can promote critical thinking, cooperative learning, etc. (11) IC**

    Lots of ideas are available that will promote critical thinking and cooperative learning. Technology allows students to see results immediately so they can be involved in higher level

thinking. They quickly learn that technology can handle the mechanics and free them for real thinking.

11. **Training should include peer coaching, sharing & team teaching. (11) IIB1, IIIA8, IIIB6, IVB1, IVB3**

    We need to send individuals out to help in classrooms to get people started so they can spread ideas to others. We should expose teachers to what other teachers are doing. Perhaps, team teaching is the way to get reluctant teachers started.

    We should survey teachers and students to find out what they are doing & what skills are sharable and use this as a basis for matching individuals for peer coaching, doing inservices or videotaping examples for others.

12. **We can give recognition by publishing a list of champions or highlighting individuals who are doing well and are willing to help others. (10) IIA5, IIC1, IIIA8, IIIB6**

    We must give more support to teachers in the form of allowing them to visit other teachers and make it easy for them to collaborate with others. We could provide support by teaming volunteers with experienced teachers.

    People doing well should be encouraged to share their ideas. We should publish a list of accomplished users who can be contacted for ideas or assistance. This would provide recognition for the accomplished user and help for the others.

    Real recognition comes from peers. Teachers need contact in user groups, classes, BBS, etc. and any method that exposes them to what others are doing. We should help create communication networks.

13. **We should use meeting days, BIT days or district-wide inservice days for training. (10) IIB1, IVB2**

Departmental meetings or BIT days should be used for training. Perhaps training could replace scheduled meetings.

We should have district wide inservice days (or half days) that are used for nothing but practical technology training.

14. We must expose teachers to technology, encourage them to give feedback and motivate them to improve. (10) IIA2, IIA8, IIIA3, IIIA7, IIB4, IIIB5, IIC2, IIIA5, IVC8

Teachers must be exposed to technology in a non-threatening atmosphere. It should be offered in the form of assistance. We must sell technology to teachers and get them motivated before spending dollars on technology.

Planning should be worked into the training sessions to get feedback from the individuals who are having difficulty. Before asking teachers for input, we must show them something to think about and try. They need to consider ideas from the outside to start them thinking because they don't know what questions to ask.

15. We must have district standards for hardware and software and defined outcomes. (10) IIB2, IVA5

A major task is deciding what the needs of students are and what we want to teach. We need to define some standard expectations or outcomes in each area and level so we have some consistency. We should have standard equipment and software available throughout the district.

16. Simulations allow students to look at real situations and practice decision making. (8) ID

17. Technology support must be increased, lab time must be available to teachers and attention must be paid to teacher needs. (8) IIA2, IIIB2, IIIB5, IIIB7, IVB4, IVC4, IVC8

Our technology support must be increased to the point where we have support and assistance readily available to all teachers.

An open lab where teachers can go in and work on computers and get some assistance would be great.

Planning for technology must include low-tech as well as high-tech. Teachers will not buy into flashy stuff if their day-to-day needs are not met.

18. Students can gather data and analyze it using spreadsheets, data bases, calculators, etc. (7) ID

Students are capable of analyzing test scores or gathered data and doing box and whisker plots, etc. They need these skills simply to pass their proficiency tests. Spreadsheets, data bases, calculators, etc. are appropriate here.

Fourth & fifth graders can learn to use data base and spreadsheet to handle real data in a way that will give them meaningful uses of data now and which will give them analyzing skills that can be used automatically in the higher grades.

19. There are a few teachers working above and beyond the call of duty. They should be at least thanked for what they are doing. Much recognition should come from building principals. They can focus attention on them within the building. (7) IIA3, IIA5, IIC3, IIIA3

20. We should use "train the trainer" or Comp Ed teachers to provide at least one trainer in each building. (7) IIA4, IVB1, IVB3, IVC4

We should use a literal "train the trainer" approach with one person in each building trained for each curriculum area to be a resource for others in the building.

We should train the Comp Ed people. They can get released for the training and they can bring the ideas into the buildings and perhaps Comp Ed funds can be used for the training.

21. We must develop a sense of community with E-Mail, user groups, etc. (6) IIIA2, IIIA4, IIIA8, IIIB6, IVC1, IVC6

We must develop a sense of community (user group possibly) and support it with resources like Internet access. All teachers must have access to E-Mail or some form of communication and training on its use.

22. Laserdiscs and other presentation devices add significantly to all subjects. (6) IB

The use of manipulatives on a computer and LCD panel can accomplish much more with students than having them all use the physical objects and trying to get to each individual.

Laserdiscs and other presentation tools are excellent for presenting works of art, art history, geography, culture, etc.

The use of display devices with microscopes makes it possible to adequately discuss discoveries under the microscope.

23. Electronic CDs and on-line services expose students to process of doing research and gathering information. (6) ID

Simply using electronic encyclopedia or other CD based research tools will expose students to the process of gathering information from a variety of sources. This presents an opportunity for the next step, which is sorting that information and making sense of it.

Electronic encyclopedia, on-line services, etc. are a natural component of research and the typical library resources that are needed to support classroom activities.

Students need to be given opportunities to do research through on-line services.

24. If technology is used regularly it will be natural. (5) IE

If technology is used regularly in the elementary schools, it will be natural for the students by the time they reach middle or high school.

Technology is accepted in a natural manner by students that are growing up with technology. New ideas and serious work is more palatable to students when it is delivered using technology.

25. Technology can support constructing knowledge through simulation and problem solving. (5) IC

The technology can be used to simulate real situations that encourage students to problem solve using collaboration. The whole Tech-ed program is centered around problem solving with technology.

26. In music, math, language arts, etc. there are many opportunities for active learning and constructing knowledge. (5) IC

In music, technology gives students an opportunity to write music, analyze it, etc. Simply supporting the writing process with technology provides an opportunity for students to construct knowledge and in math, there are a number of discovery type activities that can be done with appropriate software.

27. Students can use technology for calculations and time-consuming tasks; teachers must make connections to life. (5) IIA2

Students need to be taught to use scientific thinking and teachers need to assess before they teach and make sure there

is a connection between what's taught and where it applies in life.

Technology can do some of the time-consuming tasks and allow students to think about using results that fit in real-world applications. Students can use technology to do calculations as they work on building projects that are realistic.

28. **We must provide opportunities for all to give input for planning. (5) IIA1, IIA8, IIIA1, IIIA7, IIIB1, IIIB4, IIIB8**

We should give all teachers an opportunity to give suggestions to the representative group. (request suggestions for software, etc.) In a large district, a BBS may be the way to get the input.

29. **The principal must take some responsibility for implementing technology and teachers must take part in training and interact with students using technology. (5) IIA1, IIA6, IIA7, IVA2, IVB5, IVC5, IVC8**

At the elementary level, the principal must "buy in". The principals must be sold on the technology and they must buy in to get things to happen. Demonstrations need to be done for them and they must show a commitment before they get anything. They should be encouraged to use their BIT days for training, etc. Training in a building must be given priority. It can't be tacked on at the end of a meeting. It's good if it replaces a meeting.

When equipment is provided for a school, a commitment should be made that teachers will participate in training or the equipment will be given to those who will better use it. Teachers must interact with students using computers. They should not be allowed to just let students work by themselves.

30. **Languages, culture and a vision of the real world are available through CD and laserdisc. (4) ID**

Exposure to languages and culture through CD-ROM and laserdisc prepares students for the international world they will live in.

CDs and laserdiscs give special education students a good idea of what goes on in the real world.

31. **A place for previewing software, trying things out and getting help whenever it is needed would be very beneficial. (4) IIIA6, IVB4, IVC4, IVC8**

32. **Planning must be communicated, feedback must be encouraged, and evaluations must be used. (4) IIB4, IIC1, IIC2, IIIA1, IIIB1, IVC1, IVC6**

Teachers need to be continuously surveyed to get their input and they need to be stirred up to give their ideas.

Continue to use evaluations and ask for input following all training classes.

A call-in line or some method of allowing people to have input might increase communication.

We must communicate the progress of our planning and let people know that they have an opportunity to give input.

33. **Class sizes must be lowered (1) IVC5**

Class sizes must be lowered or paraprofessionals used with the type of students we have in our district.

34. **Technology helps support individualized instruction. (2) IA**

Technology makes it easier to individualize instruction.

Even simple drill and practice software creates a big improvement in the learning environment by providing

immediate feedback which allows students to progress at a better pace.

35. Technology can make a big difference for special needs students. (1) IA

Special needs students need opportunities where they are in control. The immediate feedback from the computer allows them to have some control over the learning environment.

For some special needs students, the computer is a natural component because it allows them to participate in the learning environment in a way that is not accessible to them without it.

Special needs students that have trouble with sequencing can do research using electronic encyclopedias that allows researching to be a natural part of their learning process rather than an area of frustration.

36. Technology works well in supporting Inter-disciplinary themes. (2) IE

Inter-disciplinary themes where students gather information and analyze and communicate their ideas lend themselves well to using technology.

The Tech-ed modules work math, analyzing, etc. into each module using technology.

37. We can use high school teachers to present technology use to elementary teachers and encourage visitations. (2) IIA4, IVB2, IVB3

Possibly, we could use high school teachers to present simple uses of technology to their feeder elementary schools.

Elementary teachers and students should be encouraged to visit middle schools to see how technology is used.

38. We should use the "Service Team" to promote using technology with effective instruction, good teaching practices, etc. (3) IE, IIA6, IIB1, IVA1, IVA5

The "Service Team" or Professional Development people should be working with people in classrooms, doing modeling, but they must first learn to use technology and then spend time there to help and encourage.

We must apply "effective instruction" to the use of technology in instruction. We should produce a list of good teaching practices using technology.

39. Release time is needed for previewing software and training. (3) IIIA6

Some release time should be used for reviewing software and planning lessons.

To accomplish adequate training, teachers must have release time for training.

APPENDIX E

INVESTIGATION COMPONENTS

NOT ADDRESSED IN THE INTERVIEWS

Investigation Components not Addressed in the Interviews

All of the comments made in the interviews were in line with change theory, but there were a number of the investigation components that were not addressed at all or were addressed minimally.

The following investigation components were in those two categories:

IIA3. The superintendent and administrative support must be visible at the start.

IIA4. Local resources should be utilized when possible.

IIA7. School leaders must be involved in change efforts at all stages.

IIA8. The change agent must communicate well and be a good listener to establish a good rapport and he must lead or collaborate with others in solving problems that arise in implementation of the innovation.

IIC1. Formative and summative evaluation procedures should be established to monitor how well the needs of students and staff are being met, using tests that match planned outcomes.

IIC2. Mechanisms for feedback must be established to monitor how an implementation is going and the data gathered must direct future modifications, training, etc.

IIC3. Milestones should be identified so steps toward a goal can be measured and actions to celebrate accomplishments should be planned.

IIIA2. Change advocates should down play mission and goals and emphasize inspirational themes to guide the change process.

IIIA7. Teachers become more committed to complex and ambitious projects, but they must be convinced that the change is worth the risk.

IIIA9. People must actively define and solve their own problems. They must develop a sense of agency and efficacy.

IIIB1. Collaborative planning is essential and it must be accompanied by extra support during implementation.

IIIB2. Long term success is dependent upon teacher participation and organizational support.

IIIB7. Change facilitators must work in concert with teachers to address their emerging and evolving needs.

IIIB8. Resistance can be minimized by including participants in the planning and early implementation.

IVA1. Technology applications must be linked to school improvement.

IVA2. All use of technology must be linked to improving learning by changing what teachers and students do and what they do with technology should be dependent upon technology.

IVA4. School personnel must have a vision of how technology will restructure the learning environment.

IVA6. Instructional change can only proceed with changes in beliefs about instruction and learning.

IVA7. Three aspects or dimensions of change must occur: use of new or revised materials or equipment; use of new teaching approaches; alteration of beliefs.

IVB5. Special emphasis must be placed on training and support for administrators.

IVC1. Address Havelock's stages of a planned change:

1. Building a relationship
2. Diagnosis
3. Acquiring resources (build a permanent capacity for resource acquisition)
4. Choosing the solution
5. Gaining acceptance (individuals, groups, communication, flexibility)
6. Stabilizing the innovation and generating self-renewal (include disengagement)

IVC2. Following the evolutionary planning process, we should cycle back and forth between efforts to gain normative consensus about the intended learning environment, plan strategies for getting there, and carry out decentralized incremental experimentation to promote creativity.

IVC4. Resources are needed for training, materials, space and release time. It is necessary to find creative ways to match needs with resources such as using schedule changes, local trainers, coordinating committees, etc.

IVC5. Change projects must be monitored closely and all participants kept informed of progress so problems can be identified and solutions can be started quickly. The management of change is best accomplished by groups consisting of a mix of teachers, administrators, parents, students, etc. and the group must have a good understanding of the extent of their power.

IVC6. Reform must deal with curriculum, teaching and learning, community, student support systems, etc. simultaneously and work on cultural issues by emphasizing collaborative work and continuous improvement.

IVC7. To accomplish change, it is important that teachers, parents, local administrators and students are very knowledgeable of the change process.

APPENDIX F

DISTRICT DOCUMENTS TEXT

District Documents Text

I. Support Learning Outcomes

A.
Instructional Technology Plan

A Vision for Technology: Instructional technology will support the achievement of learning outcomes by students in the Grand Rapids Public Schools during the next five years. Technology will be applied to assist learners in achieving school exit outcomes. Curricula will be designed to use instructional technology to assure the achievement of school exit outcomes by learners.
1. Technology will allow students to apply what has been learned. Simulated real life situations will be used by teachers and students to enable students to use higher order thinking processes in applying what has been learned. Increasing focus on problem solving and goal setting skills will be evidenced through the use of technology in curriculum delivery. 2. Technology will allow students to learn at their individual paces to assure mastery. Students will keep computerized portfolios which will include samples of their work as well as profiles of current demonstrated mastery levels. Each student, teacher, and parent will carefully monitor the student "individual educational plan" using communications and computing technology.

Technology Planning Beliefs: We (Grand Rapids Public Schools) believe that: 1. We will plan technology with the primary focus on learner outcomes.

Curriculum And Staff Development: An extensive technology staff development program, including input from parents and the community, is required to assure that the technology acquired by the District will be used effectively by students and staff to achieve mastery of specific learning outcomes.
. . . staff development will be planned and carried out.
2. Curriculum area specific technology use -- e.g. Integrated Learning Systems (ILS); on-line information retrieval for writing; science experiment data recording and processing

Primary Area Listings: 1. Language Arts - Mastery of Writing Outcomes (areas where technology can be applied), 2. Science, . . .

IT Steering Committee minutes

Goals & Objectives - district interviews: b. Provide environment for independent learning and cooperative learning.
e. Support a variety of learning styles and individualized instruction. k. Meet critical needs of students (Prepare them for job market and address language differences and needs of special education students.)

Special Issues from the Superintendent, IT in our schools: reference above from IT Plan

B.

Instructional Technology Plan

Exec Summary, Outcomes: Three, the district will increase student accomplishment of curriculum outcomes across the curriculum and with regard to specific knowledge and skill for technology application.

A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area.
I. Adopt a District software and hardware policy permitting acquisition only when there is a defined relationship to the instructional technology plan and a clear written description of the future use of software and hardware in implementing the defined District curriculum outcomes and students' individual educational plans.

Primary Area Listings: 1. Language Arts - Mastery of Writing Outcomes (areas where technology can be applied), 2. Science, . . .

PROTOTYPE_School Completion Technology Application Outcomes: The primary function of, and purpose for, the application of instructional technology to the school program is to support student accomplishment of curriculum outcomes. Additionally, specific knowledge and skill in the application of technology in work and everyday life must be accomplished.

IT Steering Committee minutes

Success Factors - district interviews: i. Technology consistent with educational objectives

Feedback - Deputy Supt: 2. We must stress the use of curricular areas. . . . The heart and soul of the plan should be not what equipment is used but how it will be used with students.

Special Issues from the Superintendent, IT in our schools: reference above from IT Plan

C

Instructional Technology Plan

A Vision for Technology: 4. Students will produce more products which have resulted from learning activities. These products will require technology for their production and communication. The products will take the form of student-designed learning programs/activities, authored projects, or cooperative learning projects. Increasingly, these products will come from interdisciplinary learning activities.

Primary Area Listings: 1. Language Arts - Mastery of Writing Outcomes (areas where technology can be applied), 2. Science - Interactive programs for students, simple basic science computer simulations, . . .

IT Steering Committee minutes

Goals & Objectives - district interviews: Support problem solving, critical thinking, team building, and decision-making skills.

Special Issues from the Superintendent, IT in our schools: Technology allows students to learn at their own pace to assure mastery and to apply what they have learned by focusing on goal setting and problem solving skills with simulated "real life" situations.

D

Instructional Technology Plan

A Vision for Technology: 3. Students and teachers will access relevant information from many sources both within the classroom, school, and outside information sources at the District, state, national, and international levels. This information will be used to do primary or secondary research; communicate personally with other persons, classrooms, or schools; carry out individual or multi-school simulations; experience enrichment activities; and/or participate in courses which cannot be offered in their local school building.

Primary Area Listings: 1. Language Arts - Mastery of Writing Outcomes - Access data sources outside classroom and initial use of sources outside school building, e.g. District-wide libraries, public libraries, on-line reference systems, Science - Some experimentation using computer-aided data gathering devices-heat sensing, etc.; Increased hands-on use of technology in data collection and reporting, . . .

PROTOTYPE_School Completion Technology Application Outcomes: Additionally, specific knowledge and skill in the application of technology in work and everyday life must be accomplished. . . . Students will have the technological skills needed for employability. Students will have ability and skill in learning to use and apply a variety of technology tools. Students will know how to access, analyze, apply, and report information using technological tools. Students will be able to problem solve individually and in groups using technological support tools.

IT Steering Committee minutes

Goals & Objectives - district interviews: f. Use job related technologies as in the work force. g. Promote real world applications of learning. h. Use technology to gather data, make conjectures, inferences, etc.

Special Issues from the Superintendent, IT in our schools: There are obvious reasons why technology is such a critical part of the future in education. Our students must become productive members of an information-based society and they must be proficient in the use of sophisticated technology to prepare them for meaningful employment in our factories and offices. . . . Technology also provides instant access to information from around the world, providing students with sophisticated research capabilities for individual and group assignments and projects. Technology will allow students to become involved in team centered activities such as those they will find in the modern day workplace.

E

Instructional Technology Plan

Primary Area Listings: 1. Language Arts - Mastery of Writing Outcomes (areas where technology can be applied), 2. Science - Wide use of fundamental science simulations, basic experimentation using data gathering devices-heat sensing, etc.,

extensive hands-on use of technology in data collection (observation) and in preparing report presentations, increased specialization of technology used, use of communications technology for group collaboration, . . .

Special Issues from the Superintendent, IT in our schools: . . . the use of technology in our classrooms is essential for our students as we strive to prepare them for success in a highly technological and information-based society.

II. Active Leadership

A

Instructional Technology Plan

A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area.

A Vision for Technology: 5. Teachers will function as facilitators in helping students manage their self-paced learning environment. Teachers will spend increasing amounts of time monitoring student progress and verifying mastery. Managing large amounts of student information will be a necessary responsibility, but one which technology will make more efficient and meaningful.

6. Teachers will use technology extensively to store presentations for students to use when they need the information. These presentations may be accessed by individuals, small groups, or large groups of students. 7. Students and teachers will be involved in ongoing training to become and remain technologically competent. That competence will provide the tools to enable learners and teachers to learn and demonstrate the accomplishment of school exit outcomes. 8. Record keeping, security, information dissemination, parent communications, inventory, testing, lesson delivery, and learning practice will be increasingly facilitated through the use of technology.

9. Students and teachers will be regularly addressing the issues of ethics and privacy related to the use of technology. The masses of information which will be available will need honest and respectful treatment. The ethical application of information

technology will be a significant component of the student's learning program.

A Series of Policy Actions: G. Adopt a five year teacher support goal of one computing workstation for every teacher. J. Establish the operational policy that, when buildings are renovated, all teaching stations will be given adequate electrical power to support instructional technology and, at least, the means to install communications system cabling. K. Approve a formal sequence of staff development and training specific to the instructional technology implementation plan. N. Establish an instructional technology acquisition plan to facilitate the use of computing by staff, when not at the school site, due to holidays and/or vacations.

IT Steering Committee minutes

Success Factors - district interviews: r. Board and executive staff support

B1

Instructional Technology Plan

Technology Planning Beliefs: We (Grand Rapids Public Schools) believe that: 5. We will acquire technology only after an appropriate plan for staff development and training has been approved as well.

GRPS Strategic Plan, Strategy No. 6

Action Plan No. 5: "3. Provide ongoing inservice training for all building staff as needed in the use of available technology and materials."

Curriculum And Staff Development: An extensive technology staff development program, including input from parents and the community, is required to assure that the technology acquired by the District will be used effectively by students and staff to achieve mastery of specific learning outcomes.

IT Steering Committee minutes

Success Factors - district interviews: l. On site training

B2

GRPS Strategic Plan, Strategy No. 6

Action Plan No. 5: "1. Establish optimal standards for educational technology and materials for the school system with annual review for updating if necessary.

Instructional Technology Plan

A Series of Policy Actions: I. Adopt a District software and hardware policy permitting acquisition only when there is a defined relationship to the instructional technology plan and a clear written description of the future use of software and hardware in implementing the defined District curriculum outcomes and students' individual educational plans.

IT Steering Committee minutes

Issues and Concerns - district interviews:

b. Standardization of hardware and software

B3

GRPS Strategic Plan, Strategy No. 6

Action Plan No. 5: "2. Develop a phased implementation plan for each educational technology and material standard as established by the District, the State Department of Education, accrediting agencies, and other legal requirements.

Instructional Technology Plan

A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area.

I. Adopt a District software and hardware policy permitting acquisition only when there is a defined relationship to the instructional technology plan and a clear written description of the future use of software and hardware in implementing the defined District curriculum outcomes and students' individual educational plans. L. Establish, by contracted service or by development of District resources, technical support personnel to assure that instructional technology facilities are in optimum working order, and that new hardware and software will be installed and operational when needed to accomplish specified educational outcomes and individual educational plans.

B5

Instructional Technology Plan

A Series of Policy Actions: E. Adopt a five year instructional computing goal to acquire and maintain an average of one student computer workstation for every six students.

F. Build within the buildings, and among the District's buildings, a comprehensive integrated communications (voice, video, and data) network to support instruction.
G. Adopt a five year teacher support goal of one computing workstation for every teacher. H. Establish, through the District and building school media centers, a teaching and learning support system of computer-based information technology.

C1
IT Steering Committee minutes
Feedback - Deputy Supt: 7. We need an evaluation component that can determine for example, "How are the ILSs used? What are their outcomes? Should their use be modified? Should we continue leases? . . ." If we state that the plan will be continuously updated, we must state how this will be accomplished.

III. Collaborative Planning

A3
IT Steering Committee minutes
Feedback - Deputy Supt: 6. We must be involved in Continuous Quality Improvement. We must establish appropriate outcomes related to curriculum.

A4
IT Steering Committee minutes:
Success Factors - district interviews: j. PR with staff, stress benefits and convenience m. Visible successes.

A5
IT Steering Committee minutes
Feedback - Deputy Supt: 3. We must paint a picture of how our process will work and articulate how results of curriculum panels will be integrated into the classroom.

A6
IT Steering Committee minutes

Success Factors - district interviews: c. Training within teacher comfort zone d. Equipment available for teacher practice n. Preview center for hardware and software.

B1
IT Steering Committee minutes
Success Factors - district interviews: s. A TEAM effort at all levels of staff.

B3
IT Steering Committee minutes
Success Factors - district interviews:
r. Board and executive staff support
GRPS Strategic Plan, Strategy No. 6
Action Plan No. 5: Objective: "To provide equitable gender fair, anti-bias, multi-cultural and developmentally appropriate educational materials and technology to support each student's educational plan.

IV. Plan for Change

A4
IT Steering Committee minutes
Feedback - Deputy Supt: 4. We lack focus on learning outcomes, how we determine them, and how we establish criteria for appropriate technology. If we intend to work with Language Arts and the writing process first and then broaden into writing across the curriculum, we should state it. It is not enough to say in our beliefs that all plans will focus on learner outcomes. We must show how we intend to do it and this should be in the implementation or meat of the plan, not just vision or beliefs.

B1
Instructional Technology Plan
Curriculum And Staff Development: 3. Staff development will be offered on new technology being considered by the curriculum area panels and the computer committee.

B2
Instructional Technology Plan

Curriculum And Staff Development: It is anticipated that the plan will use a variety of staff development vehicles, such as: College and university courses, Seminars and workshops conducted by manufacturers, vendors, professional organizations, and specialized training and education groups, Planned workshops and seminars conducted by the District & Special purpose training designed and delivered by the District.
IT Steering Committee minutes
Success Factors - district interviews: c. Training within teacher comfort zone d. Equipment available for teacher practice

B3
Instructional Technology Plan
Curriculum And Staff Development: 2. Each newly introduced technology application will be supported by custom implementation training.
IT Steering Committee minutes
Success Factors - district interviews:
q. Adequate technology staffing/support.

B4
Instructional Technology Plan
Curriculum And Staff Development: 1. Ongoing technology training will be available in the District on a continuing basis.
GRPS Strategic Plan, Strategy No. 6
Action Plan No. 5: "3: Provide ongoing inservice training for all building staff as needed in the use of available technology and materials."

B5
Instructional Technology Plan
Curriculum And Staff Development: . . . staff development will be planned and carried out. 1. Basic knowledge and skill in the application of computing for teachers, administrators, and students. 4. Basic knowledge and skill required by administrative and supervisory staff to monitor and use instructional technology, both in the course of the everyday operation of the schools and in assisting teachers in the appropriate use of technology to achieve student mastery of specified outcomes.

C3
Instructional Technology Plan
A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area.
D. Approve a long term District "Computer Technology Advisory Committee."

C4
IT Steering Committee minutes
Issues and Concerns - district interviews: g. Training, release time and incentives.

C5
Instructional Technology Plan
A Series of Policy Actions: C. Establish the "Curriculum Area Instructional Technology Panels" as the primary District group to define specific content knowledge and skill outcomes, methods of instructional technology use within the area, and criteria for assessing the effective use of technology in the area.

APPENDIX G

DISTRICT DOCUMENT LOCATIONS

District Document Locations

The GRPS Strategic Plan	- Research and Evaluation dept. GRPS District Offices Library Building
GRPS Instructional Technology Plan	- Mgr. of Instructional Tech., Computer Services dept. GRPS District Offices Library Building
Superintendent's Special Issues	- GRPS Board Secretary GRPS District Offices Administration Building
Instructional Technology Steering Committee Minutes	- Mgr. of Instructional Tech., Computer Services dept. GRPS District Offices Library Building

APPENDIX H

GRAND RAPIDS PUBLIC SCHOOLS PLANNING STEPS

Grand Rapids Public Schools Planning Steps

Following, is a list of steps used by Grand Rapids Public Schools (GRPS) in developing an instructional technology plan. The list of steps has been enhanced to represent what should have been done and to provide a more useful set of planning steps. The asterisk after any step indicates that something was lacking or done improperly in GRPS and that a reference to this step was made in Chapter VI under Suggestions for Grand Rapids Public Schools.

1. Commission the authority to develop a plan. This should come from or be connected to the district strategic plan if one exists.
2. Establish a steering committee comprised of district decision-makers that cover all groups.
3. Establish a timeline for developing the plan and stick to the timeline. *
4. Review previous plans, evaluations of technology use, surveys, etc., if they exist, and summarize all planning and implementation to date.
5. Gather technology plans from other districts to provide some ideas.
6. Determine the table of contents for the technology plan.
7. Take inventory or bring up to date an inventory of hardware and software including age and value of equipment at each

location and establish a process to keep the inventory current. *

8. Survey all personnel to find out how they use technology, how they should be using technology, their levels of expertise, their involvement in training opportunities, their needs for equipment and training and their suggestions for the planning process.
9. Study survey results and report district and individual building results back to steering committee and publish a report for all district personnel. *
10. Interview a sample of teachers, administrators, parents, students, and business people to obtain input for the planning process.
11. Report results of all assessments back to the steering committee and publish a report for district personnel and make it available to the public. *
12. Discuss all results with the steering committee, identify inequities within the district and bring all agendas out in the open for discussion. *
13. Develop a technology planning document to match the table of contents. It should include:
    a. Purpose or focus of the plan
    b. Vision and planning beliefs
    c. Processes for decision-making and problem solving during the implementation period
    d. Implementation steps - a timeline which includes establishing committees, defining personnel and

resource needs, proposing necessary budgets, purchasing equipment and providing training *

e. A description of the work of committees or groups that will be responsible for detailed planning (aligning technology with major district initiatives, previewing software, setting standards, defining training needs and providing the training.) *

f. A description of building level planning to follow the district plan *

14. Design a framework for all committees, building planning teams, etc. *
15. Firm up the proposed timelines and resource acquisitions and prepare a board presentation. *
16. Package and sell the plan to the school board, district personnel and the public. (This should include professionally prepared documents, video, etc.)
17. Implement the plan and stick to timelines. *
18. Follow up planning must be done for each building. The building plan must be consistent with the district plan and the planning should involve all personnel in that building. *
19. At the time each building is expected to implement the plans, they must have access to appropriate resources, new teaching strategies, adequate training and lots of support. *
20. Implementation at each building will require a local change agent who fully understands and can communicate the vision of how technology is to transform the learning environment. This change agent can be the principal or a teacher working

closely with the principal, but the principal must lead the change movement. *

21. Some method of identifying milestones and providing recognition of accomplishments should be established. *
22. Software must be recommended for use at each building and level and teachers must be given a variety of opportunities to preview software and participate in training. *
23. A formal means of evaluation must be established and mechanisms must be put in place to routinely gather input from teachers. *

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