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A descriptive study monitoring the change of individual teachers involved in using an innovation : a study of middle school teachers' use of telecommunications.

Diana Campbell
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A DESCRIPTIVE STUDY MONITORING THE CHANGE OF INDIVIDUAL
TEACHERS INVOLVED IN USING AN INNOVATION:
A STUDY OF MIDDLE SCHOOL TEACHERS' USE OF
TELECOMMUNICATIONS

A Dissertation Submitted

by

DIANA CAMPBELL

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School of Education

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DEDICATION

I dedicate this dissertation to my parents, Lillian and
Raymond Campbell, who have instilled in me an appreciation
for learning and who have been a constant source of support
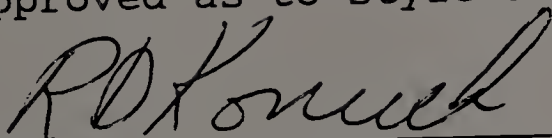for me.

ABSTRACT

A DESCRIPTIVE STUDY MONITORING THE CHANGE OF INDIVIDUAL
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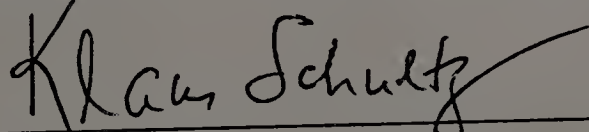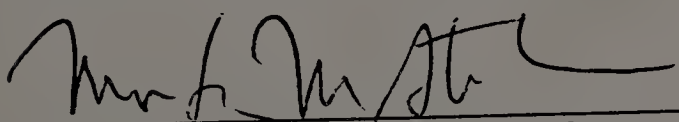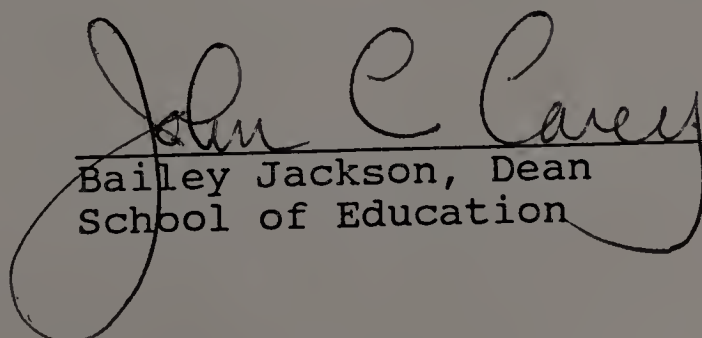A STUDY OF MIDDLE SCHOOL TEACHERS' USE OF
TELECOMMUNICATIONS

MAY 1994

DIANA CAMPBELL, B.A., UNIVERSITY OF MASSACHUSETTS AMHERST

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The purpose of this study was to monitor the change of

certain teachers in the use of an innovation as a function

of their participation in an institutionally supported

staff development program. Five middle school teachers

from rural schools participated in this project. This

group was administered the SoCQ (Stages of Concern

Questionnaire) and the LoU (Level of Use) interview on

three different dates over an eight month period. These

instruments were designed and tested by the Research and

Development Center for Teacher Education at the University

of Texas in Austin (Hall, et al., 1979).

In addition to these two data collecting instruments,

clinical interviews and classroom observations were

administered and integrated into data analysis. The

researcher was looking at how data changed during the

course of this study.

The results of this study indicated that in order for

teachers to effectively implement telecommunications in the

classroom they must be provided with support. The major issues that surround the implementation and use of telecommunications in the classroom were summarized from the teacher profiles. These categories consisted of planning and training, informational and technical support, administrative support, integration of telecommunication into the curriculum, teacher collaboration and mentoring.

Leaders in the field of telecommunications and those making decisions about the innovation will need to look at teacher training and support, long-range district planning, curricula where the innovation is incorporated, and effective assessment tools at all levels of implementation. The group of teachers represented here had gone through intensive staff development training outside of their school systems. They were experienced educators and had been using computers for some years.

The results of this exploratory and descriptive study may offer researchers, teachers, and educational administrators perspectives and information useful in implementing telecommunications in curricular reform, especially valuable at a time when technology instruction in many schools is undergoing this reform and teachers are being recognized as the primary agents implementing curricular changes and developing effective schools.

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PROBLEM STATEMENT AND BACKGROUND

The quest to provide a global education is
emerging on Earth in classrooms around the world.
It is emerging because of a new technology which
allows education to transcend national boundaries
and dispel international ignorance. It is
emerging because of telecommunications.
Telecommunications is revealing itself as the
"pencil" for the 21st Century. It will give us a
profound new learning environment called "The
Global Classroom." (Itzkan, 1988)

Statement of the Problem

Computer education in American elementary schools
appears to be in crisis. Staff development, which appears
to be the key to the success of this innovation, is not
being addressed and students are not being exposed to new
technology properly. The predominant issues surrounding
telecommunications implementation are teacher apprehension,
adaptation, and change. As teachers overcome their
apprehension and comfortably adapt to the use of
telecommunications in the classroom, the following task
will be to monitor the change of individual teachers
involved in using the innovation. Currently there is a
base of information about how teachers grow or change in
their use of this innovation in schools. Telecommunications
technology is advancing rapidly and it has become necessary
to address the issues that surround the implementation of
this innovation.

People and nations are increasingly connected with one another economically, politically, technologically and ecologically (Capra, 1985). As one of the primary institutions devoted to human development, schools are faced with the responsibility of furnishing their students with a sense of global history, an awareness of common human aspirations, and the will and ability to address the problems facing their local communities and the global community as well.

When telecommunications was introduced to the classroom in the early eighties, it was common practice for teachers to assume that students should learn to program computers and that educational television should be turned on in classrooms whether it fit the curriculum or not. Appropriate use of technology in the classroom is considerably better now, but educational leaders are concerned that the mistakes made in the early use of computers and educational television will be repeated. In response to the early misuse of computers in the classroom the following five guiding principles were set forth by Rogers (1987), and Schrum, Carton, and Phinney (1988), among others:

1. The telecommunications activity must be carrying out a specific curriculum related task.

2. The use of telecommunications must be more effective for the exchange of information than any other means.

3. The participants, students as well as teachers, must get to know each other in order for meaningful communication to take place.

4. The teachers involved must share a strong commitment, both to the lesson to be taught and to the use of telecommunications as the means of sharing data in a timely manner.

5. The teachers involved in the cooperative venture must have a commitment to share the results of the activity with other teachers.

Teachers who provide students with learning experiences that engage them in the content through interesting and challenging activities utilize the tenets of the constructivist theory of how people learn. Virtually every teacher preparation program in the United States requires teachers to study child development and psychology which focus on western philosophers including Dewey, Piaget, and Erikson, who have been called the leaders of constructivism. The theory is based on the idea that knowledge is assimilated into mental constructs built from multiple, lifetime experiences. As children play, they manipulate, organize, and process their experiences so that they may internalize them and develop concepts which are then used as building blocks for further learning. Although teachers incorporate this philosophy of learning in many of their planning and teaching activities, their teaching of computers and telecommunications does not

appear to be as well grounded in this philosophy (Schrum, 1991). Telecommunications does not appear to be an integrated part of the curriculum.

Purpose of the Study

The purpose of this qualitative/quantitative study was to monitor the change of individual teachers in the use of an innovation as a function of their participation in an institutionally supported staff development program. An outcome of this study was a description of some teachers' beliefs and teaching behaviors which may be useful to the reform efforts designed to address the growing need to incorporate telecommunications into the curriculum.

Telecommunications facilitates interaction among people. This form of communication builds a social structure where a bonding of participants can take place. It can break down barriers of culture and personality which enriches educational experiences. In the global classroom, students and teachers from around the world can work and learn together.

Questions that guided this study included:

1. What factors do teachers consider when using their telecommunications in the classroom?

2. How do teachers perceive children learning about telecommunications as a tool?

3. How does the planning and use of telecommunications relate to the teachers'

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beliefs about how children use telecommunications?

4. What activities and teaching strategies do teachers use in the telecommunications classroom?

This study was conducted with five middle school teachers and included three primary data gathering components: observing teaching practices during telecommunications usage in the classroom, the SoCQ (Stages of Concern Questionnaire) which measured the seven stages of concern about telecommunications, and the LoU (Level of Use) and clinical interview which facilitated the interviewing of teachers on their beliefs about telecommunications usage. As the study proceeded, the researcher identified themes that emerged and discussed the change of individual teachers involved in using the innovations.

Significance of the Study

The results of this study will contribute to the research base of information about the change of individual teachers involved in using telecommunications. Teachers, curriculum coordinators, and administrators concerned with the implementation and/or improvement of telecommunications education may use the findings of this study to develop useful teacher training programs. The results of this study will also illustrate the need to incorporate telecommunications into school curriculums in a manner consistent with beliefs about students' learning.

As the nation undertakes new reform efforts in the area of technological education, the results of this study will help inform members of the educational community about some of the current beliefs and behaviors of middle school teachers that should be considered when contemplating curricular change. If the change of individual teachers using the innovation can be analyzed, educators can plan to implement curricular changes drawn from research and related staff development activities in ways that will build upon and strengthen teachers and their teaching.

This exploratory and descriptive study may offer researchers and educators insights into teachers' thinking and also provoke further questions about how, and why teachers behave as they do in their telecommunications classrooms. Perhaps this study will provide the foundation and impetus for future research on the topic of telecommunications in the classroom.

Assumptions

This study was based on the assumption that all teachers were willing to share their thoughts and concerns surrounding the implementation of telecommunications in their classrooms.

Middle school teachers were assumed to be committed to helping their students learn telecommunications and to be able to identify and communicate their beliefs about how students learn telecommunications. In order to conduct this study it was necessary to work with teachers who could

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articulate their beliefs and were willing to have their classroom practices discussed.

There were no individuals who self-selected out of the study because they were unclear, unsure, or unwilling to describe their teaching practices with the researcher. This study, assumed that teachers were willing and able to share, honestly and accurately, opinions with the researcher. Another assumption, as explained in the literature review, was that students construct their own knowledge and thinking structures based on their experiences with tasks, materials and tools rather than simply by being provided information from an external source.

References to schools and teachers referred to middle schools and to middle school teachers who worked with students between the ages of 10 and 14. Although the focus was on the teachers of middle school students, it may be possible to generalize beyond that population.

Definition of Terms

Bulletin Board System (BBS): A telecommunications service for sharing information with the general telecommunications audience.

Change: Any significant alteration in the status quo which is intended to benefit the people involved. (Havelock, 1979)

Concern: The composite representation of the feelings, preoccupation, thought, and consideration given to a particular issue or task (Hall, George, & Rutherford, 1979).

Electronic Mail (E-mail): Information sent from one person to another through a computer network.

Innovation: refers to deliberate, planned change which is thought to be more effective than previous practices in accomplishing the goals of an educational system.

Implementation: refers to the developmental process of putting an innovation, whether product or process, into use. Implementation thus assumes participation by users of the innovation.

Modem: Short for MOdulator/DEModulator, a device that translates serial data into tones for transmission over telephone lines and back into digital signal for use by computers.

Online: Linked with other computer(s) for telecommunications.

Staff Development: An approach to improvement that considers the effect of the whole school on the individual and the necessity for long term growth (Lieberman, 1978, p. 1).

Telecommunications: Communications among computers across distances by use of computer networks.

<u>System Operator (sysop):</u> The person who manages the software and hardware used in a telecommunications system.

Limitations of the Study

There were a number of limitations to this study which should influence how the reader interprets and uses the findings. The research was a study of middle school teachers in Massachusetts. All of the teachers were experienced having taught at least five years. They were all white women who taught in rural public schools. Although the teachers may have portrayed various views and styles, each was committed to reflecting on their teaching. The teacher group was not intended to represent a cross-section of teachers as a whole. Detailed descriptions of their beliefs and classroom behaviors will help the reader decide if or how much of the findings can be generalized or transferred to other teachers.

The research data was drawn from an intensive study of a small number of individuals and consisted of rich descriptions of teachers' telecommunications related thinking, attitudes, fears, questions, concerns, and dreams. There were observations and conclusions drawn from indepth interactions and communication.

Economic and time constraints limited the extent of the study. Despite time limitations the intensity of the study, the depth of the interviews, and the triangulation procedures should help provide an accurate picture of these

particular teachers in regard to their development as middle school teachers of telecommunications.

A potential limitation of the study resides in the biases of the researcher. The researcher has been a student and a teacher, observed master teachers and student teachers, and interviewed many people for jobs, information, and a variety of other reasons. The researcher had her own prejudices such as a firm belief in constructivism, and experiences which influence responses as to what was seen and heard. She enjoyed exploring ideas and concepts with people. In this study, the researcher strived always to be open and supportive of others eliciting and documenting their thoughts and expressions. She examined and checked continually her own reactions and interpretations of what she saw, heard, and felt. She used multiple data collection methods and triangulation methodology in order to verify impressions. She explained her observations and thoughts as they occurred in order to identify and use them in the analysis of the data. The researcher intended to be a tool in this study to enrich the findings rather that to constrain them.

Even with the triangulation method used to add validity to the research, it is possible that the researcher added a bias to the project because of the researcher's own experiences, convictions and theoretical analyses. The researcher has considered the individual

teachers as critically as possible but it is impossible to eliminate the researcher's effects from this study.

In response to countless reports indicating the need for student exposure to telecommunications as a challenge to the twenty-first century and suggestions that middle school teachers and the curriculum need reform, this qualitative/quantitative dissertation study looked at the change of middle school teachers' use of the innovation in their teaching.

Delimitations of the Study

The patterns which emerged from the interviews were not intended to be gross statements about teachers and their use of telecommunications. The patterns only reflected the beliefs and behaviors of those interviewed and represented an attempt to describe and explain the change of individual teachers' use of the innovation. The researcher hoped to analyze these patterns as they related to theories of learning and teaching research. The methodology provided an in-depth way to articulate the usage of telecommunications as schools move toward a global perspective.

Overall Approach to the Study

This study was designed to monitor the change of individual teachers involved in using telecommunications. The interrelatedness of teachers' beliefs and actions, their perspectives on their teaching, and the dynamics of

practices in the classroom could only be fully studied using a quantitative and qualitative approach. The aim of this study was not to discover which or how many teachers practiced a specific behavior, but rather to describe how and why teachers conduct their business as they do. The goals were to provide detailed descriptions, explanations, and explorations of situations and phenomena, to interpret the findings, and to provide a foundation for future planning.

The case study approach made it possible to observe people at work in order to examine and explore the thought processes and decisions of teachers and to engage in in-depth interviews and conversations. The researcher is able to explore the multiple realities of teachers behaving and believing in different ways (Merriam, 1988). She can ". . . discover important questions, processes, and relationships . . ." (Marshall & Rossman, p. 43).

A variety of data gathering methods were selected for this study to include both qualitative and quantitative modes of inquiry. While theories can be supported by direct interview and theories of use (which may be unarticulated can be discovered by observation and analysis [Argyris & Schon, 1974]), it is still the obligation of the researcher to use multiple data sources to insure the validity of the findings (Mathison, 1988).

The Role and Background of the Researcher

For over 20 years, I have been an educator, working as a middle school teacher, a curriculum developer, a teacher of adults, and a cooperating teacher with student teachers. I have participated in National Science Foundation grants (NSF) for the past several years, which include intensive staff development training including the use of telecommunications. Throughout the training, telecommunications was portrayed as a tool for accessing information and sharing findings concerning various projects with colleagues. Since my participation in these NSF projects I have become interested in, and puzzled by the discomfort many teachers and other adults express in response to the use of telecommunications.

As a middle school teacher, I have worked on numerous occasions with other teachers encouraging them to engage their students in hands-on learning. Many teachers have some knowledge of Piagetian and constructivist philosophies, however their teaching techniques were not consistent with their philosophical ideas about how children learn. Once those teachers worked with the materials themselves they often changed their classroom teaching styles. It seemed logical to them now, that students would more effectively internalize new concepts by engaging in experiments and activities which have clear and useful applications in the real world.

Participant Selection

This descriptive study monitored the change of individual teachers involved with the use of telecommunications. Five teachers were selected from a population of participants in a National Science Foundation (NSF) project. The NSF/5C5E project was an NSF-funded model teacher enhancement program designed to improve middle school science instruction. The teachers had common reading materials, curriculum material, and opportunities for staff development and telecommunications training as participants in this project.

Only middle school teachers from rural schools were selected. Each teacher had been teaching at least five years, and demonstrated a commitment to teaching as shown by enthusiasm and an investment of time in planning and preparing for her teaching activities. Selection was also based on the teacher's ability to articulate rationales, beliefs, and other thoughts related to the teaching process. Participants had completed their first year in the NSF project when selections for this study were made. The researcher monitored these teachers' use of telecommunications. All of the participants had achieved a level of "mechanical use" as measured by the LoU interview. The researcher then monitored the change of the individuals over a 10-month period. Participation was voluntary. Throughout this research, the researcher was strictly an observer.

The co-directors of the NSF/5C5E project gave approval for the use of the project for this study. Individual teachers were contacted to determine their interest in being involved in this research project and to determine whether they met the criteria of grade level, experience, commitment, and ability to articulate their ideas.

The participants were identified and contacted in February of 1993. Each participant was formally contacted by letter with an explanation of the project which included a consent form that was required for participation. No observations or interviews were conducted until the individual had consented to participate.

Data Collection Procedures

The dominant modes of data collection were observations, the Stages of Concern Questionnaire, the Level of Use and clinical interviews. In order to learn and understand how teachers became involved with and used telecommunications, all of the teachers were observed in their classrooms twice over an eight-month period. The observation field notes included notations of the classroom environment, equipment and material used, the pedagogical techniques used, and students' responses and actions. Audiotape was used to supplement field notes. While recording some observations in the classroom, the researcher expanded and added to notes within the day of each observation to ensure clarity and detail.

Each participating teacher was interviewed three times for about an hour: at the beginning of the study, in the middle, and at the end of the study over eight months. At each of these interviews the LoU interview was administered, followed by a clinical interview which was used to gain clarity and expand participants responses. The LoU interview is a set of 15 questions designed to guide and explore teachers' beliefs and behaviors with the use of an innovation. This interview provided a developmental schema for identifying and responding to teacher concerns. Each interview was conducted individually resulting in total interviewing time of approximately 15 hours with each teacher. Interviews were audiotaped and transcribed.

Following each personal interview, participants were given a copy of the SoCQ, which was to be completed by them and sent to the researcher within one week. The SoCQ is a 35-item, psychometrically validated instrument designed to measure the concerns of teachers about a particular innovation (Hall, 1979).

One of the characteristics of qualitative research is the emergent design (Lincoln & Guba, 1985). The researcher continually monitored the procedures being used as well as the content of the data and made necessary adjustments to assure ethical access to maximum information. The chair of the dissertation committee was consulted when questions arose concerning methodology, coding, and data analysis.

Data Management

Data collected from this study was abundant and rich. The first step in controlling the sheer volume of information was to date it, identify participants by pseudonym, and record as much data as possible as it was observed and collected. All original data was maintained throughout the project so that material was available for reference at any point.

All interviews and some observations were taped. The audio tapes were transcribed and coded. Both the tapes and hard copies were maintained for future reference. Teachers were asked to write some notes concerning their thoughts about the use of telecommunications during the period of research. This provided additional opportunities for them to expand on conversations and ensure that important ideas were not forgotten. The notes, or copies of them, were collected by the researcher.

As a means of verifying the data, participants were asked to review the transcripts of their interviews and other printed summaries and add comments and emphases as they saw fit. The comments and notes added by participants became part of the data. As data were collected and analyzed, summaries were written and charted with reference to the sources.

Data Analysis

Much has been written about analyzing qualitative data suggesting the need for continual analysis, review, and

integration of new data into emerging categories and themes (Marshall & Rossman, 1989; Merriam, 1988; Lincoln & Guba, 1985). Using the SoCQ and the LoU and clinical interview, data were reviewed for patterns, repeated beliefs over time, and teacher assumptions. As general categories emerged and additional data were gathered through classroom observations, the data were reviewed monthly to modify the researcher's analyses.

Information recorded from classroom observations was used to clarify questions asked with the SoCQ and LoU interview. Categories and themes were coded to help sort the data. As categories with specific characteristics in common were identified, they were recorded. Tables and figures were made as the SoCQ and LoU interview were analyzed. The on-going process of analysis, review, and incorporation of new data occurred both during and after initial data gathering, in order to develop the conclusive analytic process. References to themes in the literature formed the basis of some initial categories, while new themes and theories emerged.

Tentative conclusions were compared with the data. Alternative explanations were looked at and tested. A doctoral student in science education was used as a peer de-briefer every two to three weeks to discuss and corroborate tentative and final categories, themes, and conclusions. Only after the data had been manipulated, analyzed, and tested in many ways, were the most likely

conclusions about the change of individual teachers summarized and described.

Assurance of Trustworthiness

The data were triangulated throughout this study. The use of a variety of qualitative/quantitative techniques including observations of the classroom, the SoCQ, in-depth structured interviews with teachers using the LoU interview and the clinical interview focusing on informal conversations and the examinations of teachers' notes all helped ensure trustworthiness and reliability.

Eight months of association with interviewees and observing and engaging in conversations in the school provided sufficient opportunity to establish trust between the researcher and the participants. This study was enhanced by a researcher's journal of the natural history of the study, participant member checks whereby participants reviewed and added to the study in progress, and periodic peer de-briefing.

Ethical Considerations

Because of the nature of a qualitative study, ethical dilemmas could have surfaced either during data collection or dissemination of findings. Several steps were taken to ensure confidence and confidentiality. All participation was voluntary and all participants signed an informed consent form prior to involvement in the study. They were able to withdraw from the study at any time before October

15, 1993, at which time observations, interviews, and initial analyses were completed but final analyses were not done.

Anonymity of all participants, schools, and the towns were guaranteed through the use of pseudonyms in all written materials and oral reports. All University of Massachusetts regulations and guidelines for the use of human subjects in dissertation research were followed. Participants had the opportunity to review transcripts and summaries and add information and emphasis. Their input was carefully considered, but it was the researcher who was responsible for final interpretations.

Summary of Chapters

Chapter I presented the background of the project and the rationale for examining the change of individual teachers involved in using an innovation. The purposes, significance, and delimitations of the study were introduced and terms were defined.

Chapter II reviews several areas of literature fundamental to understanding the change of individual teachers. This review of the literature provides background through which the change of teachers can be monitored.

Chapter III describes the methodology by which this study was conducted. The research setting, personnel, mode of inquiry, and verification and analysis of data are examined.

In Chapter IV, Description and Analysis of Data, is an analysis of the data presented on change in the teachers' concerns about the innovation, and the change in their use of telecommunications.

Chapter V presents current findings, an evaluation and recommendations for further studies.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

In order to gain a comprehensive view of the importance of staff development and support in the implementation of telecommunications in the classroom, it was necessary to review existing literature and the findings of recent research. There is an abundance of literature focusing on staff development, and specifically on various systematic attempts to bring about change in classroom practices, teacher beliefs and behaviors, and the learning outcomes of students. Some recent studies, rooted in the constructivist theory of learning, clearly define the process of change that teachers undergo as they implement a new innovation in their classroom.

There is a body of information on the history of telecommunications in the classroom and the various projects that have been implemented to date. It is possible to look to that body of literature as a foundation for this research study. This literature review is intended to serve as a filter to help the reader understand the field from which the research project was developed and carried out.

Staff Development

School is a place for continual learning for both students and teachers. There is a growing trend to expect

continuous professional growth of educational staff,
regardless of their status. Staff development programs
vary widely, yet they usually share a common purpose - to
alter the professional practices, beliefs, and
understandings of school persons toward an articulated end
(Griffin, 1983, p. 2). Staff development programs are
systematic attempts to bring about change in classroom
practice, and teacher beliefs and attitudes in order to
maximize the potential of the educational environment. It
follows then, that staff development is crucial to the
successful implementation of any innovation in the
classroom.

History

Staff development efforts in American schools can be
traced back to the early 19th century. The history of
staff development is filled with disorder, conflict and
criticism. It has been described as uninspiring and
ineffective (Lieberman & Miller, 1978). Research done by
Davies in 1967 viewed in-service education as "the slum of
American education . . . psychologically isolated, riddled
with exploitation, broken promises, and conflict" (Davies,
1967, p. 38). Before 1970, two forms of in-service
programs were considered. The first entailed a day long
schedule of "inspirational" speeches. If the district was
considered progressive, various schools within the district
might each host a speaker. In most cases, the speakers

were administratively chosen and the program rarely had anything to do with the professional lives of the teachers.

The other form of in-service education was delivered by colleges and universities in semester-long courses offered for credit. Most often, the courses were linked to certification or degree requirements. The course selection was often minimal and the content of the courses was not related to the professional lives of teachers. Even today, much of what is called "staff development" follows this model.

The early 1970s saw the emergence of the teacher center (Bailey, 1971). The term originated in Great Britain and quickly gained popularity in the United States. The National Education Association and the American Federation of Teachers worked on the legislation. The idea behind teacher centers was to involve teachers heavily in program development. The teacher centers contributed to the educational field in that the staff in the centers and the teachers in the field were seen as colleagues, never as superior and subordinate. There was a high level of respect and trust that developed from this relationship. Research shows that teacher centers were a positive step in the direction of empowering teachers (Yager & Leonard, 1974).

Teacher centers had a brief but crucial contribution toward the professionalization of teaching. They were a driving force in the progression of teacher-driven

professional development. Contributing factors that led to
the decline of teacher centers were that federal funding
ceased and school districts did not continue funding the
teacher center programs.

A Teacher Corps project in Worcester, Massachusetts,
developed and tested a model in which both individual and
organizational needs were addressed. The project began
with individual teachers, helping them identify areas of
concern in their own professional development. As these
teachers tried out new behaviors, change agents linked them
with other teachers experiencing similar change. The
ensuing dialogue gradually led to collaborative action and
change on an institutional level. This interdependent
process of change is time consuming but it serves both
individual and organizational needs for self-renewal
(Miller & Wolf, 1978).

The Concerns Based Adoption Model (CBAM) speaks to the
process of innovation adoption from both the organizational
and individual perspectives. This model was developed at
the Research and Development Center for Teacher Education
at the University of Texas, Austin. It is based on the
work of Frances Fuller, who described the concerns of
teachers as a progression from concerns about self to
concerns about the teaching task to concerns about the
impact upon students (Hall et al., 1979).

In the CBAM Model, seven basic assumptions help guide
the change facilitator's intervention:

- Change is a process not an event.
- It is made by individuals first, then institutions.
- It is a highly personal experience.
- It entails developmental growth in feelings and skills.
- Interventions should be targeted for the individual.
- The change facilitator needs to be adaptive to the differing needs of differing individuals and to the changing needs of individuals over time.
- The systemic nature of the organization needs to be considered when interventions are made.

Two other researchers, Joyce and Showers, speak to the criteria that will likely produce the most effective results in transferring staff development education to classroom implementation. They write about the time needed for teachers to process new information and the years it takes for an innovation to become routinely and effectively used in the classroom. They also discuss the individual support (coaching) necessary for teachers, as they go through the implementation process (Joyce & Showers, 1980). In a school innovation implementation, change needs to occur at both the individual and the organizational levels. Through careful planning, the process of individual and organizational change can occur.

Staff Development/Changes

Staff development should be a central component in all proposals for improving education. The best staff development programs balance the individual, school, and district needs. Since teachers may remain in the same positions for many years, there is a need to require enhancement of the professional skills of present staff members.

Peterson has outlined key steps in creating meaningful staff development programs (Peterson, 1990). He states:

* <u>Determine Purpose</u> - without a clear statement of purpose, no effort is likely to be successful.

* <u>Develop a Flexible Structure</u> - teachers are continually asked to diagnose the needs of each student and then provide appropriate instruction at the right level of difficulty and staff developers should use this model, too, responding to the needs of each staff member.

* <u>Establish a Comprehensive Program Improvement Planning Process</u> - the program improvement process should have both short-term (one year) and long range (at least 3-5 years) components.

* <u>Establish a Comprehensive Communication Process</u> - ongoing information flowing through some publication describing the progress of group projects is an important part of a healthy organization.

* <u>Evaluate Goal Achievement</u> - clarifying goals at the beginning, analyzing data, drawing conclusions and writing summary reports is very useful information in establishing next steps for the organization.

Another researcher (Oja, 1980) argues that there are several focal points to be concerned with when thinking about staff development possibilities in schools. He thinks that experiential learning, followed by examination of and reflection on those experiences, will allow for development of individuals and innovations. He believes that regular reflection on workshops and conferences eases the cognitive restructuring process necessary for integrating new ideas with old ways of doing things. With this process, he says, new behavior and curriculum are tried out and teachers have a support system to discuss their ideas and get support for their efforts.

Oja also points out that within the context of staff development teachers should be encouraged to take on more complex tasks and responsibilities in school programs and staff development activities. To develop a greater sense of self confidence, teachers should be encouraged to try out new roles such as a facilitator in group meetings, a resource person, or a teacher researcher.

Adult Development

It is necessary to be conscious of adult developmental theory when involved in staff development to help recognize and deal more effectively with individual differences.

Fullan (1988) presents the idea that any research on staff development that looks at school organization, teacher development, and teacher impressions of the processes of change should be long term. Furthermore, he writes that he believes it is important to look at adult development and find ways to document developmental growth as part of the evaluation of staff development activities. Fullan writes about adults at different developmental stages, showing different actions in their attitudes toward decision making and change, perception of the process, leadership, and supervision.

Table 1 summarizes the concepts of support and challenge at different stages of ego development in relation to different kinds of staff development activities.

New Movements in Staff Development

One new movement in staff development is the focus on the "whole" person. Many staff development projects are short term projects with a limited focus or intent. Usually the initial thrust of staff development brings with it resources and support which usually dwindles or disappears soon after, the idea fades away because the project does not fit into any interconnected picture of the teacher's life (Smylie, 1988). Huberman (1989) discusses the importance of recognizing the career and life experiences of teachers. It is important to view staff

Table 1

Matching Supports and Challenges to
Teacher Stages of Development

Developmental Stage	Stage Characteristics	Appropriate Supports	Appropriate Challenges
Self-protective	Fearful Rigid Dependent Distrustful Manipulative Authoritative	Demonstrate trust;mutual respect Set short-term goals Interact often	Role playing Journals Value Constructive feedback Social activity
Conformist	Rule oriented Conventional Concern with status, social acceptance, belonging	Focus observations Share many options Encourage visitations and workshop attendance Interact socially	Reflection exercises Role taking Assertiveness training Problem-solving projects Graduate school
Conscientious	Responsible Goal oriented Self-critical Efficient Inner standards	Facilitate sharing of district resources Structure new roles Videotape performance	Peer supervision Conflict resolution training Intern/aide supervision

Table 1--Continued:

Developmental Stage	Stage Characteristics	Appropriate Supports	Appropriate Challenges
		Model empathic behavior	Action research projects Curriculum development
Autonomous	Flexible Concern with self-fulfillment Creative Interdependent Deals with complexity Sees/uses many options and alternatives	Provide many options for growth Develop flextime options Facilitate networking Encourage self-growth Differentiate role Share power	Mentoring Assuming leadership/power roles Create new programs and policies Group supervision Becoming a change agent

<u>Note</u>: Developed by M.C. Ham and S.N. Oja.
<u>Loevinger</u> (1976)

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development as a way of enabling adults to be life long learners (Horsley, 1990).

Another new movement in staff development is the realization that innovations that are narrowly focused very often do not fit in with the daily realities teachers and administrators face. Fullan, Bennet and Rolheiser-Bennett (1989) did research on the amount of time special projects require. They described how innovations faded over time when they were not used as a tool to enhance curriculum, rather as an end in itself and therefore became little more than a temporary diversion. Huberman and Miles (1984) reviewed studies of staff development and innovation and found that large-scale, change-bearing innovations lived or died by the amount and quality of assistance their users received once the change process was under way. The high assistance sites set up external conferences, in-service training sessions, visits, committee structures, and team meetings. They also furnished ongoing assistance in the form of materials, peer consultation, access to external consultants, and rapid access to central office personnel.

Huberman and Miles found that in the process of taking on any innovative project there were early implementation problems and that new behaviors that came with innovation implementation required two or more years of active assistance and support to work through. They also found that the most substantial results of staff

development efforts appeared in the increased the levels of
commitment and practice mastery.

Strategies for Implementation

New movements in staff development have led to the
recognition of the need for teacher collegiality and
collaborative work cultures for successful implementation
of an innovation (Fullan & Pomfret, 1977; Little, 1982).
All other things being equal, those schools where there is
teacher collegiality, a collaborative staff, and an
environment where experimentation is valued and encouraged
have a much greater likelihood of having innovative
programs implemented. Good staff development models
encourage teacher-to-teacher sharing, because sharing
strengthens teacher collegiality which, in turn,
strengthens the climate of the school. A school in which a
collegial climate exists is a very important variable when
considering innovation implementation.

Little (1989) described the degrees and types of
collaborative relationships. She groups people into four
types of relationships: 1) independent to interdependent,
2) storytelling and scanning for ideas, 3) aid and
assistance, and 4) mutual sharing and joint work. The
first three levels she considers weak ties of collegiality.

Little elaborates further to describe joint work as:

> Encounters among teachers that rest on
> shared responsibility for the work of teaching
> . . . collective conceptions of autonomy, support
> for teachers' initiative and leadership with
> regard to professional practice, and group

affiliations grounded in professional work.
Joint work is dependent on the structural
organization of task, time, and other resources
in ways not characteristic of other forms of
collegiality. (pp. 14-15)

According to Hargreaves (1991) school environments

where there is a feeling of collaboration have a deep,

personal, and enduring culture. When a collaborative

culture is present in a school it has most often been

achieved through the work of key individuals. When these

key individuals leave the school in many cases, the school

culture is at risk in maintaining the collaborative

culture. When looking at the school's needs in terms of

staff development, it is important to get a sense of the

school culture. Since school culture maintains the flow of

any new project it is important to have staff development

complement that culture. Change can be difficult in the

best of situations and to alter the powerful organization

of culture would be counter-productive.

Roadblocks to Staff Development

One potential roadblock to change that staff

development projects may encounter is personal issues

around collaboration and cooperation among staff members.

Research has shown that teachers find it difficult to work

together even when they want to (Nias, 1989). The school

setting has historically been a site of insolation for

classroom teachers and to think that this can change just

because of a staff development project is naive.

Initially, with the enthusiasm of a new project, the

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collaborative style may be strong but in time that usually dies (Little, 1989; Smylie 1989). Quick starts involving complicated innovations often result in simplifying and shortening the intended scope of the change. Huberman and Miles (1984) based this conclusion on several of their case studies:

> Smooth early use was a bad sign. Smoothly implementing sites seemed to get that way by reducing the initial scale of the project and by lowering the gradient of actual practice change. This "downsizing" got rid of most head aches during the initial implementation but also threw away most of the potential rewards; the project often turned into a modest, sometimes trivial enterprise. (p. 273)

There are many possible roadblocks to change, but there are two which have been an integral part of staff development projects in the past. First, staff development efforts have historically represented an attempt to bring knowledge to teachers from an outside source (Joyce & Showers, 1980). However, the constructivist theory about learning states that in order for change to happen, people need to have active involvement in all stages of the proposed change.

Second, staff development efforts usually attempt to provide information to teachers through workshops and lectures where they are little more than passive observers. Albert Shanker (1990) reports that staff development is seen as giving out knowledge while productivity is measured by the curriculum covered and courses taken.

<center>Telecommunications</center>

The growth of telecommunications is changing the image of the classroom for the 1990s. It is one of the fastest growing areas of technology and although it has been integrated into the business and research worlds for some time, it is being adopted slowly in educational settings. Telecommunications is a tool that can help people access information and resources, communicate with others, and solve mutual problems in many areas. The possibilities that this technology offers are far reaching.

We are living in the Information Age. The amount of words, pictures and numbers that are produced daily is massive. The United States has over 9,000 newspapers, 11,000 magazines, 10,000 radio stations and 1,200 commercial and public television stations. Publishers produce over 50,000 book titles annually. The number of computers storing information has grown from one in 1946 to well over 30 million today. A study done in the late 1980s estimated that Americans were exposed to over 8.7 million words a day through newspapers, books, radio and television (Roberts, et al., 1990).

Clearly, we are at a time in history where it is impossible for an individual to process all the information produced. It is becoming increasingly important to focus education on learning how to learn. Students must be taught where to find information and how to process the information rather than memorizing facts. The U.S. Office

of Technology Assessment notes that the so-called

information revolution, driven by rapid advances with

communication and computer technology, is profoundly

affecting American education. It is changing the nature of

what needs to be learned, who needs to learn it, who will

provide it, and how it will be provided and funded (Office

of Technology Assessment, 1987). Collaboration requires

communication and this communication can be fostered by

telecommunications. Telecommunication networks do link all

parts of the world, bringing people together from all

cultures. As one educator describes it:

> At a rate and to an extent envisioned only
> by the most extreme futurists, the world is
> becoming interconnected by an electronic network
> system over which immense amounts of information
> flow at nearly the speed of light. (White, 1987,
> p. 1)

Telecommunications in Education

Telecommunications can give students and teachers

access to current information and research. This tool

allows for an interdisciplinary approach to education

connecting science, social studies, language arts and

mathematics in concrete ways. Telecommunications is a way

of accessing current information, promoting collaboration

and communicating with colleagues near and far.

Where it is being used at all, telecommunications has

been introduced to students in a variety of ways. One

common way is through key pal letters. This is a

fundamental way for students and teachers to start using

the technology, since all that is needed is a computer, a modem, software, access to a phone line and access to other people. This electronic letter writing is a classroom experience that helps students discover a purpose for writing (Kumpf, 1986, p. 27). The exchange of letters can be motivated by a questionnaire or some given topic for discussion. This allows for people to get to know the people they are communicating with. It can also lead to specific projects.

Electronic bulletin boards can be used to provide a non-threatening experience with telecommunications. An area of the bulletin board can be set up for private use for a small group, classroom or district. The users are then limited to a small group who presumably have something in common. An area might by set up for a group of students from two different schools who are doing a project together. With this experience, confidence grows, interest in telecommunications grows, exploration of other possibilities within telecommunications occurs and leads to a clearer understanding of the basic technology (Honey, 1993).

Interdisciplinary projects on line allow for a connection between subject matter. Students can begin to take on real life issues and problems instead of working within the traditional approach by rote or through contrived problem-solving activities. Science and social studies projects fit nicely into this mode. Two well-known

educational telecommunications projects in this country,
the National Geographic Kids Network and the FrEd Mail
Network, take this interdisciplinary approach to learning
(Rogers, 1987). The Kids Network, a telecommunications
based science curriculum for fourth through sixth grade
students covers science topics, such as acid rain, weather
and water quality. The students are given a series of
hands-on activities, they collect data and then share it
with other schools on the network.

The FrEd Mail Network, which was developed by Al
Rogers of San Diego, is a network into which many local
bulletin boards connect. This network allows the sending
of electronic mail throughout the United States. Teachers
and students may set up both long- and short-term projects.
One such project, the "Santa Claus" project, matched an
elementary school class with a middle school class, the
latter playing Santa Claus (Dodge & Dodge, 1987, p. 18).

Project SHINE is an interdisciplinary regional
telecommunications network linking seven towns in eastern
Massachusetts and has students researching such issues as
water pollution, nuclear power and nuclear war (Mendrinos,
1988). The students share their finding and carry on
discussions about their concerns. These projects stress
the importance of sharing and discussing real-life
situations.

Now, more than ever, we need to be able to rapidly
move vast amounts of information from one place to another

and business people, researchers, and students of all ages already have a tool at their disposal for doing this. An increasing number of educators have access to the Internet, which is comprised of numerous networks that are technically and organizationally prepared to support communication among a wide array of individuals and communities. It is frequently referred to as an information highway. Like a network of highways, the Internet allows users to travel to computers in remote places, access their resources, and communicate via electronic mail (e-mail) with people throughout the world. And, like our highway system, no one entity or organization owns it.

The Internet grew as more and more university and government facilities began to interface their information and resources. The K-12 educational institution soon saw this potential resource and began tapping into the infrastructure (Honey, 1993). Increasingly, telecommunications services are providing full access and use of the Internet services to anyone interested.

Researchers have found that certain things must be built into a telecommunications training program for real and lasting value. Rogers (1987) notes the guiding principles behind successful implementation of this innovation. He reports that:

1. Telecommunications activities must be guided by specific curriculum goals.

2. The use of telecommunications must be the most effective way to present the given information.

3. Both teachers and students must get to know one another so that effective communications can take place.

4. The teachers involved must have a strong commitment to both teaching and the use of telecommunications.

5. The teachers involved in the collaborative work must be willing to share their projects with other teachers.

In summary, telecommunications allows for the gathering of current information and data and also promotes collaboration and communication between individuals, within a class or among classes on a network. It also expands the boundaries of the classroom so that students can explore problems, issues, and events in a meaningful way from a variety of perspectives. As telecommunications is being implemented into the school setting it must be remembered that sound staff development training parallels the innovation implementation. The need is often discussed for students to be given time as they learn new skills, yet teachers are seldom given this opportunity.

Successful use of telecommunications requires not just learning to use a machine, but learning new ways of conceptualizing the teaching process. It is necessary that teachers learn to identify their own teaching methods and processes, and then learn how to use technology in the realization of their educational goals (Carlson, 1991). In some research done by two university science educators they suggest that telecommunications use may increase over time

when there is a purpose (Schultz & Konicek, 1992). In an

editorial on the possibilities of telecommunications

networks changing education, Jason Ohler (1987) writes:

> . . . the complexity of our world and the huge
> amount of information needed to find solutions to
> problems make it necessary that students and
> teachers learn to work together effectively.
> Telecommunication networks not only give students
> and teachers access to the information they need
> to make informed decisions, they give students
> and teachers the ability to communicate and
> collaborate with others in school or on another
> continent. (p. 8)

Reforming/Restructuring/Telecommunications

There is a growing movement to restructure education.

Many educational reform activities have been initiated at

the local and state level and now there is a trend toward

the restructuring of schools. A major reason for the

transformation of education is the realization that we have

moved from the industrial age into the information age.

In recent years, huge amounts of new scientific and

technological information have been generated. It is

estimated that the total knowledge of the human race

doubles every three to five years. This rapid development

in science and technology is moving us from a society

focused on raw materials and production to one based on

human resources and knowledge. Many scientists have

claimed that, perhaps for the first time in history, the

human race is confronted by a widening gap between the

complexity of world problems and the intellectual power of

individuals and societies to solve them (Botkin, 1979).

Also it is evident that society is becoming more
interdependent. As noted by Capra (1985), we live today in
a globally interconnected world in which biological,
social, and environmental phenomena are all interdependent
and we need a fundamental change in our thoughts,
perceptions and values. Given this new reality, educators
around the world are now looking for new ways to make
significant changes and improvements in their educational
systems. Thomas Kuhn (1963) notes that revolutions in
science come about when the old theories and methods fail
to solve new problems. We are at this stage in education
where there is worldwide consensus that present educational
theories and practices are not working as well as they
should.

There also is a recognition that technology can play
an important part in reforming education. Growing in the
educational circle is a view of learning, seen as a process
by which learners outgrow their current selves (Rosenblatt,
1978). Rather than viewing learning as a process of
information transfer to a deficient learner, Rosenblatt
described the "transactional" process as a joining of
information and learner as an open potential. The
learner-information model changes constantly in the context
of new situations and the strengths brought by the student
to the learning setting. The idea of transaction sets up
new functions for teaching and learning just when we as
educators are beginning to understand the failures of our

traditional methods and approaches to learning. With this
new model, the teacher is seen as a mentor, facilitator and
co-learner in the learning process (Becker, 1992). The
learning environment is seen as a place where the student
is provided with the opportunity to access knowledge and to
synthesize and apply that knowledge to other situations and
learning tasks (Wilson, 1988).

Ernst von Glasersfeld, a philosopher, talks from the
constructivist perspective when he says that learning is
the product of self-organization. He describes
constructivist teachers as those who tend to explore how
students see a problem and why their path toward a solution
seems promising to them. This in turn makes it possible to
build up a model of the student's conceptual framework and
to adapt instructional activity so that it provides
occasions for accommodations that are within the student's
reach (von Glasersfeld, 1989). The use of tele-
communications does support this type of learning.
Telecommunications emphasizes participation and involvement
of students in activities that have real solutions and
consequences. Telecommunications can help provide the
links to access new areas of information whether they are
national electronic data bases, connections to scientists
or collaborative learning projects between classroom miles
apart from one another.

The educational use of telecommunications can offer
the unique opportunity for students to connect and work

collaboratively with national and international peers in helping to meet the challenges of the 21st Century. The technology is available and research shows that telecommunications can play a role in revitalizing education and facilitating the restructuring of education worldwide (Honey, 1993). The need to provide a global education is emerging in classrooms around the world. It is emerging because of a new technology that allows education to transcend national boundaries and dispel international ignorance. Telecommunications is revealing itself as the "pencil" for the 21st Century. It will give us a profound new learning environment called "The Global Classroom" (Itzkan, 1988).

The current literature presented in Chapter II on staff development and telecommunications presents useful information used to guide the researcher in this study. Chapter III presents an overview of the methodology which was used to gather information about teachers' change in their use of telecommunications. Methodology used in obtaining data about the level of implementation of an innovation is also presented in Chapter III.

C H A P T E R   I I I

METHODOLOGY

Setting

The setting for this research was three rural
elementary schools and one rural high school in Western
Massachusetts. All of the schools function within a
constrained financial budget. Parents and students speak
positively about their schools and students continually
achieve high levels on basic skills testing and various
other achievement assessments. The research focused on the
changes of five classroom teachers in their use of
telecommunications in the classroom. Since the school
setting and population were not typical of all schools, the
researcher cannot generalize to other settings.

Subjects

All of the classroom teachers interviewed for this
study had been recent participants in a National Science
Foundation environmental education project, NSF/5C5E,
project #TPE9150262 (Appendix E). In the summer of 1992,
the participants attended a three week training institute
which met eight hours a day, five days a week.
Participants also met for three all-day Saturday sessions
during the school year prior to the three week institute,
and then for four full day sessions and two after school
sessions during the school year and then finally for a one
week session during the summer of 1993. The objective of

the project was to enable teachers to develop and manage student research projects that would reflect the recommendations of the national reports on science education and the Five College/Public School Partnership goal of establishing long-term, self-sustaining improvements in science teaching.

Initially, all 54 teachers involved in the project were administered a telecommunications questionnaire (Appendix A) regarding their background in the use of computers and telecommunication. The form included questions about the teachers' professional background, their feelings about themselves as students and teachers, and their general reaction to computers and telecommunications. From this group of 54 teachers, five were chosen based on the following criteria. Those who: worked in a rural setting, had at least five years of teaching experience in the middle grades, had some background in the conceptual development process, were using telecommunications in some form, and those who responded with an interest in this research project. Unfortunately, the limited sample, narrowed further by these criteria, yielded a somewhat homogeneous participant population. All five teachers were white females from middle class socioeconomic structures.

The preparation portion of the study measured teacher involvement in the school's decision-making processes. This included a study of the school goals and objectives, a

review of class sizes, materials available to the teachers, and how the daily schedule was organized. Information from these sources was coded and reviewed. This preparation served two purposes. It gave the researcher a sense of the school culture, and it identified who was in charge of decision making. The research design did not focus specifically on decision making, as the interest here was to discover paradigms within which the teacher was operating.

Modes of Inquiry

The modes of inquiry used in this study include: A) telecommunications questionnaire, B) classroom observations, C) quantitative inquiry D) interviews. This research plan included a variety of methods which, when integrated, gave a realistic portrait of the individual teachers.

Telecommunications Questionnaire

The telecommunications questionnaire was administered as a preparation for the study to gather basic biographical information from all of the participants in the NSF/5C5E project from which the five participants for this study were selected. The questionnaire also asked potential participants to describe the extent of their use and knowledge of computers and telecommunications. The questionnaire concluded with a short series of questions regarding their previous experience with administrative

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support and their visions for the future of
telecommunications in the classroom.

Classroom Observations

The project researcher observed each teacher's
classroom for about one hour on two different occasions for
the purpose of determining the classroom layout,
telecommunication access, the nature of teacher-student
interactions, and school atmosphere. These were spaced as
far apart as possible within the overall term of the study.
Observation notes were coded. The field notes were used as
descriptors of classroom practices and as lead-ins for the
clinical interviewing. One consideration in the selection
of strategies was that, while supported theories can be
determined by direct interview, theories in use, which may
be unarticulated, will only be discovered through
observation and analysis (Argyris & Schon, 1974).

Quantitative Inquiry

Quantitative data were collected and analyzed using an
instrument developed by researchers connected with the
Concerns Based Adoption Model (CBAM) at the University of
Texas in Austin: the Stages of Concern Questionnaire
(SoCQ) was used (See Appendices C and D).

The Stages of Concern Questionnaire (SoCQ). The
Stages of Concern Questionnaire was developed at the
Research and Development Center for Teacher Education at
the University of Texas, Austin (Hall, George, &

Rutherford, 1977) to assess the seven stages of concern about an innovation. The questionnaire is set up in the format of a Likert-type instrument having an eight-point scale that allows respondents to reflect on 35 statements designed to measure the seven stages of concern about an innovation. Five questions are included for each stage. Responses range from 0, "This statement seems irrelevant to me," to 7, "This statement is very true of me at this time." The questionnaire was developed over a three-year period and it has been tested for its reliability, consistency, and validity (George, 1977).

A percentile table was used in this study to score the data from the SoCQ. Scores were plotted on individual SoCQ profiles showing the intensity of each concern. After the data had been collected and analyzed using the SoCQ, it was interpreted in several ways. The most basic interpretation identifies the peak score. A more advanced way of looking at the data takes into consideration both the peak and the second highest score and in some cases the low score. A total profile interpretation can be found by examining the significance of the different highs and lows and their interconnectedness (Hall, George, & Rutherford, 1979).

Interviews

In an attempt to build upon and delve deeper into the intricacies of the quantitative data gathered the researcher invoked a qualitative measure through the use of the LoU and clinical interview.

The Level of Use interview (LoU). The LoU interview, which was developed and tested at the Research and Development Center for Teacher Education at the University of Texas in Austin (Loucks, Newlove, & Hall, 1976), was selected because it is designed specifically to measure the level of implementation of an innovation as assessed by the user's behavior. The instrument was designed to collect data through a focused interview (Appendix B). When the individual described the use of the innovation, it was categorized. Table 2 identifies the seven distinct levels of use of an innovation that an individual may demonstrate.

Table 2

Seven Levels of Use

0	Non-Use
1	Orientation
2	Preparation
3	Mechanical Use
4A	Routine
4B	Refinement
5	Integration
6	Renewal

Clinical Interview. The clinical interview took the form of a conversation between the researcher and the teacher in which it was the teachers themselves who

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articulated their experiences and, as much as possible, connected ideas and events. The interview format is a powerful method investigating some aspects of cognition. Hall, Loucks, and Newlove discussed the advantages in using clinical interviewing:

1. Interviews can get at past events, at events when the interviewee is alone, and at situations where outsiders would alter behavior;

2. Interviews can reveal behavior not occurring during times when observations are made;

3. Interviews can reveal relationships that cannot be observed;

4. Interviews are quick and efficient. (1975, p. 3)

Patton is another researcher who discussed qualitative interviewing at length. He wrote:

> We interview people to find out from them those things we cannot observe. . . . The fact of the matter is that we cannot observe everything. We cannot observe feelings, thoughts, and intentions. We cannot observe behaviors that took place at some previous point in time. We cannot observe situations that preclude the presence of an observer. We cannot observe how people have organized the world and the meanings they attach to what goes on in the world. We have to ask people questions about those things. The purpose of interviewing, then, is to allow us to enter into the other person's perspective. Qualitative interviewing begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit. (Patton, 1980)

Interviews were audio-taped and transcribed for coding and analysis. The transcriptions were returned to the teachers for them to check for correctness, as recommended by the research findings of Lincoln & Guba (1985). Though

teachers could add afterthoughts in the margins of their
transcripts, few comments were made.

Description and Timeline

This study began with an informational meeting of the
participants and the researcher in February of 1993. The
purpose of the meeting was to provide an opportunity for
the researcher to present a proposed overview of the study
and to answer questions. The requirements and timeline of
the research project were explained (Table 3).

One month after this initial meeting, the researcher
arranged for classroom observations and interviews. The
researcher visited each participant's classroom to observe
the teacher and students engaged in their daily routine.
The observations took place during March and again during
June of 1993. The teachers were interviewed with the LoU
and clinical interview and administered the SoCQ in March
just after the first classroom observation. After the
NSF/5C5E summer institute in July of 1993, the teachers
were again administered the LoU and clinical interview and
SoCQ. During the one week summer session in 1993, the
teachers were introduced to new telecommunications
capabilities with the use of telecommunications and they
also received additional training with regard to its
possibilities (Appendix F). In October of 1993, the final
SoCQ, LoU and clinical interview were administered in order
to assess any changes that might have taken place over

Table 3

Timeline of Events for Data Gathering, 1993

Summer Institute	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Oct.
NSF/5C5E began March 1992									
Summer institute July 1992									
Telecommunications questionnaire		+							
Introductory meeting			+						
Classroom observations				+			+		
SoCQ				+				+	+
LoU interviews				+				+	+
Clinical interviews				+				+	+
One-week summer session							+		

that period of time and to note the planned activities that would take place during the 1993-94 school year. The data are presented and analyzed in Chapter IV.

Verification of Data

The four modes of inquiry previously explained were used in conjunction with one another to maximize accuracy, completeness, and validity of the findings of this study. Sandra Mathison supports the idea of triangulation as a strategy for increasing the validity of evaluation and research findings.

> Good research practices obligates the researcher to triangulate, that is, to use multiple methods, data sources, and researchers to enhance the validity of research findings. Regardless of what philosophical, epistemological, or methodological perspectives an evaluator is working from, it is necessary to use multiple methods and sources of data in the execution of a study in order to withstand critique by colleagues. It is essentially a

strategy that will aid in the elimination of bias
and allow the dismissal of plausible rival
explanations such that a truthful proposition
about some social phenomenon can be made.
(Mathison, 1988)

Since there was a single researcher involved with this
project, a procedure of triangulation with the data was
used to lessen weaknesses that might surface. At the onset
of the research, interpretation of the open-ended Level of
Use questions were checked by an independent researcher.
Differences were discussed and coding was adjusted
accordingly. When the composite profiles of teachers were
finished, they were given to an outside reviewer and
researcher skilled in using the CBAM who supported most of
the interpretations of the data. Where there were
discrepancies, the researcher reexamined the data for
possible revision.

Validity of data is a primary concern for those who
may be using the results of this study for future use. The
school setting of all of the teachers in this study was
rural and the fact that teachers using telecommunication
were sought out initially to participate in this study may
influence the results of this research but, overall, the
researcher believes that there are some common threads that
can be applied to other situations.

After writing up each case study, the researcher gave
it to the teacher to read and check to be sure that it was
a representation of what was said or observed. The
teachers were asked to make any corrections they felt to be

necessary in order to make the picture as clear as possible. Teachers were asked to pay particular attention to places where they had been quoted or paraphrased. It was made clear to them that it was the researcher's judgement, based on other evidence, as to whether or not to integrate their comments into the final study. In no cases did the teachers contradict the researcher's reporting. In fact, in several cases the teachers were able to clarify and provide additional background. Some of their comments were integrated into the text where appropriate.

When the teachers returned their profiles, an informal, unrecorded discussion about the process and about how they were doing was held. Issues and questions that were raised as a result of the research interactions were discussed.

Analysis of Data

The discussion concerning the analysis will include the mechanics by which the cases were prepared and the theoretical framework which was used in deriving meaning from the data. The mechanics can most easily be explained by means of listing the steps involved:

Preparation of Cases

1) A transcriber developed the first draft of the interviews from the cassette recordings.

2) The researcher read over the transcripts while listening to the tape.

    a) to check for transcription errors, and

b) to review for questions and to follow up on
        ideas, which were written in brief memo
        form.

3) The transcripts of the tapes were given to the
    teachers

    a) to check for transcription errors, and

    b) to add any after thoughts they might care
        to.

4) From an initial framework: a tentative list of
    codes was prepared to use in the analysis of
    data. For example, coding was done for strengths
    and weaknesses in using telecommunications, it
    with regard to the purposes telecommunications is
    used for in the classroom, and with regard to the
    effects telecommunications has had on the teacher
    and students. All of this information was
    self-reporting and was from the teacher's point
    of view.

5) At this point another reader, a doctoral student
    in science education, did an initial reading and
    coding on all of the transcripts.

6) After the entire data collection process was
    over, all of the transcripts and notes were
    reread. The order of the transcripts was mixed
    to reduce the possibility of any one teacher's
    interaction shaping the reading of another's.

This reading was to lay the foundation for future
case analysis by:

a) coding the transcripts using the tentative
   list, developing new codes as they emerged,
   making other margin notes regarding the
   reactions/interpretations of what was going
   on in the teacher's thinking and actions

b) writing a summary memo for each interaction,
   identifying major events, ideas, emerging
   themes; and

c) writing a summary memo for each set of
   interactions identifying areas of common
   interest, differences, possible themes, and
   general reactions of the effectiveness of
   this data gathering method.

7) After the above ground work was laid, one case
   study at a time was examined. The data were
   reviewed paying particular attention to emerging
   themes by noting words, phrases or ideas that
   were repeated.

8) A rough outline for each profile was made.

9) The entire set of notes was once again reviewed,
   paying special attention to statements that were
   in agreement or in disagreement with other things
   said and done.

10) Pieces of the transcript were then cut and pasted
    on the computer to fit into the outline format.

11) After reading all of the transferred pieces under each outline heading, selected and representative pieces were used to write the profile. In selecting the illustrative pieces, special attention was given to including different examples of how a teacher came to a given thought using different viewpoints and in different contexts, in order to support more fully the teacher's meaning. Attention was also given to discussing possible conflicts or differences in ideas, meanings and actions.

12) The profile, once in draft form, was given to the teacher to check for:

    a) accuracy in representing what happened;

    b) correct representation of her thoughts and ideas, as best she could remember them;

    c) the accuracy of the researcher's interpretation of what the teachers said.

A variety of tools was used to gather information concerning the change teachers were experiencing during the eight-month research period. Information presented in the teacher profiles will be discussed in Chapter IV.

C H A P T E R   I V

DESCRIPTION AND ANALYSIS OF DATA

<u>Individual Profiles</u>

Analysis of data regarding the teachers can assist
administrators, educators and staff developers during the
implementation of an innovation. The individual teacher
profiles provide insight into the change process and
self-renewal efforts that the individual teachers went
through. These profiles were written based on the data
collected from the SoCQs, LoU interviews, clinical
interviews, and observation field notes. The data will be
organized in a chronological time frame. It might also be
appropriate here to restate the definition of the word,
concern. Concern, being the composite representation of
the feelings, preoccupation, thought, and consideration
given to a particular issue or task (Hall, George, &
Rutherford, 1979). Brackets found in the quotes of
teachers are the researchers' words, it is an attempt to
clarify the meaning of some phrases.

<u>Anna</u>

Anna is a fourth grade teacher. She has been teaching
in a rural school for 22 years. She has a Master's Degree
in Education, with an emphasis in reading. She
characterizes her teaching style as dynamic and well
organized. She uses cooperative learning strategies and
encourages students to formulate problems that they wish to

solve and, in turn, asks them to observe and study those problems. She has access to a computer and telecommunications capabilities in her classroom.

Anna's classroom was neatly organized with several learning centers with the students' desks arranged in a horseshoe formation. The students had access to two computers, two printers, a VCR and T.V., and an overhead projector, while student art work and reading dioramas were displayed on the walls (Figure 1).

Anna has a quiet and friendly manner which was reflected in her students. She spoke softly and politely to them and listened carefully as the students conversed with her. On one of the days during which the researcher was observing in her classroom, the students gathered in a circle around a pet gerbil because they were concerned it might be dead. The teacher reassured the children that she could see the gerbil breathing and that she would keep an eye on it all day. It was obvious to the researcher that her concern for the students and the pet was genuine.

Another group of students meanwhile was sending some weather information to a partner school, in another district. The students were deeply engrossed in what they were doing and were looking forward to hearing from the other school. Anna left them to their work, demonstrating confidence in their abilities. The researcher noted a peaceful atmosphere in the room and the children spent most of their time engaged in productive activities.
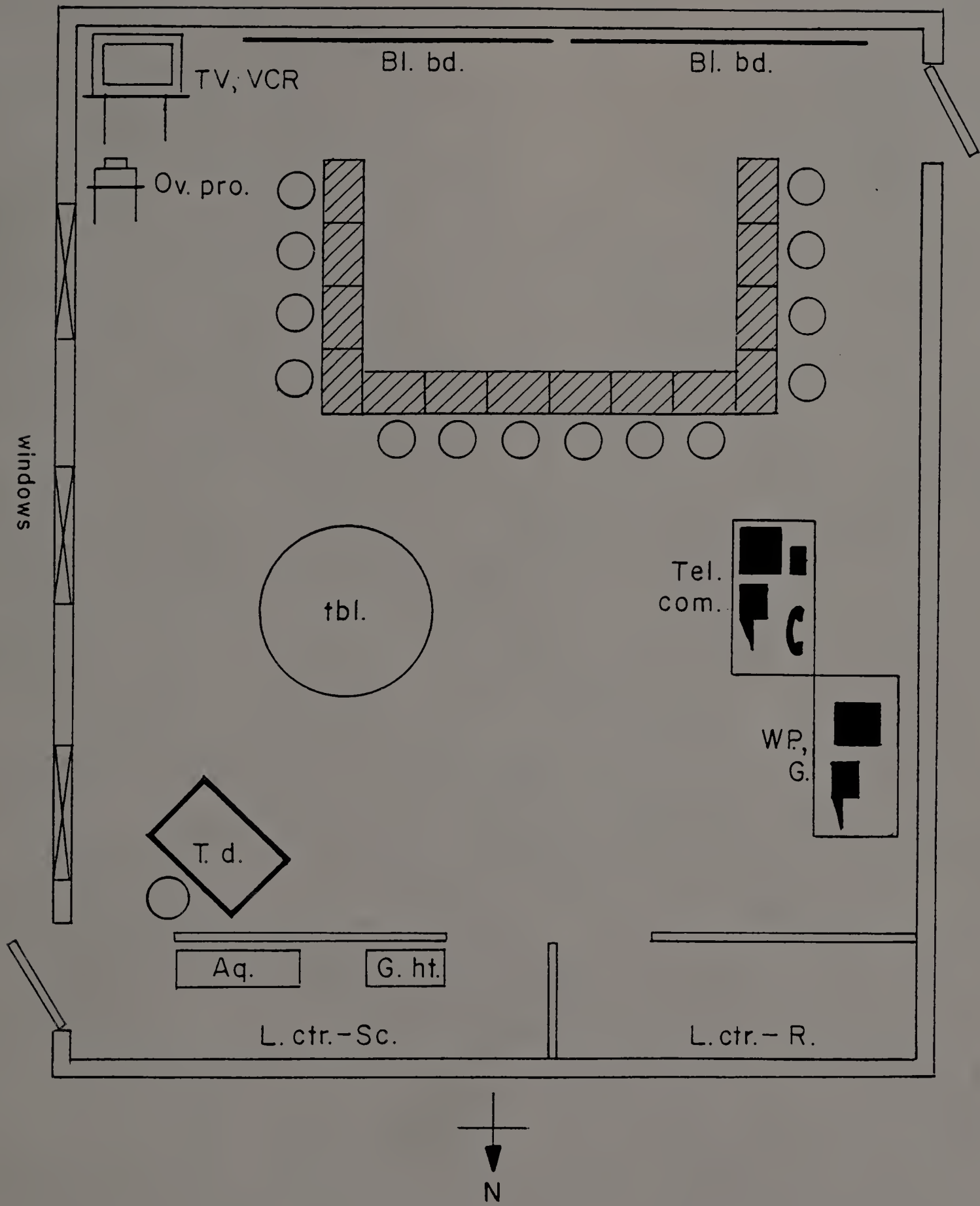
Figure 1. Anna's Classroom Layout (14 stud.)

During the first observation, it was noted that Anna demonstrated little visible anxiety about the addition of the innovation in her classroom. She had the phone line connection in her classroom, with a modem connected to a computer. Anna expressed the desire to use the innovation and did so with little disturbance to her routine. Throughout the course of the study Anna's concerns moved from the areas of management and refocusing to multiple concerns back to management and collaboration concerns. These points will be presented in a chronological sequence.

March, 1993. Although Anna appeared calm during the researcher's initial observation, her first SoCQ scores showed peak scores in the categories of Management and Refocusing (Figure 2). There was a high Stage 3 (Management) score which was indicative of intense concern about management, time, and logistical aspects of the innovation. Anna clearly expressed her concern with time and management in her LoU interview.

> Well I am definitely finding it is very hard to
> find the time to work with students on it. I
> think it takes time to deal with them one on one
> and the only time I can find to do that, to
> initially explain how to get them on, is during
> recess time.

Anna also related her frustration with the management of the innovation in her room after visiting a colleague's class which is actively involved with the use of
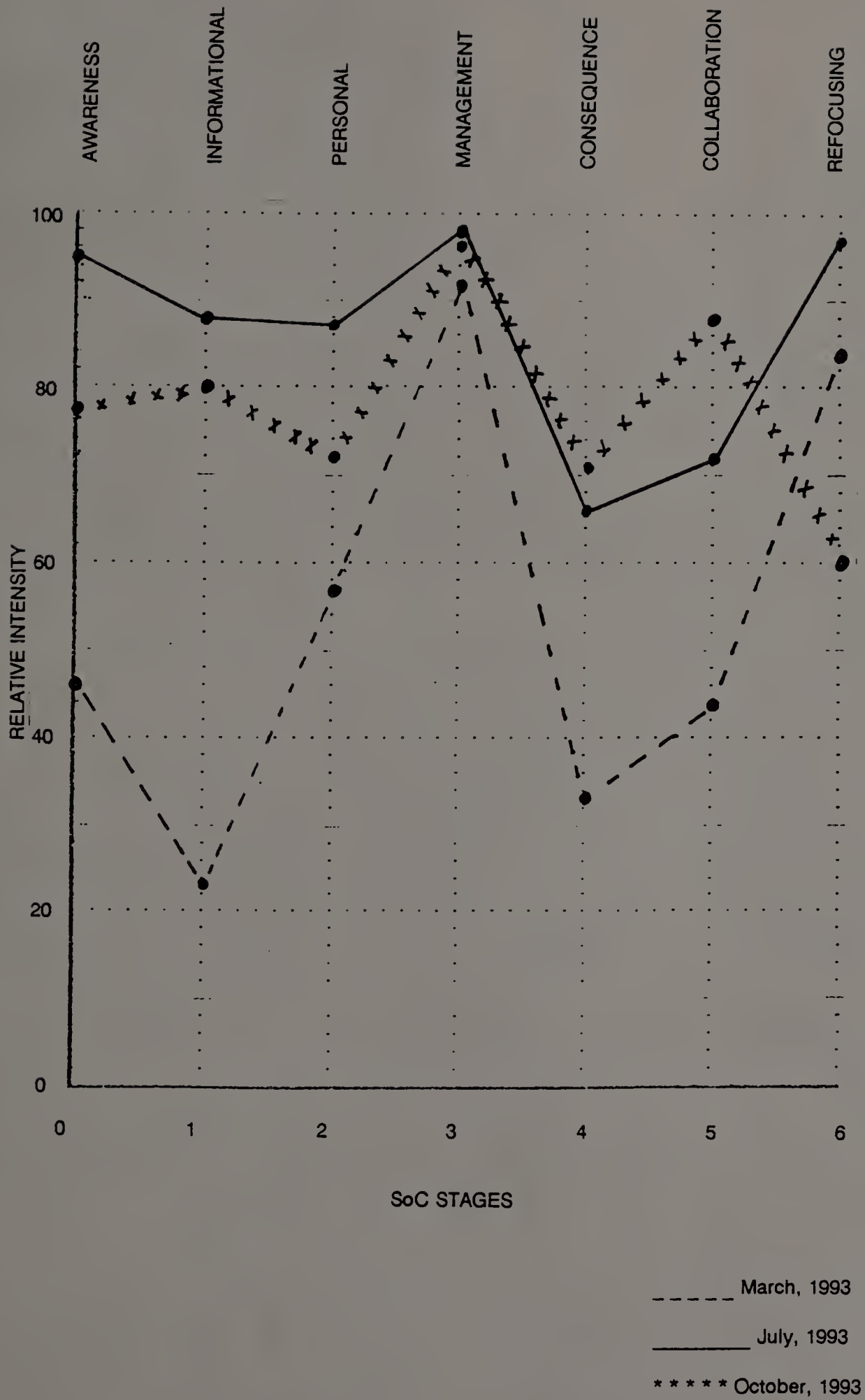
Figure 2. Aggregate Stages of Concern Profile - Anna

telecommunications. Taking great care to express the
administrative support she receives, she noted some
problems, in sharing a line with the office. Her colleague
did not have to deal with this as she had a dedicated phone
line in her classroom.

> I was in [her] class when it just seemed to be on
> in the morning. She had a separate computer for
> it. I would like to have a line I didn't share
> with the principal because we have a lot of
> problems with that. I mean, he is very support-
> ive of it. I would never have gotten the line in
> the first place if he hadn' really pushed for it
> and if he hadn't actually run the thing through
> the ceiling, I probably wouldn' have gotten it.
> So he really has supported it and whenever we
> have asked to use it, as long as he knows, but
> sometimes he picks up his phone not realizing, or
> forgets that we are on, then everything goes
> dead. And after you have spent twenty minutes
> with the kids and you were on question nine and
> the whole thing dies, it just causes a lot of
> frustration. So I would like a separate line and
> just be able to turn it on in the morning and
> leave it on. Now when I do that it starts
> beeping. If you are not actually typing in, it
> beeps, then it just dies.

Another incident which Anna described in her LoU which
illustrated her frustration in organization, and working
out the logistics of the innovation came about because of a
joint project with another school in which they were
sharing weather data. Anna was trying to use the innova-
tion in a new way. At first she was writing all the
incoming data down by hand, then she tried to use the
innovation to assist her in this long and tiresome task.

> . . . it was impossible for me to copy down their
>
> answers. I mean the whole point of getting on
>
> there to have access was that I wanted the kids
>
> to be paired up, and I really felt like I had to
>
> figure out how to [print the information]. I
>
> tried it and I couldn't get it to work. I had
>
> brought the computer home last summer. . . . I
>
> don't know, I guess I didn't have it plugged
>
> right or something. Anyway it works and that was
>
> one thing I learned. I wish there was somebody
>
> at school that knew more about it than I do,
>
> someone who could be my mentor.

The high Stage 6 (Refocusing) score demonstrated a
concern about incorporating new ideas into her use of
telecommunications. During her clinical interview, Anna
described her desire to incorporate new information she had
recently learned in a one on one tutorial session.

> At first it was hard to balance all of the other
>
> things I was doing with telecommunications but

with so much groundwork laid during the 5C5E

[tutorial], I just kept moving ahead with it,

it's coming along, and I feel good about it.

Anna went on to clarify the intensity she was feeling

after having gone through a tutorial session in

telecomunications with completely new information to

process.

I was trying to figure out how to download

something and I just never got to access a file.

I'd go over the directions and I'd go over them

again, but basically I was just trying to explore

different channels and look at things. . . . I

think I did it with somebody's help, we were

doing it together as partners. I did it with

somebody who already knew how to do it but then

when I got home I couldn't repeat it. Slow

learner. . . . For sure, I do take everything

seriously, whether it be at home or in school. I

want to do a good job in whatever I do. I have

an intense need to follow through on whatever I

start. I think this is a positive thing about

me. I mellow out fast and the leaps I take in

the meantime are so great. It would be wonderful

to have someone available in our district or

within the project who could come to my classroom

and coach me along.

Although Anna did not score high on the SoCQ with regard to the collaboration stage she did speak to this concern during both her LoU and clinical interview, indicating that she had some concern with it. During the LoU she stated:

> I think this year it has been good having a partnership with another school. I have a real focus for who [her students] are going to be sending messages to and they can definitely expect messages back from them. That has made a difference [in her using telecommunications]

During Anna's clinical interview she elaborated on how her students were becoming independent learners and using their time wisely. She discussed the weather project that had been set up with her partner school, another participant of the NSF/5C5E project.

> Well, I have the computer set up at the back of the room and at various times during the day the students do data collecting on various science projects they are involved with. When the students record their data in their journals, they then go to the computer and write messages to the partnership school we are doing the weather project with. Sometimes the students choose to do this at recess time and some choose to use class time to write messages. We have a pretty independent class and the students know

their long and short term projects they are
responsible for.

July, 1993. In July of 1993, Anna had completed all
of the NSF/5C5E telecommunications training when the second
SoCQ was administered. The rise in scores is diagnosed as
a shift to multiple concerns which indicates a rise in
enthusiasm coupled with a rise in concerns. In a sense it
is a mixed bag of excitement, desire to succeed and worries
about how it is going to happen. Not only did her March
management and refocusing concerns continue to rise but all
of the other areas tested by the SoCQ rose considerably.
Stage 1 (Informational), for example shifted from low level
concern to intense concern. Some of the multiple areas of
concern are represented here.

> I feel overwhelmed with the amount of information
> I have been exposed to. It is great stuff and I
> will sort it out. I may look calm on the outside
> but on the inside my mind is spinning.
> Information settles in my mind in time and
> somehow it all makes sense when that happens. I
> guess I am always going through change for some
> reason I seek out project that are intense. I
> really like learning new information and passing
> it on to my students and others.

As indicated in her multiple peak SoCQ scores, Anna is
still involved and enthusiastic about the use of the
innovation. This is also evident in her interviews.

During the LoU interview, Anna talks about the connections
she and her students have made outside of the classroom.

Teaching is an isolating profession and I know
that from experience. If I do not collaborate, I
fizzle out real fast with new ideas and projects.
I like to get a good base of knowledge for when I
work in a new innovation, have coaching and
support along with way as I integrate it into the
curriculum. With regard to telecommunications,
that innovation can meet goals I have within the
curriculum. I see that innovation linking what I
want kids to do, they can share information of
what they have learned, find out new things on
their topic and they know where they can go for
more information in the future if they want.

When the researcher asked Anna about collaboration she
was involved, with she offered the following information.

I like to work with others as often as I can. I
feel that being able to collaborate with the 5C5E
staff and teachers has opened up new ways of
teaching for me. I now teach topics that are
more in depth. I use to struggle with this
thought not knowing if this was good or not. Now
I feel that teaching in depth real problem issues
is good. It makes learning connected for
teachers and students. All kids can be part of
this and it makes sense for them. In my school

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[all] students are integrated into the classroom
regardless of ability level and mainstreaming has
given all kids access to the many innovations
going on in our school. This gives a real sense
of community to the school and lots of
educational exposure to all kids. I think
collaboration is so good, both adults and
students can learn from their peers and other
groups of people.

Anna continues to be concerned with using the
innovation and how this innovation is impacting on her
students. She analyzes it in the following way.

I am a very reflective person and I think about
what my students write and share, I want to do
some kind of assessment with what they do on the
bbs and write in their journals but I have not
discussed this with others and have not given
much thought to it myself yet.

October, 1993. In October, six weeks after the new
school year began and four months after Anna had gone
through the intensive telecommunications summer training,
her third and final SoCQ scores indicated some shifts in
her concerns. Although her scores in the management of
telecommunications in the classroom did not change
significantly from the her first SoCQ, her scores in the
area of refocussing, which had previously been high,
decreased slightly. Over the course of the study, Anna's

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SoCQ scores reflect a steady increase in her desire to collaborate with her peers in her use of telecommunications in the classroom. Her final LoU interview demonstrated this desire as well.

> The big strength I see with telecommunications is
> that I have been empowered and I feel like I am
> now a teacher leader in the school. I am really
> just learning about this new innovation myself
> and my colleagues look at me as an expert. This
> feels very good and I do want to share with
> others what I have learned. I really feel less
> isolated because I have this connection to other
> teachers and students. I know some things very
> well and others I am just learning but the
> contacts are there from the 5C5E staff and other
> peers and they encourage me along. It would be
> very helpful to have someone in my school
> building who could coach me along occasionally.

During Anna's clinical interview she told of her frustration with the fact that despite constant efforts she still had management concerns which were unresolved. She also described her difficulty in refocusing even though her SoCQ scores indicated a moderate level of concern in that area.

> I still have not felt like I can manage to fit
> telecommunications into my routine smoothly. I
> am such a reflective person, I need lots of time

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to process what is going on and at the same time

I want to move quickly ahead. This has always

been an issue for me no matter what I do. Every

time I learn something new I go into a spin for

days or months until things settle down and I

have had time to process the new information.

The frustration she described mirrored her SoCQ scores in

the area of management concerns. In her October LoU

interview, Anna reported a need for assistance with the

management of the innovation. Her desire to collaborate

with others around the use of telecommunications was

previously noted in her high level 5 SoCQ, (collaboration)

scores.

Summary. During the research project, Anna

demonstrated some changes in her approach to the

innovation. Her initial observation and SoCQ scores

provided discrepant conclusions about her comfort level

with the presence of the innovation in her classroom. The

LoU and clinical interview, however, explained the

discrepancy as being the result of training which occurred

between the two. Anna described herself as a reflective

person who goes through change slowly, in a methodical way.

I am always looking for new information. I

really like having the training sessions with the

staff of the project. I take all of this

learning very seriously, maybe I should not but

that is me. It's great that the staff has

patience with people like me and will walk me
through the new information on a one on one
basis. I have really liked that about the
support the staff has given . . . I am always
making changes in my life. That is one reason I
am probably stressed out so much of the time. In
one way it is a lot of fun and a challenge but it
sure can be stressful too. I can't seem to find
the time to ever finish anything, I guess that
can be good, too. It keeps life interesting. I
think about being able to just sit down and work
with the kids one on one like I had this summer
in the telecomm training. It's just not possible
now, but I think about how I might make it
happen.

Over time, she began working with another teacher
outside her district from the NSF/5C5E project. Their two
classes shared data on a joint weather project. As she
moved through the study, the empirical data gathered
identified an increase in her desire to collaborate with
her colleagues, on which she subsequently followed through
(Table 4).

Table 4

Profile of the Overall Level of Use: Anna

Month				Categories of Use			
	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Performing Reporting	Overall LoU
March	III	III	III	III	III	III	III
July	III	IVb	IVa	III	III	III	III
October	III	IVb	IVa	III	III	III	III

KEY: Level III. Mechanical Use. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Use is often disjointed and superficial.

Level IVa. Routine Use. Use of innovation is stabilized with little variation inpattern of use.

Level IVb. Refinement. Use of innovation is varied to increase impact on clients.

Level V. Integration. User collaborates with others in use of innovation to expand impact on clients.

Level VI. User re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

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Betty

Betty is a sixth grade teacher in a rural school. She has taught there for nine years and she has a total of 17 years of teaching experience. She has a Bachelor's Degree in Elementary Education. She described herself as a teacher who tries to allow for democracy and cooperative learning but said that her classes end up very structured so that there is order at all times.

At first glance, her classroom appeared to be cluttered, but, at closer inspection, it was obvious that it was filled with meaningful long-range projects, experiments, and learning centers. Most notable was the life-sized papier-mache walrus hanging from the ceiling. There were tropical fish in a tank and a huge, litter-box-trained rabbit that had free reign of the classroom (Figure 3). A group of three students was using the electronic bulletin board which was located in one section of the room. Betty began her own bulletin board, a node connected to a major existing hub because she and her class were using telecommunications so frequently. The NSF/5C5E project staff felt that the capacity of the host computer could be freed up by creating this local board. Betty discussed the excitement for herself and her students in being able to run the board. The freedom of having the bulletin board in her classroom allowed for unlimited access when using the various features of the bbs, and at
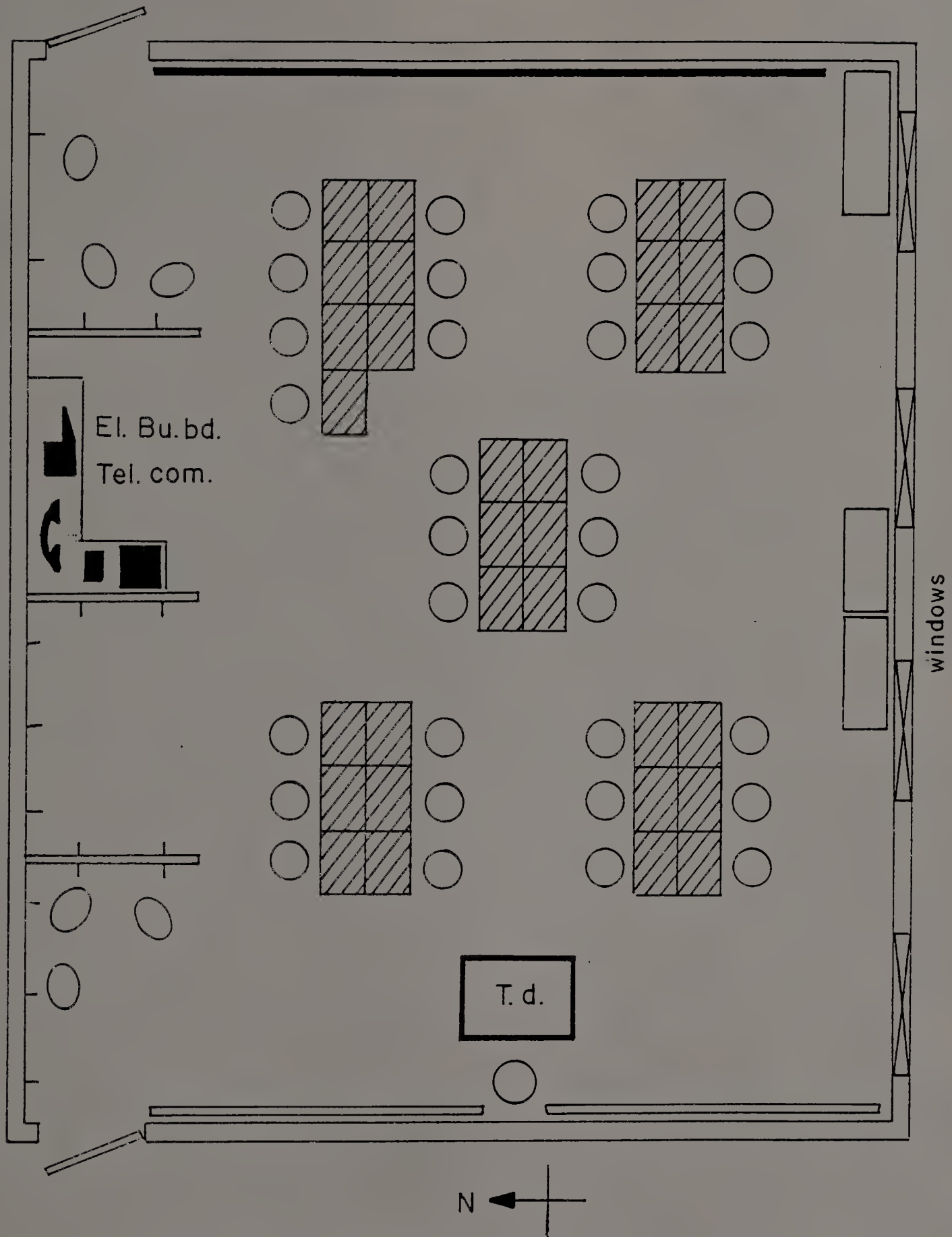
Figure 3. Betty's Classroom Layout (31 stud.)

the same time it added to her responsibilities as a sysop of the bbs.

Betty appeared to be self-motivated, eclectic in her teaching methods and ever learning with her students. She addressed the children in a skillful way that seemed supportive. She built upon the enthusiasm, needs, and talents of the students as she encouraged them to explore and grow. She also encouraged them to interact freely with one another and share their experiences. Throughout the course of the study, Betty's concerns moved from awareness, management, and collaboration in March to continued concerns about management and collaboration in July; finally shifting in October to informational and personal. Management continued to be high. These points will be presented in a chronological sequence.

March, 1993. In analyzing Betty's first SoCQ scores, it was noted that there was a high Stage 0 score which indicated intense concern about what the innovation was and what the use of the innovation entailed (Figure 4). Intense Stage 0 concerns represent an interest in having descriptive, general information about the innovation. Concerns are quite substantive in nature, focusing on the structure and function of the innovation. It is also interesting to note that when an experienced user displays such a peak score "it indicates a user who is more concerned about things not related to the innovation" (Hall, 1975, p. 53). Betty is considered a previous

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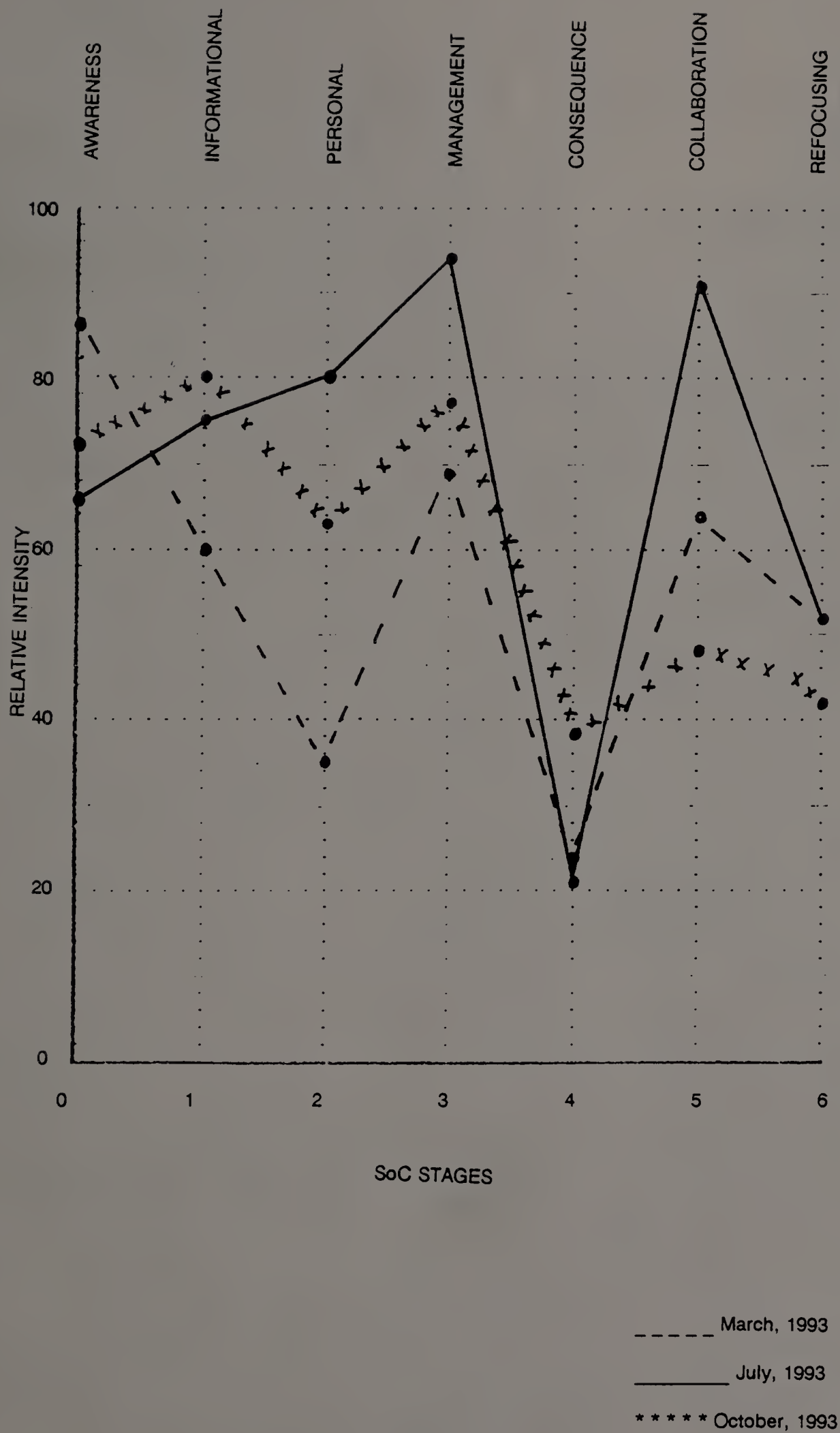
Figure 4. Aggregate Stages of Concern Profile - Betty.

telecommunication user since she had been involved in a
previous NSF project, NSF/Spacemet, and this project had a
telecommunications component of which Betty was part. This
preoccupation was also noted in Betty's clinical interview
several times when she said, "What were we talking about?
. . . What was the question?"

A second peak score was noted at Stage 3 (Management)
which indicated that Betty was also concerned about the
efficient use of the innovation. During both the LoU and
clinical interview Betty discussed management issues. In
March, during the LoU interview, Betty made the following
comment regarding the hardware.

> The computer shuts down on us lots of times and
> it takes the kids forever with their hunt and
> peck method [of typing] to get their messages on
> and all of a sudden the screen goes black. So
> although that is a really negative thing, the
> kids have persevered. It sure would be good to
> have someone on my staff who could drop in every
> so often and help me with such problems.

During the clinical interview, Betty discussed her time
management in getting her students to use telecommunica-
tions.

> I am finding that I need to keep my day more
> flexible. If I'm going to use the bbs, it has to
> be in use all day and that means having small
> group activities planned so there can be a

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continual stream of kids on the bbs. I want to

take advantage of the 24 hour bbs we run from our

classroom. Now I have to manage our time in how

to make this happen.

It was also interesting to note that there is a low

level of concern with Stage 4, (Consequence). The initial

observation field notes and SoCQ scores indicated a low

level of concern with potential conflicts within her

existing classroom structure. She said she was not

concerned with any evaluation of the innovation on

students' learning at that time. In Betty's first clinical

interview, she described herself as a "very laid back

teacher," she saw herself as someone "teaching at the

moment." She described her style as "going with the flow

of the day."

I love teaching, I'm in a school where I have

lots of freedom and I can "teach at the moment."

If something comes up that is of interest to the

class we deal with it, and that in turn may turn

into something big. It's a way of making meaning

to students' lives. They are able to

interconnect what's going on for them and talk

about it. One reason I'm able to do this is that

I'm a very laid back teacher and I go with the

flow of what is around me. It sure makes the

class interesting, with fresh ideas surfacing

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often. No one bothers me up in my room, it's

just me and my students. We have a great time.

This attitude was also reflected in her SoCQ reading

indicating a low concern regarding the consequences in

using telecommunications.

Several times during both the LoU and the clinical

interview Betty mentioned the positive facets she has

experienced in collaborating with others.

I think collaboration can only make a better

education for the students which is what we're

are there for. If we are collaborating, working

together and working through problems that we are

having, then what we present [to our students] is

going to be stronger. . . . Collaborating not

only with your staff but with others, you're not

an island. There are other people dealing with

the same kind of dilemmas and you now if their

style doesn't work for you, maybe some of the

ideas that they do have would work for your

style.

When asked whether she had any new plans for

collaborating, Betty gave the following response.

I really like, outside the school that I have

been able to network, it helps me grow. I mean

the projects Spacemet, 5C5E, any of the

partnership kind of things that have happened to

me have just made me grow and realize that there

is a bigger world out there and there are all

sorts of exciting things that are happening and

to be part of those things just makes me want to

learn that much more and to continue to grow and

the people I network with, they just open up all

sorts of new vistas and it is nice because their

vision seems to be similar to mine so we can pull

each other along.

During the clinical interview, Betty offered the

following comment regarding collaboration.

I would like to be a leader in my school with the

innovations [I have been involved with]. Right

now three of my colleagues have an interest [in

telecommunications], I would like to help them

out. That's how I got interested, by people

taking the time to work with me in the very

beginning. The early training was very necessary

for me to feel like I could take risks and try

this out. Wouldn't it be good to have someone

who could come into our classes on a regular

basis and offer telecommunications support?

July, 1993. After completing the NSF/5C5E

telecommunications training, Betty's concerns about the

innovation shifted greatly. Her primary concerns at this

time became those of time and management (Stage 3) and that

of collaboration (Stage 5). The high stage 5 concern

portrayed the concern about working with her colleagues in

coordinating the use of the innovation. While these scores

indicated an increased desire to collaborate with

colleagues in the use of the innovation they also showed an

increase in her concern about the management of the use of

the innovation. In her clinical interview, Betty

attributed these scores to the fact that she had completed

the one-week summer telecommunications training only one

week earlier. Betty said that, although she was excited

about collaboration, she was also concerned with how she

would manage all that she wanted to do.

> The weaknesses are far outweighed by the
>
> strengths but there are weaknesses for sure. The
>
> bbs takes a lot of time to keep going, I spend
>
> several hours each night on the bbs. Making time
>
> for each kid to get on line is hard, too, I try
>
> to provide the time for each person, whether or
>
> not they take advantage of it is another thing.

Betty reflected on the extended telecommunications training

that she had just been part of during the LoU interview.

> The training and support that we [just had] has
>
> allowed me to keep a focus and want to keep
>
> working with the innovation. I think the
>
> training we have had to expose us to the
>
> innovation was very important. I feel like I
>
> have a good base about how to use
>
> telecommunications and the project game me a
>
> reason to explore further. It has been so good

to be able to connect with other teachers and have them share their experiences with me. Doing the stream team has allowed me to do a long term project. The kids are going into a lot of complicated information that I would not have even considered if I did my usual teaching from past years. The kids are doing real science and they are relating it to their lives. Many of the students bring in water from their neighborhoods and test it with the various kits. They are linking their home life to what they do in school. All of this came about because of the planning my team did together. It took a lot of time and it was so much fun.

During the clinical interview, Betty gave more positive statements regarding her continued collaboration with others.

I am learning so much from the teachers that I worked with this summer. Telecommunications makes me feel like I am not isolated in my school. I can get on the board at night and tell my friends what went on during the day. It's different than using the phone. I can use the computer when I want to, write to the [sysops] if I have a questions and get very fast feedback, its great.

Another area about which Betty expressed concern, even though it was not one of the listed concerns measured by the instruments, was that of equal opportunity for all students to be exposed to telecommunications in her mainstream classroom.

> I have a totally mainstream classroom, so all kids are mixed and I think this provides for equal opportunities which is important. I am changing very fast in the way I teach. I'm glad of that, I like to be exposed to new things and then try them out. I am becoming more sensitive to all groups of students [focusing on] gender, ability and ethnic groupings, all of which come into play in my classroom.

Betty continues to show a low concern for consequences as demonstrated in this comment from her July clinical interview.

> I was in such a spin about I would incorporate the internet bbs into my classroom. I'm mellowing out now and only a few days have gone by. I keep thinking about how I'll do all that I want to do with my kids, connect with other teachers about what they are doing, work with my project group and get out to the stream with my hip waders. Oh well, it's just my students and me, we'll have a great time figuring it all out.

October, 1993. During the final round of data gathering it was noted in the SoCQ that Betty received a peak score in the informational area (Stage 1) with the other concerns being personal and management. The high stage 1 concern suggested that although she continued to be interested in learning more about the innovation from a positive proactive perspective, Betty was not involved with the innovation at this time. A new phone system was being installed in her school building and the phone system was shut off to her classroom. During the LoU interview, Betty did allude to the fact that she was still seeking information regarding telecommunications.

> I am always looking for new information as I
> said, I would like to find out about the Internet
> and how I can get my students involved. I had
> great training this past summer in expanded
> telecommunications possibilities and I would like
> to pass the information on to others. Spacemet,
> the local bulletin board was great for making the
> world seem smaller, now with the Internet that
> will even be more powerful and resourceful of a
> tool.

The overall profile described her as interested, not overly-concerned, positively disposed, non-user. Upon reviewing this data during her interview, Betty discussed her non-use of the innovation. Also, for personal reasons, she had chosen not to use telecommunications at home.

Prior to this point, Betty was using telecommunications at home each night for about two hours. At the October LoU interview, Betty did discuss her non-use of the innovations.

I want to get my life back in order, if there is order to life and then I want to slowly make a balance in my life to reconnect with telecommunicating with people. It is so enriching and fun to share academic and non academic things. Right now I'm on hold with lots of things in my life . . . [Regarding the phone line] I have no idea how long this will take, here we are six weeks into the school year and nothing. I am not too hopeful. Whenever we get reconnected, I am sure we will continue with a positive movement, I always like the challenge of jumping into something again, it's just my nature to enjoy the challenge. It is a lot of work to keep telecommunications up and running in the room. Whatever happens, happens.

During Betty's clinical interview, she gave the following information.

I love to talk and share with others. Having telecommunications capabilities has allowed me to meet new and interesting people and keep my life so much fun. I tell people that telecommunications can be addicting and to watch out. I used

to spend several hours a night on the bbs until
it was either the bbs or my [personal life], now
I do not use telecommunications at all at home.
I made the choice. . . . I do no bbsing at home,
none, it's cold turkey. At school the phone line
is disconnected while another line is put in so
there is nothing going on there either.

Summary. Throughout the study, Betty exhibited high
levels of concern regarding management of the innovation.
She continually sought out new information about the
innovation and this may have contributed to her management
concerns as she was continually changing her thinking
patterns.

Betty appeared to enjoy the use of the innovation in
her classroom while it was being used. During the
interviews, she spoke of the collaboration she was involved
in during the NSF/5C5E project (Table 5). She spoke of
doing a long-term science project in her classroom where
the bbs was incorporated into the unit. She also spoke of
the leadership role she would like to take on working with
other teachers in her school as they were beginning to
implement telecommunications into their classrooms. It was
difficult, however, to analyze the data conclusively
because her use of telecommunications in the classroom was
discontinued for personal reasons. She demonstrated her
willingness to take risks and in turn she encouraged her

Table 5

A Profile of the Overall Level of Use: Betty

| Month | Knowledge | Acquiring Information | Sharing | Categories of Use | | | | |
				Assessing	Planning	Status Reporting	Performing	Overall LoU
March	III	III	III	III	III	III	III	III
July	IVb	III	IVb	III	IVa	III	III	III
October	IVb	III	IVb	III	IVa	III	III	III

KEY: Level III.   Mechanical Use. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Use is often disjointed and superficial.

Level IVa.   Routine Use. Use of innovation is stabilized with little variation inpattern of use.

Level IVb.   Refinement. Use of innovation is varied to increase impact on clients.

Level V.   Integration. User collaborates with others in use of innovation to expand impact on clients.

Level VI.   User re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

students to do the same. Despite the standstill in Betty's use of telecommunications she looked forward to the time when her classroom would be reconnected and when she would be able to move forward with the use of the innovation.

Carmen

Carmen has been teaching for 12 years. She has a Bachelor's Degree in Early Childhood Education. She had been teaching sixth grade at a rural elementary school for the past five years. She described herself as a non-traditional teacher working in a cooperative learning setting. She characterized her daily schedule as open, not rigid.

Draped across the front wall of her room was a huge banner that read, "Nothing was ever accomplished without enthusiasm!" The entire window sill was filled with plants and weather equipment. The wall near the windows had colorful graphs that the students had made for a comparative study that they were conducting on weather with another school. The rest of the walls were filled with student writing and art work. The students had access to two computers and printers (Figure 5). They ran their own electronic bulletin board. Like Betty, Carmen began herown bulletin board; a spoke of an already existing backbone hub (SpaceMet) because she and her class were using telecommunications frequently and it was felt that capacity of the host computer could be freed up by creating this other link.
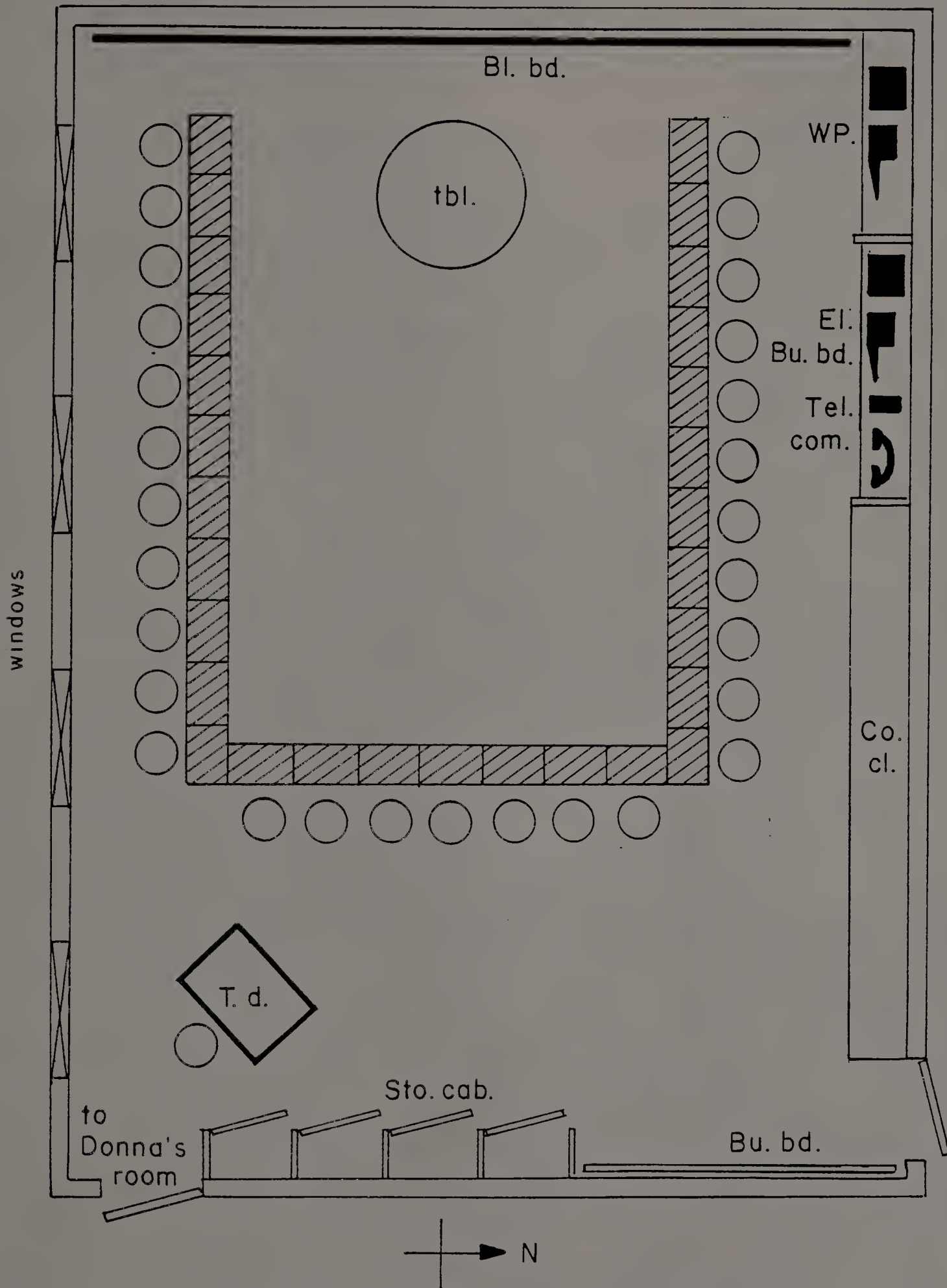
Figure 5.   Carmen's Classroom Layout (29 stud.)

During the classroom observation, several students
were using the board to share some data about their weather
research project with a school from another district whose
teacher was also part of the NSF/5C5E project. The rest of
the students were engaged in a cooperative learning style
math problem-solving activity. Carmen played the role of
questioner, facilitator, and resource person during the
activity. The students treated each other with respect.

Throughout the course of the study Carmen's concerns
moved from the areas of awareness, consequences and
collaboration to informational and personal, with
consequences and collaboration continuing to be high, to a
continued concern for personal, consequences, collaboration
and a new concern of refocusing. She moved from peak
scores in awareness, consequences and collaboration and
even though these were peak scores they indicate moderate
level of concern. In July, information, consequences and
collaboration continued to be peak scores rising from a
moderate level of concern to intense levels of concern.
The personal stage was a new peak level of concern. In
October, consequences and collaboration again were peak
scores, remaining the same as in July. Refocusing, however
rose significantly from moderate to intense. These points
will be presented in a chronological sequence.

March, 1993. Carmen's peak scores in awareness,
consequences and collaboration indicated she was concerned
with the impact of the innovation and how she could

implement it (Figure 6). Even though all of Carmen's scores were in the low range on the scale, the concerns around consequences and collaboration stood out as being a focus. This was apparent in both her LoU and clinical interviews where she spoke of these concerns.

Well, I think [telecommunications] has opened up a whole new world for myself and my students. Two years ago if you put me near a computer I froze right away. I had no ideas how to use one other than to turn it on and a little bit of Appleworks. I knew how to do some word processing, where in the last two years I've really kind of found a whole new world out there and places to connect with people. I'll type something on the computer and people will usually get back to me with the answers. My students have just blossomed. They love it. They have met a lot of friends through telecommunications, they have also learned how to explore and find information. If they have certain interests, they will get on the computer and find areas where there are other people that have those interests and they will talk with each other over the computer or just look for information.
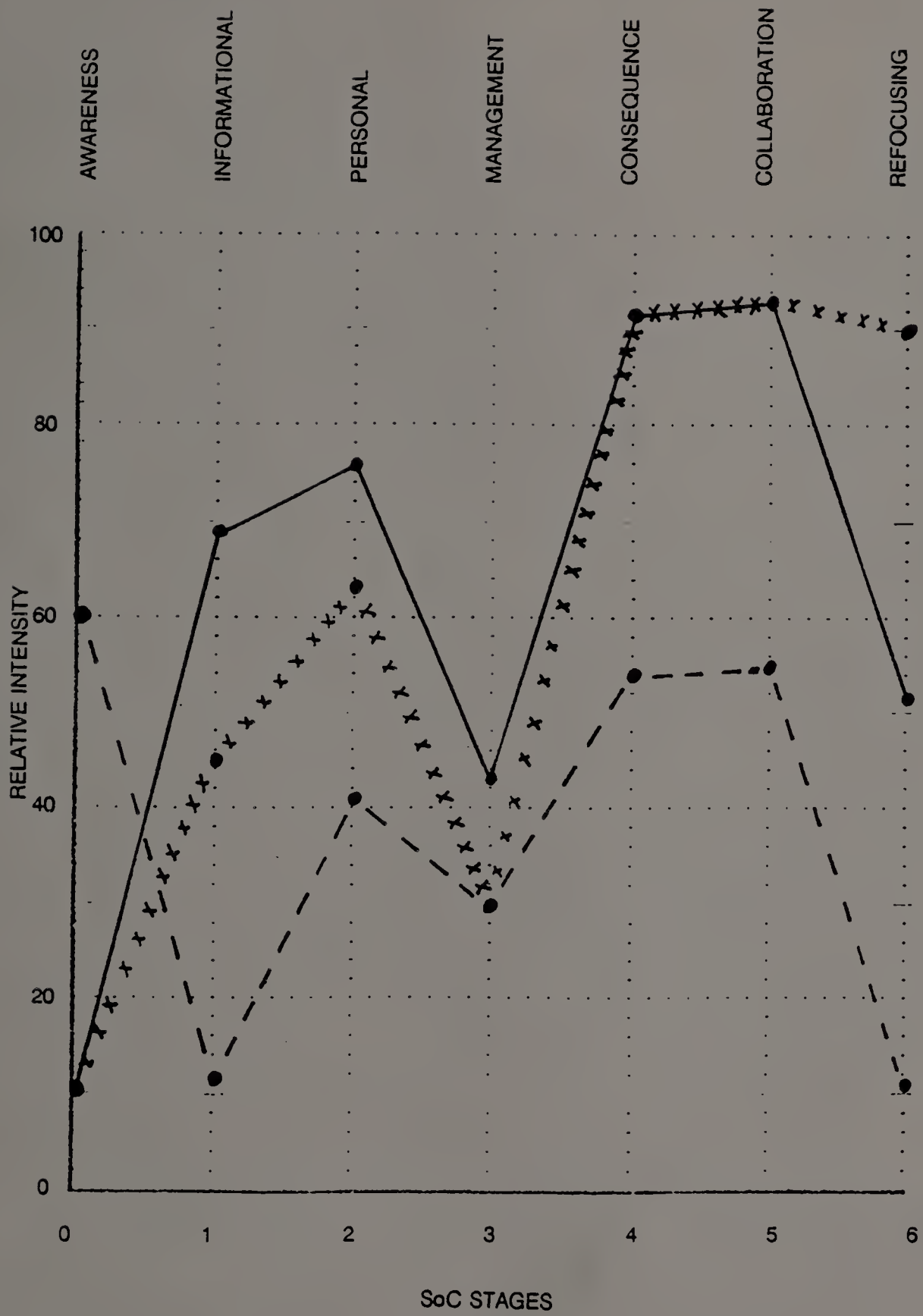
Figure 6. Aggregate Stages of Concern Profile - Carmen

During her clinical interview, she described her
previous experience as a success. Carmen described herself
as one who processes new information quickly, and enjoyed
thinking about the change process with regard to new ideas.

> I remember being a part of Spacemet. I learned
> so much about telecommunications there. I felt
> comfortable with the great peer and staff
> support. My school district was so excited about
> me bringing this into the school and it gave me a
> great feeling to be successful with such a new
> innovation. I love to learn, I absorb new
> information fast and pass it on to my students
> and colleagues. I have changed so much in my
> years of teaching and it has been fun to see how
> fast I change. I guess its my personality. I'm
> a go getter, I love new challenges, I've always
> gone after them.

During the LoU interview, Carmen described her
collaborative efforts in teaching.

> In general I work quite a bit with the other 6th
> grade teacher. She and I bounce ideas off each
> other every day first thing in the morning,
> during recess time, and during lunch time. We
> have a class of 54 6th graders. . . . We talk
> about activities that we have done in class, what
> has worked, what hasn't worked, ask for ideas and
> suggestions from one another or just sit there

and listen to one another and how we are having a
good day or a bad day, just to give each other
support. I think this kind of thing would really
be good if some people in school could begin to
do this with telecommunications. Beginning
teachers get mentored in how to do new things in
the classroom and even though we are experienced
teacher we are learning a new thing, too.
Mentors are good for everyone in some way. If I
have special projects coming up, a lot of times
if I know a teacher in the building has an
expertise on that, I will go and ask them if they
can help out or if they have any suggestions on
certain things. I think our building is pretty
open in the sense that we try to help each other
out.

During the clinical interview, Carmen also talked of
collaborative efforts.

I have taken lots of courses in cooperative
learning and I think this has helped me to be the
kind of teacher I am. I consider myself a
non-traditional teacher where students are
working in small groups doing lots of problem
solving. The school day in my room is flexible,
students are very much in charge of their
learning. I see myself as a facilitator in the
classroom. The classroom seems to run itself

much of the time. We have class meetings daily

where we get issues and concerns out on the table

for discussion. It seems to work wonders. There

is a real sense of community in the room. It

really makes for a wonderfully, relaxed

atmosphere; most of the time. . . . I try to

model this collaborative style and in turn

students see me planning with colleagues in the

building and over the bbs connecting with other

teachers.

She described herself as a reflective learner, processing

new levels of thinking with excitement. Although this may

be true, the researcher believed her low level SoCQ scores

are a result of her previous experiences. Carmen was part

of the NSF/Spacemet project in 1991. Included in this

summer training session was a telecomunications component.

Carmen stated in her clinical interview that this initial

contact with telecommunications was very valuable and she

reflects on this past training during the clinical

interview.

I have had wonderful staff development training

in lots of areas. I guess I've connected with

the right people, because I know all staff

development models are not sustained over time.

Often they are a one shot deal.

July, 1993. At this time, Carmen had just completed
her NSF/5C5E telecommunications training. Carmen's SoCQ
scores reflected a high level of concern about information,
personal, consequences, and collaboration with other
teachers and about the impact that the innovation had on
her students. Carmen still demonstrated minimal concern
about managing the innovation, she was confident in her
management of the innovation. As Carmen stated in both the
March and July LoU and clinical interviews, she processes
and integrates new information quickly. During the July
LoU interview Carmen offered these insights.

> I am always changing, that is what is great about
>
> teaching. I am open to new ideas and I like to
>
> hear what others have to say. I am always
>
> looking for more information, that is one reason
>
> I am on the Internet so much. I am looking for
>
> resources for my students to connect into and for
>
> new projects to align my students with. We . . .
>
> I really became interested in telecommunications
>
> during the Spacemet project. That project, like
>
> the 5C5E project, was so well planned out. The
>
> personal contacts we had with knowledgeable
>
> resource people gave me the feeling that they
>
> were really interested in what they were doing
>
> and they had all kinds of support systems in
>
> place that we cold take advantage of. I did just
>
> that. I went to so many telecomm training

sessions. I remember giving up lunch times often
to get one-on-one support. It would be a big
help to have this kind of support in the school
too.

Still, reflecting on the training that she has just been
through, Carmen elaborates in the clinical interview, her
thoughts on the newly acquired information.

Wow, I feel like I have taken a major leap with
telecommunications. Using the Internet is so
vast. Imagine all of the projects my students
will get to be part of. I am going to spend the
rest of the summer exploring the Internet, I'll
be ready for my students in the Fall. I really
like to be at least one step ahead of the kids.
I think back to when I was part of the Spacemet
project. I have great memories of how I got
hooked into telecommunications. It was such a
great learning experience.

Carmen mentioned two points in her July LoU interview
that correlated with the July SoCQ profile. The
correlating points surrounded the areas of consequences and
collaboration. She states:

The strengths are too numerous to mention.
Actually students have become more independent
and eager to learn more during their own time.
They really like doing the long term weather
project. They were able to do some of the

experiments at home, make connections to other
areas besides just the weather. They began to
listen to the news and the weather forecasts and
they began to see real life connections to what
they were doing in school. They used
telecommunications to share their data and they
were able to find resource people within the 5C5E
project that could help them with their questions
and they got into databases that dealt with
weather. I really have the flexibility to do
what I want during the day and I sure do that.
The bbs is going all of the time. It is great to
run one from our classroom and not have to
compete for a phone connecting into Spacemet. It
has been great to have so many people make
telecomunications work. My whole way of teaching
is ever changing and its so much fun. I like to
always be thinking of new ways to do things.
This weather projects is a joint venture with
several 5C5E teachers. It's been so much fun to
plan together and to have the scheduled release
time from the school day to meet and plan.

October, 1993. The last round of data collection took
place 6 weeks after the start of the new school year. At
this time, Carmen's SoCQ scores displayed a multiple peak
profile. This profile is typical of a highly involved,
broad-range, impact-concerned user of the innovation.

Carmen's profile showed high Stage 4, 5, and 6 scores reflecting her concerns about these various responsibilities. In her LoU interview, Carmen describes her role as a leader in the field of telecommunications.

I feel so empowered and like being a teacher leader. My community and district looks to me for information about telecommunications. It has given me so much confidence as a person. I spend hours each night on the bbs, probably more than I should but it's so much fun and a hobby for me now.

Carmen also describes the great satisfaction she gets from staying current in knowledge about the innovation and conducting workshops and teaching about its virtues and educational implications.

I am so current in my knowledge of telecommunications. I talk with others at workshops and on the bbs. We are all searching for similar meaning to this new innovation. I gave a workshop this Fall and it was so wonderful. People were coming up to me after the talk wanting to know how I could incorporate such a thing into my classroom, I just simply told them what I was doing. It seemed so little to me but people just ate up what I shared with them. It was wonderful. I guess I have moved pretty fast in my implementing this innovation. . . . I

have gotten several students in my class onto the Internet. I know that there is so much out there on the Internet and I want the students to be able to connect with it. I am always making changes in my life. The latest thing is to learn about the off line reader. I think this may allow more students to work on telecommunications.

In her clinical interview, Carmen expands on her definition of herself as a leader and a resource for the community.

I'm really making such progress in telecommunications. This is a main focus that I have now. I have been so empowered and affirmed in that area. I'm considered a leader of telecommunications in my community. Just three years ago, I was just learning this. I really feel great being able to take a leadership role in this area. I sure am busy keeping my classroom going and working with the community with house calls and all.

When asked by the researcher to explain what was meant by a house call, Carmen described it.

Well, I have been helping former and present students to set up their modems. I have also been helping community members and school board members do the same. I really feel like I could

open up a business. My time is really in demand

and I love it.

She has been responsible for many people in her school and

community linking up to a local bulletin board. She talked

about the "house calls" she makes to students' homes and of

the time demand this makes. This is also evident in her

previously mentioned high stage 5, or concern for

collaboration around the use of the innovation.

Summary. From the beginning, Carmen showed a high

interest in telecommunications and demonstrated ease in her

understanding and use of the innovation, which was probably

due to her past experiences. She quickly learned about

further possibilities and integrated new information

readily when it was made available to her through the

NSF/5C5E telecommunications training. Carmen presented

herself in this study as a leader in the field of the

educational use of telecommunications (Table 6). It may be

interesting to note that outside of this study, but during

its time frame, she received a grant which provided her

with a new computer, modem, and printer for her classroom.

Donna

Donna has been a teacher for 20 years. She holds a

Bachelor's Degree in Elementary Education and is currently

enrolled in a master's program in education. She charac-

terizes herself as both a traditional and non-traditional

teacher who incorporates cooperative learning into her

teaching. She and Carmen teach in the same school.

Table 6

A Profile of the Overall Level of Use: Carmen

Categories of Use

Month	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
March	IVb	IVb	IVb	IVb	IVb	IVb	IVb	IVb
July	V	V	V	V	V	V	V	V
October	V	V	V	V	VI	V	VI	V

KEY: Level III.   Mechanical Use. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Use is often disjointed and superficial.

Level IVa.   Routine Use. Use of innovation is stabilized with little variation in pattern of use.

Level IVb.   Refinement. Use of innovation is varied to increase impact on clients.

Level V.   Integration. User collaborates with others in use of innovation to expand impact on clients.

Level VI.   User re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

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Donna's classroom was orderly and quiet. The walls were filled with visual aids that she had made or bought. There were few of the children's projects on the walls. The desks were arranged in a horseshoe shape, side by side, with the teacher's desk in the front of the room. There were bookshelves filled with storage boxes and text books (Figure 7).

At the time of the observation, the students were all working on individual writing projects. Donna explained to the students that if she was involved with another student they were to work with their peers to clarify any questions they had. She exhibited a patient sensitivity to her students and at the same time, she set clear limits.

Donna had a computer and printer in her room, but they were not being used. She had a shared phone line with Carmen. Donna had not become involved with telecommunications in the school and she did not have a computer at home to explore telecommunications possibilities. During the course of the study, Donna's concerns did not change. She consistently showed high concerns in the areas of management, consequences and collaboration. It should be kept in mind that Donna did not use telecommunications in her classroom during the course of this study. These points will be presented in a chronological sequence.
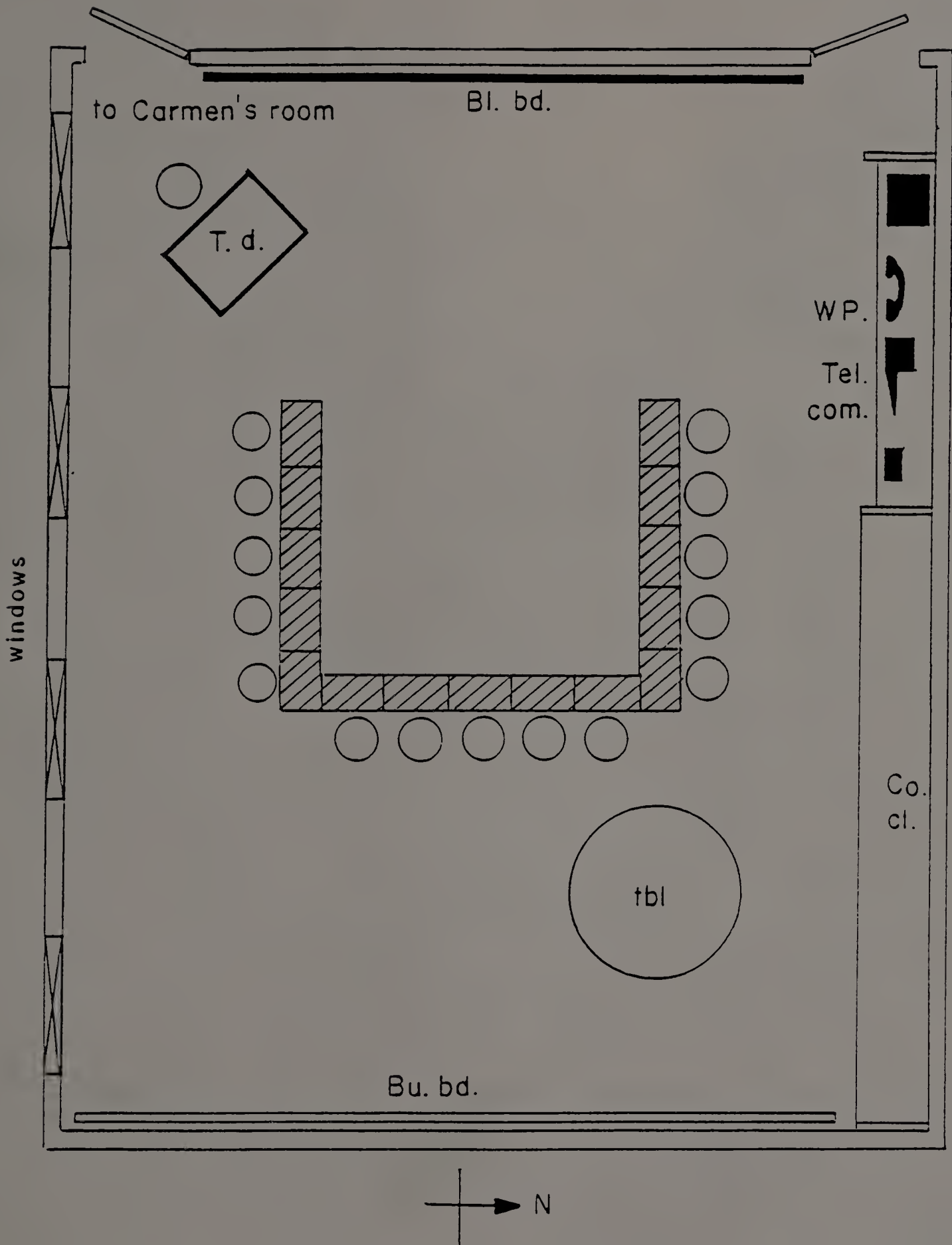
Figure 7.   Donna's Classroom Layout (15 stud.)

March, 1993. Donna's first SoCQ scores showed very high stage 3, 4, and 5 (management, consequence, and collaboration) levels of concern (Figure 8). This was particularly interesting to the researcher as Donna was not involved in any use of telecommunications in her classroom at all. The telecommunications hardware was not even in use. Donna demonstrates ambivalence about her desire to use telecommunications in the classroom. When asked if she was looking for any information about telecommunications during her LoU interview, Donna discussed her interest in the innovation and desire to implement the program but then immediately followed it with a reason why she could not.

I'd like to continue to be kept abreast of it. Basically for me the problem is having a time to sit down and really play with it. My child has to be picked up by three, and I don't always have the time to sit down after school and play with it. That is why I would like to get a computer at home and do telecommunications from home, but I don't think I can get a computer and practice with it more, I do find it interesting. It is just that limited access and the time restraints. . . . Maybe it would help to have someone I could call on to walk me through the process.

Donna's high level of concern score for stage 5 (consequence) is consistent with the researcher's observation of the order and control she maintains in her
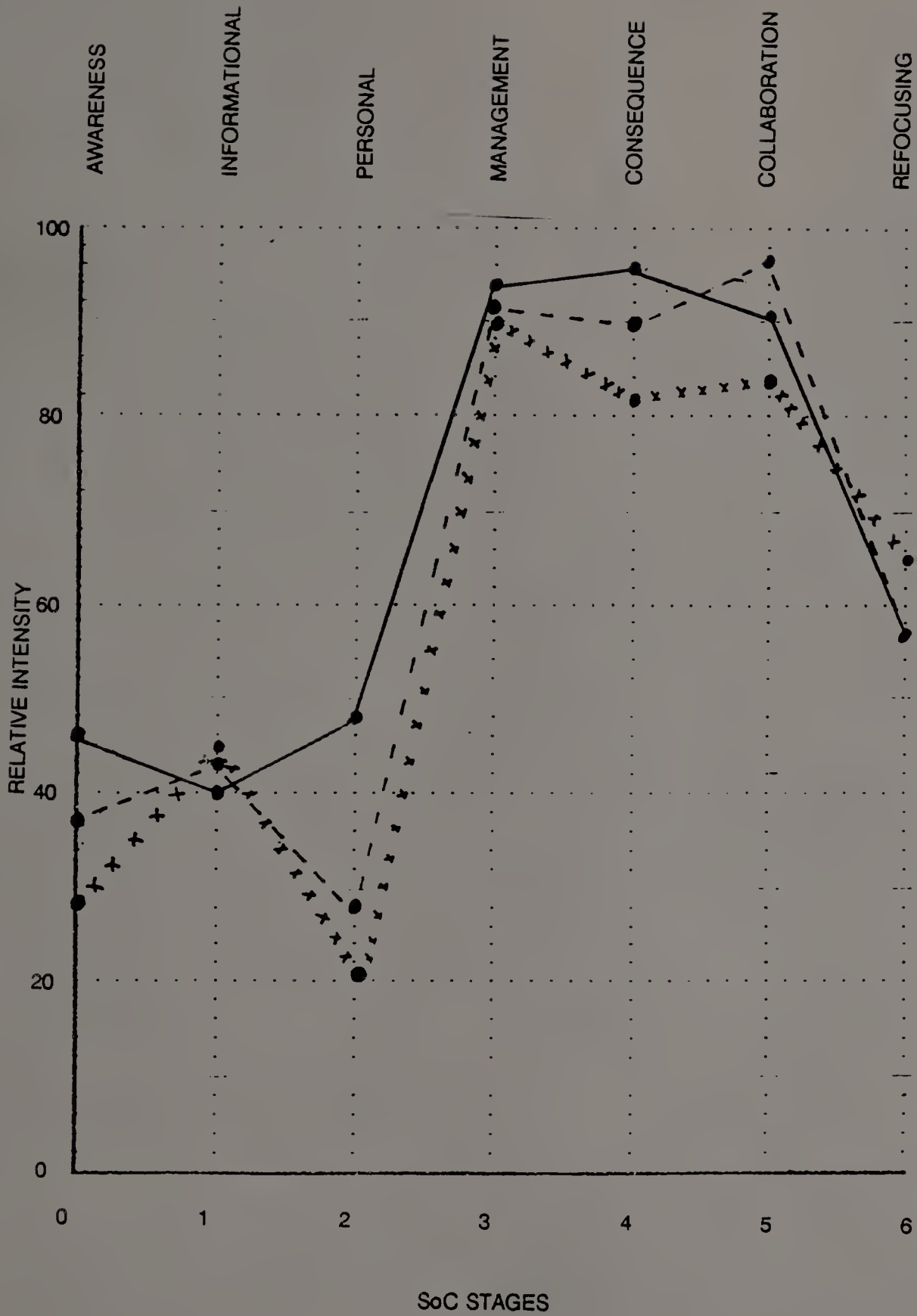
Figure 8. Aggregate Stages of Concern Profile - Donna

classroom. A high stage 5 score on the SoCQ represented a
strong desire to collaborate, which however was not evident
upon observation. At this point, despite her professed
enthusiasm about the innovation, Donna has not yet
introduced it to her students. She said, though, that she
had to share a phone line with another classroom using a
modem (Carmen's classroom) and this was a road block. She
mentioned this in her March LoU interview.

> Right now [the administration] wants us to use
> the same line, but we really didn't want it
> because there would be too many people trying to
> get access at the same time.

It should be noted that in order for Donna to use the phone
line she would have had to coordinate her scheduled use
with Carmen. She made no clear attempt to initiate this.
Donna goes on in her LoU interview to describe other
roadblocks.

> Basically, I just feel guilty that I haven't used
> telecommunications as much as I would really like
> to. It hasn't been the lack of desire, it's more
> the availability of not having a computer. Not
> having the time to stay at school and practice
> with it. I guess also partially being somewhat
> insecure about it and I need to become more
> secure about it. Whereas [Carmen] is very secure
> about telecommunications, I am fairly insecure
> about it and I need to build up my own confidence

in that, and be willing to take more risks.

When asked at the end of the LoU interview if she had anything to add, Donna gave the following information.

I just have a guilty feeling. You know, when I

volunteered to do this, it was because I did want

to do more and I do feel guilty because I haven't

pursued it as much as other people, but also the

fact that I had lyme disease this year and it has

wreaked havoc on my body. I just haven't had the

energy to do things. I just try to pull myself

to school everyday. It has been a struggle.

July 1993. After completing the NSF/5C5E telecommunications training, Donna's SoCQ scores did not show any significant change in her concerns about the use of the innovation. During the interviews, Donna brought up several times that she was very interested in the telecommunications capabilities in her classroom. In her LoU interview, Donna attributed her non-use of telecommunications in the classroom to the limited access that she had to telecommunications hardware in her school situation.

The weakness is that there is limited access to a

computer. I would love to be using it, its just

I can't seem to get started. I feel like I have

had good training, I'm interested in it but it's

just not happening. . . . I have not had a chance

to practice. I plan to fight again for access

full time for telecommunications. I have not had
this support from my administration.

October 1993. Soon after the start of the school
year, the final data was recorded for the research project.
There was not significant change in the SoCQ or the
interview information from the previous two data recording
sessions. Donna's current excuse for her non-use, as
expressed in her LoU interview, was lack of administrative
support.

> No, I am not using telecommunications. I wish I
> were, though. I just can't seem to find any time
> to just plunge in. And I am not getting
> administrative support.

Donna continued to express the desire to work in a
collaborative setting focusing on the learning outcomes of
her students.

> I like to work with other people, but there again
> there is not time and at the end of the day I
> want to go home. I guess using telecommunica-
> tions could help this situation but it just does
> not happen. I do think about it and know it
> would probably be good.

Summary. It is unclear what applications the data
from Donna's case had to this study, as she did not ever
use the quipment with her class during the course of the
study. According to Donna's interviews, both at the onset
and at the end of the research, she was concerned with

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using the innovation. Yet this concern was not acted upon during the research period (Table 7). Her data present a paradox in that she consistently demonstrated concern about and enthusiasm for working with the innovation yet she never actually did. It is not the role of the researcher to judge whether the perceptions Donna held are valid or invalid. The data presented reflect how Donna perceived her situation. It is impossible to tell whether Donna's motivation is suspect or whether she was stymied at every attempt to overcome the hurdles. In reality, telecommunications was not used in Donna's classroom and the only evidence available to the researcher is the information Donna shared during the study.

<u>Emily</u>

Emily is a seventh grade science teacher with 13 years experience teaching in a rural high school which includes grades seven to 12. She has a Bachelor's Degree in Biology. She describes herself as a teacher who has a structured daily routine but within the routine there is room for flexibility and individual interests.

Her classroom was a science lab which was filled with research projects, and plant and animal experiments (Figure 9). There was a telecommunications computer and printer at the front of the room. A conventional bulletin board on the wall at the back of the room was devoted to the posting of electronic messages which she and students printed out

Table 7

A Profile of the Overall Level of Use: Donna

Categories of Use

Month	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
March	III	III	III	III	III	III	III	III
July	III	III	III	III	III	III	III	III
October	III	III	III	III	III	III	III	III

KEY: Level III.   Mechanical Use. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Use is often disjointed and superficial.

Level IVa. Routine Use. Use of innovation is stabilized with little variation inpattern of use.

Level IVb. Refinement. Use of innovation is varied to increase impact on clients.

Level V.   Integration. User collaborates with others in use of innovation to expand impact on clients.

Level VI.   User re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

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Figure 9. Emily's Classroom Layout

each day so that her students could have their own copy and respond to their mail during the class period.

Emily had a pleasant relationship with her students. Students appeared interested in what she was doing, there was much student to teacher dialogue, and student to student dialogue as well. While most of the class was working on an ocean project, two students at a time were entering data into the telecommunications network. This class has an ongoing research project on plant growth with another group of students from another school. It should be noted that Emily's participation in the NSF/5C5E project was her first exposure to telecommunications. She described herself as a low key individual who processed information methodically and with a lot of reflection. Throughout the course of the study, Emily's concerns moved from the areas of information and management to collaboration and refocusing concerns, management continued to being high throughout the research period. These points will be presented in a chronological sequence.

March, 1993. Emily's first SoCQ results showed high stage 1 and 3 (informational and management) scores revealing a high level of concern about information concerning the innovation and the logistical aspects of implementing it (Figure 10). The researcher observed that Emily's extremely high management concern score may be due to the fact that she teaches in a departmentalized setting and teaches a class of 15-25 students forty-five minutes,
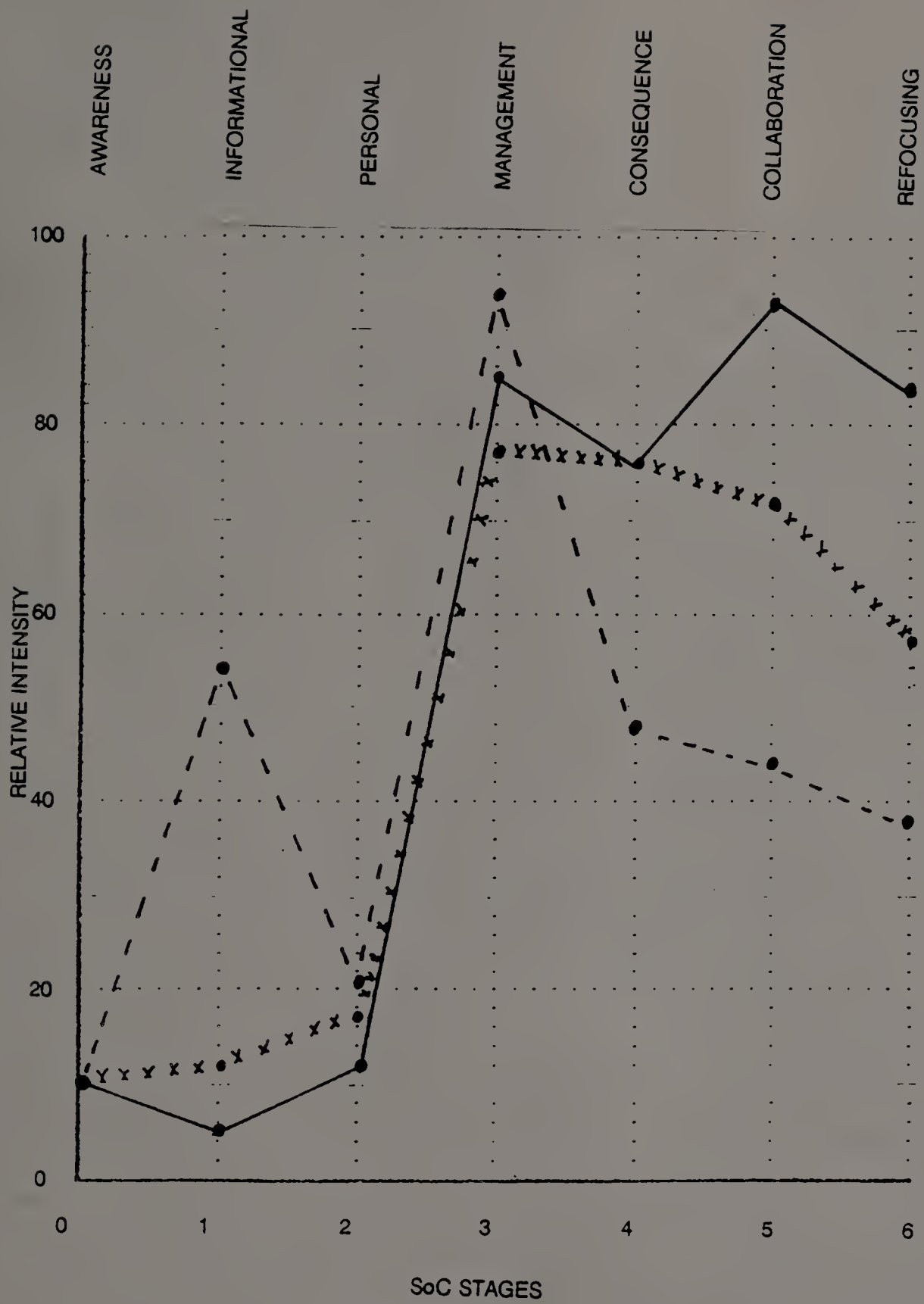
Figure 10. Aggregate Stages of Concern Profile - Emily

five times a day. When asked if she was looking for any information about telecommunications, Emily stated the following in her LoU interview:

> I would love to get some more training and
> information. . . . I would love to spend more
> time learning. Learning how to use Internet and
> learning how to use some of the bulletin boards
> that are around here. . . . I'm finding I just
> don't have enough time in my day, and the better
> trained I am I think the better I could use it
> with my students. . . . I think we could access a
> whole lot more information that is out there,
> plus we could access a lot more current
> information. . . . For the first year [for me], I
> think that has been wonderful, but now I'd like
> to see it go farther.

As a follow up question to the comment Emily made regarding accessing additional information, the researcher asked Emily if she had long-range plans in mind for her class surrounding the use of telecommunications. Emily did respond with clear goals.

> I would like someone to take me through Internet
> and say "Hey, this is what is there, this is how
> you access it," and I could do it if I just sat
> down and took the time. . . . Having someone on
> my staff or in the district who could be on call
> for this sort of thing would be wonderful.

It should be noted that Emily had, just the week before, gone through a telecommunications tutorial one-on-one session. Emily elaborated on her experience with this session. During her clinical interview, Emily described herself as a fast learner who likes the challenge of learning new things in group setting and then learning more on her own. Her self-assessment was supported by her moderate concern about obtaining more instructional information about the innovation upon her introduction to it.

> The tutorial session that I just experienced was
> full of information. It's all such new
> information. The training we get as participants
> of the 5C5E project really is good. It's so well
> planned out, all connected to the total picture
> [of the project] with solid content. I think
> right from the beginning of writing the 5C5E
> grant long range goals were considered. So many
> facets to education were considered ranging from
> the teacher concerns to student issues. It's an
> intense project and so positive.

Emily went on to describe herself as a learner as she reflected on the training session in which she had just taken part.

> I take everything in stride. I think it helps me
> to balance my life. I have a variety of things
> going on in my personal and professional life and
> I think about what's important to me as I process

what I'm involved with. In my free time I do a

lot of reflecting on the meaning of life and with

those who I come in contact with. In one way I'm

very reflective and at the same time I'm a fast

learner, challenged by new things. I really like

processing information in a group, then

reflecting on all of the ideas until I assimilate

my own meaning. I really like the challenge of

being exposed to new information.

Emily discussed the joint project she was doing with

another middle school science teacher. Partly because she

was such a reflective teacher and also because she was so

involved with her students Emily expressed the excitement

she felt for the long-range telecommunications project she

was involved in.

The kids really like it. They enjoy getting

messages from other students. They have been

involved in a real long project with [another

school]. . . . [This other teacher and I] met at

the 5C5E program last summer and we had to work

on some sort of project and eventually decided

that what we would like to do would be to teach

our students what scientists actually do which is

to do experiments, to do some active

investigation. So we began our year off both he

and I, modeling an experiment, he and I did an

experiment and the experiments were originally

the same. At the end of that experimental

process, when we had our conclusion, we sent our

conclusion to [the other school's] bulletin

board, and they sent their conclusions to us.

After that introduction to experimentation, we

then had our students select individual topics

and develop their own problems to solve. Through

active investigation they designed and developed

their own experiments, performed their own

experiments, wrote them up as lab reports and

drew some conclusions and at the end of that

process they presented them to the class. . . .

The project has lasted all year, it has been a

very big undertaking.

Emily's management concerns were noted to be high in

March and the researcher questions whether one reason for

this may be due to the fact that Emily is so involved with

her students, presenting them with continual new

challenges. After discussing her long term project with

the researcher, Emily offered the following information

regarding the feedback she has received form her students.

The students really enjoyed doing their own

experiments, and I think they have enjoyed trying

to repeat experiments of other students. They

like the idea that they can talk back and forth

to each other and get feedback very quickly.

They do get very frustrated however when the

person they are writing to doesn't correspond

quickly. That is sometimes a problem because of

time during the school day. When you run on a

high school schedule it is really tough to allow

kids enough time to sit down at the computer and

type, and because their typing skills are so poor

they are so slow, so often during a class I only

get 2 to 3 kids on the bulletin board.

July 1993. After Emily completed the NSF/5C5E

telecommunications training, her SoCQ scores showed a

dramatic increase in her stage 5 and 6 (collaboration and

refocusing) concerns, management continued to be high.

During her LoU and clinical interviews she discussed her

excitement about implementing her newly acquired

information. When asked about strengths in using

telecommunications in the LoU interview, Emily described

her class.

I am able to teach in depth subjects and the

students really get into it, too. There is

always something new to find out and the mail

keeps coming in and [the students] get hooked and

want more.

As a follow up question, the researcher asked if she was

looking for any additional information about the

innovation. Emily gave the following response in her LoU

interview, which made a connection to the consequences

concern that was see in her SoCQ score.

Yes, I'm looking for general information about the use of the internet. I want to know what is out there that is usable in the science classroom. I want real science for the students to connect with. That has been a great focus of the 5C5E project, we do real science and then expose it to our students.

Emily then went on in her LoU interview to describe her continued work with the middle school teacher she was working with during the past school year.

This other teacher from the 5C5E project and I have really developed a very good, long term unit for our students and everyone in our classes is involved. It's really good to see the students grouping themselves into mixed groups and carrying our their experiments in cooperative learning model. I think just as the 5C5E project staff has modeled this for the teachers, it helped when [the other teacher and I] set up our plans for how we wanted our students to carry out their work. It goes both ways for success to be ensured, teachers have to work cooperatively and so do students.

Emily's stage 1 (informational) concern score dropped significantly, emphasizing her previously mentioned ability to incorporate new information easily. This was also

evident in her clinical interview when she gave the
following account.

> It's so much fun to be using telecommunications.
> I have networked with so many people over the
> bbs, it has brought a new dimension to my way of
> thinking. It has kept my thoughts stimulated.
> . . . The new information I am taking in daily is
> just falling into place. It's like I am building
> a puzzle.

October, 1993. Emily's third and final interview, six
weeks into the new school year, coincided with her leave of
absence from the school system for four months
(September-December). This may be reflected in the drop in
stage 3, 5 and 6 (management, collaboration and refocusing)
scores of the final SoCQ, but the researcher feels that
Emily's concerns demonstrate that, as she became more
comfortable with the use of the innovation, her stage 3
(management) scores dropped steadily during the course of
the study. Emily did, over time, implement the innovation
into her classroom setting. She reflects how she managed
it each step of the way.

> I have opened up something to myself and my
> students that is exciting. We now have a
> resource that will connect us with current,
> global information very quickly. I look back to
> when I started using the bbs. I have, over time,
> gotten many more students onto the bbs weekly,

then when I first started. I feel like I am

working some sort of a schedule out in my mind to

keep the flow going. When I return to school in

January, I think I will be able to manage this .

. . my mind is ever racing to keep it all

juggling. I think about ways to keep it all

going in a smoother way.

In her LoU and clinical interviews, Emily demonstrated
confidence in her teaching ability, which is also reflected
in her consistently low stage 2 (personal) SoCQ scores.
During the LoU interview, Emily discussed her confidence in
herself as a person.

I love learning new things and learning about

telecommunications was a real challenge. I think

I assimilate new information fast. I have opened

up something to myself and my students that is

exciting.

During the LoU interview Emily, offered some
information about her work in collaborating with others.
These comments linked with her previous thought about being
a lifelong learner.

I feel like I am a good teacher and I relate well

to students. We do meaning[ful], interesting

projects. I have the confidence to take risks

and I am a good listener and want to incorporate

other people's ideas into my teaching.

In order to find out more about Emily's perception of
her change in attitude, the researcher asked her during the
clinical interview if she thought she had changed in her
desire to use the innovation. Emily's answer demonstrated
how some of her anxiety around the use of telecommunica-
tions in the classroom had lessened over time and with
experience.

> After having been part of the 5C5E project for
> many months, I have had time to really think
> about what has gone on with myself and with my
> students. I have gained so much information in
> the use of telecommunications and I have a very
> good support system to turn to when networking at
> the colleague level and when needing technical
> support with the technology. My administration
> has been very supportive in working with me to
> get a dedicated phone line into my classroom and
> in assisting me in getting good computer
> equipment. The change I have gone through has
> increased my desire to use telecommunications
> with my students. It has been a joint effort in
> me doing this and I am feeling more and more
> comfortable each step along the way.

Summary. Although Emily was a novice in the use of
telecommunications, having used the innovation for less
than one year, within two months of the first NSF/5C5E
training session, she had incorporated her new knowledge of

telecommunications into the classroom. Emily's confidence, ability to incorporate new information readily, and enthusiasm for the innovation were all clearly demonstrated in the researcher's field notes, her SoCQ scores, and her interviews (Table 8). Also, she aggressively collaborated with another participant and continued this relationship throughout most of the study period. She was also the only departmentalized teacher who gave data on this type of management situation.

Conclusion

This chapter has presented the words of classroom teachers and explored their thoughts on a variety of ideas concerning the change they went through during the implementing of telecommunications in their classrooms. The sources of the data concerning teachers' thoughts as they went about implementing the innovations were qualitative and quantitative in nature. Through classroom observations, questionnaires and interviews, data were analyzed and findings were confirmed. The final chapter will address the findings this study identified along with recommendations and implications for future research.

Table 8

A Profile of the Overall Level of Use: Emily

				Categories of Use				
Month	Knowledge	Acquiring Information	Sharing	Assessing	Planning	Status Reporting	Performing	Overall LoU
March	IVb	IVb	IVb	IVb	IVB	IVb	IVb	IVb
July	V	V	V	V	V	V	V	V
October	V	V	V	V	V	V	V	III

KEY: Level III.   Mechanical Use. State in which the user focuses most effort on the short-term, day-to-day use of the innovation with little time for reflection. Use is often disjointed and superficial.

Level IVa.   Routine Use. Use of innovation is stabilized with little variation inpattern of use.

Level IVb.   Refinement. Use of innovation is varied to increase impact on clients.

Level V.   Integration. User collaborates with others in use of innovation to expand impact on clients.

Level VI.   User re-evaluates the quality of use of the innovation, seeks major modifications of or alternatives to present innovation to achieve increased impact on clients, examines new developments in the field, and explores new goals for self and the system.

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C H A P T E R   V

SUMMARY, FINDINGS, RECOMMENDATIONS AND IMPLICATIONS

<u>Summary</u>

The primary purpose of this research project was to monitor the change of individual teachers in their use of an innovation as a function of their participation in an institutionally supported staff development program. It may seem reasonable to assume that staff development and continued support automatically bring about a desired change, but research indicates that change is very complex (Goodson, 1992). A multiplicity of different beliefs may be influencing a teacher's practice at any given time with various levels of intensity and focus. Another factor in teacher change is the influence of a teacher's background, both as student and as a teacher. A third factor lies in the external forces that may be beyond the teacher's control.

This study focused on middle school teachers and their change in response to the NSF/5C5E project. As the country's policymakers undertake the immense task of curricular reform and address issues around telecommunications, it will be important to consider the needs of the teachers, who will be the agents of that reform. Through monitoring teachers' change in the use of telecommunications in the classroom this researcher

believes that some of their needs for future successful implementation can be ascertained.

Problem

Schools are one of the primary institutions devoted to human development in this country. Their function is to foster and encourage the growth of the community of children so that they may be functioning members of the larger community. As technology advances and information can be transmitted almost instantly across the world, the greater community reaches far beyond state or even country boundaries. As people and nations are increasingly connected with one another economically, politically, and technologically, schools must assume the responsibility of furnishing students with the information they will need to make sense of the global community.

Unfortunately, much of the educational reform rhetoric ignores this responsibility. There does not appear to be a substantial base of information for curriculum designers and administrators to use in devising effective telecommunications programs in the schools. Another symptom of this lack of information is the fact that many teachers or schools that may want to implement such a program, and even have the resources, do not know enough about training and support to sustain the project for any length of time.

Methodology

The research setting was three rural elementary
schools and one rural high school which started at grade
seven. The teachers were chosen from a group of 54
teachers participating in a NSF/5C5E environmental
education project which contained a telecommunications
component. They were selected based on criteria mostly
having to do with location and teacher experience. This
resulted in a participant population of five, white, female
teachers.

The modes of inquiry selected incorporated both
quantitative and qualitative approaches to data gathering.
This method of triangulation was selected to enhance the
accuracy and validity of the research findings.
Quantitative methods included the use of the Stages of
Concern Questionnaire developed by the research and
development center for teacher education at the University
of Texas in Austin (Hall, et al., 1979). Qualitative
methods used included classroom observations, the Level of
Use Interview, also developed at the University of Texas in
Austin, and a clinical interview which was used for
clarification and enhancement of the LoU Interview.

The data were gathered in the following sequence and
time frame: the telecommunications questionnaire was
administered in January 1993, the SoCQ, the LoU, and the
clinical interviews were administered to each teacher in
March, July and October of 1993 and the classroom

observations were conducted in March and again in June of 1993. These tools may serve as a useful guide for administrators and innovators during an implementation process, this researcher found them useful in eliciting change teachers were going through while implementing telecommunications into their classrooms. The SoCQ was designed as a quantitative measure of stages of concern about an innovation. Interpretation may be simple or complex depending on the researcher's needs. An alternative measure to the SoCQ is an interview format. Both measures were used in this study.

Regardless of which method is used, information about concerns can provide valuable information for administrators and innovators. It is recommended that administrators and innovators receive adequate training in the theory and practice of the Concerns Based Adoption Model and use this method regularly to determine individual and group interventions in change efforts.

Findings

Teacher Discussion

Although each of the five teachers is unique, each has traits or combinations of traits which are familiar to all of us and remind us of people we know. While no attempt should be made to generalize these findings to all teachers, these commonalities among these five teachers and

others can be used as guides for innovators when seeking to develop guidelines and resources for special situations.

The following will be a short discussion of each of the teachers in which their special personalities and learning attributes will be discussed. The reader may then be able to apply findings from this study to teachers in other given situations. It is important to note here that the researcher is reporting teacher-stated perceptions.

Anna, a methodical, analytical individual needed and appreciated support as she was implementing telecommunications in her classroom. At times, she found it stressful to manage the daily requirements to keep her project going. Because of this, it will be important for administrators and innovators to consider the importance of a gradual process of implementation when working with teachers such as Anna supporting them along their way.

Betty, a spontaneous person, one who thrives on taking risks and is capable of juggling many things at once, might be encouraged to share with the staff or district her involvement with the innovation. This would help to keep such individuals focused, involved and feeling empowered by the leadership role. Betty did comment on the fact that she wanted to take on a leadership role and this should be encouraged whenever possible. Aside from this, it is also important to remember that, regardless of the innovation, people make choices based on personal needs and the

innovation implementation process may be slowed down or halted for periods of time.

Carmen could be characterized as a go getter, one who is dedicated to using the innovation and one who has a steadily increasing success in using it. It is important for such individuals to be encouraged. At the same time, the researcher believes that it will be important for administrators or innovators to think about how such people are teamed up with others in sharing their knowledge. In this research, it is possible that Donna was reticent in asking any favors of Carmen. Enthusiastic people are to be encouraged; administrators and innovators should not hold the excitement back but at the same time enthusiastic people paired up with those who might be intimidated, might unwittingly appear unwilling to share what they know. It is also important to mention here that, as a dedicated telecommunications user, the researcher is aware that when a phone line is shared, limited time is possible for the next classroom of students. It is optimal to have multiple classes involved but with this comes a limited amount of actual on-line time.

Donna, a teacher who has taken advantage of varied staff development training programs, was never able to actually implement telecommunications in her classroom. It appeared that she had major management concerns during the project and it would be important for administrators or innovators to probe deeper into Donna's thinking to get at

the real issues. It appears that, except for Donna, the other teachers in this study were able to adjust to change as they went about implementing the innovation.

Emily, also a methodical person, one who likes the challenge of learning new things, was the only member of the research project in a departmentalized setting. She grappled with the question of how she could keep her students using telecommunications within the limited time frame and with limited hardware. Electronic technology, and in particular fiber optics, may help with this issue in allowing a greater number of students to use telecommunications even when only one phone line is available. This technological advancement will solve many classroom problems surrounding the issue of telecommunications connections. This appears to be the case for people such as Emily. This next section will discuss the more general findings from this study.

General Discussion

In order for teachers to effectively implement telecommunications in the classroom they must be provided with visionary administrative support which in turn can provide for effective telecommunications in-service training. The major issues that surround the implementation and use of telecommunications in the classroom were summarized from the teacher profiles and are presented here.

1. Planning and training

2. Informational and technical support

3. Administrative support

4. Integration into the curriculum

5. Mentoring

6. Teacher collaboration

Recommendations

Recommendations of Findings

This dissertation has identified some of the important points in teaching environments and teaching practices that help teachers use telecommunications in their classrooms. The teachers were, indeed, a small group of people to target, and it will be important to look at larger numbers with more diverse backgrounds and classrooms as telecommunications becomes a widely used educational resource. Leaders in this field and those making decisions about the innovation will need to look at teacher training and support, long-range district planning, curricula where the innovation is incorporated, effective assessment tools and financial support at all levels of implementation. The group of teachers represented here is a special group which has gone through intensive staff development training outside of their school system. They are experienced in this field and have been using computers for some years. The following is the list of the issues and an explanation concerning them.

1. __Planning and Training__. This research found
consistent associations between the presence of
telecommunications usage and substantial investment in
support and training of personnel. As with all research,
the direction of cause and effect is a question that must
be carefully examined. This research suggests that
projects choosing to invest larger amounts of
administrative and faculty time on staff development and
support generate more sophisticated and accomplished
telecommunication-using teachers. It was also noted by
some research participants that it is important that there
be equity in telecommunications access to __all__ students
regardless of their sex, ability, and ethnic groupings.
School policies fall on a continuum from having no policies
at all, where the parents, teachers, administrators or
students are allowed to determine who will use them; to
priorities being set among uses for subject areas, grade
levels or special populations.

All five teachers mentioned the importance of their
NSF/5C5E telecommunications training in their use of the
innovation. They spoke continually of the need for that
training and information and that the NSF/5C5E project
provided that training. The teachers believed that the
pre-training and continued training that the project
offered were crucial to the success of the use of the
innovation in the classroom.

2. Informational and Technical Support. One
consistent theme that teachers mentioned was the need to
invest heavily in staff development and technical support
after the project began. Teachers felt that much of their
success could be attributed to the NSF/5C5E project staff
whom they could turn for support. In fact, four of the
teachers began using telecommunications at the suggestion
of a previous NSF funded project, NSF/SpaceMet, project
#8850948. Having access to formal staff development
activities was also an important point mentioned by all of
the teachers and they felt three of the activities were
considered very important:

- the initial instruction in how to access a local
    bulletin board
- the formal training in using telecommunications with
    the specific subject matter that they taught: stream
    studies, weather data, plant/insect studies
- on-going support for participants

The researcher feels very strongly that the NSF/5C5E
project could be used as a model for giving this technical
support.

3. Administrative Support. One participant in this
study continually mentioned the lack of administrative
support as a roadblock. Other teachers mentioned positive
administrative support as a vehicle in implementing and
sustaining the innovation. If the SoCQ is used as an
instrument in gaining information about the change process,

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the researcher believes that it will be important to look at people whose questionnaires demonstrate high management concerns. It appears that they should be targeted for additional support. Had the researcher been the supervisor with Donna, the reason for her non use could have been probed and addressed. It appears that there needs to be discussion and agreement between teachers and administrators around their visions for the use of the innovation so that common ground is supportive. Teachers did mention that they thought the innovation should be used in activities that have implications and meaning in the real world, rather than as an end in and of itself. The researcher recommends that the SoCQ and the LoU instruments be used as tools when implementing innovations. These instruments target concerns of teachers and information gained from the tools can be used to probe more deeply into those concerns.

In four out of the five cases the SoCQ and the LoU showed the teachers concerns at given times, but, in the fifth case, Donna's, all the words were there but the action never took place. The use of the SoCQ for whoever is advocating the innovations is not foolproof but it could be used to great advantage. In the case of Donna, her concerns regarding management and support were so strong, talking with her about all of the reasons for <u>not</u> using telecommunications could have brought her fears out into the open and then they could have been addressed. For

example, an administrator might have been able to negotiate a meeting between Carmen and Donna, in which the use of the phone line could have been discussed and concerns could have been brought to the surface. This points to the fact that the SoCQ and the LoU can be a research tool and also used as a tool for innovators. It is a tool for observing change over time and for supporting teachers in their communication of needs.

4. <u>Integration into the Curriculum</u>. Four teachers using telecommunications in their classrooms talked about having made a change in the way they address curriculum topics as they introduced the tool of telecommunications into their school day. The four teachers mentioned the potential to alter curriculum coverage as they began to network outside their classroom, as the teachers and students shared their work with others. Using telecommunications, they talked about teaching more subjects in-depth as students did long-term projects "over the network" and explored other topics of interest.

Four of the teachers also mentioned that projects and sharing of student work on the electronic bulletin board has allowed them to focus on current, interesting curricula relating to real life topics of study. These same teachers also expressed the freedom they felt in their classrooms to integrate telecommunications into learning and instruction, and had a sense that whatever they did in their classroom was acceptable. It is important, therefore, for teachers

and administrators to allow for flexibility and room within the current curricular structure to incorporate the use of telecommunications into long-term projects where students are researchers gathering information and sharing it with their peers. This researcher also believes that teachers should look at themselves as researchers. It can lead to increased collegiality, a sense of empowerment and increased self-esteem. It is this researcher's belief that teacher-researchers view themselves as being more open to change, more reflective, and better informed than they had been when they began their research, all of this being important when implementing innovations into the classroom.

5. Mentoring. Teachers described mentoring which provided support for them as they were implementing an innovation into their curriculum. These same teachers said this support would be helpful as they adjusted to the innovation and its new expectations. The teachers mentioned the role of the mentor as being someone who might accelerate the implementation process and be there, for occasional on site assistance and support. Teachers explained the need to have someone in their school building at various times, someone who could be involved during the school day and work with the students and staff in the use of the innovation, exposing them to new and expanded areas, and troubleshooting roadblocks. It is the researcher's belief that the feasibility of a technology specialist or other interested teacher assisting colleagues during

telecommunications implementation is a worthy investment.
The researcher also believes that it is not too much to
expect all teachers to have such skills since all students
should have the opportunity to use this technology.

      6. Teacher Collaboration. Teachers who maintain a
social network with others, through telecommunications feel
connected as well as supported in their efforts to continue
with the innovation. Furthermore, the sustained use of
telecommunications to accomplish a goal proved to be a
common thread running through four of the five teacher
interviews. Where there was organized, on-going support
for telecommunication, in the form of staff development
activities and a technical support role, this was seen as a
positive force necessary in order to implement and sustain
telecommunications in the schools. Teachers did mention
that much of their professional lives were spent out of
sight of other adults. They noted the need to have access
to other people from whom they could learn; either experts
who have already mastered the resource or a community of
teacher-learners who were pooling their effort and their
exploratory findings.

      To help remedy this situation, it appears that four of
the five research participants created an environment in
which they connected with one another in their use of
telecommunications. Teachers felt that, coupled with the
volume of computer use, it was the culture in which that
use was embedded, cooperative projects, long-term research

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projects, and problem solving activities that create the positive conditions for telecommunications. Something to consider here is the fact that telecommunications can be used as its own support system, reducing the isolation that teachers feel in their daily routine and when confronted with an innovation.

Evaluation of the Study

The researcher believes the research design was effective and representative in eliciting information regarding the change process and descriptions of experiences that the five teachers were going through. Each of them seemed to enjoy the interaction during the course of the study. One of the most gratifying things in the course of this dissertation research was the willingness of these five highly professional teachers to work with the researcher as intensely as they did. During the research and even now the researcher feels welcome in their rooms. The researcher thinks the only real area of frustration was that they frequently articulated a desire for feedback and assistance which, of course, the researcher could not provide in the context of the research. The teachers understood this, but could not help occasionally asking for it. Offering the NSF/5C5E support staff as a way to provide assistance where they could get their needs met, was the best the researcher could offer them.

Recommendations for Further Study

This study, resulted in many unanswered questions and suggests many directions one might take to conduct research on planning and implementing innovations. Incorporated into the suggestions for future research are areas in which the researcher could have conducted the study differently.

A) <u>Long-term Research</u>. Studies of specific innovations over periods of one to two years are rare. There is great potential for obtaining new and important information about effective inservice by studying the introduction and implementation of an innovation over time. Within this suggestion, research on implementation might be carried out using the Levels of Use interview developed by the Research and Development Center for Teacher Education at the University of Texas at Austin (Hall, et al., 1979). The researcher could have begun this study at the inception of the NSF/5C5E project and followed the teachers over a longer period of time. This would have allowed the researcher to delve deeper into the teachers' thought processes and to probe their thinking to a new level. The interview format would have allowed for this, and one interview could have built on the next. This researcher also believes that a study is needed which builds on the present research, using the

mentoring strategy in implementing
telecommunications with a larger sample of
teachers over a longer period of time.

B) <u>Larger and More Diverse Groups</u>. Since this study
focused on the innovation of telecommunications
within middle school/rural school settings, with
white female teachers, forming generalizations
concerning the use of the model with other groups
is difficult. Studies of this nature need to
focus on urban and suburban schools and
elementary and high school settings and various
innovations in other curriculum areas as well as
a more diverse teaching population/mixed gender
group. Total involvement of all school staff
members would provide an additional variation.
The involvement of parents in inservice programs
also needs study. The researcher feels that it
would have been valuable to work with a larger
research population to see if any generalizations
could be made regarding the change process
teachers go through in relationship to their
personalties.

C) <u>Learning and Personality Style</u>. Each teacher is
unique in many ways, as is each classroom. More
research on how teachers' learning styles affect
their perception of and reception to staff
development models could provide valuable

information. For some, telecommunications may be a concern that is overwhelming, for others it is seen as matter to be solved. As stated above, the researcher would liked to have delved into the personalities of teachers as a factor of change. With the use of daily logs, the researcher could have interacted with the teachers within the logs, probing their teaching practices.

D) Student Change. This study did not gather any substantive data on student change as a result of the staff development model. Further research could look at the means and amount of influence the model has upon the students involved. It would have been interesting for the researcher to have students keep logs of their activities regarding the use of telecommunications and to have compared this data with the teachers' data regarding the changes that were taking place.

In conclusion, the results of this exploratory study are encouraging, although much remains to be studied. The effectiveness of the intense, institutionally supported staff development project for introducing telecommunications to teachers is encouraging, given the complex demands of a technological society on public education.

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APPENDIX A

TELECOMMUNICATIONS QUESTIONNAIRE

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Dates:              January 1993
To:                 5C5E participants
From:               Mort Sternheim and Mary Alice Wilson
Subject:            Telecommunications Questionnaire
```

Attached is a questionnaire concerning your background in computers and telecommunications. We plan to use the information from this to help us understand how we can better assist teachers to use telecommunications.

Diana Campbell is assisting us with this survey, and would like to use some of the data in connection with a research project she is doing in conjunction with her graduate work at the University of Massachusetts. No names will appear in her research. Please indicate if she may use your questionnaire as part of her study.

_____I give permission for Diana Campbell to include my responses in her research.

_____I do not give permission for Diana Campbell to include my responses in her research.

Please sign:_____

TELECOMMUNICATIONS RESEARCH INFORMATION

Today's date _____

Name _____

Fall Teaching
Assignment _____

Total Number of years
teaching _____

Number of years teaching at present
location _____

Is your school setting:

urban_____   suburban_____   rural_____

B.A. and higher degrees to
date_____._____

Degree work in
progress_____

How would you best describe your classroom teaching model:
self-contained_____
team teaching in a shared space_____
departmentalized model_____

Questions 1 - 11 pertain to the computer

  1. Number and type(s) of computers in your
      home_____

      _____

  2. Number and type(s) of computers in your
      classroom_____

      _____

  3. Number of other computers available to you and
      students in your school _____

  4. If you have a computer lab in your school, how many
      hours per week do you use it with your students?

      _____

  5. Do you have a phone line in your classroom?_____   If
      yes, is it a dedicated line?_____

6. Do you have a dedicated phone line elsewhere in your school for you to use for telecommunications?
   _____

7. Number of separate phone lines into your home
   _____

8. How often do you use computers and for what purpose?

   _____never
   _____rarely
   _____daily for_____
   _____ 2-3 times a week for _____
   _____ 1-3 times a month for _____

9. What fraction of your computer use is done at school rather than at home?

   _____all at school
   _____mostly at school
   _____1/2 and 1/2
   _____mostly at home
   _____ all at home

10. Have you taken any computer workshops in the past 3 years ? _____ If so, on what topics?

    _____
    _____

11. What activities do your students do on the computer?

    _____ drill and practice   _____ word processing
    _____ daily   _____ daily
    _____ 2-3 times a week   _____ 2-3 times a week
    _____ 1-3 times/month   _____ 1-3 times/month

    _____ games   _____ basic programming
    _____ daily   _____ daily
    _____ 2-3 times a week   _____ 2-3 times a week
    _____ 1-3 times a month   _____ 1-3 times a month

    _____data base experiences
    (please explain)_____
    _____

    _____telecommunications
    (please explain)_____
    _____

    _____other
    (please explain)_____
    _____

Questions 12 - 16 pertain to telecommunications

12. Do you use telecommunications outside of the classroom? (check off any and all appropriate slots)

_____on a personal basis
_____with students
_____ other (describe)

13. Rate your knowledge with telecommunications via computers

_____none
_____beginner
_____intermediate
_____advanced
_____have taught telecommunications

14. In your classroom, is telecommunications used for: (check off choices)

_____ students at random
_____all students
_____learning impaired students
_____advanced students
_____for reward/recess times
_____not at all

15. How do you rate your interest in telecommunications?

_____oppose the innovation
_____not interested
_____neutral
_____ somewhat interested
_____highly interested

16. How important do you think it is for your students to learn about telecommunications?

_____negative
_____not important
_____neutral
_____somewhat important
_____highly important

Questions 17- 18 pertain to support and special projects

17. What kind of support is given to you by your
     principal/superintendent for projects or innovations?

          _____release time
          _____funding for attendance at conferences
          _____money to purchase materials
          _____none
          _____other (please explain)
          _____
          _____
          _____

18. Have you been involved in any special projects or
     innovations in the past year?
     please explain_____
     _____
     _____

19. Further comments you might want to share with regard
     to computers/ telecommunications_____
     _____
     _____

     Thanks for your time with this!

APPENDIX B

LoU INTERVIEW GUIDE

LoU Interview Guide

What do you see as the strengths and weaknesses of the innovation in your situation? Have you made any attempt to do anything about the weakness? (Probe those they mention specifically.)

Are you currently looking for any information about the innovation? What kind? For what purpose?

Do you ever talk with others about the innovation? What do you tell them?

What do you see as being the effects of the innovation? In what way have you determined this? Are you doing any evaluating, either formally or informally, of your use of the innovation? Have you received any feedback from students? What have you done with the information you get?

Have you made any changes recently in how you use the innovation? What? Why? How recently? Are you considering making any changes?

As you look ahead to later this year, what plans do you have in relation to your use of the innovation?

Are you working with others in your use of the innovation? Have you made any changes in your use of the innovation based on this coordination?

Are you considering or planning to make major modifications or replace the innovation at this time?

LoU Probes

How do you work together? How frequently? What do you see as the strengths and the weaknesses of this collaboration? Are you looking for any particular kind of information in relation to this collaboration?

When you talk to others about your collaboration, what do you share with them? Have you done any formal or informal evaluation of how your collaboration is working? What plans do you have for this collaborative effort in the future?

APPENDIX C

CONCERNS QUESTIONNAIRE

Name (Optional) _____

Date Completed _____

It is very important for continuity in processing this data that we have a unique number that you can remember. Please use:

Last 4 digits SS#: ___ ___ ___ ___

The purpose of this questionnaire is to determine what people who are using or thinking about using various programs are concerned about at various times during the innovation adoption process. The items were developed from typical responses of school and college teaches who range from no knowledge at all about various innovations to many years experience in using them. Therefore, a good part of the items may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, please circle "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale, according to the explanation at the top of each of the following pages.

For example:

0 1 2 3 4 5 6 7   This statement is very true of me at this
                    time.
0 1 2 3 4 5 6 7   This statement is somewhat true of me now.
0 1 2 3 4 5 6 7   This statement is not at all true of me at
                    this time.
0 1 2 3 4 5 6 7   This statement seems irrelevant to me.

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with TELECOMMUNICATIONS. We do not hold to any one definition of this innovation, so please think of it in terms of your own perception of what it involves. Since this questionnaire is used for a variety of innovations, the name TELECOMMUNICATIONS never appears. However, phrases such as "the innovation," "this approach," and "the new system" all refer to TELECOMMUNICATIONS. Remember to respond to each item in terms of your present concerns about your involvement or potential involvement with TELECOMMUNICATIONS.

Thank you for taking time to complete this task.

A.2 SoC QUESTIONNAIRE ITEMS

0	1	2	3	4	5	6	7
Not true of me now		Somewhat true of me now				Very true of me now	

0 1 2 3 4 5 6 7   I am concerned about students' attitudes toward this innovation.

0 1 2 3 4 5 6 7   I now know of some other approaches that might work better.

0 1 2 3 4 5 6 7   I don't even know what the innovation is.

0 1 2 3 4 5 6 7   I am concerned about not having enough time to organize myself each day.

0 1 2 3 4 5 6 7   I would like to help other faculty in their use of the innovation.

0 1 2 3 4 5 6 7   I have a very limited knowledge about the innovation.

0 1 2 3 4 5 6 7   I would like to know the effect of reorganization on my professional status.

0 1 2 3 4 5 6 7   I am concerned about conflict between my interests and my responsibilities.

0 1 2 3 4 5 6 7   I am concerned about revising my use of the innovation.

0 1 2 3 4 5 6 7   I would like to develop working relationships with both our faculty and outside faculty using this innovation.

0 1 2 3 4 5 6 7   I am concerned about how the innovation affects students.

0 1 2 3 4 5 6 7   I am not concerned about this innovation.

0 1 2 3 4 5 6 7   I would like to know who will make the decisions in the new system.

0 1 2 3 4 5 6 7   I would like to discuss the possibility of using the innovation.

0 1 2 3 4 5 6 7   I would like to know what resources are available if we decide to adopt this innovation.

0 1 2 3 4 5 6 7   I am concerned about my inability to manage all the innovation requires.

0 1 2 3 4 5 6 7   I would like to know how my teaching or administration is supposed to change.

0 1 2 3 4 5 6 7   I would like to familiarize other departments or persons with the progress of this new approach.

0 1 2 3 4 5 6 7   I am concerned about evaluating my impact on students.

0 1 2 3 4 5 6 7   I would like to revise the innovation's instructional approach.

```
      0    1                  2    3    4    5              6    7
Not true of me now      Somewhat true of me now      Very true of me now


0 1 2 3 4 5 6 7    I am completely occupied with other things.

0 1 2 3 4 5 6 7    I would like to modify our use of the innovation
                   based on the experiences of our students.

0 1 2 3 4 5 6 7    Although I don't know about this innovation, I am
                   concerned about things in the area.

0 1 2 3 4 5 6 7    I would like to excite my students about their parts
                   in this approach.

0 1 2 3 4 5 6 7    I am concerned about time spend working with
                   nonacademic problems related to this innovation.

0 1 2 3 4 5 6 7    I would like to know what the use of the innovation
                   will require in the immediate future.

0 1 2 3 4 5 6 7    I would like to coordinate my effort with others to
                   maximize the innovation's effects.

0 1 2 3 4 5 6 7    I would like to have more information on time and
                   energy commitments required by this innovation.

0 1 2 3 4 5 6 7    I would like to know what other faculty are doing in
                   this area.

0 1 2 3 4 5 6 7    At this time, I am not interested in learning about
                   this innovation.

0 1 2 3 4 5 6 7    I would like to determine how to supplement,
                   enhance, or replace the innovation.

0 1 2 3 4 5 6 7    I would like to use feedback from students to change
                   the program.

0 1 2 3 4 5 6 7    I would like to know how my role will change when I
                   am using the innovation.

0 1 2 3 4 5 6 7    Coordination of tasks and people is taking too much
                   of my time.

0 1 2 3 4 5 6 7    I would like to know how this innovation is better
                   than what we have now.
```

APPENDIX D

STAGES OF CONCERN ABOUT THE INNOVATION

0	AWARENESS:	Little concern about or involved with the innovation is indicated.
1	INFORMATIONAL:	A general awareness of the innovation and interest in learning more detail about it is indicated. The person seems to be unworried about himself/herself in relation to the innovation. She/he is interested in substantive aspects of the innovation in a selfless manner such as general characteristics, effects, and requirements for use.
2	PERSONAL:	Individual is uncertain about the demands of the innovation, his/her inadequacy to meet those demands, and his/her role in relation to the reward structure of the organization, decision making and consideration of potential conflicts with existing structures or personal commitment. Financial or status implications of the program for self and colleagues may also be reflected.
3	MANAGEMENT:	Attention is focused on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, scheduling, and time demands are utmost.
4	CONSEQUENCE:	Attention focuses on impact of the innovation on students in his/her immediate sphere of influence. The focus is on relevance of the innovation for students, evaluation of student outcomes, including performance and competencies, and changes needed to increase student outcomes.
5	COLLABORATION:	The focus is on coordination and cooperation with others regarding use of the innovation.
6	REFOCUSING:	The focus is on exploration of more universal benefits from the innovation, including the possibility of major changes or replacement with a more powerful alternative. Individual has definite ideas about alternatives to the proposed or existing form of the innovation.

Original concept from Hall, G.E., Wallace, R.C., Jr., & Dossett, W.A. A developmental conceptualization of the adoption process within educational institutions. Austin: Research and Development Center for Teacher Education, The University of Texas, 1973.

Statements on the Stages of Concern Questionnaire Arranged According to Stage

Item Number	Statement

STAGE 0

3	I don't even know what the innovation is.
12	I am not concerned about this innovation.
21	I am completely occupied with other things.
23	Although I don't know about this innovation, I am concerned about things in the area.
30	At this time, I am not interested in learning about this innovation.

STAGE 1

6	I have a very limited knowledge about the innovation.
14	I would like to discuss the possibility of using the innovation.
15	I would like to know what resources are available if we decide to adopt this innovation.
26	I would like to know what the use of the innovation will require in the immediate future.
35	I would like to know how this innovation is better than what we have now.

STAGE 2

7	I would like to know the effect of reorganization on my professional status.
13	I would like to know who will make the decisions in the new system.
17	I would like to know how my teaching or administration is supposed to change.
28	I would like to have more information on time and energy commitments required by this innovation.

STAGE 3

4	I am concerned about not having enough time to organize myself each day.
8	I am concerned about conflict between my interests and my responsibilities.
16	I am concerned about my inability to manage all the innovation requires.
25	I am concerned about time spent working with non-academic problems related to this innovation.
34	Coordination of tasks and people is taking too much of my time.

STAGE 4

1	I am concerned about student's attitudes toward this innovation.
11	I am concerned about how the innovation affects students.
19	I am concerned about evaluating my impact on students.
24	I would like to excite my students about their part in this approach.
32	I would like to use feedback from students to change the program.

STAGE 5

5	I would like to help other faculty in their use of this innovation.
10	I would like to develop working relationships with both our faculty and outside faculty using this innovation.
18	I would like to familiarize other departments or persons with the progress of this new approach.
27	I would like to coordinate my effort with others to maximize the innovation's effects.
29	I would like to know what other faculty are doing in this area.

STAGE 6

2	I now know of some other approaches that might work better.
9	I am concerned about revising my use of the innovation.
20	I would like to revise the innovation's instructional approach.
22	I would like to modify our use of the innovation based on the experiences of our students.
31	I would like to determine how to supplement, enhance, or replace the innovation.

APPENDIX E

THE NSF/5C5E PROJECT DESCRIPTION

THE FIVE COLLEGE EDUCATION IN THE

EARTH'S ENVIRONMENT, ECOLOGY, AND ENERGY PROJECT

An Environmental Science Research Project
of Teachers Grades 4-9

Project Directors:

Morton M. Sternheim
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    and Astronomy
University of Mass.
Amherst, MA 01003
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The Model: Environmental science offers an exciting vehicle for introducing middle school students to scientific research. The NSF/5C5E project provides teachers with the basic scientific information underlying environmental issues, acquaints them with the relevant teaching materials and techniques, and, most importantly, helps them to undertake meaningful research in environmental problems and to lead their students in conducting their own studies.

NSF/5C5E focuses on three broad areas:

Atmosphere: stratospheric and ground-level ozone, global chemical cycles, physics of the atmosphere, global circulation and acid rain, global warming and the GAIA hypothesis. Projects include weather, climate, and air quality monitoring.

Geosphere: earth as a living planet (atmosphere-ocean-crust interactions, mobile crust/self-renewal, people-resources-pollution), the water planet (rainfall-chemical composition, ground water-origin/use/protection, streams and rivers-changes in flow/flooding/environmental impact). Projects include stream monitoring for flow and water chemistry.

Biosphere: ecology as a study of diversity/ complexity/interactions, sampling and manipulative experiments, ecology of agriculture and integrated pest management. Projects include indoor and outdoor plant/insect sampling and experiments.

Teachers are introduced to all three areas and join a research community working in one area. In the summer, members of the community decide on common research activities that each participant will pursue. Working individually or in small groups, members also carry out more specialized research projects. During the academic year, the students participate in a similar research community experience in their classrooms. Teachers return for a one-week summer institute to report on their work and to plan future projects.

Schedule: A total of 120 teachers and school staff were selected as NSF/5C5E Scholars to participate in the two cycles of this National Science Foundation project (1992-93 and 1993-94). Many came as part of school teams led by a science teacher and including other subject area teachers or a principal, librarian, or guidance counselor. Each Scholar attends:

3 Saturday introductory workshops in the spring

a 3-week non-residential summer institute at the University of Massachusetts of workshops on the three environmental areas, research procedures, effective instructional strategies, and the use of computers for data analysis, reporting, and telecommunication

Participants spend the morning in background lecture/ demonstration/discussion and the afternoon as a member of one of the three research communities

6 academic year events to report and reflect on teacher and student research

a 1-week second summer institute to report on the year and to plan for the future

follow-up activities including additional workshops and presentations at professional meetings

Stipend/Credit: Each NSF/5C5E Scholar receives a stipend of $1,020 for the first spring-summer program and $480 for the academic year and second summer. Scholars are also eligible for 6 graduate credits in Education from the University of Massachusetts.

Staff: The project is directed by Morton M. Sternheim, Department of Physics and Astronomy, University of Massachusetts and Mary Alice B. Wilson, Coordinator, Five College/Public School Partnership. Staff members for the second cycle are:

Carolyn Boardman (Research Support Coordinator)
Quentin Clark, University of Massachusetts '94 (Student
        Assistant)
Terry Dun, Computers and Electronics, Franklin County
        Technical School (Telecommunications Training and
        System Operator)
Nancy English, Woodland School, Southwick (Geosphere)
Wendy Kohler, Amherst-Pelham Junior High School
        (Evaluation)
Wanita Sioui Laffond, Buckland Shelburne School
        (Evaluation)
Claudia Pittman Lee, Kennedy Middle School, Springfield
        (Atmosphere)
Rena Moore, Pelham Elementary School (Biosphere)
Maura O'Leary, University of Massachusetts '93 (Student
        Assistant)
Stephen Schneider, Physics and Astronomy, University of
        Massachusetts (Atmosphere)
Brian Schultz, Entomology, Hampshire College (Biosphere)
Helen Sternheim, University of Massachusetts
        (Telecommunications Training and System Operator)
Richard Yuretich, Geology, University of Massachusetts
        (Geosphere)

Resource Center: The NSF/5C5E project and the
Partnership's earlier NSF/SpaceMet project are supported by
a Resource Center at the University of Massachusetts of
print materials, videotapes, slide packets, and kits. An
on-line catalog is available.

Telecommunications: The SpaceMet Network is a system of
free, multiuser microcomputer electronic bulletin boards
run for teachers and students. It is accessible by local
phone calls in several western Massachusetts location and
via the Internet from anywhere in the world. A new
bulletin board service, UMassK12, is a full Internet site
which allows up to 100 concurrent users real time access to
worldwide resources via telnet, gopher, ftp, etc. SpaceMet
and UMassK12 exchange messages and echomail (newsgroups).
Support for the boards is provided by NSF/5C5E, the
University of Massachusetts, Five College, Inc., Franklin
County Technical School, and MassNet.

SpaceMet and UMassK12 give students and teachers the
opportunity to obtain information and share ideas.
Participants can take part in projects with their
counterparts in the next town or across the globe. The NSF
Scholars and their classes use the boards to meet each
other and to exchange their research data and conclusions.
For more information, call the SpaceMet system with a modem
at (413)545-4453 or via telnet to spacemet.phast.umass.edu
(128.119.50.48). The Internet address for UMassK12 is
k12.ucs.umass.edu (128.119.175.2); login is guest.

APPENDIX F

TELECOMM ACTIVITIES FOR 5C5E PARTICIPANTS

Telecomm Activities for 5C5E Participants

See the telecomm staff if you need help with any of these activities.

PART I - Bulletin Menu, Main Menu, and Message Section

1. Once you log on, you will see the bulletin menu. (If you have not previously logged on, you will have to complete a simple questionnaire.) Select 5 (Five College/Partnership Events). Make a few notes on events you might like to attend.

    _____

2. Go to the Message area from the Main Menu by entering M. Using the A)reas command note all the bulletin board message areas. _____ Check

3. Next go to message area 1, the General Conversation area. Use I)nquire to find a message from Helen Sysop to 5C5E Participants.

    Write the message here.

    _____

4. Go to one of the 5C5E project message areas. (PT, WT, ET or ST). Find a message that sounds interesting using the L (List) command. _____Check

5. Leave a note in one of the 5C5E project messages areas (see #4) to someone in your research community (participant or staff). Use the R)eply or E)nter option. Type in the message, then save it. _____Check

6. Go to the Main Menu. Select U)ser and find a user with Mary as part of her name.   List a few here.

    _____

7. Go to the Help Menu by entering ? . Use it to find out what happens when you choose C)hange. _____Check.

8. Get out of the help option by typing a 0. Find out how long you have been on line today by entering S)tatistics. Go to message area #2 and enter a message to Helen telling how long you have been on line. _____Check

Telecomm Activities - 2

9. Go to the national Educator message area (message area 26). Find a message that is interesting to you. List the number of the message, where it was from (BBS Origin) and the date it was sent.

_____

10. Go to K12 Teacher Chat (message area H4). Read some of the messages there. _____Check.

11. Go to one of the K12 subject matter areas. Read some messages. Reply if appropriate. _____Check

12. Go to one of the national Ecology or Environmental message areas. (There are 4 of them). Read at least 5 messages in the area you choose. Note an interesting message. What are its number and subject line?

_____

13. Go to Message Area 18, the national Latino echo. Read some of the messages. If you are able to read Spanish, please translate a message and tell us what it says. Please enter a message in this area if you feel comfortable doing this.

_____

14. Go to Message Area D1 (K12 Elementary Chat) or D2 (K12 Jr High Chat). Read the last 10 messages. Would your class enjoy using this area? _____.

This completes Part I. We have covered most but not all the options in the Message Areas; we will cover uploading messages in Part II. At some point you may want to explore the Q)uote, F)orward, and B)rowse commands. You may also want to use the + and - keys to follow an ongoing discussion in a conference.

15. Go to the Main Menu and from there to the Files area. Go to file area 1. Enter an F followed by two returns to see a listing of all the files in the area. Make a note of a text file of interest. (Most text files end in .DOC or .TXT; files with extensions of .ARC or .ZIP are usually programs or compressed text files.) Write its name, number of bytes (characters), and date.

_____

16. Using the V)iew command start displaying the file you made note of above _____Check.

17. Use the L)ocate command to find files relating to a topic of interest. (Enter a "string" of a few letters, e.g., math, water, climate ...). Note the string you used and how many files the system found.

_____

18. Select a text file from the list produced with the L)ocate command. G to its file area. Use open-apple R in TIC or Alt-L in Telix to open a capture buffer and capture the text that will appear on screen. Now use the V)iew command to display your file. After a few screens, close the buffer (open- apple R in TIC or Alt-L in Telix).

19. Saving the captured file is automatic in Telix. If you are using TIC, save it by entering open-apple W to write the file to a formatted disk in drive 2. Refer to the separate handout for down/uploading for Telix or for TIC for the following activities.

20. Go to the file area for your research community. Download one of the files to a formatted disk in your second floppy drive (Apple) or to your hard drive (IBM). Pick a small file (under 10,000 bytes).

21. Create a text file using your word processor. Save the file as ASCII text. Upload the file you created to file area 20 (the upload area).

22. Create a small text file (under 3000 bytes) using your word processor. Put a return at the end of each line (Keep line width 60 or under). Have no true blank lines; to skip a line indent using the space bar once or twice followed by a return. Try uploading this file as a message using the Upload command in the message area and XModem or ZModem transfer protocol.

23. Try uploading this same message by starting to E)nter
    a message and then telling your telecomm program to do
    an ASCII upload while in the body of the message.
    (This may not work with TIC.)

                    Part III - Database (MINDS) Searches

24. From the Main menu, enter D for the Database, and the
    D again from the next menu. In the database program,
    use the control-Z key combination to see the help
    screen. Make note of the various key combinations you
    can use.

    _____

25. In the ERIC "context set" or database look for
    information on a specific minority group. (Note:
    When you search for information in MINDS, it is
    usually best to start by entering just one or two key
    words.) Select one of the indicated references. Then
    use control-R to highlight the key words.

    What key words did you use? _____

    What is the name of the file corresponding to your
    selected reference?

26. Find a bulletin board in San Diego CA from the
    FIDOLIST context set, and give the board name and
    phone number.

    _____

27. Look in the CLIM_NWS (climate newsletters) context set
    for a topic of your choice. What key word(s) did you
    use, and how many references were there?

    _____

                    Telecomm Activities - 4

28. Look in the USDA_NWS (biotechnology newsletters)
    context set for a topic of your choice. Select one
    entry, and note which file it came from.

    _____

29. Go to the energy, atmosphr, stream, or ecology context
    set and find something interesting for your research
    community. Summarize the information briefly:

    _____

30. In activity # 25 you made note of a document. Leave
    the database, then locate the original document on the
    board in the ERIC file section. (Use the A command
    followed by a return to locate the ERIC File Area.)
    Note the following information.

    Eric file area #_____.

    File Name _____ (bytes)_____
    (date)_____

    ==

Congratulations if you have completed everything!

APPENDIX G

WRITTEN CONSENT FORM

Written Consent Form

A Descriptive Study Monitoring the Growth of Individual Teachers
Involved in Using an Innovation

A study of middle/high school teachers' use of telecommunications

To participants in this study:

   I am Diana Campbell, a graduate student at the University of
Massachusetts in Amherst. The purpose of my doctoral research is to
monitor the growth of individual teachers in the use of an innovation
as a function of their participation in an institutionally supported
staff development program. I am interviewing some 5C5E participants
with regard to their interaction with telecommunications.

   To investigate this issue, you will be asked to participate in
three interviews and one classroom observation. The interviews will
focus on the stages of concern and levels of use of
telecommunications. While formal questions will provide structure for
the interview, my intent in the interviews will be to stimulate
discussion of your stories and recreation of your experiences within
the framework the questions establish.

   My goal is to analyze the materials from your interviews, in
order to understand better your telecommunications experiences. I am
interested in the concrete detail of your experiences. As part of the
dissertation, I may use the material from your interviews for journal
articles or presentations to interested groups or for instructional
purposes in my teaching.

   Each interview will be audiotaped and later transcribed and
analyzed for common themes and notions about the use of
telecommunications. You will have the opportunity to review
transcripts. In all written and oral products of the research,
pseudonyms will be used for all participants including teachers,
students, administrators, schools and communities. If you consent to
participate in this study, you may withdraw at any time through the
interview schedule. You may request that specific comments be deleted
from your transcript.

   You must also agree to make no financial claims for the use of
the material in your interviews; you are also stating that no medical
treatment will be required by you from the University of Massachusetts
should any physical injury result from participating in this study.

****

I,_____, have read the above
statement and agree to participate as an interviewee under the
conditions stated above.

_____   _____
signature of interviewer   date

_____   _____
signature of participant   date

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