AN INVESTIGATION OF THE CONCERNS
OF TEACHERS ABOUT THE IMPLEMENTATION
OF MICROCOMPUTERS IN THE SCHOOLS

GARY EDWARD MARTIN WHITE

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by

© Gary Edward Martin White, B.Sc., B.Ed.

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ABSTRACT

This study was motivated by the perceived need for appropriate staff development programs for educational computing. One element receiving scant attention in the design of such programs is the attitudes of teachers about this technology.

The main goal of this study was to ascertain the concerns of teachers about the implementation of microcomputers in the schools. Teachers' perceptions, fears, and considerations about this technology represent their concerns. Several factors including gender, place of residence, accessibility of microcomputer at home or in school, and the date of last university study, were investigated to determine if they influenced the intensity of these concerns. Concerns of teachers at primary, elementary, junior high and senior high were examined to determine if differences were apparent.

The subjects for this study were 467 teachers and administrators of the public schools in the province of Newfoundland and Labrador during the school year 1986-87. Data were received from 238 or 51.0% of the sample.

The data were gathered by use of a self-administered questionnaire that consisted of a modified version of the Stages of Concern Questionnaire together with questions

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designed to gather demographic data about the subjects. Stratification into various subgroups was based on responses to these questions.

Teachers who responded expressed varying levels of intensity on the seven Stages of Concern: Awareness, Informational, Personal, Management, Consequence, Collaboration, and Refocusing. Most teachers (90.8%) had their highest level of concern on the self-oriented concerns (Awareness, Informational and Personal). This indicates that teachers require more information of a general nature about this technology, what its capabilities are and how the teachers' role will be affected by introduction of the technology.

The study found that the place of residence and the date of most recent university study did not influence the concerns of teachers.

The accessibility of a microcomputer either at home or at school produced significant differences in four of the Stages of Concern: Awareness, Consequence, Collaboration and Refocusing. This appears to support the theory of developmental concerns — more "mature" concerns are aroused and become more intense with increased use of the technology.

Significant differences between females and males were found to exist on only two of the stages: Informational and

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Refocusing.

Differences between teachers at different grade levels appear to be most pronounced on the more "mature" concerns: Management, Consequence, Collaboration and Refocusing, although these differences were not tested for significance.

ACKNOWLEDGEMENTS

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CHAPTER I

BACKGROUND TO THE STUDY

> Before any educational change can be implemented
> efficently and effectively, the levels of expertise
> and attitudes of educators must be determined prior to
> designing preservice and inservice programs. (Stevens,
> 1980, p. 222)

Few would deny that the microcomputer is having a
tremendous impact on the school of today. (Anderson, 1983a).
This technology has the potential to bring about
educational change. It has been perceived at one extreme as
a panacea for all of the problems of education and at the
other as another passing fad that will have only a limited
impact on education (Jackson & Deal, 1985). The promise of
this technology may not be realized if the implementation
effort is not based on an important component in the
educational change process – the teacher. As indicated in
the quotation from Stevens (1980) above, teachers'
expertise and attitudes must be assessed and the results
used in the design of staff development so that the
probability of this technology enhancing education is
increased.

The potential impact of microcomputers on education
has been recognized at various levels. Various educational
journals (Bozeman, 1981; Greenes, 1981; Patterson, 1983;
Wulf, 1985) and magazines have used "the microcomputer in

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education" as the theme of a full issue and discussed the many facets of the use of this technology in schools. Various professional organizations (National Council of Supervisors of Mathematics, 1978; National Council of Teachers of Mathematics, 1978; Nova Scotia Teacher's Union, 1983) and government agencies (Alberta Education, 1983; Manitoba Department of Education, 1983; Newfoundland and Labrador Department of Education, 1985; Prince Edward Island Department of Education, 1983) have identified the need and called for the introduction of courses about computers and/or the use of computers as instructional tools. Other publications have devoted their cover story to microcomputers and the impact of this technology on various aspects of life including education (Friedrich, 1983; Sheils, 1980). In addition, parents have recognized the importance of computer education for their children (Burin Peninsula Integrated School Board, 1986). They have responded by raising funds to purchase computers (Scott, 1985) and by applying pressure to schools and school boards to incorporate computer education in their schools.

In addition to the direct call for computer education, the rapid purchase and placement of microcomputers in schools has subtly forced educators to examine the role of this technology in the educational setting. It has been estimated that there were 53,524 microcomputers in use in 1983-84 in all school settings in Canada and that by the end of 1985-86 the number in English public schools would

be 86,476 (Scott, 1985). It has been estimated that by the end of 1985-86, approximately 1366 microcomputers will have been purchased for use in the schools of Newfoundland and Labrador (Scott, 1985).

These pressures for changes in the educational system have caused, and will cause, decision makers to purchase more microcomputers and place them in schools (Jackson & Deal, 1985). The extent to which the potential of this technology is realized depends largely on teachers (Kinzer et al., 1985) and teacher education (Leonard & LeCroy, 1985). Kinzer et al. stated, "microcomputer implementation in instructional activities will not occur if teachers do not know how to use microcomputer technology in their classroom" (p. 127). The question that begs answering is, "Do teachers have the skills and attitudes necessary to use microcomputers effectively in instruction?"

Lack of Teacher Training

It appears that a large number of teachers are ill-prepared to use this innovation. Surveys of the extent of teachers' knowledge about computers have been conducted to determine their ability to teach about computers and to utilize them as tools in their instruction. The results of these surveys are not unexpected, since the majority of teachers received their preservice education prior to the introduction of the microcomputer.

In 1983 it was estimated that only 6% of the active teachers in Alberta had a working knowledge of computers and were acquainted with different applications (Alberta Education, 1983). Other surveys (Bitter, 1980; Dickerson & Pritchard, 1981; Rodiquez, 1985; South Carolina State Department of Education, 1984; 1985) conducted in the United States have had similar results, indicating that there is a enormous void that must be filled. The results in Canada appear to be similar, with 37% of teachers having training in a general introductory course on computers in education: Newfoundland and Labrador has only 14% of its teachers with such training (Scott, 1985).

Teachers have recognized their lack of expertise. A survey of teachers and administrators in a school district in Texas found that 89% would like to attend inservice training on computer uses in education (Lumsden & Norris, 1985). This confirmed the results of an earlier study of teachers in Nebraska, which found that 80% of the teachers did not know how to use a computer and 88% indicated their training to use computers in their classrooms was inadequate (Stevens, 1980). Over half of the teachers in this study specified a need for training. Ninety-seven percent of teachers in one school district in Newfoundland indicated that they would like to become more knowledgeable in the area of computers with 82% indicating that their present knowledge was inadequate (Burin Peninsula Integrated School Board, 1986). Other studies (Bassler,

Almeida, & Van Voorst, 1984; Wepner, 1986) have confirmed teachers' lack of knowledge and their willingness to attend sessions designed to increase skills and knowledge to use these tools for instruction.

Muir & Foreman (1982) found that there was almost unanimous agreement that teachers and administrators should receive an introduction to educational applications. In Newfoundland and Labrador the need for teacher education in microcomputer applications has been addressed in a report to the Minister of Education by the Computer Advisory Committee (Newfoundland and Labrador Department of Education, 1985). Recommendation 13 stated: "An inservice training program in computer literacy be made available to all educational personnel in the school system of the province" (p. 14). Additionally, the committee has recommended, "inservice programs relating to specific applications of computers to education be developed and made available throughout the province" (p. 15).

In spite of the tremendous void there is some evidence that progress is being made in expanding teacher knowledge about computers. Stevens (1982) found in a replication of a study conducted in 1979 (Stevens, 1980) that there had been some improvement in the computer knowledge of practicing teachers. In most jurisdictions, however, the effort has not been extensive enough to substantially increase teacher expertise.

Teacher Education in the Use of Microcomputers

Few would argue that the evidence points to a massive
job of teacher education if the implementation of this
technology is to be successful. The acquisition of the new
skills, knowledge and attitudes can be achieved in a number
of ways: 1) through self education; 2) through preservice
training; and 3) through inservice or staff development
activities.

Self-education

Some teachers have taken upon themselves the task of
acquiring the knowledge necessary to utilize the
microcomputer. This would ideally be the most
cost-effective measure; however, it is unlikely that the
majority of teachers will receive computer expertise in
this manner. Those who will learn this way would probably
fall into the categories of "innovators" or "early
adopters" as proposed by Rogers and Shoemaker (1971). These
two categories together usually represent only 16% of the
population for any innovation (Rogers & Shoemaker, 1971).
Teachers usually are unwillingly to educate themselves or
otherwise become involved, citing lack of time as one
reason for the lack of effort (Blank & White, 1984; Rubin,
1983).

Many teachers have expressed an apprehension and fear

of the microcomputer technology and will avoid use of it (Jay, 1981). Jay has termed this phenemonen, "computerphobia" (p. 47). Jay outlined the following as characteristics of computerphobia:

- a) resistence to talking or even thinking about computer technology;

- b) fear or anxiety, which may even create physiological consequences;

- c) hostile or aggressive thoughts and acts, indicative of some underlying frustrations. (p. 47)

A closely associated term is computer anxiety, "which results from fear or apprehension when using computers or when faced with the prospect of using computers" (Jonassen, 1986, p. 2). Maurer and Simonson (1984) postulated that behaviors associated with computer anxiety are:

1. Avoidance of computers and the general areas where computers are located.

2. Excessive caution with computers.

3. Negative remarks about computers.

4. Attempts to cut short the necessary use of computers. (p. 3)

However, there appears to be inconclusive evidence that such anxiety does occur (Jonassen, 1986).

Some teachers also avoid using microcomputers because of a fear of being replaced by a computer (Clement, 1981; Jay, 1981; Rubin, 1983; Stevens, 1980). They are fearful that their position of dominance in the classroom will be challenged by students who are more knowledgeable about the technology than they (Diem, 1981; Jay, 1981; Rubin, 1983).

The avoidance of use and unwillingness to become involved
is due in large measure to a lack of preparation and
training (Diem, 1981).

The above evidence suggests that most teachers might
not take it upon themselves to obtain the education
necessary for productive use of microcomputers in their
instruction.

Preservice education

Most of the preparation teachers receive for the job
occurs during their preservice training. There is evidence,
however, that such is not the case in preparation for use
of the microcomputer.

The faculties of most universities and colleges of
education lack the expertise to provide training for
student teachers in educational computing (Anderson,
1983a). Anderson outlined three barriers to teacher
educators acquiring computer expertise:

   (a) the traditional focus of teacher training
      programs,

   (b) the lack of instructional computer facilities and
      support staff on university campuses,

   (c) the reward system on most university campuses.
      (p. 7).

Despite these barriers, it appears that a large number
of Schools of Education both in Canada and the United
States are incorporating courses in microcomputers in their
programs (Collis & Muir, 1986; Judd & Dieterle, 1984; Kull

& Archambault, 1984). This evidence indicates an increase in offerings from the results of an earlier survey (Uhlig, 1982).

This increased interest may not be reflected in graduates who are more knowledgeable since the large majority of these faculties have not made the course or courses a requirement for graduation. Only 38% of education faculties in Canada (Collis & Muir, 1986) and 22.4% of those in the United States (Kull & Archambault, 1984) reported that these courses were required for teacher certification or graduation.

Even those graduates who have received computer education may not reduce the gap between the present lack of and the need for teachers versed in computer education. The declining enrollments in our schools have lead to stable staffs that mean the opportunity for new teachers to enter the profession is limited (McLaughlin & Marsh, 1978; Swenson, 1981).

The provision of preservice education does not appear as a viable solution to the problem of educating teachers about microcomputers.

Staff development

The development of inservice or staff development programs appears to be the most appropriate method for dealing with the massive training problem that exists in

preparing teachers to use microcomputers effectively in our schools (Stasz, Winkler, Shavelson, Robyn, & Feibel, 1984). The majority of the literature relative to teacher training in the use of microcomputers has focused on the provision of inservice activity for teachers.

The literature on educational change reflects this view about the importance of staff development in bringing about lasting change (Fullan, 1982b). Fullan elaborated:

> Educational change involves learning how to do something new. It is for this reason that if any single factor is crucial to change, it is professional development. (p. 257)

In spite of valiant efforts by schools and school districts, it appears that the present effort is falling short in providing adequate education (Stasz et al., 1984). Stasz et al. outlined the problems with this type of effort:

> such efforts typically fall short in the number of teachers trained, in the length of training, in the amount of "hands-on" experience provided in the topics covered and in the provision of in-class follow-up after the staff-development activity. (p. 2)

These criticisms of staff-development activities for microcomputers are similar to those directed at inservice and other attempts at bringing about educational change. Most often innovations fail because of an underestimation of teacher training needs (Fullan, 1982b; McLaughlin & Marsh, 1978). Despite a lack of success in affecting real change, the one-shot, fragmented, irrelevant workshop that is held over a one day period and then forgotten by developers is still used (Swenson, 1981; Verma, 1981).

Another problem usually associated with staff development is the lack of consideration of the teacher as an adult learner (Orlich, 1983). In considering educational change, planners must be aware that educational change is "a learning experience for the adults involved" (Fullan, 1982b, p. 55). Knowles (1970) described adult learners as human beings who are highly self-directed, draw heavily upon past experiences, and are more problem-centered than content-centered with the immediacy of application a high priority. These learner characteristics are manifested in inservice programs as learner concerns (Wedman, 1986).

The failure of the conventional approach to staff development makes it necessary to reconsider the problem if microcomputer technology is to effect real change in schools.

In addressing reasons for failure of staff development, Fullan (1979) summarized several as follows:

1. Follow-up support for ideas and practices introduced in in-service programs occurs in only a small minority of cases.

2. In-service programs rarely address the individual needs and concerns.

3. There is a profound lack of any conceptual basis in the planning and implementing of in-service programs that would ensure their effectiveness. (p. 3)

These reasons for failure should be considered in planning staff development.

In planning staff development activities in the area of microcomputers, most of the concentration has been on

the increasing of computer expertise (Wedman & Heller, 1984; Wedman, 1986). It has been asserted, however, that teacher attitudes are as significant to successful implementations as is computer expertise itself (Podemski, 1981; Stevens, 1980). Very little attention has been paid to teacher attitudes or concerns (Wedman & Heller, 1984; Wedman, 1986), and this deficiency may well explain the failure of such inservice programs.

Cicchelli and Baecher (1985), in discussing the planning and preparation for introduction of microcomputers in the classrooms, stated:

> Unless the real concerns of teachers are seriously and systematically considered as a critical variable in the process of change, the use of computers will take on the usual "hit and miss" orientation so typical of innovations that we educators effectuate. For innovations to be successfully implemented, attention must be given to the involvement of individuals in the change process, for change will occur only when individuals change. (p. 56)

The computer expertise of teachers has been more than adequately determined; however, it appears that the attitudes of teachers have not been adequately assessed. In particular the concerns of teachers should be determined so that there is a broader knowledge about teachers for whom inservice programs are to be designed.

Several studies (Cicchelli & Baecher, 1985; Wedman & Heller, 1984; Wedman, 1986; Wedman, Heller & Strathe, 1986; Whiteside & James, 1986) have determined the concerns of teachers relative to microcomputers. However, the samples have been from a school system (Cicchelli & Baecher, 1985;

Wedman, 1986), in which teachers volunteered from teachers enrolled in university courses on microcomputers (Wedman & Heller, 1984; Wedman, 1986; Wedman et al., 1986) and teachers of a particular school (Whiteside & James, 1986). Given the nature of the samples the majority of which were self-selected, it is important to determine the concerns of a larger and more diverse sample.

In summary, it appears that massive staff development activities will be required to provide the knowledge and attitudes required for successful implementation of microcomputers in the schools. This will require a comprehensive and well-planned strategy for such action. An important component in planning such action will be attention to the concerns of teachers. Prior to attending these concerns, it is necessary to determine the present level of such concerns.

Purpose of the Study

The preceding section has outlined the pressing need that exists for providing teachers with inservice activities in microcomputer education. Stevens (1980) has identified the importance of determining the attitudes of teachers regarding microcomputers and Cicchelli and Baecher (1985) specified the assessment of "concerns" if a serious attempt at educational change is to be planned.

The concept of concern has been defined as:

The composite representation of the feelings, particular preoccupation, thought, and consideration given to a particular issue or task is called concern. Depending on our personal make-up, knowledge, and experiences, each person perceives and mentally contends with the given issue differently; thus there are different kinds of concerns. The issue may be interpreted as an outside threat to one's well being, or it may be seen as rewarding. There may be an overwhelming feeling of confusion and lack of information about what "it" is. There may be ruminations about the effects. The demand to consider the issue may be self-imposed in the form of a goal or objective that we wish to reach, or the pressure that results in increased attention to the issue may be external. In response to the demand, our minds may explore ways, means, potential barriers, possible actions, risks, and rewards in relation to the demand. All in all, the mental activity composed of questioning, analyzing, and re-analyzing, considering alternative actions and reactions, and anticipating consequences is concern. An aroused state of personal feelings and thought about a demand as it is perceived is concern. (Hall, George, & Rutherford, 1977, p. 5)

In the study herein reported, an attempt was made to determine the concerns of teachers in the province of Newfoundland and Labrador about microcomputers in the schools. Knowledge of such concerns is important in planning and designing staff development. These expressed concerns will be analysed together with demographic data to see if certain factors influence the concerns of teachers.

The specific questions that this study attempted to answer are outlined in Chapter III, The Design of the Study.

Description of the Study

The main purpose of this study was to determine the concerns (Hall et al., 1977) of teachers about

microcomputers in the schools. Other factors investigated
were differences that might exist between the concerns of
teacher based on factors such as gender, place of
residence, accessibility to microcomputer at home or in
school and, date of last university study. The concerns of
four different levels of teachers - primary, elementary,
junior high and senior high - were investigated to see if
any differences among the levels were evident.

The population for this study was all teachers in the
province of Newfoundland and Labrador during the school
year 1986-87. Thirty schools were randomly selected giving
a sample of 467 teachers.

Data were gathered for the study by means of a survey
which used a self-administered instrument. Each teacher in
the sample was sent a questionnaire (Appendix A) that
attempted to determine their concerns and to ascertain
other information about the respondents. The survey
instrument consisted of two sections: the first, a modified
version of the Stages of Concern Questionnaire (Hall et
al., 1977), and a second, which gathered data about the
respondents. The data collected were used to answer the
questions posed by this study.

Limitations of the Study

This study was conducted by surveying teachers in the
province of Newfoundland and Labrador during the winter of

1987. Certain delimitations were imposed on the results:

(1) The sample that was chosen consisted of teachers from the province of Newfoundland and Labrador and the results can only be generalized to that population.

(2) The return of completed questionnaires to an immediate superior, the principal, may have influenced the responses given by teachers. Despite an attempt to overcome this potential bias by providing envelopes in which to seal the completed instrument, some responses may reflect this influence.

(3) All the teachers in a school were administered a questionnaire and were asked to complete them individually. There may have been some collaboration on these with a resulting influence on the data.

Outline of the Thesis

In Chapter II of this report a review is made of the literature related to the change process, concentrating on the literature related to educational change. One model of educational change – the Concerns-Based Adoption Model (CBAM) (Hall , Wallace, Jr., & Dossett, 1973) – will be described in some detail since it forms the conceptual base for the assessment of teacher concerns as conducted in this

study.

The outline of the design of the study will constitute Chapter III with a description of the sampling procedures, the instrumentation, and the questions to be answered together with a description of the analysis to be performed on the data to answer each question.

In Chapter IV the results of this investigation are described on a question-by-question basis.

A summary of the study and a discussion of the results will follow in Chapter V. This chapter will conclude with some recommendations based upon the results and the implications of the same.

REVIEW OF THE LITERATURE

There is a belief in some circles that the
introduction and use of microcomputers in schools has the
potential to make the school of the future different from
that of the past (Anderson, 1983a; Coburn et al., 1982): it
has even been argued that the educational system as it is
presently organized will be revolutionized by this
technology (Papert, 1980). Others conclude that the very
nature (the organization and conservative nature) of
schools work against their being changed to any great
extent (Luehrmann, 1985; Oettinger, 1969). The potential
for progress offered by this technology may go unrealized
unless careful consideration is given to the elements and
factors that bring about change sucessfully.

This review of the literature will examine the
research on change and the process of change and its
implications for this study. The process of educational
change will be discussed. A major portion of this chapter
is a detailed description of one theory of educational
change - the Concerns-Based Adoption Model (CBAM) (Hall et
al., 1973), which focuses on the individual as the frame of
reference. The concluding sections focus on research of
teacher concerns about microcomputer use in the schools and

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on the implications of this model for this study.

Research on Change

What is Change?

Change is a very complex concept that can be
considered from several viewpoints. It can be viewed from
the macroanalytic level of the organization or social
system as well as from the microanalytic level of the
individual and focus on an individual's change behaviour
(Rogers & Shoemaker, 1971). It can also be considered from
the point of view of the scope of the change (Fullan,
1982b) and the unit of analysis (Berman, 1981).

Change has been viewed as a modification to the social
system in which the change occurred (Rogers & Shoemaker,
1971). Rogers and Shoemaker (1971) view all change as a
"social change" (p. 7) and define it as "the process by
which alteration occurs in the structure and functioning of
a social system" (p. 7). The structure consists of the
statuses of both individuals and groups and the functioning
is the actual behaviour of the individual in his/her
individual or group status (Rogers & Shoemaker, 1971).

Havelock (1973) also placed value on the modification
in the social system. He described change as "any
significant alteration of the status quo, but usually ...
this will mean an alteration which is intended to benefit

the people involved" (p. 4). This presupposes that all change will be beneficial to the individuals or groups experiencing it.

Change can also be viewed from the individual perspective as well as the social system level (Rogers & Shoemaker, 1971). Fullan (1983) described change from the individual point of view as "a process whereby individuals alter their ways of <u>thinking</u> and <u>doing</u>. It is a process in developing new <u>skills</u> and above all in finding <u>meaning</u> and satisfaction in new ways of doing things" (p. 10).

Fullan (1982a), in discussing the purpose of educational change, describes it as being "to help schools accomplish their goal more effectively by replacing some programs or practices with better ones" (p. 2).

The foregoing illustrates that change is very complex and can be viewed from organizational perspectives or individual perspectives. In spite of differences in perspective, it is generally agreed that change is a process and not an event (Fullan & Park, 1981; Hall & Loucks, 1977).

Change Process Theory

It is generally agreed that the process of change takes place in a series of stages or phases (Fullan, 1982b; Rogers & Shoemaker, 1971), although there is varying opinion as to the number of phases and the label that

should be given to each.

Rogers and Shoemaker (1971) viewed the change process as consisting of three sequential stages: invention, diffusion and consequences. They define these three stages as:

> Invention is the process by which new ideas are created and developed. Diffusion is the process by which new ideas are communicated to the members of a social system. Consequences are the changes that occur within a social system as a result of the adoption or rejection of the innovation. (p. 7)

This process is considered to be dependent upon communication between the individuals in the social system since "communication is essential for social change" (Rogers & Shoemaker, 1971, p. 6).

Hall (1981) proposed a four phase model of the change process that included: development, dissemination, implementation and institutionalization. During the first phase the innovation is being developed or created. Hall (1981) differentiates between diffusion and dissemination with diffusion being the natural spread of the innovation through the social system while dissemination involves deliberate attempts to enhance the spread of the innovation. In contrast Rogers and Shoemaker (1971) viewed diffusion as including both the natural and planned spread of the innovation. However, for both, the diffusion/dissemination phase includes the decision to adopt the innovation. Hall (1981) considered the process of change to be one during which the individual experiences change.

Many researchers of change (Berman, 1981; Berman & McLaughlin, 1974; Loucks-Horsley & Cox, 1984; Zaltman, Duncan, & Holbek, 1973) adhere to three stages as suggested by Rogers and Shoemaker (1971), but they conceptualize these in a slightly different fashion. These phases or "subprocesses" (Berman, 1981, p. 264) are generally labelled as : initation/adoption, implementation and institutionalization/continuation (Loucks-Horsley & Cox, 1984). Most of the early research on educational change focused on the initation phase while the most recent research has concentrated on the implementation of change, with research of continuation just beginning to appear in the literature (Loucks-Horsley & Cox, 1984).

The first phase, initiation, consists of "the process which leads up to and includes the decision to adopt or proceed with a change" (Fullan, 1982b, p.39). This conceptualization varies from that of Rogers and Shoemaker (1971) in that they included the decision to adopt in the second phase. Fullan (1982b) describes adoption as the "decision to proceed (or the process leading up to and including the decision) with a change that affects more than one person" (p. 41). Once the decision has been made to proceed with change, efforts are made to put this proposed change into use.

The implementation phase involves "the process of putting into practice (or failing to do so) an idea, program or set of activities new to the people attempting

or expected to change" (Fullan, 1982a, p. 5).
Implementation is a very "complex, dilemma-ridden,
technical, sociopolitical process" (Fullan, 1983, p. 1).
Implementation in schools is multidimensional with at least
three kinds of change at stake: "possible use of new or
revised materials; possible uses of new teaching approaches
(e.g., teaching stategies); and the possible incorporation
of new or revised beliefs (e.g., philosophical assumptions
and beliefs underlying the particular approach)" (Fullan &
Park, 1981, p. 6). Even if the change is successfully put
into use, it may or may not be continued.

The third phase, institutionalization, refers to
"whether the change gets built in as an ongoing part of the
system or disappears by way of a decision to discard or
through attrition" (Fullan, 1982b, p. 39). The limited
research on this component (Loucks-Horsley & Cox, 1984) has
resulted in the lack of a thorough understanding of the
complexity of the change process. Fullan (1982b) viewed
this phase as consisting of another "adoption decision,
which may be negative, and even if positive may not itself
get implemented" (p. 76). If the decision to continue is
positive, the school may have achieved change - this
achievement is quite difficult, but not impossible.

In discussion of the change process, Fullan (1982b)
has added a fourth phase to the process of change -
"outcome" (p. 39), which is described as being "thought of
generally as the degree of school improvement in relation

to given criteria" (p. 40). This concept is similar to
Rogers and Shoemaker's (1971) "Consequences" phase but
rather than being thought of as a phase, it should be
considered as a means of evaluating the degree to which the
attempt at change has been successful.

The change process in education is a very complex one
with many variables and factors affecting the ultimate
success of the effort (Berman, 1981). After reviewing the
literature on change, Fullan (1982b) outlined ten factors
associated with and influencing initation of change in
schools:

    1. Existence and quality of innovations
    2. Access to information
    3. Advocacy from central administrators
    4. Teacher pressure/support
    5. Consultants and change agents
    6. Community pressure/support/apathy/opposition
    7. Availability of federal or other funds
    8. New central legislation or policy
        (federal/state/provincial)
    9. Problem-solving incentives for adoption
    10. Bureaucratic incentives for adoption (p. 42)

In addition, Fullan (1982b) identified fifteen factors
affecting implementation. He categorized these into four
groups:

    A. Characteristics of the Change

    1. Need and relevance of the change
    2. Clarity
    3. Complexity
    4. Quality and practicality of programs (materials
        etc.)

    B. Characteristics at the School District Level

    5. The history of innovation attempts
    6. The adoption process
    7. Central administrative support and involvement
    8. Staff development(in-service) and participation

This process is complex, and, in an attempt to understand it, certain researchers have concentrated on only one of the three phases in their research or have examined the change process from different units of analysis or with different objectives in mind (Berman, 1981).

One unit of analysis of the change process is from the viewpoint of the individual as he/she undergoes the learning of new skills and beliefs associated with the change. The individual in the change process has been the focus of research since "educational change depends on what teachers do and think - it's as simple and complex as that" (Fullan, 1982b, p. 107). "It goes without saying that the process of change in schools cannot be studied in a meaningful way without attending to the role of teachers" (Rutherford, 1986, p. 1).

In examining change from any perspective, the researcher should be aware of the complexity of educational change and the many factors and influences that determine whether individual teachers change their behaviour and

beliefs. Fullan (1982b) stated, "it is individuals who have
to develop new meaning, and these individuals are
insignificant parts of a gigantic, loosely organized,
complex, messy social system which contains myriad
different subjective worlds" (p. 79). Hall (1986) stated,
"it must not be forgotten that teachers are part of an
organization that includes fellow teachers and other actors
who make a significant difference in the potential and the
accomplishments that each and all can achieve" (p. 11).

While being cognizant that change is a dynamic and
complex process, this review will now focus on the point of
view of the teacher in the change process. One model of
change that views change from the individual perspective is
the Concerns-Based Adoption Model (CBAM) (Hall et al.,
1973).

Development of Concerns-Based Adoption Model

The Concerns-Based Adoption Model(CBAM) (Hall et al.,
1973) is a model of change that was developed to describe
the changes individuals undergo as they adopt new programs
and how these people can be helped to make these changes in
an effective, efficient and humanistic manner (Loucks,
1983). This model was developed during the early 1970s by
researchers at the Research and Development Center for
Teacher Education at the University of Texas at Austin. The
model had its roots in the work of Francis Fuller, a

psychologist at the University of Texas at Austin, who
studied the concerns of preservice teachers (Hall et al.,
1973). The model is based on the premise that in order for
an innovation to be successfully adopted in education, it
must be accepted by individuals, particularly by teachers
(Hall & George, 1979).

Teacher Concerns Model

Fuller (1969) studied the concerns of novice teachers
and education majors during the 1960s. As a result of this
research and a review of the literature, she proposed that
the concerns of pre-service teachers fall on a self-other
continuum from concerns about self to concerns about the
impact of their teaching on pupils (Fuller, 1969).

A three phase model was originally conceived. It was
based upon data collected from student teachers during
counselling seminars and in a series of written concerns
statements, and upon the results of studies conducted by
other researchers addressing the concerns of both
preservice and experienced teachers (Fuller, 1969). Fuller
identified the three phases in a developmental
conceptualization of teacher concerns as "a pre-teaching
phase, an early teaching phase and a late teaching phase"
(Fuller, 1969, p. 218).

During the "Pre-teaching Phase: Non-Concern" (Fuller,
1969, p. 218), the beginning teachers have not yet

experienced teaching on a large scale basis and as a result can not use first hand experience with which to relate concerns. The concerns expressed by these students are probably typical of students of this age and indicate a lack of concern with the specific elements of teaching (Fuller, 1969).

The second phase, the "Early Teaching Phase; Concern with Self" (Fuller, 1969, p.220), deals with the concerns of individuals relative to themselves as teachers. The concerns expressed in the data compiled by Fuller showed evidence of both covert and overt concerns related to student teachers' first experiences with teaching. Student teachers were concerned about questions such as: " Where do I stand?", and "How adequate am I?" (Fuller, 1969, p. 220). Principal concerns are related to class control, content adequacy and supervisor evaluation (Fuller, 1969). "

In the last phase, "Late Concerns: Concerns with Pupils" (Fuller, 1969, p. 221), teacher concerns focused on pupil gain and self evaluation as opposed to personal concerns and evaluation by others. These concerns included:

> concern about ability to understand pupils'
> capacities, to specify objectives for them, to assess
> their gain, to partial out one's own contribution to
> pupils differences and gain and to evaluate oneself
> in terms of pupil gain. (Fuller, p. 221)

During this phase the concerns expressed are more "mature" reflecting those of experienced superior teachers (Fuller, 1969).

Fuller's original third phase was based primarily on

conjecture since the data were collected almost exclusively
from students who exhibited few of these types of concerns
(Fuller, 1969). Later work (Fuller, 1970) confirmed the
existence of these concerns in experienced teachers.

Further analysis of the data collected from student
teachers (Fuller, 1970) resulted in the proposing of seven
types of concerns associated with the three phases. These
seven were:

Phase I: Concerns about Self: Non-teaching Concerns

Phase II: Concerns about Self as Teacher
            Concerns about Role
            Concerns about Adequacy
            Concerns about Being Liked or Liking

Phase III: Concerns about Pupils
            Concerns about Teaching
            Concerns about Pupil Needs
            Concerns about Educational Improvement
                        (Fuller et al., 1974, p. 6-7)

These concerns were considered to be hierarchial in nature
with "Non-teaching Concerns" being least "mature" and
"Concerns about Educational Improvement" being most
"mature".

Factor analysis of these seven concerns indicated that
the three phase model originally proposed could not explain
all seven factors (Fuller et al., 1974). This required the
inclusion of a fourth phase "concern about the teaching
performance" (Fuller et al., p. 48). Concerns of teachers
could then be expressed on a developmental continuum from
unrelated concerns, to concerns about self relative to
teaching, to concerns about the teaching task, to concerns
about impact on pupils (Hall, 1985).

Fuller's contribution to concerns theory amounted to more than just a proposal of a developmental sequence of concerns (Hall, 1985). In addition, her work dealt with the dynamics of the arousal and resolution of these concerns.

Arousal and Resolution of Concerns

Fuller theorized that concerns are arranged on a continuum from least mature concerns (Code 0) to most mature (Code 6) and that "progress from less mature to most mature concerns seems to occur through concern-related content" (Fuller, 1970, p. 11). There was more to the dynamics of concerns than one concern being intense at one time and another intense at another time. Least mature concerns must be dealt with (resolved) before more mature concerns are aroused and resolved. If concerns do not exist, then they need to be aroused. If concerns already exist, then they need to be resolved before more mature ones can emerge. The successive arousal and resolution of concerns are the steps of a learning staircase (Fuller, 1970).

Fuller proposed that concerns become more mature "through a process involving assessment, arousal, awareness and resolution of concerns" (Fuller, 1970, p. 32). Concerns seem to be aroused through affective experiences while resolution appears to be achieved through "more cognitive experiences: acquisition of knowledge, practice,

evaluation, synthesis" (Fuller, p. 11). As a result of the successive arousal and resolution of concerns, teachers move to mature concerns. The concern that is most intense would therefore determine the affective and/or cognitive experiences necessary to arouse or resolve that concern. An attempt to achieve mature concerns represented the basis of Fuller's teacher education program (Fuller, 1970).

Concurrently with Fuller's work on teacher concerns, other researchers at the same university were assisting educators to bring about the adoption of innovations. In discussing the results of these seemingly unrelated research activities, surprising similarities became apparent (Hall & George, 1979).

Early CBAM Research

During the early 1970s researchers at the University of Texas at Austin were involved with assisting teachers and college professors to implement various innovations (Hall & George, 1979). They observed that these individuals experienced certain feelings and apprehensions about the innovation as they went through the process of implementing it in their particular setting (Hall et al., 1973). These concerns appeared to be quite similar to those observed by Fuller (1969) in her study of student teachers (Hall & Loucks, 1978).

Subsequently, the researchers began to collect

qualitative data to document the innovation adoption
process (Hall & George, 1979; Hall et al., 1973). Using the
research of Fuller, the literature on change, the data
they collected on innovation implementation, and their
field experience, the researchers conceptualized a model
describing the change process (Hall & George). It
concentrated on the experiences of individuals as they go
through the process of adopting an innovation.

Description of Concerns-Based Adoption Model

This model has undergone some fine tuning since its
original proposal in 1973 (Hall et al., 1973). This section
will examine the model, outlining the assumptions on which
it is based and the two components which form its
framework.

Assumptions of the Model

The model as postulated is based on certain underlying
assumptions that set the perspective from which change in
schools and colleges is viewed. It was developed in
response to the lack of successful change in educational
institutions resulting from previously conceived models of
change. The developers viewed these unsuccessful efforts as
resulting from the lack of consideration of the individual
in the adoption process (Hall et al., 1973). This model

viewed the adoption process in a different fashion from
those proposed by other change researchers of the day
(Rogers & Shoemaker, 1971). Adoption was considered to be
more than the decision to use the innovation. Adoption
involved "the multitude of activities, decisions, and
evaluations that encompass the broad effort to successfully
integrate an innovation into the functional structure of a
formal organization such as schools, colleges and industry"
(Hall et al., 1973, p. 5). This concept of adoption appears
to include the three phases (initation, implementation and
continuation) of the change process as reviewed previously.

The developers (Hall et al., 1973) considered this
model to be eclectic in that it included ideas from the
three schools of thought in change literature (Havelock,
1971): the Research, Development and Diffusion perspective;
the Social Interaction perspective; the Problem-Solver
perspective. The assumptions of this model are most closely
related to the R, D & D perspective in that it assumes a
specific innovation will be adopted in the process of
trial, installation and integration of the product or
process (Hall et al., 1973). This model also places
emphasis on the adopter's collaboration with an external
change or resource agency, and on the development of the
problem-solving ability of the user as the adoption process
progresses (Hall et al., 1973).

This model assumes the existence of two primary
systems: the user system and the resource system and the

establishment of a temporary third system - the collaborative system. The user system consists of the adopters of the innovation while the resource system consists of the agency or institutions that has the capability to assist the users with the adoption of the innovation. The collaboration system is established to facilitate the adoption process with the other two systems assisting each other in the analysis of needs, an identification of concerns and an analysis of the innovation. Following the completion of these analyses, interventions are designed to alleviate needs, resolve concerns and facilitate the adoption process (Hall et al., 1973)

An intervention is "any action, event or set of actions or events that influences use of an innovation" (Hord & Huling-Austin, 1986, p. 100). These actions are taken during the engaging of the second component of the CBAM - the prescriptive component.

Several assumptions of this model have been expressed in short point form. (See Appendix B for a more detailed description) These assumptions are:

1. In educational institutions change is a process, not an event. (Hall & Loucks, 1978, p. 37)

2. The individual must be the primary target of interventions designed to facilitate change in the classroom. (Hall & Loucks, 1978, p. 38)

3. Change is a highly personal experience. (Hall & Loucks, 1978, p. 38).

4. There are identifiable stages and levels of the change process as experienced by individuals. (Hall, 1978, p. 4).

5. Staff development can be best facilitated for the individual by use of a client-centered diagnostic/prescriptive model. (Hall & Loucks, 1978, p. 38)

6. The change facilitator needs to work in an adaptive/systematic way. (Hall, 1978, p. 4)

7. Full description of the innovation in operation is a key variable. (Hall, 1978, p. 4)

These assumptions form a base from which to understand the framework of the Concerns-Based Adoption Model.

Components of the Model

The CBAM consists of two principal components: a diagnostic component and a prescriptive component (Loucks, 1983). The diagnostic component can provide a picture of individuals within an organization before, during or after implementation. Most of the research to this point has focused on this component. The prescriptive component suggests action as a response to a given diagnosis (Loucks).

Diagnostic Component of the Concerns-Based Adoption Model

This component of the CBAM is involved with the diagnosing of individual's concerns, use of an innovation and how the innovation is being adapted by the individual. Three dimensions have been identified to pinpoint the

individual's position relative to the innovation: Stages of Concern (SoC); Levels of Use (LoU); and Innovation Configuration (IC) (Loucks, 1983). A series of evaluation procedures have been developed to assess each of these dimensions.

Stages of Concern (SoC)

This dimension deals with the kind of concerns which individuals may experience across time, related to the innovation (Hord, 1979). Hord elaborated:

Individuals experience a variety of concerns at any one time; however the degree of intensity of different concerns about an innovation will vary depending on the individual's knowledge and experience. Whether a person is using or not using, whether he or she is preparing for use, has just begun use or is highly skilled with the innovation will contribute to the relative intensity of different concerns. (p. 2)

These concerns change over time. From research it appeared that individuals using an innovation go through the progression of concerns as expressed by Fuller (1969) from concerns about self to concerns about the task to concerns about impact (Hall, 1978). These concerns and the progression appears to be the same for all teachers (Hord & Loucks, 1980). It appears that early stage concerns must be resolved, or at least reduced in intensity before later more mature concerns can emerge or increase in intensity (Hall & George, 1979).

The original conceptualization identified seven Stages of Concern About the Innovation. These stages were:

```
Stage 0 - Unaware
Stage 1 - Awareness
Stage 2 - Exploration
Stage 3 - Early Trial
Stage 4 - Limited Impact
Stage 5 - Maximum Benefit
Stage 6 - Renewal (Hall et al., 1973)
```

These move from "early self-oriented concerns, to task-oriented concerns, to ultimately impact-oriented concerns" (Hall, 1979, p. 20). These seven Stages of Concern (See Figure 1) were later renamed as:

```
Stage 0 - Awareness
Stage 1 - Informational
Stage 2 - Personal
Stage 3 - Management
Stage 4 - Consequence
Stage 5 - Collaboration
Stage 6 - Refocusing (Hall et al., 1977)
```

Individuals do not have concerns on only one stage but some stages show relatively more intensity than others. Research on this model confirmed the existence of these stages and their developmental nature (Hall & Loucks, 1978). Teachers who are nonusers of an innovations will have concerns high on Stages 0, 1 and 2. (See Figure 2) They are more concerned about gaining information (Stage 1) or how using the innovation will affect them personally (Stage 2). As they begin to use the innovation, Stage 3 (Management) concerns become higher and more intense. When teachers become experienced and skilled with an innovation, the tendency is for concerns at Stages 4, 5, and 6 to become more intense with a decrease in Stages 0, 1, 2, 3 (Hall et al., 1977).

A concerns profile can be plotted for each individual

0   **AWARENESS:** Little concern about or involvement 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 most of the demands, and his/her role with the innovation. This includes analysis of 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 the 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.
    (Hall, George, & Rutherford, 1977, p. 7).

Figure 1

Stages of concern about the innovation*

* Original concept from Hall, Wallace, Jr., & Dossett, 1973.
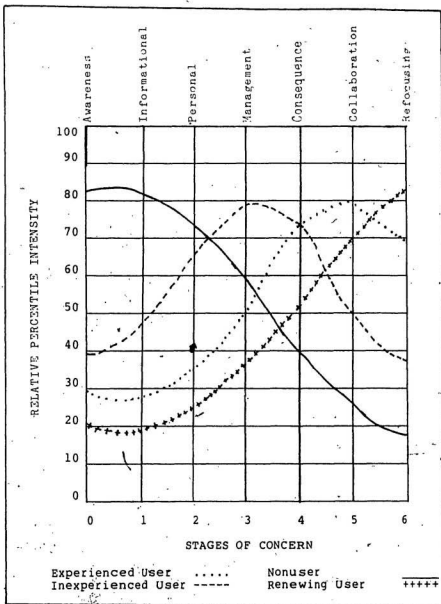
Figure 2

Hypothesized development of stages of concern

showing the intensity on each of the seven Stages of
Concern. The profile will show which concern(s) are most
intense at that particular time. (See Figure 2). An
individual's concern profile plotted over time should have
a progressive wave motion from left to right as shown in
Figure 2 (Hall et al., 1977).

This dimension provides a powerful tool for
determining the perceptions and feelings of individuals
about an innovation that they are using or about to begin
using.

Levels of Use (LoU)

The second dimension that can be utilized to determine
the individuals' position in the adoption of the innovation
is the Levels of Use dimension. This dimension describes
how performance changes as the individual becomes more
familiar with an innovation and more skillful in using it.
The levels proposed were based on the hypothesis that
growth in the quality of use of an innovation is
developmental (Rutherford, 1977) and on an analysis of the
first hand experiences of researchers with the process of
innovation adoption (Hall, Loucks, Rutherford, & Newlove,
1975).

Originally, six levels of use and an absence-of-use
level were defined (Hall et al., 1973). These were later
refined to eight distinct Levels of Use (Hall et al.,

1975). These levels range from lack of knowledge of the
innovation, to its active, sophisticated, and highly
effective use, and further, to actively searching for a
superceding innovation (Rutherford, 1977) (See Appendix C
for a list of the eight Levels of Use and a summary of
characteristics of each level). Theoretically, Stages of
Concern and Levels of Use move in a nearly, one-to-one
correspondence (Loucks & Hall, 1977).

As is the case with the Stages of Concern, individuals
move through the Levels of Use in a developmental manner
from nonuse to highly sophisticated use. However, some
individuals may skip a level in progressing to more
advanced use. In general, individuals first "orient"
themselves to the innovation and prepare to use it.
Usually, they begin to use an innovation at a "Mechanical"
level, during which first use is rough and characterized by
short-term planning and organization with mechanical
adherence to the procedures required by the innovation. As
experience increases, innovation use becomes routine, and
eventually it may be refined. At the three refinement
levels -- LoU IV (b) - Refinement, LoU V - Integration, LoU
VI - Renewal -- changes are made in the individual's use
based on formal or informal assessments of students' needs
(Hord & Loucks, 1980). The adapted use is based on the
impact of the innovation on the students.

The focus of the LoU is to describe in behavioral
terms what the individual is doing with the innovation.

Innovation Configurations (IC)

The third dimension of the diagnostic component,
unlike the other two, does not focus on the individual but
instead focuses on the innovation. Innovation
Configurations are defined to be "the various forms of an
innovation that result when users 'adapt' it for use in
their particular situation" (Hord & Loucks, 1980, p. 12).
As an innovation is disseminated and the developer's model
is translated into practice in different classrooms, one or
more of the components may be modified to fit local needs.
This modification of the innovation to fit the adopter's
conception has also been referred to as "mutual adaption"
(Berman & McLaughlin, 1975, p. vii). Any one innovation,
therefore, can be said to have several different
operational forms or "innovation configurations".

These configurations can be used in two different
ways. First, the possible and acceptable adaptations from
the developer's point of view can be specified so that the
adopter is aware of the concrete image of the innovation.
In addition, the Innovation Configurations can be used to
monitor how many or in what manner the components of the
innovation are being implemented permitting the change
agent to take action to ensure that the omitted parts of
the program are included in later use (Loucks, 1983). A
continuum can be visualized along which various innovation
configurations exist, from a description of the developer's

model of the innovation, to greater and greater adaptation, to some point where the developer insists that the mutations are so drastic that what is being used is not the innovation (Hall, 1978).

These configurations provide a means of accurately portraying the innovation and its components so that the adopters are clear in their understanding of how the innovation should look in practice.

An important part of the diagnostic component, as the name implies, is to ascertain where the individual is in his/her level of concern and use of the innovation and in what ways he/she has modified the innovation. Measures for assessing each of these dimensions have been developed since the original proposal of the model.

Assessing the Stages of Concern

Three methods have been used for the assessment of teacher concerns about an innovation: the "one-legged conference", the Open-Ended Concerns Statement, and the Stages of Concern Questionnaire (Hord & Loucks, 1980). These range from very informal methods to a rigid psychometric pencil and paper measure.

The most informal of these is the "one-legged conference" process (Hord & Loucks, 1980, p. 8). In this informal interviewing technique the inservice instructor can ask casual questions that draw out concerns. This can

be combined with informal listening in the staff room to get a feel for teacher's concerns. Based on this informal data the inservice leader could adapt the interventions planned, if required.

A more formal method is the Open-Ended Concerns Statement of Concerns About an Innovation. Respondents are asked to write complete statements to answer the question "When you think about (the innovation), what are you concerned about?" (Hord & Loucks, 1980, p. 8). A manual is available that outlines administration and scoring procedures (Newlove & Hall, 1976). A first reading provides an overall feel for the individual's concerns while the second reading provides a more substantive and detailed assessment of the concerns (Hord & Loucks, 1980).

The most formal and precise measure of the Stages of Concern is the Stages of Concern Questionnaire (SoCQ) (Hall et al., 1977). This pencil and paper instrument is a Likert-type questionnaire which allows respondents to react to 35 statements of concern by indicating how closely each statement describes a concern they feel at that point in time. This measure provides a profile for each individual or the group showing those concerns which are most intense. (A more detailed description of this instrument is provided in Chapter III)

Anyone of these three methods can be utilized to provide the facilitator with data related to the concern level of the individual or group.

Assessing the Levels of Use

An assessment of the present level of use of the innovation can be obtained by using one of two procedures: an informal interview and a focused interview (Hord & Loucks, 1980)

The first, the informal interview, provides staff developers with a simple means of determining Levels of Use. Adopters can be informally questioned in the staff lounge to obtain a description of their activities. Simply listening to comments and complaints and asking pointed questions can provide a fairly good rating of the individual's level of use. While this method of gathering data has low reliability and validity, it can provide a staff developer with valuable information (Loucks, 1983).

The second procedure is a focused interview technique. This procedure provides more psychometrically valid and reliable data and is based on a series of prescribed questions designed to elicit more rigorous data (Loucks, Newlove & Hall, 1976). These data can permit the rating of the individual at an overall level of use (Hord & Loucks, 1980).

Assessing the level of use provides the staff developer with a picture of the degree of implementation of the innovation.

Assessing Innovation Configurations

A tool that has been developed to apply the concept of
Innovation Configurations is the "Practice Profile" (Loucks
& Crandall, 1982). This instrument provides a standardized
cost-effective method to summarize program components and
requirements (Loucks & Crandall). This procedure consists
of three parts: the Component Checklist, Implementation
Requirements and Practice Characteristics (Loucks &
Crandall).

The component checklist identifies a number of
concrete behaviors, usually six to twelve, that is expected
of the user. These are prescribed by the developer and are
broken down into three categories: ideal, acceptable, and
unacceptable. This provides the adopter and disseminator
with precise behavioral information about how the
innovation should look (Loucks, 1983). Once developed, this
checklist can be used as the benchmark against which to
evaluate how closely the adopter is following the intended
practice. This information can be useful to assist a
disseminator in getting the adopter back on track.

The second part of the Practice Profile lists the
implementation requirements. These include the training,
the personnel, facilities and resources needed to implement
the program (innovation). This information is very valuable
to the adopters as they decide whether or not to use the
program or during actual use to outline the resources

needed (Loucks, 1983).

The final part, Practice Characteristics, outlines those characteristics of the program that should be used in practice. This list can be used to assess the program in practice. The developers (Loucks & Crandall, 1982) listed several characteristics that they have used: "purpose, concreteness of benefits, pedagogical approach, precision of definition, prescriptiveness and complexity" (p. 13).

A series of seven steps have been outlined to be used in developing a practice profile (Loucks & Crandall, 1982).

Prescriptive Component of the Concerns-Based Adoption Model

This component provides the means of conceptualizing and organizing in a coordinated fashion the planning and operation of an attempt to bring about change in schools. This component represents the action component that is based on the assessment of individuals along the three dimensions of the diagnostic component. The actions to be taken are referred to as "interventions". Two frameworks have been developed to facilitate the improved use of the innovation: Taxonomy of Interventions and Anatomy of Interventions (Hord & Loucks, 1980).

The taxonomy of interventions refers to the level of interventions that have been formulated. Six of these have been conceptualized: Policy, Game Plan, Strategy, Tactic, Incident, and Themes (Hall, Zigarmi, & Hord, 1979). The

first five are intentional actions and the last results from unplanned effects. The planned levels of interventions are distinguished by their size and the intensity of their impact (Hord & Loucks, 1980).

The second, the anatomy of interventions, provides the change facilitator with a coding schema (Hord, Hall, & Zigarmi, 1980) that can be used to increase the understanding of how to select, design or analyze interventions (Hord & Loucks, 1980). Included in this framework is a list of dimensions of interventions that can help the disseminator in the design of interventions.

This component, although not highly researched, can provide the framework for the design of interventions based on information obtained from the diagnostic component that can bring about school improvement.

Applications of the Model to Education

The Concerns-Based Adoption Model has been used in a variety of research efforts in education including research to verify the existence of some of the conceptualized dimensions.

Uses in Educational Research

Early research on and with this model was used to verify the existence of the Stages of Concern as

conceptualized and to examine the proposition that they were developmental in nature. Research on the innovation of team teaching (Hall & Rutherford, 1976) and the use of modules by college professors (Hall, 1976) confirmed the existence of the different levels of concerns. Confirmation of the developmental nature of concerns resulted from the collection of SoC data during the implementation of a new science curriculum by elementary teachers (Loucks, 1977). The hypothesized relationship between Stages of Concerns and Levels of Use has also been confirmed (Rutherford, 1977).

Following confirmation of the existence of Stages of Concern and Levels of Use, research has focused primarily on the use of this model and its dimensions for applied research. The majority of research has focused on use of the Stages of Concern concept to assess teachers' concerns about an innovation in preparation for staff development (Cicchelli & Baecher, 1985; Cunningham, Hillison & Horne, 1985; Pelland & Huling-Austin, 1985; Wedman & Heller, 1984). Other work has been done with large system wide curriculum implementation activities (Melle & Pratt, 1981) and with the investigation of the impact of principals and other facilitators on the change effort (Hord & Huling-Austin, 1986).

There still is a lack of research on the use and value of this model for a comprehensive school district wide change effort. Some recent research has used the CBAM

model for work with the implementation of microcomputers.

Educational Computing Research Using CBAM

In the rapidly expanding field of educational computing, some research on staff development has begun to examine the CBAM as a means of providing data and a conceptual framework for design of such staff development. These efforts have concentrated primarily on the Stages of Concern dimension of this model.

Several studies (Cicchelli & Baecher, 1985; Wedman & Heller, 1984) have assessed teacher concerns prior to the implementation efforts or to the providing of staff development activities. Others (Wedman et al., 1986; Whiteside & James, 1986) have used the "teacher concerns" dimension to study the change in teachers' concerns during an inservice or university based course on microcomputers in education.

The concepts of the CBAM have also been used in the design of inservice courses for both university faculty (Wedman & Strathe, 1984) and for teachers (Phillip, Munter, & Cutlip, 1982), although the assessment of teacher concerns was not a formal part of the design of these courses.

The results of the studies assessing the concerns of teachers have been very similar. Prior to the providing of inservice activity, concerns were found to be most intense

on Stages 0, 1, 2 (Awareness, Informational, Personal) with
less intensity on Stages 3, 4, 5, 6 which is typical of a
non-user of the innovation (Hall et al., 1977), although in
one study it was found that a group of respondents had a
"two-humped" profile with concerns most intense in Stage 1
(Informational) and Stage 5 (Collaboration) (Wedman et al.,
1986). This is probably indicative of teachers who already
have considerable computer experience (Wedman et al.).

Generally these studies found that variables such as
age, years of experience, sex and grade level did not
affect the concerns of teachers. Those examining the change
of concerns as a result of inservice activities reported
slightly conflicting results (Wedman et al., 1986;
Whiteside & James, 1986). Both found that with inservice
activities, impact concerns (Stages 4, 5, 6) increased in
intensity, however contrary to the theory (Hall et al.,
1973) self oriented concerns (Stage 0, 1, 2) did not
decrease substantially (Wedman et al., 1986; Whiteside &
James, 1986). Wedman et al. (1986) found that Management
concerns did not increase in intensity as a result of the
inservice. One reason proposed for the lack of the decrease
in the intensity of self-oriented concerns is that
educational computing represents an "innovation bundle" and
thus these assessments were in fact determining the
concerns on a number of closely related innovations
(Wedman, 1986).

The results of these studies may have been biased to

some degree by the samples selected. The number of
respondents in each study was relatively small; Cicchelli
and Baecher (1985) (n=78); Wedman and Heller (1984)
(n=87); Wedman et al. (1986) (n=91); Whiteside and James
(1986) (n=41). In addition, the participants were all
volunteers who were participating or about to participate
in staff development relative to microcomputer use in
education. The fact that these persons were seeking more
information about microcomputers may have influenced their
concerns. The samples of the studies may have made results
ungeneralizable to a larger population.

The research on teacher concerns suggests that
teachers are expressing self-oriented concerns (Stage 0, 1,
2) about the microcomputer.

Implications of the Model for this Study

The Concerns-Based Adoption Model, as the review of
the literature has indicated, is a model of change that has
been verified through research and by use. The model
focuses on the individual as the most important component
in the change process. Its use in a variety of studies of
educational change or innovation has indicated its
usefulness as a generic model for any change effort; thus
its application to the major change effort required to
introduce microcomputers into schools.

The diagnostic component of this model provides a

means of assessing where teachers are, both individually and as a group, relative to the implementation of microcomputers. This is a first step in planning appropriate interventions for the implementation of microcomputers. Assessment can be done for the three dimensions of the model.

Unfortunately, assessing the teachers on all three dimensions is a mammoth task that is beyond the scope of this study. It was decided to determine the concerns of teachers about microcomputers since an understanding of these can help in the planning of staff development activities that can resolve these concerns and probably overcome the computerphobia that so often prevents teachers from attempting use.

The actual planning of the staff development needed is beyond the scope of this study; however, data collected about teacher concerns could be quite useful in the design of such activities.

This model provides the framework and the instrument required to assess teacher concerns.

Summary

The review presented in this chapter has focused on the literature relevant to understanding change and the assessment of teacher concerns as a component in bringing about such change successfully.

The review of the literature on change attempted to provide an overview of what constitutes change and the process involved in it. Change is a complex process that is generally considered to consist of three subprocesses or phases. Many factors and elements are necessary to bring about change. The change process can be viewed from several perspectives, one of which is from the point of view of the individual experiencing the change.

One model of educational change that focuses on the individual perspective was examined in detail. The Concerns-Based Adoption Model provides a comprehensive framework for attempting to institute change. The concerns and level of use of an individual relative to an innovation together with the adaptation being attempted can be assessed using principles of this model. The data collected can then be used to prescibe interventions needed for an individual or a group to improve the likelihood of change occurring.

This model has wide applicability to any educational change. Its use with a variety of innovations ensures its usefulness in this study for determining the concerns of teachers about microcomputers.

CHAPTER III

THE DESIGN OF THE STUDY

Statement of Problem

Staff development is an important component in any plan to successfully implement microcomputer technology in the schools. Present attempts at educating teachers in the field most often fall short due to lack of consideration of a number of factors, including the needs and concerns of the individual about the innovation.

One means of making staff development more meaningful and successful is to address the concerns of teachers when planning such an effort. The necessity of considering the concerns of teachers about microcomputers prompted this study.

This study investigated the concerns of teachers regarding the introduction and use of microcomputers in the schools. Additionally, concerns were analysed to determine if differences existed between the concerns expressed by different subgroups of the population. These subgroups were stratified based on gender, educational background, place of residence, grades taught, ownership of microcomputer and availability of microcomputer at school. Specifically, this study attempted to answer the following seven questions:

Question 1.

What are the concerns of teachers about microcomputers in the schools?

Question 2.

What are the concerns of primary, elementary, junior high and senior high teachers about microcomputers in the schools?

Question 3.

Are there significant differences between females and males in the intensity of concerns on each of the stages of concern about microcomputers?

Question 4.

Are there significant differences between teachers who live in rural areas and those who live in urban areas in the intensity of their concerns on each of the stages of concern about microcomputers?

Question 5.

Are there significant differences between teachers who have access to a microcomputer at school and those who do not in the intensity of their concerns on each of the stages of concern about microcomputers?

Question 6.

Are there significant differences between owners and nonowners of microcomputers in the intensity of their concerns on each of the stages of concern about microcomputers?

Question 7.

Are there significant differences between teachers who have recently completed university study and those who have not in the intensity of their concerns on each of the stages of concern about microcomputers?

Selection of Subjects

Previous studies of the concerns of teachers about microcomputers have selected relatively small populations

who were about to attend or were attending inservice
courses. These populations may have had inherent bias due
to their small numbers and the fact that teachers were
already concerned enough about computers to attend courses
on the technology. It was decided, therefore, to choose a
larger population and to randomly select a sample of that
population.

Population

The population that was the subject of this study
consisted of all the approximately 8,000 teachers in the
public schools of the province of Newfoundland and Labrador
during the school year 1986-87. This population consisted
of those teachers who were engaged in teaching on a full
time basis. Excluded from this sample were teachers at
schools operated directly by the Department of Education,
including the Newfoundland School for the Deaf, and a
number of schools run by hospitals for their in-patients.

Sampling Procedures

The collection of data from such a large and widely
dispersed population would have been a mammoth task which
was beyond the scope of this study. The investigator,
therefore, decided to select a sample that was
representative of this population and to collect data from

those individuals.

The selection of the sample was carried out by first choosing randomly 30 schools from the approximately 600 in Newfoundland and Labrador. All teachers, including the principal, in each of the selected schools were the subjects for this study. The total number of subjects was 467. The decision to sample in this manner was made based upon the belief that it would increase the response rate and make followup easier. In addition, problems were encountered in the initial attempt to obtain a list of teachers and their addresses.

These subjects were stratified into various subgroups for the purpose of data analysis. These stratifications were based upon responses to a number of questions on section two of the questionnaire. These subgroupings were based on gender, ownership of a microcomputer, the availability of a microcomputer at school, the place of residence (rural vs. urban), grade level taught and the date of most recent university study.

Instrumentation

A self-administered questionnaire (Appendix A) was used to collect data to answer the questions posed by this study. This survey instrument consisted of two sections.

The first part is a modified version of the Stages of Concern Questionnaire (SoCQ) (Hall et al., 1977) which was

developed at the Research and Development Center for
Teacher Education at the University of Texas at Austin. The
SoCQ is a generic questionnaire which was designed to
determine the concerns of individual teachers about an
innovation. The validity and reliability of this instrument
for assessing the concerns of teachers about a number of
educational innovations has already been documented based
upon the results of a number of studies (Hall et al.,
1977). The existence of such an instrument, with the
reliability and validity confirmed, eliminated the need to
design one which would provide data to determine the
concerns of teachers. This instrument was judged to be most
appropriate for a relatively large sample since it provided
an easy means of scoring the data to determine teacher
concerns. Data collected on this section was used to
determine teachers' concerns. The second part of the
instrument was designed specifically for this study, and
collected descriptive data about the respondents.

The remainder of this section will briefly describe
the design, development and validation of the original
Stages of Concern Questionnaire and its modification for
this study. The reliability and validity of the original
instrument and the modified questionnaire is also
discussed.

Stages of Concern Questionnaire (SoCQ)

The SoCQ consists of thirty-five items, each of which has a Likert scale (0 - 7) (irrelevant, not true of me now ... very true of me now) on which respondents are asked to indicate their present level of concern on each statement about an innovation (Hall & Loucks, 1977). This questionnaire is based conceptually on the Concerns-Based Adoption Model (CBAM) and contains five statements for each of the seven Stages of Concern (SoC) hypothesized by the model.

This instrument was designed to provide a quick-scoring, valid and reliable measure for assessing the Stage-of-Concern hypothesized in the Concerns-Based Adoption Model (Hall et al., 1977).

Five hundred forty-four items of concern about innovations were generated from elementary teachers, college professors and researchers. These were Q-sorted and edited to provide a total of 195 items. These items were included in a pilot instrument that was administered to teachers and professors. The participants responded to each statement by indicating on a one-to-seven Likert scale how each statement was like them (Hall & George, 1979). As the result of factor analysis and item correlation, seven distinct factors associated with the seven Stages of Concern were identified (Loucks, 1977). A thirty-five item questionnaire was constructed by selecting five items from

among those having the highest factor loadings on each of the rotated factors (Hall et al., 1977). This questionnaire was later used in a variety of settings and with various innovations which led to verification of its validity and reliability.

Modified Questionnaire

After using the original instrument with a small group (n=4), it was decided to modify it slightly for the purposes of this study, by replacing the phrases "this innovation" and "the innovation" with the word "microcomputers". This modification is similar to one used by Whiteside and James (1986) in their assessment of the concerns of teachers about microcomputers. This change required the deletion of one sentence from the introductory page of the questionnaire. These changes were not expected to seriously damaged the validity and reliability of the instrument (G. E. Hall, personal communication, February 18, 1987).

In section one teachers were asked to express their concerns on the thirty-five items relative to microcomputers. They were instructed to circle the number on a scale of 0 (not relevant) to 7 (very true of me now) to indicate their level of concern on each statement.

Section two of the instrument consisted of 21 questions, each with several possible answers. The

respondents were asked to circle the choice that represented their best answer. These questions were designed to elicit information regarding grade level taught and area of responsibility, population of school and town, educational background and teaching experience, age and sex, experience and training with microcomputers and use in school and at home. Respondents were provided an opportunity at the end of the questionnaire to express any specific concern about microcomputers that they had in addition to those on section one.

Reliability and Validity

The instrument used to gather the data for this study collected both factual information regarding the respondents and data regarding the concerns expressed by teachers about microcomputers.

The mail survey method was selected because it could provide data from a large dispersed population without an excessive expenditure of time or money. The collection by mail was selected despite the common problem of low response rates due to the difficulty of administering the instrument personally to the sample selected. This method was also selected because of freedom from interviewer bias. In addition, respondents could remain anonymous, and this encouraged them to respond truthfully and freely (Kanuk & Berenson, 1978). This method also provided respondents with

the time to verify certain answers such as those regarding the number of microcomputers in the school and the number of students in the school.

Since section two collected only factual information, it was judged unnecessary to consider the reliability and validity of that section. The remainder of this section will focus on section one of the questionnaire and its validity and reliability.

Following its construction, the original SoCQ was judged to be both reliable and valid as the result of studies of the concerns of various groups.

The instrument was shown to have an high internal reliability with alpha coefficients for the seven stages ranging from .64 to .83 with six of the seven above .70 (Hall et al., 1977). The test-retest reliability over a two week interval was found to be acceptable. Correlation ranged from .65 to .85 for the seven stages with four of the seven above .80 (Hall et al., 1977).

The assessment of the validity of the SoC Questionnaire was a little more difficult since no other measure was available with which to compare data from the SoCQ (Hall et al., 1977). Inter-correlation matrices, judgments of concerns based on interview data and the confirmation of expected group differences and changes over time were used to test the validity (Hall et al., 1977). These all provided evidence that the SoCQ measured seven separate constructs identifiable as the Stages of Concern

as they have been conceptualized (Hall & George, 1979).

The modification of the Stages of Concern Questionnaire for use in this study is not expected to effect either its reliability or validity. A similar study (Whiteside & James, 1986) affected similar changes, but there was no comment in the report of the study covering the affect of these changes on the validity or reliability. Correspondence with one of the developers (G. E. Hall, personal communication, February 18, 1987) has confirmed that these changes probably will not affect the reliability and validity.

Administration of Questionnaire

The questionnaire was administered to the subjects during the month of February, 1987. The 30 schools selected had a total staff of 467, including non-teaching principals.

A package of questionnaires, together with a covering letter (Appendix D) to the principal, was either mailed to or dropped off at each school. The letter explained the purpose of the study and requested permission from the staff and the principal to conduct the study in the school. Principals to whom questionnaires were delivered were telephoned prior to delivery to inform them that they were about to receive the package. The letter indicated that if schools did not wish to participate, the investigator

should be contacted. No such request was received. Provided in each mailed package was a large pre-stamped, self-addressed envelope for return of the completed questionnaires. Provisions were also made to pick up completed questionnaires from schools to which questionnaires were delivered.

The principals were requested to distribute to each staff member a copy of the questionnaire together with an attached envelope. They were asked to collect completed questionnaires from respondents at the end of a one week period. The completed questionnaires were to be returned in the envelope provided. The end of February was given as the deadline for return of the completed questionnaires, if possible.

The questionnaire, as described previously, had attached to the front a letter explaining to respondents the purpose of the study and the time limit in which to complete the questionnaire.(See Appendix A) Upon completion, the respondents were asked to seal it in the envelope provided and return it to the principal. Teachers were asked to complete them individually and not in consultation with a colleague. This request was made so that responses on each questionnaire would represent that individual's concerns rather than the collective concerns of several teachers.

As of March 9, 1987 responses had been received from 20 of the schools that received packages. A total of 181

responses had been received up to that time.

During the following week the principals of the remaining schools were contacted to request return of the questionnaires that were completed. One principal indicated non-receipt of the questionnaires, but since time was a factor it was decided not to send a new set of questionnaires to the school.

This followup resulted in eight schools returning questionnaires with an additional 57 responses. This brought the total responses to 238 which represented a response rate of 51.0%. This response rate will influence conclusions and the ability to generalize the results to the population sampled.

The data collected from the respondents were used to answer the questions posed by this study.

Treatment of Data

Scoring of the Data

This study collected two sets of data: descriptive data relative to the demographic characteristics of the respondents and intensity scores on 35 statements of concern. The descriptive data collected on section two of the instrument was used in its raw form to stratify the respondents into various subgroups. Prior to dealing with the analysis procedure employed, a description of the

procedures for interpreting the raw data on the concerns statements will be described.

For each of the respondents, the score for each item in section one is the number circled (0 - 7) on that statement. For each of the seven Stages of Concern a raw intensity score was computed by totalling the score on each of the five statements associated with that stage (see Appendix E for a listing of the statements by Stage of Concern). From these individual raw scores a group mean raw score was calculated for each of the seven Stages of Concern.

The raw scores for each stage were converted to percentile scores using the conversion chart (See Appendix F) outlined by Hall et al. (1977) in their scoring manual. Percentiles were calculated for each individual on each of the seven stages. In addition subgroup mean raw scores were calculated for each stage. These subgroup mean raw scores were then converted to percentile mean scores. Group mean percentile scores were computed for each stage as well.

Profiles showing the relative intensity of concerns on each stage can be constructed by graphing the percentile score on each stage. Profiles were constructed using the group percentile mean scores and for each subgroup as stratified for questions in the study.

The percentile scores for each individual were used to determine the individual's "peak" score. The "peak" score is the stage showing the highest percentile intensity

score.

The interpreted date together with the descriptive data from section two was analysed to provide answers to the questions posed in this study.

Analysis Procedures Used

This study attempted to answer seven questions related to the intensity of concerns expressed by teachers regarding microcomputers in the classroom. These questions, together with the statistical analysis used to test them or describe the data collected, are given below.

Question 1.

What are the concerns of teachers about microcomputers in the schools?

The question was answered by tabulating the number of teachers having each Stage of Concern as the "peak" score. A table was constructed to display the number of teachers and the percentage of respondents with each stage as the "peak" score.

To supplement the results provide by the tallying of "peak" scores, a profile showing the group mean percentile scores was constructed. This demonstrated the relative intensity of each Stage of Concern for all teachers.

Question 2.

What are the concerns of primary, elementary, junior high and senior high teachers about microcomputers in the schools?

The teachers were asked in section two of the questionnaire to indicate whether they taught the majority of their time in primary, elementary, junior high or senior high grades. Based upon the response to that question, the repondents were stratified into one of these four groups.

A profile for each subgroup was plotted on the same graph to show any differences in their relative intensity of concerns.

Question 3.

Are there significant differences between female and male teachers in the intensity of concerns on each of the seven stages of concern about microcomputers?

The population for this study was stratified into two groups - female and male teachers.

The question was answered by conducting a t-test on the difference of the mean raw scores of female and male teachers. A separate test was conducted for each of the seven stages. These tests were judged at the .05 level of significance.

To illustrate differences and similarities in the intensity of concerns of these two groups, profiles were plotted for both groups on the same graph.

Question 4.

Are there significant differences between teachers who live in rural areas and those who live in urban areas in the intensity of their concerns on each of the stages of concern about microcomputers?

Teachers were judged to live in an urban area if they lived in a town or city with a population in excess of 10,000. All others were considered to live in rural areas. Stratification was determined based on answers to a question on section two of the questionnaire.

This question was tested by conducting a t-test on the difference of the mean raw scores of rural and urban teachers. The test was conducted separately on each of the seven stages. These tests were judged at the .05 level of significance.

A profile for each of these two groups was displayed on the same grid to point out similarities and differences.

Question 5.

Are there significant differences between teachers who have access to a microcomputer at school and those who do not in the intensity of their concerns on each of the stages of concern about microcomputers?

The population for this study was stratified into two groups based upon the availability of a microcomputer in their school. A question on section two of the questionnaire delineated the respondents into these two groups.

This question was answered by conducting a t-test on

the difference of the mean raw scores of teachers whose
school has a microcomputer and those whose school does not.
The test was conducted separately on each of the seven
stages. The results were judged at the .05 level of
significance.

Profiles for each of these two subgroups were plotted
on the same graph to illustrate differences and
similarities.

Question 6.

Are there significant differences between teachers who
own a microcomputer and those who do not in the intensity
of their concerns on each of the stages of concern about
microcomputers?

Teachers who own microcomputers and those who do not
were determined by responses to a question on section two
of the questionnaire.

This question was answered by conducting a t-test on
the difference of the mean raw scores of teachers who own a
microcomputer and those who do not. The test was conducted
separately on each of the seven stages. The results of
testing were judged at the .05 level of significance.

Profiles for the two subgroups were displayed together
on the same graph.

Question 7.

Are there significant differences between teachers who
have recently completed university study and those who have
not in the intensity of their concerns on each of the
stages of concern about microcomputers?

Two groups were stratified. Teachers who had completed university courses since 1983 were placed in the recently completed grouping. All other teachers were in the group who have not recently completed courses. Responses on section two determined placement.

This question was answered by conducting a t-test on the difference of the mean raw scores of teachers who had recently completed university courses and those who had not. The test was conducted separately on scores for each of the seven stages. The results were tested at the .05 level of significance.

Profiles for each of the two subgroups were displayed on the same grid to illustrate differences in the relative intensity of concerns.

Summary

This chapter has described the design of a study conducted to determine the concerns of teacher in Newfoundland and Labrador about microcomputers. The questions posed in this study have been listed together with the analysis used to answer them. A description of the population and the procedure for selecting subjects was also provided. The instrument used and its administration has been described along with its validity and reliability. A description of the procedures used to calculate teacher

concerns was provided.

The data collected from this study were used to
address the questions posed in this chapter. Chapter IV,
which follows, describes the results of analysis of this
data.

CHAPTER IV

THE RESULTS OF THE INVESTIGATION

This study was undertaken to investigate the concerns
of teachers about the implementation of microcomputers in
the classroom and to investigate some factors that may
influence the level of intensity of these concerns.
Specifically, it sought to answer seven questions which
were listed in Chapter III.

The population for this study included all the
teachers in the province of Newfoundland and Labrador for
the school year 1986-87. The sample selected was stratified
into several subgroups for the purpose of determining if
certain factors influenced these concerns. These
stratifications were identified in Chapter III in the
description of the analysis used for each question. This
chapter will present the results of this study on a
question-by-question basis.

Question 1

What are the concerns of teachers about microcomputers
in the schools?

This question was posed to ascertain the feelings and
perceptions of teachers about their present or future use
of microcomputers in their classrooms. The planning of

meaningful and appropriate staff development activities related to use of microcomputers in instruction could be enhanced by a knowledge of teachers' concerns about this innovation.

The results from the administration of a modified version of the Stages of Concern Questionnaire (SoCQ) provided the data to answer this question.

The data collected on the 35 statements of concern were used to provide a raw score for each individual on each of the seven Stages of Concern. The raw scores were obtained by adding the levels of concern expressed on the five items related to each Stage of Concern (See Appendix E for a listing of concerns statements by Stage of Concern). These raw scores were converted to percentile scores using the conversion chart (Appendix F) outlined by Hall et al. (1977) in their scoring manual.

The percentiles for each teacher on each of the seven stages were used to determine the individual's "peak" score - the score which had the highest relative intensity of the seven. A tally of the peak scores for all 238 teachers is presented in Table 1.

The results indicate that the majority of teachers expressed concerns related to self (Awareness, Informational and Personal) as most intense. The largest number (102) had their most intense concerns at the Awareness level (Stage 0). This was followed closely by the Informational level with 85 teachers or 35.7% of the

Table 1

"Peak" concerns of teachers about microcomputers

Stages of Concern	Number of Teachers	Percentage of Respondents
Stage 0 Awareness	102	42.9
Stage 1 Informational	85	35.7
Stage 2 Personal	29	12.2
Stage 3 Management	6	2.5
Stage 4 Consequence	2	0.8
Stage 5 Collaboration	9	3.8
Stage 6 Refocusing	5	2.1
Total	238	100.0

respondents expressing this as the most intense concern level. Awareness or Informational concerns were most intense for 78.6% of the respondents. It was on the first three stages (Awareness, Informational and Personal) that 90.8% of the teachers had their most intense concerns about microcomputers.

The group raw mean score on each level of concern was converted to percentiles to determine the relative intensity of each stage. The percentile mean score for each stage was displayed graphically as a profile and is shown in Figure 3. This profile confirms that the first three Stages of Concern are most intense for the teachers responding.

The preceding would seem to indicate that the majority of teachers have their most intense concerns at either the Awareness, Informational or Personal levels. These concerns have been aroused and need to be resolved before other concern levels can become more intense. Teachers require more information about the microcomputer - what it is, what it can do and how it will affect them as teachers.

Implications of and reasons for the intensity of concerns on these levels will be discussed more fully in Chapter V.

Question 2

What are the concerns of primary, elementary, junior high and senior high teachers about microcomputers in the schools?
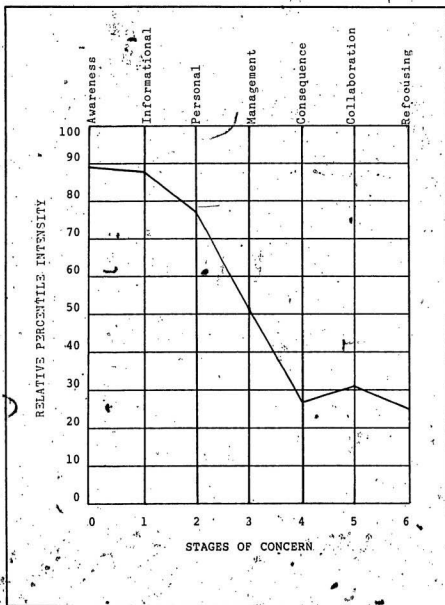
Figure 3

Percentile mean scores of the concerns of teachers about microcomputers

Teachers were asked to indicate which of the four groups of students they taught the majority of their time. Eleven teachers indicated student groups other than the four given on the questionnaire so these respondents were excluded for this analysis. A total of 227 teachers responded to this question with the number from each level as follows: primary (61), elementary (59), junior high (53), senior high (54).

A profile for each subgroup was plotted and the four were placed on the same grid to illustrate the similarities and differences in the intensity of concerns. These profiles are displayed in Figure 4.

The concerns of elementary teachers appear to be higher on most levels than the majority of the other subgroups. On the Informational, Personal, Management and Consequence levels their concerns are more intense than all other subgroups. As a group, all concerns other than at the Awareness level are higher than those of primary and junior high teachers. On the Informational level, their intensity of concern is 10 points higher than those of senior high teachers. Substantial difference was found between task and impact concerns of elementary and primary teachers with ranges from 11 to 17 points as follows: Management (13), Consequence (17), Collaboration (11) and Refocusing (13). These differences were unexpected and will be discussed in the next chapter.

Primary teachers as a group appear to be generally
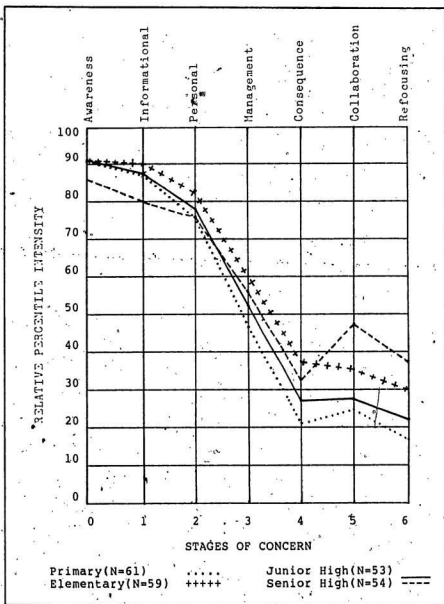
Figure 4

Percentile mean scores of the concerns of primary, elementary, junior high and senior high teachers about microcomputers

less concerned than the other subgroups. Their concerns are less than all other groups on the Personal to Refocusing concerns. They are slightly more concerned than senior high teachers on Informational concerns and among those showing the highest concern on the Awareness stage. Differences are large between primary teachers and senior high teachers on the Management to Refocusing concerns with difference as follows: Management (9), Consequence (12), Collaboration (23) and Refocusing (21). Again these differences have implications for designing staff development activities and will be discussed in the next chapter.

The junior high teachers are amongst the most concerned on the Awareness stage and the Informational stage. As a group, they are slightly less concerned than elementary teachers on Personal concerns. They are less concerned than both the elementary and senior high teachers on Management, Consequence, Collaboration and Refocusing stages. These differences are most pronounced on the Collaboration (8 and 20 points) and Refocusing stages (8 and 16). Junior high teachers are only slightly more concerned than primary teachers on the Personal to Refocusing levels with the greatest differences being a spread of 6 points on Consequence concerns.

The senior high teachers are much less concerned about self oriented concerns (Awareness, Informational and Personal) than other groups. They are much more concerned on Consequence, Collaboration and Refocusing concerns. The

arousal of these concerns may reflect the presence of
microcomputers in the majority (100% of those surveyed) of
senior high schools.

There are quite pronounced differences between some of
these subgroups on the intensity of their concerns on
various stages. These differences can have ramifications
for the planning of staff development activities. This will
be discussed in Chapter V.

Question 3

Are there significant differences between female and
male teachers in the intensity of their concerns on each of
the seven stages of concern about the microcomputer?

The question was answered using a series of t-tests
for independent samples. A separate test was conducted on
the subgroup means for the seven stages of concern. The
results of these tests are summarized in Table 2.

The results of these tests were judged at the .05
level of significance. In order to be significant at this
level with 236 degrees of freedom, a t-value of
approximately 1.96 was required. Differences appear to be
significant at that level on only the Informational and
Refocusing stages.

To further illustrate these differences the profile
for each subgroup was graphed and they are shown in Figure
5. These point out that the concerns of females are higher
for stage 0 and 1 and lower for stages 3 through 6
(Management through Refocusing). These profiles also

Table 2

Results of t-tests on intensity of concerns
of female and male teachers

Stage	Group	N	Mean	Std. Dev.	t-Value	2-Tail Prob.
0	Female	130	13.60	6.02	1.51	0.132
	Male	108	12.41	6.09		
1	Female	130	24.76	6.69	2.42	0.016
	Male	108	22.56	7.31		
2	Female	130	21.95	8.26	0.15	0.883
	Male	108	21.79	8.28		
3	Female	130	14.02	7.24	-0.78	0.438
	Male	108	14.74	6.93		
4	Female	130	18.83	8.64	-1.17	0.242
	Male	108	20.13	8.33		
5	Female	130	15.48	8.41	-1.60	0.111
	Male	108	17.30	9.09		
6	Female	130	9.63	7.06	-3.45	0.001
	Male	108	12.83	7.20		
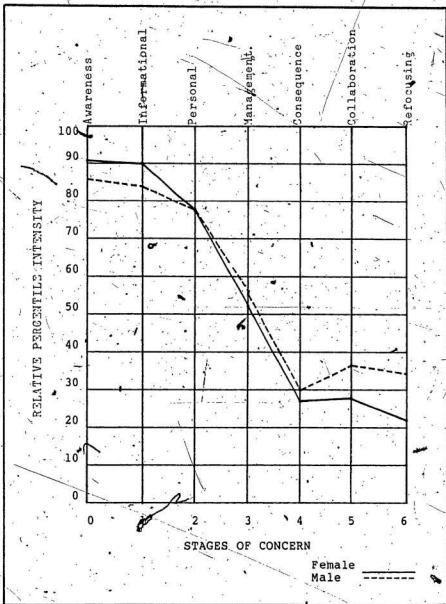
Figure 5

Percentile mean scores of the concerns of female and male
teachers about microcomputers

confirm the differences found from testing and point to a difference of 8 points on the intensity of Collaboration concerns. Although not significant at the .05 level, it was significant at the .12 level.

Further discussion of these differences and the implications will take place in Chapter V.

Question 4

Are there significant differences between teachers who live in rural areas and those who live in urban areas in the intensity of concerns on each of the seven stages of concern about microcomputers?

Teachers who lived in a community or town of 10,000 population or less were judged to live in a rural area. All others were urban dwellers. T-tests for independent samples were conducted for each of the seven stages of concern. The results are displayed in Table 3.

The results of the t-tests were judged at the .05 level of significance. With degrees of freedom of 236, a t-value of approximately 1.96 was necessary for significance. Since the t-values for all seven stages were below that level, the assumption can be made that there are no sufficient grounds for justifying differences between these two groups. No inference can be drawn that the concerns of these two groups are different on any of the stages.

Examination of the subgroup profiles, which are shown in Figure 6, confirms the results of the t-tests. Minor

Table 3

Results of t-tests on intensity of concerns
of rural and urban teachers

Stage	Group	N	Mean	Std. Dev.	t-Value	2-Tail Prob.
0	Rural	163	13.33	5.84	1.02	0.308
	Urban	75	12.47	6.55		
1	Rural	163	23.43	7.45	-1.08	0.280
	Urban	75	24.49	6.06		
2	Rural	163	21.95	8.23	0.21	0.833
	Urban	75	21.71	8.36		
3	Rural	163	14.34	7.22	-0.02	0.987
	Urban	75	14.36	6.88		
4	Rural	163	18.99	8.64	-1.16	0.248
	Urban	75	20.36	8.19		
5	Rural	163	16.14	8.72	-0.43	0.664
	Urban	75	16.67	8.86		
6	Rural	163	10.98	7.48	-0.32	0.750
	Urban	75	11.31	6.89		
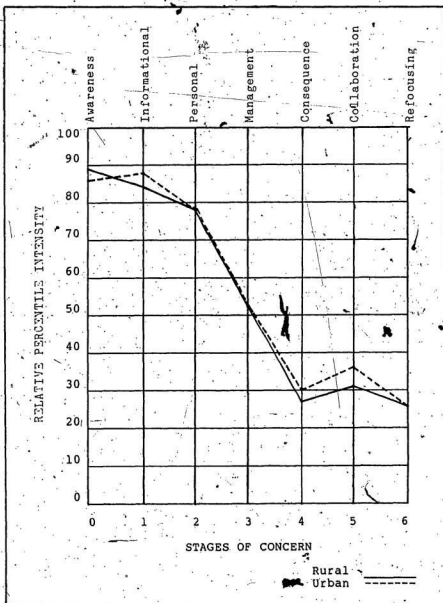
Figure 6

Percentile mean scores of the concerns of rural and urban
teachers about microcomputers

differences do exist with the largest difference being 5
points on Collaboration concerns with the urban group
appearing a little more concerned. The urban group was also
more concerned on the Informational and Consequence stages
while the rural group was more concerned only on the
Awareness stage with a difference of 3 points recorded. The
lack of significant differences in the groups would seem to
suggest that differential staff development should not be
designed based on place of residence of the teacher.

Question 5

Are there significant differences between teachers who
have access to a microcomputer at school and those who do
not in the intensity of their concerns on each of the
stages of concern about microcomputers?

Teachers were questioned about the availability of a
microcomputer in their school. It was surprising that in
some schools a few teachers were not aware that there were
microcomputers present in the building. The responses of
these were included in the category of those not having
access since they were unaware that these machines existed.
Data analysis was conducted on 231 respondents with 7 non
responses. This question was answered by conducting t-tests
for independent samples on seven stages of concern. The
results are found in Table 4.

In order to be significant at the .05 level for 229
degrees of freedom, a t-value of approximately 1.96 was
required. Results indicate that for four of the seven

Table 4

Results of t-tests on intensity of concerns of teachers at schools with microcomputers and those without

Stage	Group	N	Mean	Std. Dev.	t-Value	2-Tail Prob.
0	With	169	12.40	6.13	-2.75	0.006
	Without	62	14.87	5.79		
1	With	169	23.55	6.92	-0.94	0.348
	Without	62	24.53	7.34		
2	With	169	22.00	8.33	-0.09	0.927
	Without	62	22.11	8.06		
3	With	169	14.92	7.05	1.47	0.142
	Without	62	13.37	7.19		
4	With	169	20.43	8.21	2.64	0.009
	Without	62	17.19	8.37		
5	With	169	17.24	8.90	2.29	0.023
	Without	62	14.31	7.79		
6	With	169	12.12	7.25	3.34	0.001
	Without	62	8.61	6.57		

stages of concern there are differences that are significant. On Stage 1 (Informational), Stage 2 (Personal) and Stage 3 (Management), the results indicate no significant differences.

The profiles for these two groups are presented in Figure 7. This confirms the results of the t-tests. On Stage 2 (Personal), the percentiles are identical. On the remainder of the stages differences vary from 2 points on Informational concerns to 11 points on Collaboration concerns. Except for Awareness and Informational concerns the intensity of concerns is higher for those with access to a microcomputer at school.

The results of the testing procedure and profiles would seem to indicate that the presence of a microcomputer in the school aroused the task and impact concerns of teachers. More discussion of these differences will occur in Chapter Five.

Question 6

Are there significant differences between teachers who own a microcomputer and those who do not in the intensity of their concerns on each of the stages of concern about microcomputers?

Owners and nonowners of home microcomputers were determined by responses on the questionnaire. Seven teachers failed to respond to the question leaving a group of 231 for data analysis. The results of the t-tests for independent samples conducted for each stage of concern are
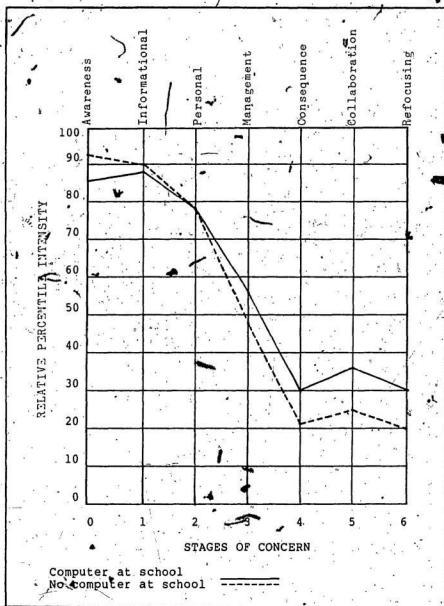
Figure 7

Percentile mean scores of the concerns of teachers about microcomputers for teachers with microcomputers at school and teachers without them

displayed in Table 5.

A t-value of 1.96 was required for significance at the .05 level with 229 degrees of freedom. The t-values for four of the seven stages support the assumption that differences exist between these two groups. These are the Awareness, Consequence, Collaboration and Refocusing stages.

Support for these differences is shown in the subgroup profiles in Figure 8. On Informational and Personal concerns the intensity of concerns for the two groups is identical. On the Awareness stage the concerns of the nonowners are more intense than the owners by approximately 10 points. However, for the Consequence, Collaboration and Refocusing stages, differences vary from 8 points on Refocusing to 20 points on the Collaboration stage with the concerns of owners being most intense. These results appear similar to those for the subgroups of question 5. The implications of these results will warrant further discussion and will take place in Chapter V.

Question 7

Are there significant differences between teachers who have recently completed university study and those who have not in the intensity of their concerns on each of the seven stages of concern?

Respondents were asked to indicate the date of most recent university study. The responses to this question were used to stratify teachers into two groups: 1) recent

Table 5

Results of t-tests on intensity of concerns
of teachers who own a microcomputer
and those who do not

Stage	Group	N	Mean	Std. Dev.	t-Value	2-Tail Prob.
0	Owner	60	10.38	5.76	-4.07	0.000
	Nonown.	171	14.01	5.98		
1	Owner	60	24.22	6.62	0.51	0.607
	Nonown.	171	23.67	7.19		
2	Owner	60	21.73	8.68	-0.32	0.746
	Nonown.	171	22.13	8.11		
3	Owner	60	14.72	7.10	0.27	0.791
	Nonown.	171	14.43	7.13		
4	Owner	60	21.60	8.25	2.21	0.028
	Nonown.	171	18.85	8.31		
5	Owner	60	19.63	8.21	3.37	0.001
	Nonown.	171	15.33	8.61		
6	Owner	60	13.00	7.68	2.29	0.023
	Nonown.	171	10.54	6.97		
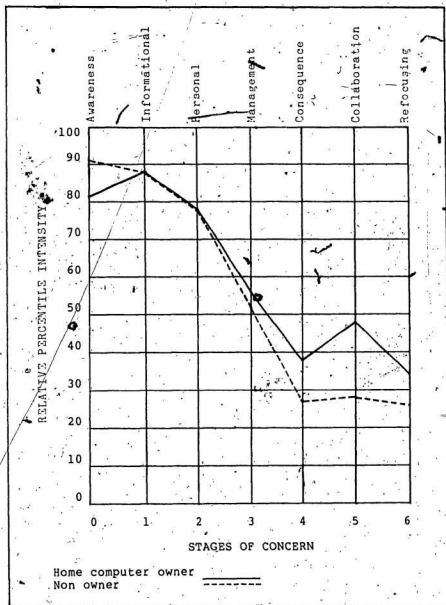
Figure 8

Percentile mean scores of the concerns of teachers about
microcomputers for teachers who own a microcomputer and
teachers who do not

students(1983-) and 2) non-recent students(pre 1983). Three
teachers did not respond to this question, the result was a
group of 235 responses for analysis. T-tests were conducted
on the means of the subgroups on all seven Stages of
Concern and the results are displayed in Table 6.

For significance at the .05 level with 233 degrees of
freedom, a t-value of approximately 1.96 was required. The
results of the testing indicate that no significant
differences are apparent.

Profiles for the two groups are displayed in Figure 9
and illustrate only minor differences. The largest
difference appears on the Collaboration stage with a
variation of 5 points. In general it appears that more
recent university students have had their concerns more
aroused on all but the Management concerns. Although the
date of university study does not appear to have
significantly influenced the intensity or arousal of
concerns.

Summary

This chapter has presented the results of the study on
a question-by-question basis. Implications and conclusions
drawn from these results were kept to a minimum and will be
discussed in Chapter V together with some recommendations
regarding further study and direction for staff development
for instructional computing.

Table 6

Results of t-tests on intensity of concerns
of teachers who have recently completed university
study and those who have not

Stage	Group	N	Mean	Std. Dev.	t-Value	2-Tail Prob.
0	Pre 1983	111	13.41	6.13	0.85	0.397
	1983-	124	12.73	6.00		
1	Pre 1983	111	23.15	7.57	-1.40	0.162
	1983-	124	24.44	6.53		
2	Pre 1983	111	21.70	8.83	-0.29	0.773
	1983-	124	22.09	7.83		
3	Pre 1983	111	14.76	7.44	0.69	0.490
	1983-	124	14.11	6.83		
4	Pre 1983	111	18.62	8.19	-1.41	0.160
	1983-	124	20.19	8.82		
5	Pre 1983	111	15.57	8.77	-1.14	0.257
	1983-	124	16.87	8.80		
6	Pre 1983	111	10.65	7.09	-0.78	0.436
	1983-	124	11.40	7.53		
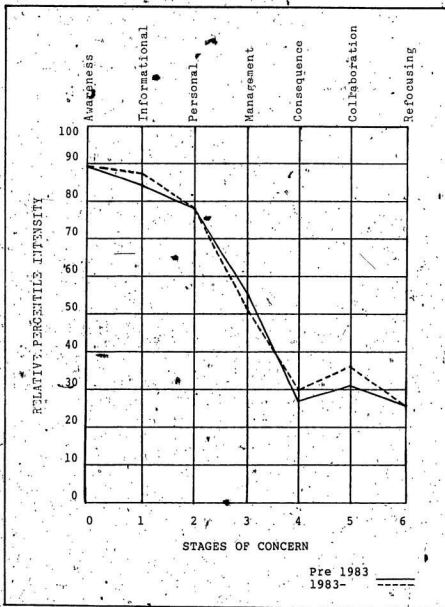
Figure 9

Percentile mean scores of the concerns of teachers about microcomputers for teachers who have recently completed university courses and teachers who have not

CHAPTER V

CONCLUSIONS AND IMPLICATIONS

Since the introduction of the microcomputer in 1975, microcomputer technology has been the subject of considerable discussion in educational circles regarding its place and possible uses. Because of the versatility and power of this technology and the potential for use in education, educators have given more thought to it than to other technological innovations such as instructional television and the overhead projector. The impact of this technology on our daily lives implies that it is more than a passing fad.

A large portion of the initial discussion about the technology centered on what students should be taught to be able to function in a society in which computers are prevalent and at what grade level "computer literacy" should be introduced. Presently, it appears that more interest and research is focusing on using the microcomputer as a mode and manager of instruction and on the merits of using microcomputers for instruction in contrast to other teaching strategies. However, little consideration appears to have been given to the issue of the role and preparation of teachers to use this new technology.

Initial work in the area of teacher education for this technology focused on the competencies or knowledge needed to control this technology. There appears to be no consensus, however, on the skill and knowledge required to use the microcomputer for instructional purposes. The debate has followed a somewhat parallel path to that evolving in the discussion of student computer literacy.

Most controversy surrounds the issue of the need for and level of programming competence. The advocates of the need for substantial programming have difficulty agreeing on the most appropriate programming language. Recent advances in the "user friendliness" of software has resulted in more support for the view that proficiency in programming is unnecessary and emphasis on it probably results in increased computerphobia.

In spite of the debate over the skills needed, there appears to be little disagreement about the need for preparation of teachers to use this technology. Due to stable teaching staffs and lack of undergraduate preparation both in the past and presently, it appears that staff development is required to ensure a teaching population competent in the use of the technology.

The majority of initial attempts at providing such staff development has followed the pattern prevalent in education. The oneshot, one day workshop, with little or no follow up to ensure continued use, dominates. Evaluation of this type of staff development has indicated that the

results are less than satisfactory for implementation of innovations. Successful implementation requires more than a single day or half day workshop to introduce teachers to the change and then expect them to "take the ball and run with it". Research has shown that for change to be successful, teachers must change and this requires a well planned, comprehensive and ongoing staff development program.

In planning for staff development, it is important to determine teachers' attitudes and reactions to the proposed innovation. This study attempted to determine the reactions and attitudes of teachers to this innovation by assessing their concerns, in particular the concerns of teachers of the province of Newfoundland and Labrador. The assessment of the intensity of their concerns was done prior to any implementation effort at a school district or provincial level. To determine if differential plans were necessary for various groups, the study also sought to find factors that may have influenced these concerns.

This study attempted to determine if differences existed between various groups. Female and male teachers, rural and urban teachers were compared to see if differences existed. The intensity of concerns of primary, elementary, junior high and senior high teachers were compared. Availability of a microcomputer at home and in school were considered to be potential factors influencing concerns. Finally, the date of most recent university study

was used as a variable to evaluate its impact on teacher concerns about the microcomputer.

The Study

The population studied for this investigation was teachers in the province of Newfoundland and Labrador for the school year 1986-87. A sample consisting of 467 teacher was chosen and their concerns about microcomputers were assessed. The sample was stratified into several different subgroups for the purpose of data analysis.

The study was conducted using a survey questionnaire (Appendix A). The questionnaire used was a modified version of the Stages of Concern Questionnaire which had previously been validated and checked for reliability. The slight modifications were not expected to affect the reliability and validity of the instrument.

During the winter of 1987, the questionnaires were distributed to the principal of each of the 30 schools selected. Each teacher received a questionnaire to complete and return to the principal within a one week period. Upon receipt of the completed questionnaires the principals were to return them to the investigator.

In addition to collecting data related to the concerns of teachers, certain other data were collected. Information was obtained related to the teachers' educational background in general and specifically with reference to

the microcomputer. Data were obtained about the teaching responsibility and grade level taught as well as the teaching experience and school population. Information about the age, sex and town population was also obtained. Information was also sought on the availability of a microcomputer both at home and in school and the uses of these by the respondent if available. The number of microcomputers present in each school was also determined together with teachers' experience with microcomputers.

The information collected on teacher concerns, together with the information collected on the other questions, provided the data for analysis. A discussion of the results of this study follows in the next section.

Discussion of the Results

The results of this study were presented on a question-by-question basis in Chapter IV. This section will provide a discussion of these results. Prior to that, the impact of the response rate on generalizability will be discussed together with possible explanations for the response received.

Response Rate

Of the total of 467 teachers sampled only 238 responded, resulting in a response rate of 51.0%. This

response rate was lower than expected. Any discussion of the results of this study must be done being fully cognizant of this response rate.

Several probable reasons can be surmised to try to explain this low response. The research method employed, the mailed survey questionnaire, has a history of low response rates (Dillman, 1978; Kanuk & Berenson, 1978) but was used despite this inherent problem because of the advantages discussed in Chapter III. In addition, in following up on nonresponses, it became apparent that both teachers and principals questioned the applicability of the study to them since either they had no experience with microcomputers and/or their schools had no machines in use. Respondents sharing this view probably did not respond, thus affecting the response rate. Also, teachers without experience might be suffering from computerphobia, which may have manifested itself in nonresponse to the questionnaire. Some principals may have distributed the instruments to only those teachers who had some experience with microcomputers to make it appear that the school was more innovative with computers than was the case. In addition, environmental conditions may have been a factor.

During the period of the survey in the month of February, the province experienced one of the worst winters on record resulting in schools being closed for quite a few days. This loss of time may have placed additional pressures on teachers for completion of other duties,

resulting in the perception of less time to complete the
questionnaire. This may have negatively affected the
response rate.

Due to the low response rate inferences will be valid
only for those who responded. Projections of these results
to the teaching population of Newfoundland and Labrador
must take into account the low response rate and its
implications for generalizability. In spite of this caveat,
certain new hypotheses can be generated that could be
resolved in future work.

Discussion

This study found that the vast majority (90.8%) of
teachers responding had the highest intensity of concerns
on one of the first three stages or levels. These three -
Awareness, Informational, and Personal - are associated
with concern about self in relation to the innovation.
Persons having these concerns as most intense are typical
of nonusers or beginning users of the innovation (Hall et
al., 1977). This was borne out in the fact that only 45
(18.9%) of the respondents had used the microcomputer for
instructional purposes. If one assumes that nonrespondents
do not use the microcomputer, the percentage of teachers
using the microcomputer as an instructional tool is reduced
to 9.6%. The study did not attempt to determine how
extensively each user used the microcomputer, but 185

respondents or 77.7% indicated that they would classify themselves as either nonusers or novice users. A further breakdown revealed that 78.6% of the respondents had most intense concerns on either the Awareness level or Informational level.

The profile of this group of teachers showed that the mean percentile scores for this group are highest on the first three stages varying from 89 points to 78 points. The other four levels showed lower intensity of concern ranging from 52 points on Management concerns to 26 points on Refocusing concerns.

These results are similar to those found by others (Cicchelli & Baecher, 1985; Wedman & Heller, 1984; Wedman et al, 1986; Whiteside & James, 1986) about the concerns of teachers about to start inservice on microcomputers. The intensity of concerns on the task and impact levels were much lower in the present study than in the other studies. The lower concerns on these levels may be attributed to the fact that the samples for the other studies were teachers who were voluntarily entering courses on microcomputers in education and their interest in pursuing these courses may indicate an increased arousal on these later stages.

The arousal of high self-oriented concerns can be attributed to many factors. Teachers may have become aware of the potential of this technology for education through various media such as magazines, newspapers, professional journals and television. Purchase of a home computer for

use by the owner or children may have aroused these
concerns since approximately 25.2% of those responding
owned one. The presence of a microcomputer in the school
may also have aroused these concerns since there was at
least one microcomputer in 70.0% of the schools surveyed.

The low intensity on task and impact concerns is most
likely due to the limited use or nonuse of this technology
by the majority of teachers. Hall et al. (1977) indicated
that with increased use of the new technology these
concerns become aroused and more intense. The existence of
a one-to-one relationship between level of use and the
level of concern has been postulated (Loucks & Hall, 1977)
and appears to be reflected in these results.

These results have implications for the design of
staff development activities for those who responded and as
well for all teachers of the province if an implementation
effort in microcomputer teacher education were to be
undertaken. If one could assume that the majority of
nonrespondents had very little or no experience with the
use of microcomputers, they would most likely have their
most intense concerns on the Awareness and Informational
stages. This hypothesis could be tested by administering
the Stages of Concern Questionnaire on site to any group
slated for inservice activity prior to the delivery of the
same to confirm that highest concerns exist at one of these
three levels.

The high intensity of arousal of self-oriented

concerns requires resolution prior to the intensity of
concerns at the task and impact levels increasing. This can
be accomplished through provision of staff development
targeted at the resolving of these concerns about the
microcomputer.

At the Awareness stage, teachers are not excessively
concerned about the microcomputer or involved with it.
Staff development should include information that will make
teachers more aware of the microcomputer and its potential
for education.

On the Informational level teachers have a general
awareness of the microcomputer but are seeking more
information about it. To resolve these concerns, teachers
should be provided with general information about the
technology, what it is, how it works, what its capabilities
are, what will be required to use it and what are its
effects. At this juncture teachers should be provided with
some experience with the operation of the microcomputer.
This should include only enough information to turn the
machine on and off and how to boot a disk and load a
program from a diskette. It is most important that success
is achieved on the first encounter with this technology. No
concentration should be given to programming. Teachers who
have an interest in this could pursue it on their own.
Teachers should be made aware that to successfully use this
technology does not require an extensive or elaborate
background in BASIC or any other programming language.

On the Personal level teachers are concerned about the demands that the new technology will place on them and how well they can cope with these new demands. Teachers should be reassured that this technology will not become a replacement for them but an aid to help free them to do what they do best, teach. Various utility software should be illustrated to show teachers how it can be an aid to them in their every day work. Use of the computer to calculate marks, print out a poster and save a worksheet are uses that all teachers could use and appreciate.

Initial staff development activities could concentrate on these three levels of concerns together since they are all self-oriented and are high in intensity.

It is important that no attempt be made to resolve the concerns at the task and impact level since they are not most intense at this time (Anderson, 1983b). Attempts to do so may unduly arouse these concerns prior to resolution of the self-oriented concerns. Teachers must feel comfortable with the technology before they will attempt to use it in their instruction. Arousal of these higher level of concerns could lead to computerphobia with the result that the teacher may never attempt to use the microcomputer. No emphasis should be placed on the impact of the technology on students, nor should time be spent on the dealing with managing or scheduling the microcomputer in the classroom setting. As the self-oriented concerns are resolved then these concerns will become more intense and should be

resolved through staff development targeted at those concerns.

Teachers whose highest concerns are at the task and impact level could be pinpointed in each school or school district and they could be pressed into service as instructors for staff development for their colleagues. They should not be forced to endure activities designed to resolve concerns which they have had resolved. If on site investigation reveals enough teachers at the task and/or impact concern level then staff development activities should be provided for them to resolve those concerns.

This study has shown that microcomputers are present in 70.0% of the schools but only 18.9% of the teachers had used them for instructional purposes. The lack of use is due in large measure to the unavailability of machines, but lack of teacher education for their use is another important factor. This could be corrected in part by beginning a staff development based on the level of concern assessed in this study.

This study also attempted to determine if different groups of teachers had different concerns.

The results of analysing the concerns of teachers at primary, elementary, junior high and senior high were somewhat unexpected. It was assumed that concerns of primary and elementary teachers would be somewhat similar in the same way that junior high and senior high teachers were expected to be. It appears that the concerns of

primary and junior high teachers are more closely related
than any other relation. However, the most intense concerns
are common at self-oriented concerns levels although levels
vary quite a bit on the task and impact concerns.

The difference could be the result of many factors.
The somewhat lower self-oriented concerns and much higher
impact concerns for senior high teachers may result from
microcomputers already being present in these schools. If
one assumes that the microcomputers in these schools are
used primarily for computer studies then, despite lack of
actual use the lower order concerns have been resolved to
some extent. This may be due to awareness of the machines
in the school and through discussion with colleagues. The
somewhat higher level on the Refocusing level may reflect a
negative attitude toward the microcomputer in that some of
these teachers feel that teaching strategies they presently
use are superior to any new approach.

The lack of microcomputers in some primary and
elementary schools may explain the more intense
self-oriented concerns and lower task and impact concerns.
This does not explain, however, the generally higher level
of concern for elementary teachers on almost all stages.

The concerns of junior high teachers almost mirror
those of primary teachers but at a slightly more intense
level. This may result from some of these teachers being in
a central high school where microcomputers are present but
seldom for their use.

The similar high intensity on self-oriented concerns for all groups has some implications for staff development. It appears that it may not be necessary to have different programs for teachers in these different settings since their concerns on Stages 0, 1 and 2 are very similar. Variations of 13 points on Stage 3, 26 points on Stage 5 and 23 points on Stage 6 indicate that different activities need to be developed for these different groups beyond the resolution of self-oriented concerns. The intensity of concerns should be assessed again after the initial staff development since these activities may greatly influence the arousal of these higher order concerns.

Females and males differed on their intensity of concerns for two stages, the Informational level and the Refocusing level. Females are more concerned about seeking more information. This may be because females are less likely to express interest in or use things perceived as connected with mathematics or science. This may reflect the number of females enrolled in computer studies in high schools. It has been hypothesized that the lack of receptiveness of females towards computers is due in part to their socialization (Winkle & Matthews, 1982).

These differences should not warrant differential staff development initially since both groups have intense self-oriented concerns that could be resolved by similar activities. Again, later assessment of concerns may show differences on task and impact concerns necessitating

differential inservice.

It appears that the place of residence of the teacher did not influence the intensity of concerns. Teachers in rural communities appear to have had equivalent exposure to knowledge about microcomputers as their counterparts in urban areas.

It appears that exposure to a microcomputer either at home or in school does strongly influence the intensity of concerns of teachers. For the Awareness, Consequence, Collaboration and Refocusing stages exposure to the microcomputer made a significant difference in the intensity of these concerns. This confirms the hypothesis of the CBAM that as use increases higher level concerns become more intense and lower level ones become less intense. Figures 7 and 8 confirm this difference.

Those teachers who are already using the microcomputer could assist with staff development or separate inservice could be set up for them if their numbers are large enough. After the staff development to resolve lower order concerns, these teachers could becoming "helping" teachers as others experience frustration with first use and trial..

The date of last university study did not significantly influence the intensity of concerns. It could be surmised, therefore, that the limited knowledge gained so far has been gained from mass media or from personal communications amongst teachers.

The lack of a high response rate without a doubt

influenced the intensity of concerns. The author surmises that the lack of responses was from individuals with a lack of knowledge or information and that the nonresponse probably deflated the magnitude of intensity that would have been expressed on the self-oriented concerns. This could only be confirmed by an indepth followup to this survey by having a battery of individuals visiting a sample of schools and conducting the SoC questionnaire. The questionnaire could be administered at a staff meeting to ensure 100% response.

The results of this study, though tainted by an inadequate response rate, have implications for the implementation of microcomputers in the schools.

Implications

The discussion of the results in the previous section outlined potential approaches to providing staff development for teachers about microcomputers in the classroom. These suggestions were based on the concerns levels expressed by teachers in this study.

The review of the literature indicates that a need exists to provide staff development for teachers in the area of microcomputer education. This study has assessed the concerns of a small group of teachers about this technology. If staff development in this area becomes a reality, it will be necessary to complete a more

comprehensive assessment of teacher concerns since concerns
do change over time and with the acquisition of more
knowledge.

The development of a comprehensive staff development
program must be part of a well planned computer education
policy. Financing is a problem but a developmental plan
would bring about the implementation as part of a long term
gradual effort without the outlay of all monies up front.

Any plan should not consist only of provisions in the
budget for the purchase of a specified number of
microcomputers. As research in this paper has shown,
implementation does not result from the decision to adopt
this technology. Implementation and continuation comes
about when planning and action form an important component
of the long term plan.

The purchase of microcomputers for schools does not
ensure use. A case in point is the province of Alberta
which is quickly approaching a ratio of one computer to
every 19 students as the result of an extensive government
purchase agreement. Yet only 26.6% of the teachers use the
microcomputer (Petruk, 1985). A mammoth teacher education
program must now be developed to realize the benefits of
the investment already made.

The first step would be to begin work on the
development of a comprehensive computer education policy.
This policy should result from input from many sources:
teachers, teacher educators, students, parents and society

at large. This policy should include more than a decision about the type or brand of hardware to be used. In addition, the focus should be on developing "computer literate" students as a result of using this tool in a variety of subjects and projects. This would necessitate the preparation of teachers already in the field to use this technology.

If an attempt at implementation of any computer education policy is to be successful, staff development must be started on day one and continued throughout the implementation effort. Otherwise, the expenditure on hardware could have been better utilized elsewhere since only a small percentage of "keeners" will continue to use it after the initial effort has ceased.

Teacher concerns about microcomputers in the province of Newfoundland and Labrador were examined in this study and the results have raised several questions that could be dealt with in future research. These questions are:

1. Are there significant difference between the concerns of primary and elementary teachers and if so what are probable causes for these differences?

2. Are there significant differences between the concerns of junior high and senior high teachers and if so what are the probable causes of these differences?

3. How extensive is the use of microcomputers in schools and is there a relationship between its use and the use of other instructional media?

4. How do the concerns of teachers in a school district compare with those found in this study?

5. Do teacher concerns about microcomputers change over time and if so what factors influence the resolution of old concerns and the arousal of these new concerns?

The formulation of a comprehensive computer education policy, including a well planned staff development program, is a necessity for the successful implementation of microcomputers in the schools. Additional research is needed to provide planners with information to aid in the development of this policy. The investigation of the questions posed above will provide some of this information.

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APPENDIX A

INTRODUCTORY LETTER AND SURVEY INSTRUMENT

General Delivery

Topsail, NF

AOA 3YO

February 5, 1987

Dear Colleague:

I am a graduate student in the Learning Resources
Division of the Faculty of Education at Memorial
University. I am presently writing my thesis and would
appreciate it if you could take a few minutes from your
busy schedule to provide some of the data required to
complete this task.

The purpose of this study is to determine what
concerns(feelings) teachers of our province have regarding
the present or future use of microcomputers in the
classroom. The present and future placement of these
machines in our schools and classrooms has undoubtedly
raised some concerns in your mind. Teachers' fears,
feelings and perceptions about microcomputers and the
implementation should be considered when inservice is being
designed. Therefore, this survey is attempting to ascertain
how teachers feel at the present time.

The attached questionnaire is divided into two parts.
The first asks you to express your concern on 35 items

related to the introduction and use of microcomputers in the classroom. The second part requests you to provide some demographic data which will be used to determine if certain factors influence these concerns.

It would be greatly appreciated if you could complete the questionnaire individually, within a one week period, and then return it sealed in the envelope provided to your principal.

Thank you in advance for your cooperation and time in providing this information.

Yours in education

Gary White

CONCERNS ABOUT MICROCOMPUTERS SURVEY*

School # _____

The purpose of this questionnaire is to determine the concerns of teachers about the use of microcomputers in the schools. The items were developed from typical responses of school and college teachers who ranged from no knowledge at all about various innovations to many years experience in using them. Therefore, some of the items may appear to be of little or no relevance 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, 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 MICROCOMPUTERS. There is no

universally accepted definition of this innovation, so
please think of it in terms of your own perception of what
it involves. Phrases such as "the program", "this
approach", and "the new system" all refer to
MICROCOMPUTERS. Remember to respond to each item in terms
of your present concerns about your involvement or
potential involvement with MICROCOMPUTERS.

Thank you for taking the time to complete this
questionnaire.

SoC Questionnaire Items

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

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

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
                        microcomputers are.

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 microcomputers.

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

0 1 2 3 4 5 6 7   I would like to know about 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 microcomputers.

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

0 1 2 3 4 5 6 7   I am concerned about how
                        microcomputers affect students.

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

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

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

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

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

0 1 2 3 4 5 6 7 I am concerned about my inability to manage all microcomputers require.

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 microcomputers' instructional approach.

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 microcomputers based on the experiences of our students.

0 1 2 3 4 5 6 7 Although I don't know about microcomputers, 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 part in this approach.

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

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

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

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

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

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 microcomputers.

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

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
          microcomputers.

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
          microcomputers are better than
          what we have now.

Demographic Information

Circle the letter which best answers the question.

1. Which group do you teach the majority of your time?
   a) K-2   b) 3-6.   c) 7-9   d) Level I-III

2. Which of the following best describes your primary responsibility? Circle one only.
   a) Social Studies b) Language Arts c) Art or Music
   d) Mathematics e) Science f) Foreign Language
   g) Health/Phys Ed h) Special Education
   i) Classroom Teacher j) Administrator

3. Have you or are you presently teaching Computer Studies 2206?
   a) Yes   b) No

4. What is the student population of the school in which you teach?
   a) 0-99 b) 100-199 c) 200-299 d) 300-399 e) 400 +

5. What is the population of the town in which you live?
   a) 0-10000   b) 10000 +

6. What is your gender?
   a) female   b) male

7. What is your age?
   a) 0-29   b) 30-39   c) 40-49   d) 50+

8. What is the highest degree you have obtained?
   a) no degree b) bachelors c) masters d) doctorate

9. What was your major area of study?
   a) English b) Social Studies c) Math d) Science
   e) Other(please specify) _____

10. What was the date of your last university study?(full time, summer school, correspondence or evening course)
    a) pre 1981 b) 1981-1982 c) 1983-1984 d) 1985-1987

11. How many years have you been teaching?
    a) 0-4 b) 5-9 c) 10-14 d) 15-19 e) 20+

12. How many years have you been involved with microcomputers, including this year?
    a) 0 b) 1 c) 2 d) 3 e) 4+

13. Have you received training in microcomputer use?(workshops, university course, etc.)
   a) Yes   b) No

14. (Answer if response to # 13 was Yes)
   In what type of course did you receive your microcomputer training?
   a) university graduate course
   b) university undergraduate course
   c) school board workshop
   d) programming course(BASIC, etc)
   e) other(please specify) _____

15. Are there microcomputers in use in your school?
   a) Yes   b) No

16. (Answer if response to # 15 was Yes)
   How many microcomputers are there in use in your school?
   a) 1   b) 2-5   c) 5+

17. (Answer if response to # 15 was Yes)
   Do you or have you used the microcomputer as an instructional tool, other than in Computer Studies 2206?
   a) Yes   b) No

18. Do you have a microcomputer at home?
   a) Yes   b) No

19. (Answer if response to # 18 was Yes)
   Who uses your home computer?
   a) all the family   b) father
   c) mother   d) children only

20. (Answer if response to # 18 was Yes)
   What is the primary use of your microcomputer?
   a) educational   b) games
   c) business   d) word processing

21. In your use of the microcomputer, in which of the following groups would you place yourself?
   a) nonuser   b) novice   c) intermediate user
   d) old hand   e) past user

22. If you have any additional concerns or feelings about microcomputers in the classroom, please express them below and/or on the reverse side.

APPENDIX B

ASSUMPTIONS OF THE CONCERNS-BASED ADOPTION MODEL

Assumptions of the Concerns-Based Adoption Model

The model as postulated is based on certain underlying assumptions that set the perspective from which change in schools and colleges is viewed.

1. In educational institutions change is a process, not an event. Too often policymakers, administrators, and even teachers assume that change is the pivotal result of an administrative decision, legislative requirement, a new curricular acquisition, or procedural revision. They casually assume that a teacher will put aside an old reading text and immediately apply an individualized program with great sophistication. Somehow the conviction lingers that with the opening of school under the new program the teachers will blend their talents into effective teams. As reflected in the CBAM, the reality is that change takes time and is achieved only in stages. (Hall & Loucks, 1978, p. 37-38)

2. The individual must be the primary target of interventions designed to facilitate change in the classroom. Other approaches to change(e.g., Organizational Development) view the composite institution as the primary unit of intervention and place their emphasis upon improving communication and other organizational norms and behaviors. CBAM, however, emphasizes working with individual teachers and administrators in relation to their roles in the innovation process. CBAM rests on the conviction that institutions cannot change until the individuals within them change. (Hall & Loucks, 1978, p. 38)

3. Change is a highly personal experience. Staff developers, administrators, and other change facilitators often attend closely to the trappings and technology of the innovation and ignore the perceptions and feelings of the people experiencing the change process. In CBAM, it is assumed not only that the change process has a personal dimension to it, but that the personal dimension is often of more critical importance to the success or failure of the change effort than is the technological dimension. Since change is brought about by individuals, their personal satisfactions, frustrations, concerns, motivations and perceptions generally all play a part in determining the success or failure of a change initiative. (Hall & Loucks, 1978, p. 38)

4. There are identifiable stages and levels of the change process as experienced by individuals. The change process is not an undifferentiated continuum. There are identifiable stages that individuals move through in their perceptions and feelings about the innovation, and identifiable skill levels that individuals move through as they develop sophistication in using the innovation. (Hall, 1978, p. 4)

5. Staff development can be best facilitated for the individual by use of a client-centered diagnostic/prescriptive model. Too many in-service activities address the needs of the trainers rather than those of the trainees. To deliver relevant and supportive staff development, change facilators need to diagnose the location of their clients in the change process and to direct their interventions toward resolution of those diagnosed needs. (Hall & Loucks, 1978, p. 38)

6. The staff developer or other change facilitators need to work in an adaptive, yet systemic way. They need to stay in constant touch with the progress of individuals within the larger context of the total organization that is supporting the change. They must constantly be able to assess and reassess the state of the change process, and be able to adapt interventions to the latest diagnostic information. At the same time the facilitator must be aware of the "ripple effect" that change may have on other parts of the system. (Hall & Loucks, 1978, p. 38)

7. Full description of the innovation in operation is a key variable. All too frequently it appears that innovation developers have not clearly or fully developed operational definitions of their innovations. Change facilitators and teachers do not know what the innovation is supposed to look like when it is implemented. Thus another key assumption for concerns-based change is that there must be a full description of what the innovation entails when it is fully in use. (Hall, 1978, p. 4)

APPENDIX C

CHARACTERISTICS OF THE
LEVELS OF USE OF THE INNOVATION

Characteristics of the

Levels of Use of the Innovation

Levels of Use are distinct states that represent observably distinct types of behavior and patterns of innovation use as exhibited by individuals and groups. These levels characterize a user's development in acquiring new skills and varying use of the innovation.

0	NON-USE	State in which the user has little or no knowledge of the innovation, no involvement with the innovation, and is doing nothing toward becoming involved.
I	ORIENTATION	State in which the user has acquired or is acquiring information about the innovation and/or has explored or is exploring its value orientation and its demands upon the user and user system.
II	PREPARATION	State in which the user is preparing for first use of the innovation.
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. Changes in use are made more to meet user needs than client needs. The user is primarily engaged in a stepwise attempt to master the tasks required to use the innovation, often resulting in disjointed and superficial use.
IV (a)	ROUTINE	Use of the innovation is stablized. Few if any changes are being made in ongoing use. Little preparation or thought is being given to improving innovation use or its consequences.

IV (b)   REFINEMENT   State in which the user varies the
                        use of the innovation to increase
                        the impact on clients within the
                        immediate sphere of influence.
                        Variations are based on knowledge
                        of both short and long-term
                        consequences for clients.

V   INTEGRATION   State in which user is combining
                        own efforts to use the innovation
                        with the related activities of
                        colleagues to achieve a collective
                        impact on clients within their
                        common sphere of influence.

VI   RENEWAL   State in which the user
                        reevaluates the quality of use of
                        the innovation, seeks major
                        modifications of or alternatives
                        to present innovations to achieve
                        impact on clients, examines new
                        developments in the field, and
                        explores new goals for self and
                        system.

                                    (Hall et al., 1975, p. 54)

APPENDIX D

LETTERS TO PRINCIPALS

General Delivery

Topsail, NF

AOA 3YO

February 5, 1987

Dear :

I am a graduate student in the Learning Resources
Division of the Faculty of Education at Memorial
University. This letter is written to solicit your support
with the collection of some of the data required for my
master's thesis.

The purpose of this study is to determine what
concerns(feelings) teachers of our province have regarding
their present or future use of microcomputers in the
classroom. Teachers' fears, feelings and perceptions about
microcomputers and the implementation should be considered
in any inservice plan. This survey is designed to determine
the feelings of teachers about this innovation.

The teachers of your school have been selected as part
of the sample for this study. Enclosed you will find
questionnaires for distribution to all staff members
including yourself.

If you are willing to assist with this study, I would
ask you to give a questionnaire to each of your staff

members and ask them to complete it, individually, and return it to you sealed in the envelope provided. A period of one week for completion should be sufficient.

It would be greatly appreciated if you could forward the completed questionnaires to me in the enclosed self-addressed, pre-stamped envelope. I would appreciate return of these at your earliest convenience(by February 28th if possible).

A summary of the results for your school or the province can be provided upon request.

If you feel that you can not assist with this project, or if problems or questions arise, please contact me by phoning 834-3966(collect).

Thank you in advance for your time in assisting with this project.

Yours in education

Gary White

General Delivery

Topsail, NF

AOA 3YO

February 10, 1987

Dear :

   I am a graduate student in the Learning Resources
Division of the Faculty of Education at Memorial
University. This letter is written to solicit your support
with the collection of some of the data required for my
master's thesis.

   The purpose of this study is to determine what
concerns(feelings) teachers of our province have regarding
their present or future use of microcomputers in the
classroom. Teachers' fears, feelings and perceptions about
microcomputers and the implementation should be considered
in any inservice plan. This survey is designed to determine
the feelings of teachers about this innovation.

   The teachers of your school have been selected as part
of the sample for this study. Enclosed you will find
questionnaires for distribution to all staff members
including yourself.

   If you are willing to assist with this study, I would
ask you to give a questionnaire to each of your staff

members and ask them to complete it, individually, and return it to you sealed in the envelope provided. A period of one week for completion should be sufficient.

It would be greatly appreciated if you could collect the completed questionnaires. I will drop by your school on February 28th to collect these. If they are ready prior to that time, you can contact me at 834-3966 so that I may pick up same.

A summary of the results for your school or the province can be provided upon request.

If problems or questions arise, please contact me by phoning 834-3966.

Thank you in advance for your time in assisting with this project.

Yours in education

Gary White

APPENDIX E

CONCERNS STATEMENTS BY STAGE OF CONCERN

Item Number	Statement

Stage 0

3   I don't even know what microcomputers are.

12   I am not concerned about microcomputers.

21   I am completely occupied with other things.

23   Although I don't know about microcomputers, I am concerned about things in the area.

30   At this time, I am not interested in learning about microcomputers.

Stage 1

6.   I have a very limited knowledge about microcomputers.

14   I would like to discuss the possibility of using microcomputers.

15   I would like to know what resources are available if we decide to adopt microcomputers.

26   I would like to know what the use of microcomputers will require in the immediate future.

35   I would like to know how microcomputers are better than what we have now.

Stage 2

7   I would like to know about 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
      microcomputers.

33   I would like to know how my role will change
      when I am using microcomputers.

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 microcomputers require.

25   I am concerned about the time spent working
      with nonacademic problems related to
      microcomputers.

34   Coordination of tasks and people is taking too
      much of my time.

Stage 4

1   I am concerned about students' attitudes
      toward microcomputers.

11   I am concerned about how microcomputers affect
      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 microcomputers.

10   I would like to develop working relationships
      with both our faculty and outside faculty
      using microcomputers.

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 microcomputers' 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 microcomputers.

20   I would like to revise microcomputers' instructional approach.

22   I would like to modify our use of microcomputers based on the experiences of our students.

31   I would like to determine how to supplement, enhance, or replace microcomputers.

APPENDIX F

RAW SCORE TO PERCENTILE CONVERSION CHART

Raw Score to Percentile Conversion Chart

Five Item Raw Scale Score Total	Stage 0	Stage 1	Percentiles for Stage 2	Stage 3	Stage 4	Stage 5	Stage 6
0	10	5	5	2	1	1	1
1	23	12	12	5	1	2	2
2	29	16	14	7	1	3	3
3	37	19	17	9	2	3	5
4	46	23	21	11	2	4	6
5	53	27	25	15	3	5	9
6	60	30	28	18	3	7	11
7	66	34	31	23	4	9	14
8	72	37	35	27	5	10	17
9	77	40	39	30	5	12	20
10	81	43	41	34	7	14	22
11	84	45	45	39	8	16	26
12	86	48	48	43	9	19	30
13	89	51	52	47	11	22	34
14	91	54	55	52	13	25	38
15	93	57	57	56	16	28	42
16	94	60	59	60	19	31	47
17	95	63	63	65	21	36	52
18	96	66	67	69	24	40	57
19	97	69	70	73	27	44	60
20	98	72	72	77	30	48	65
21	99	75	76	80	33	52	69
22	99	80	78	83	38	55	73
23	99	84	80	85	43	59	77
24	99	88	83	88	48	64	81
25	99	90	85	90	54	68	84
26	99	91	87	92	59	72	87
27	99	93	89	94	63	76	90
28	99	95	91	95	66	80	92
29	99	96	92	97	71	84	94
30	99	97	94	97	76	88	96
31	99	98	95	98	82	91	97
32	99	99	96	98	86	93	98
33	99	99	96	99	90	95	99
34	99	99	97	99	92	97	99
35	99	99	99	99	96	99	99