EVALUATION OF AN IN-SERVICE TRAINING MODEL IN ELEMENTARY SCHOOL SCIENCE

by

RONALD N. BANISTER

A thesis
presented to the University of Manitoba
in partial fulfillment of the
requirements for the degree of
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ABSTRACT

This study examined eight factors which influenced the success of an in-service training program in science for elementary (grade kindergarten to six) school teachers. A goal free model of evaluation in which the teacher participants themselves identified the outcomes of a long-term in-service project was employed. After identifying outcomes, the teachers classified those outcomes into categories of change ; specifically, changes in materials, changes in methods, and changes in beliefs. Subsequently they assigned up to eight pre-selected factors to each of the outcomes. These factors were chosen by the author from variables identified in the research literature and from variables peculiar to the locale of this study.

The purpose of this study was to determine if it was possible to identify changes which occurred in the schools' science programs during the course of the in-service project. Secondly, it was to identify which of the eight pre-selected factors the participant teachers believed accounted for those changes.

It was found that the changes could in fact be identified and assigned to the three categories. Also, the most noted factors were identified to be the long term integrated nature of the in-service program itself and three factors at the school level: a team approach, a school commitment, and the leadership skills of the participants.

The overall conclusion of this study is that in-service training of teachers must consist of a program of training over a significant period of time in order to be effective.

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CHAPTER 1

INTRODUCTION

In the late 1970's and early 1980's, public schools in Manitoba were faced with a deluge of new curricula. These curricula were developed and distributed by the provincial ministry of education. The result of this activity was to place a great deal of pressure on the public school system to implement these new programs. Each local school district or school division had the responsibility for the implementation of the programs but lacked a process or a mechanism to achieve this goal.

One large urban school division (the site of this research) recognized the need for a process and has taken steps to develop a meaningful policy of curriculum implementation at the school division level. The first step in this process was communicating to all professional staff that the provincial curricula would form the basis of all programs taught in the school division.

The second step was the creation of a committee to oversee the development of the process and to represent the interests of particular segments of the professional staff. This committee was named the Curriculum Implementation Committee and was composed of a secondary superintendent, an elementary superintendent, two senior high principals, two junior high principals, two elementary principals, and two subject area consultants. Since its inception, the committee has changed membership approximately every two years, but has maintained the original pattern of representation. Two additions have been made to the committee. These are a teachers' association representative and the division's Curriculum Implementation and Evaluation Consultant.

The Curriculum Implementation Committee developed the process for curriculum implementation within the school division in 1982-83. This process is largely based on the work of Fullan, Park and others working out of the Ontario Institute for Studies in Education (OISE) (Fullan and Park 1981).

These researchers predicted that any curriculum implementation process would itself have to be implemented and that as part of that implementation, the process itself would change. This did, in fact, happen. A most significant aspect of the revised process in this instance is the emphasis which has been placed on program review. In fact, at this time (1988) it may be argued that the program review process has overshadowed the original curriculum implementation process.

The curriculum implementation process as developed by the Curriculum Implementation Committee consists of five steps: Awareness, Trial, General Adoption, Full Adoption and Review. Each of these steps is defined in some detail and each step would normally take one school year. Most curricula, however, have been implemented in time periods which do not conform to the five year pattern.

The program review process has replaced the fifth step of the curriculum implementation process. This review process consists of three steps, each of which, normally takes one school year. The three steps are: monitoring, review proposal development, and program review. These steps have been superimposed over the last two or three steps of the curriculum implementation process.

The three steps of program review require some definition. "Monitoring" is an attempt to determine the state of implementation of a particular curriculum and the level of consistency of that state with the stage of implementation expected by the implementation schedule. Monitoring includes the identification of success and problem areas. Expert advice is sought in order to determine what information should be gathered and by what means. To date, this stage of program review has included student testing; interviews with students, teachers and administrators; and questionaires of many different types. Budgets and expenditures have been examined and teacher qualifications and interests have been assessed. In summary, monitoring is an attempt to find out what is worth investigating in more detail at the review stage.

"Review Proposal Development" is a self-descriptive stage of program review. Approximately one school year is spent in the development of a thorough review proposal by the Curriculum Implementation and Evaluation Consultant and the appropriate subject area coordinator or consultant. The review proposal is submitted to the Curriculum Implementation Committee at various points for approval. The final version of the review proposal is submitted to the board of trustees for approval.

The "Review", like monitoring, may include many different types of information gathering. It is conducted as outlined in the review proposal and the information gathered is summarized and submitted to the Curriculum Implementation Committee. This committee then makes recommendations to the superintendents of the school division based on the conclusions of the review report. The report is also presented to the board of trustees for information, after which a summary report is made available to all schools in the division.

It is common for the recommendations of a review to include some definite changes which are desirable in the teaching of the program.

In the recent review of the elementary science program in the division, specific weaknesses were identified and recommendations were made to improve the situation. Some of the recommendations referred to providing more in-service training to teachers and principals.

Subsequently, a plan of in-service was developed which would address the program weaknesses identified in the program review and at the same time implement some of the new ideas of teacher in-service training which have emerged in recent years.

The in-service plan has a number of features which are unique in their combination. It is the evaluation of this model of in-service training which forms the substance of this study.

Purpose of the Study

The purpose of this study was to evaluate an in-service training model for elementary school teachers in a particular subject area. The subject area was science and the particular in-service model was developed in response to program needs outlined through the curriculum review process.

<u>Motivation for the Study</u>

The in-service training model was developed by the author in response to three primary motivators. First among these was a recognition of the futility of one day or one-shot in-services. This recognition was gained during fifteen years of classroom teaching during which the author was the "recipient" of this approach to in-service. This conclusion was reinforced by working with teachers as a subject area consultant for a period of five years. The experiences gained as a presenter of in-service programs in daily conversation with teachers about their professional needs have strongly encouraged this writer to try to find a better way.

The second motivator was the strong focus brought to this particular program by the curriculum review process. The timing was very appropriate for a major commitment of resources to the elementary science program as a response to the recommendations of the elementary science review.

The third motivator was the support and encouragement received from colleagues in the field of public school science consulting. An endorsement of the plan from other science consultants in the province had suggested that the plan had much to recommend it and indeed should be tried.

Other Considerations

A committee of knowledgable practicing teachers was formed to consider the model and to help develop the content of the in-service program. This committee was so enthusiastic about the model that the members met frequently over many months to refine and develop the implementation plans for the model.

A large group of elementary school principals was also given an opportunity, not only to consider the model, but to incorporate it into each school's professional development planning for the next school year. The principals indicated their support and approval by over-subscribing to the project. The project had to be limited to ten schools.

The Plan

The in-service plan had a number of features which do not necessarily form part of this study. The following general description will provide a context against which the reader may interpret the research.

Ten schools had self-selected themselves on the basis of having a "less successful" science program from kindergarten to grade six. These ten schools were from a school division which has upwards of fifty elementary schools. These schools had made science a priority for the school year 1987-88. The schools varied widely in size, location and administration. All ten schools had agreed to participate in this project without outside influence to do so.

Although ten schools were participating in the project, only some teachers from each school participated directly in the in-service component. Each school nominated an intermediate teacher (grade 4-6) to attend ten full-day sessions in the fall term and a primary teacher (grade K-3) to attend ten full-day sessions in the spring term. Each principal agreed to attend three half-day sessions during the program. Thus, each school had had three participants in the program by the time it was concluded. The impact of the project at the school level was largely determined by these three direct participants. The science consultant also provided some direct support and supervision at the school level.

The content of the in-service training sessions was of two main types. Each participant teacher was trained to be authorative and comfortable with all aspects of the elementary science curriculum, including content, processes, values and attitudes, evaluation, materials, methodology and resources.

In addition, each participant teacher was trained to be a change agent in the school to help other teachers improve their science programs.

A project of this size requires a significant commitment of time, money and personnel. The release time for the participant teachers was provided by the school division and the provincial department of education. Some additional time was provided by the schools themselves. Money for materials was provided by the school division. Personnel for presenting of the in-service sessions were provided by the school division directly in the person of the science consultant and indirectly on a fee for service basis.

The Research Problem

The purpose of this study was to evaluate an in-service training model for elementary school teachers in a particular subject area. The subject area was science and the particular in-service model was developed in response to program needs outlined through the curriculum review process.

The research problem in this study was twofold. First, an attempt was made to identify changes in the science program at the school level which occurred during the period of the study and secondly to have those identified changes attributed by the participants to particular features of the in-service model.

The search for change was left very open-ended to eliminate as much as possible of researcher bias. The only direction given to the subjects was to consider at least the three areas of curriculum change outlined by Fullan and Park: materials, methods, and beliefs (Fullan and Park 1981 p.6). No attempt was made to restrict identified changes to positive changes. In fact, the data collection instruments were designed in a way which would allow for recognition and recording of negative changes.

The eight factors examined were selected from the research and from the experience of the author as key elements in in-service training of teachers. They included:

1. the creation of a team within the school dedicated to improving the science program.

2. the commitment of the school to improving the science program

3. the leadership skills of the in-service participants.

4. the quality and quantity of in school support by a science consultant

5. the involvement of the principal

6. the effects of having long-term integrated program of science in-service

7. the impetus created by the curriculum review process

8. the effects of a network of support among participant schools.

Methodology

Although the pre-test post-test methodology for identifying change has a long history in this type of research, Scriven and others have pointed out that the focussing of a subject's attention onto specific questions can have the effect of blinding that subject to much more meaningful changes which have occurred (Scriven 1981 p.68). Goal-free evaluation allows the subject to identify what has changed during the course of the treatment. This degree of openness in the evaluation of change presents some problems. One may specify categories of change to be considered by the subject, but if the categorization becomes too detailed, the effect is the same as asking specific questions on a pre-test and a post-test.

Consequently, the categorization was limited to the same three areas identified by Fullan and Park (1981) as the three components of curriculum implementation: changes in materials, changes in methodology, and changes in beliefs (p.6)

In addition, participants were asked to rate the changes they identified on the following four point scale:

1. This change is definitely detrimental to the science program
2. This change is likely detrimental to the science program
3. This change is likely beneficial to the science program
4. This change is definitely beneficial to the science program

Finally, participants were asked to attribute the changes they identified to eight specified factors in the in-service model.

Teacher participants were asked for their responses by questionnaires. Principals were interviewed for their responses.

Summary

Curriculum implementation has led to an emphasis on program evaluation or "program review" in this particular jurisdiction. A recent program review of the elementary science program has concluded that more in-service training of teachers is desirable. A model of teacher in-service training has been developed to meet this expressed need. It is the evaluation of this model and in particular eight specified factors within the model that forms the substance of this study.

In chapter two an examination of the research literature on effective in-service models and specifically on the effects of the eight factors which are being studied here is undertaken. Some reference to goal-free evaluation and the ecology of change as it relates to the methodology of this study is also included.

CHAPTER 2

REVIEW OF THE LITERATURE

Purpose of the Study

The purpose of this study was to evaluate an in-service training model for elementary school teachers in a particular subject area. The subject area was science and the particular in-service model was developed in response to program needs outlined through the curriculum review process.

The research problem in this study is twofold. First, an attempt was made to identify changes in the science program at the school level which occurred during the period of the study and secondly those identified changes were attributed by the participants to particular features of the in-service model.

This chapter examines the research literature relating to effective in-service models with specific attention to the eight factors identified as the focus of this study. There is also some reference to the ecology of change as a process. Finally, goal-free evaluation as it relates to this study will be examined in some detail.

Definition of Change

Most of the research literature on the nature of change assumes that the objectives of the change process and the character of the innovation is known and valued. Authors then proceed to great lengths in explaining what factors affect the rate of implementation of the change and the degree of success in achieving the specified change. For example, R.F.McNergney identifies three factors which may determine the success or failure of an innovation. These are: the person, the environment and the task (McNergney 1980, p.235).

House argues that the important factors affecting the change process are related to the perspective of the people involved. He further suggests that there are three basic perspectives which one may hold. These are: the technological, political, or cultural perspectives (House 1981, p.18-19). Again, however, the focus is on the effect these perspectives will have on the success or failure of pre-determined outcomes.

The Concerns Based Adoption Model (Hall et al.1980) assumes the desired change is known in advance of the implementation, and concentrates on the factors which will affect the rate and success of the process of achieving the innovation.

To a large extent this study attempts to back-up one step and examine what is actually meant by change. The operational approach was to provide the subjects with only broad categories in which they could identify changes in their school science program. These broad categories were developed by Fullan and Park (1981):

> "Change" is the generic term, with "innovation" usually referring to a more radical or thorough change than "revision". In either case,implementation is involved when a person or a group of people attempt to use a new or revised program for the first time....at least three aspects or dimensions of change appear to be

> involved. Implementation is multi-dimensional. To take a curriculum guideline or document as an illustration, we can immediately discern that at least the following three kinds of changes are at stake: possible use of new or revised <u>materials</u>; possible use of new <u>teaching approaches</u>; and the possible incorporation of new or revised <u>beliefs</u> (p.6. underlining added).

With a slight rewording the dimension :"teaching approaches" to "methods", these broad categories of change are in fact the focus of this study.

Subjects in this study were deliberately not given a precise definition of the changes they were to document. In keeping with the goal-free approach to evaluation, this researcher did not wish to prejudice the respondents objectivity by providing a narrow focus for their observations. Respondents were encouraged to report any and all changes which they observed to occur in the science program at their home school during the course of this study. The only guidance they were given was to consider the three categories of change outlined by Fullan and Park.

Models of Staff Development

Gene Hall and Susan Loucks developed the "Concerns Based Adoption Model"(CBAM) at the Texas Research and Development Center for Teacher Education following on the work of Frances Fuller and others. The CBAM approach focusses on the concerns of the affected individuals about the innovation and attempts to meet those concerns as they emerge. Hall and Loucks (1978) identified seven levels of concern as listed below:

Stages of Concern		Expressions of Concern
6	Refocusing	I have some ideas about something that would work even better.
5	Collaboration	I am concerned about relating what I am doing with what other instructors are doing.
4	Consequence	How is my use affecting kids?
3	Management	I seem to be spending all my time in getting material ready.

2	Personal	How will using it affect me?
1	Informational	I would like to know more about it.
0	Awareness	I am not concerned about it (the innovation) (p.36-53).

These levels of concern are thought to shift from the individual and how the proposed change will affect each teacher personally, to managing the new practice, controlling the rate of change, and finally to the impact on students and on ways of improving the program.

More recently, Loucks, now Loucks-Horsley, has expanded on CBAM and developed an extensive guide to school improvement strategies at the NETWORK Inc., in Andover, Massachusetts. She has published a handbook on school improvement titled: <u>An Action Guide to School Improvement</u> with Leslie F.Hergert (1985). A large part of this guide reflects the CBAM.

Loucks-Horsley and Hergert have divided their guidebook into seven sections.

1. Establishing the School Improvement Project

2. Assessment and Goal Setting
3. Identifying an Ideal Solution
4. Preparing for Implementation
5. Implementing
6. Review
7. Maintenance and Institutionalization

Although the CBAM was not used specifically in this research, the applicable ideas were included and the project was conducted in a way which would only lend support to the concepts embodied in that model.

In 1981, the Association for Supervision and Curriculum Development (ASCD), published a model of staff development titled: RPTIM (readiness, planning, training, implementation, and maintenance). This model was based on research and assumptions of practitioners. The model was articulated into thirty-eight practices which were deemed advisable in any in-service project. Subsequently, (1982), a survey of practitioners and education professors identified eight of these thirty-eight practices as essential. The eight were:

1. A positive school climate is developed before other staff developments are attempted.
2. The school staff adopts and supports goals for the improvement of school programs.
3. The school staff identifies specific plans to achieve the school's goals for improvement.
4. Differences between desired and actual practices in the school are examined to identify the in-service needs of the staff.
5. Leadership during the planning of in-service programs is shared among teachers and administrators.
6. After participating in in-service activities, participants have access to support services to help implement new behaviors as part of their regular work.
7. The school principal actively supports efforts to implement changes in professional behavior.
8. Responsibility for the maintenance of new school practices is shared by both teachers and administrators.

(Wood, McQarrie and Thompson,1982 p.30)

There is sufficient similarity between these factors and the eight factors identified for this study that confidence in the in service model should be assured.

The Factors in the Model

The features which are being examined in this research are the eight factors which have emerged from the research literature on teacher in-service training and which are found in unique combination in this project. These include:

1. the creation of a team within the school dedicated to improving the science program.
2. the commitment of the school to improving the science program
3. the leadership skills of the in-service participants.
4. the quality and quantity of in school support by a science consultant
5. the involvement of the principal

6. the effects of having long-term integrated program of science in-service
7. the impetus created by the curriculum review process
8. the effects of a network of support among participant schools.

These factors were initially distilled out of an educational tour experience in which the author had the good fortune to participate. The tour was a cooperative venture between the University of Manitoba and the University of Liverpool in the spring of 1986. The participants, all Canadian science educators, visited a number of in-service projects in the United Kingdom. A brief description of these projects follows.

The Junior and Infant Science Teacher Training Project (JISTT) within the Inner London Education Authority is a project which under the direction of Ron Lavington releases teachers for two weeks of intensive training in science. This is later followed by another two weeks of training provided to different teachers from the same schools. Follow-up support is provided in the schools by the JISTT staff.

The second project on the tour was the Cheshire County Science Specialists' weekend retreat. This in-service consisted of an annual or bi-annual weekend residential session for science coordinators and advisory teachers. These individuals then took the responsibility for the in-service training of teachers in their local districts. The science advisor for Cheshire county, Brian Leake coordinated the weekend.

The third and final in-service project on the tour was the Whitehaven Diploma in Science Education course run by Sheila Jelly and Tony James. These two educators from St.Martin's College, Lancaster conduct an in-service program for primary teachers which involves the release of the teachers from classroom duties for a block of four weeks which is followed up with support at the schools by Dr.Jelly. A second four week session with the same teachers is held in the second term of the school year and this is also followed up with school level support. The participants in the program commit themselves to a weekly meeting throughout the following school year.

These three projects were included in the educational tour because of their success. Most of the eight factors are well represented in all of them although none of the projects includes all eight factors explicitly.

Most of the factors can be found in many of the exemplary in-service training programs which have been sufficiently successful to find their way into the research literature. A description of each factor and the related research literature follows.

1. The creation of a team within the school dedicated to improving the science program.

The idea of attempting to create an on-site team of individuals who are not only familiar with the curriculum but also trained to assist others in its implementation is a feature in many successful in-service projects. Notable among these is the <u>Program for Effective Teaching (PET)</u> (as in Evans 1982) in which the whole teaching staff of a school becomes the team. The whole school team approach is also a component of <u>The Napa-Vacaville Follow-Through Project</u>,(described in Robbins 1986). The less than whole staff team development approach is seen in two of the three British projects described above. The value of on site expertise is expressed clearly by Rutherford (1987).

> Ideally, every teacher of science would be well-grounded in that subject. That is not now the case, and is not likely to become so. The next best thing is to insist that every elementary school have one or more science specialists.(p.9)

2. The commitment of the school to improving the science program.

It seems almost trivial to suggest that the school must make a commitment to program improvement. However, in the past, many program improvement projects including an in- service training component for teachers, were designed from the "top down". That is to say, teachers in the schools had little say in what the priorities for program improvement might be. The Joyce and Showers (1980) model incorporates the idea that schools, i.e. teachers , must have some commitment to the need for change. This idea is developed more fully in the work of Hall, George and Rutherford (1977) in their "Stages of Concern" model. Simone and Manarilo (1980) refer to the voluntary participation of teachers in an in-service project. The voluntary participant would normally have a commitment to the project. The school as an assembly of teachers must make a conscious decision to commit to a goal of program improvement. This is well stated by Searle (1981) "Both commitment and long-term learning were seen to be best assured when inservice was school focussed (p.19).

3. The leadership skills of the in-service participants.

Most in-service projects have as a secondary goal the transmission of new information or new learning from the in-service participants to the teachers who did not attend. If the participant teachers have good leadership skills then this transmission of learning should occur. The teachers involved in all three of the British projects described above were expected to go back to their schools and effect positive change. It may be assumed that they were selected by their headmasters on the basis of perceived ability to produce that change. The in-service training of non-participating teachers is best done by credible practicing teachers. In the NSTA booklet <u>Focus on Excellence: Elementary Science</u> editor Penick makes the following comment about the teachers in the exemplary programs:

> Inservice is often run by practicing teachers using actual materials and strategies which will later be used in classrooms.
> (Penick, 1983 p.154)

4. In school support by science consultant.

Most in-service projects in the current literature incorporate some form of follow-up by the presenter or designer of the in-service. The three British models all include an aspect of this. The support offered to teachers trying to promote the program improvement is of great value. This idea is repeated again and again.(as in Lombard et.al 1985 and Simone and Manarino 1980). Therrian in concluding a summary of research in this area quotes Young (1980):

> Emotional support to teachers and continued on-site coaching will prove to be the most successful stategies in inservice programming.
> (Therrian, 1980 p.5)

5. Involvement of the principal.

The involvement of the school principal in an in- service program is increasingly being recognized as a key factor in the success or failure of this type of venture. This importance of the participation of an on site administrator was recognized by Hall (1979).

> ...our own research findings lend evidence to the notion of the importance of the administrator to the change process.
> (Hall, 1979 p.207)

The principal in a school is important to the change process not only because he/she values the proposed change but also because he/she has the decision making power to support the change or conversely to prevent the change from occurring.

6. Long-term integrated program of in-service

Teachers, administrators and in-service providers have reached the stage where there is almost universal agreement that the one-shot in-service is not effective in achieving change. This is stated in different ways by Farris (1977), Baldwin (1975), Hayden and Lloyd (1980). Therrian (1980) provides the following as a summary opinion:

> Short term in-service has no impact on either teacher change or pupil change.Planners who hope to affect change in teacher attitude, teacher classroom practices, or pupil

> achievement should be planning long term
> programs (p.4).

7. Impetus for change created by the curriculum review process.

This factor is particular to the review process as developed in the school division which is the site of this study. As such, there is nothing in the literature which relates specifically to this process.

8. A network of support from other participant schools.

In some of the projects examined, an effect has been the establishment of a functioning network of support. This network involves the participant teachers who, having been through a common experience, are bonded in their commitment to the program improvement. This is certainly true of the three British projects. Interviews with the current participants and with previous participants indicated that the network aspect was a reliable outcome of those programs.

Detailed references to these kinds of teacher networks may be found in Lombard, Konicek and Shultz (1985).

Research Methodology

House (1978) points out that virtually all contemporary evaluation models are grounded in liberalism. That is to say, there is a genuine concern about freedom of choice for the consumer of the evaluation. Unfortunately, the definition of consumer seems to be somewhat elusive. In an educational context, the consumer can be defined as management or persons who fund the evaluation. This definition leads to persistent probabilities that positive information will always be more favourably received than negative. In other words, the consumer has undue influence on the outcome of an evaluation and the freedom of choice becomes a freedom to choose the evaluation and the evaluator which will provide the most satisfactory results.

Most evaluation is carried out for the purposes of finding out if a particular program or project is worthwhile. Often, the people asked to evaluate the program or project are the same people who work with it every day and who could potentially be reassigned to inferior positions or worse if the results were not positive.

The most common type of educational research is a situation where some variable has been measured by the researcher, some treatment or activity has been applied to the subjects ,and then the variable has been measured again.
All of this is done in the finest traditions of physical science research methodology.

Michael Scriven (1982), as part of his consistent concern about bias in evaluation states, "Crude measurements are not as good as refined measurements, but they beat the hell out of the judgements of those with vested interests" (p.253).

Scriven is well known as an evaluator who is willing and able to examine critically some of the axioms of his profession. He has developed a model of evaluation which is called "goal-free" and through it he strives to eliminate bias. This is largely achieved by concentrating on the actual results of a program or project without regard to what the original intent of the program or project may have been.

The design of this present research is based on the goal-free model of Michael Scriven. The subjects were asked to identify changes which occurred in the science program in their home schools. They were not confederates of the researcher in the sense of knowing what to look for or sharing knowledge of what the researcher felt was important. The only guidance they were given was to consider the three areas of: materials, methods, and beliefs, in looking for changes.

The advantage of goal-free evaluation is that the actual effects of the treatment are reported, whether or not those effects were related to the purpose of the treatment. The disadvantage is that the researcher takes the risk that the findings may relate very little to the intended outcomes.

Summary

Hall and Loucks developed the Concerns Based Adoption Model (CBAM) as a method of implementing a change in a school or school system. Many of the key elements of the CBAM are also found in the eight essential practices identified by the Association for Supervision and Curriculum Development as part of their RPTIM model of staff development.

Many of the ideas from both of these sources were in evidence in successful in-service training projects which the author visited in Great Britain in 1986. The eight factors identified for closer scrutiny in this study were well represented in the CBAM, the RPTIM, and in the British projects.

In order to evaluate the results of this model, goal-free evaluation, as articulated by Michael Scriven was chosen as the most appropriate method. The primary advantage would be that the subjects would then be able to report the effects of the in-service without

having known the purpose or intent. Chapter three will articulate this approach in more detail.

CHAPTER 3

RESEARCH DESIGN

Introduction

This chapter describes the research questions in some detail, the instruments and methods used to collect data relating to the research questions, and the methods used to interpret the data. Chapter four will describe the actual analysis of data.

The Model

The in-service plan had a number of features which do not necessarily form part of this study. The following general description will provide a context against which the reader may interpret the research.

Ten schools had self-selected themselves on the basis of having a "less successful" science program from kindergarten to grade six. These ten schools were from a school division which has upwards of fifty elementary schools. These schools had made science a priority for the school year 1987-88. The schools varied widely in size, location and administration. All ten schools had agreed to participate in this project without outside influence to do so.

Although ten schools were participating in the project, only some teachers from each school participated directly in the in-service component. Each school nominated an intermediate teacher (grade 4-6) to attend ten full-day sessions in the fall term and a primary teacher (grade K-3) to attend ten full-day sessions in the spring term. These days of in-service were spread over four months for the intermediate teachers and over two months for the primary teachers. Each principal agreed to attend three half-day sessions during the program. Thus, each school had had three participants in the program by the time it was concluded. The impact of the project at the school level was largely determined by these three direct participants. The science consultant also provided some direct support and supervision at the school level.

The content of the in-service training sessions was of two main types. Each participant teacher was trained to be authorative and comfortable with all aspects of the elementary science curriculum, including content, processes, values and attitudes, evaluation, materials, methodology and resources. In addition, each participant teacher was trained to be a change agent in the school to help other teachers improve their science programs.

The schedule of in-service for both the primary and intermediate level teacher groups was as follows: one day on the topic of the nature of science; one day on the history, philosophy and relevance of curriculum; three days on inquiry science with balanced tratment of content and process; one day on materials; one day on unit and lesson planning; one day on evaluation in science; and two days on acting as a change agent at the school level.

The three half-days of principal in-service concentrated on the curriculum, evaluation, and acting as a change agent.

The in-school support provided by the science consultant varied from none to two full days of in-service for the whole school staff.

The level of support was determined by each school in the context of that school's plans and needs.

The Research Problem

The purpose of this study was to evaluate an in-service training model for elementary school teachers in a particular subject area. The subject area was science and the particular in-service model was developed in response to program needs outlined through the curriculum review process.

The research problem in this study was twofold. First, an attempt was made to identify changes in the science program at the school level which occurred during the period of the study and secondly to have those identified changes attributed by the participants to particular features of the in-service model.

The search for change was left very open-ended to eliminate as much as possible of researcher bias. The only direction given to the subjects was to consider at least the three areas of curriculum change outlined by Fullan and Park: materials, methods, and beliefs (Fullan and Park 1981, p.6). No attempt was made to restrict identified changes to positive changes. In fact, the data collection instruments were designed in a way which would allow for recognition and recording of negative changes.

The eight factors examined were selected from the research and from the experience of the author as key elements in in-service training of teachers.

The Experimental Design

In order to gather data which was as unbiased as possible the subjects were asked to record any changes that occurred in the school's science program during the period of the in-service project. Since the project extended across seven months of the school year and since the forty participants were grouped into four distinct groups of ten, the timing of the completion of questionnaires was important.

The ten intermediate teachers completed two sets of questionnaires, one in early January 1988 (INT.1.) immediately following the completion of their training sessions, and the other (INT.2.) in early March at the same time as the other three groups. The other three groups included the ten primary teachers (PRIM.), the ten principals (ADMIN.) and a group of ten randomly selected classroom teachers (RANDOM).

The randomly selected classroom teachers were selected on the basis of one from each school using an appropriate random selection procedure determined by the size of the school.

The questionnaires were identical, but the ADMIN group of respondents were surveyed by structured interview rather than paper and pencil questionnaire. Respondents were asked to record changes which they had observed in their school's science program in the areas of: materials, methods, and beliefs. These terms were taken from Fullan and Park (1981). A fourth category of observed change was, other. No further indication as to what should be recorded was provided. It was believed that the relatively goal-free approach would remove much of the researcher's bias from the data.

In addition to identifying change in the school's science program, respondents were then asked to rate each change on a four point scale as:

1. This change is definitely detrimental to the science program.
2. This change is likely detrimental to the science program.
3. This change is likely beneficial to the science program.
4. This change is definitely beneficial to the science program.

Finally, respondents were asked to consider the eight factors identified by the author and to indicate whether or not each of the eight factors had a significant effect on each change which they had identified. The eight factors identified by the author were:

1. The creation of a team within the school dedicated to improving the science program.

2. The commitment of the school to improving the science program

3. The leadership skills of the in-service participants.

4. The quality and quantity of in school support by a science consultant

5. The involvement of the principal

6. The effects of having long-term integrated program of science in-service

7. The impetus created by the curriculum review process

8. The effects of a network of support among participant schools.

<u>Method of Data Analysis</u>

All respondents reported a list of changes which they had observed in the science program in their school. This list was categorized by them into four groups: materials, methods, beliefs, and other.

No attempt was made to confirm the respondents' categorization of their identified changes in the school's science program. For example, if a respondent classified a change as a change in methods, that classification was left intact even though it might seem to be more appropriately labeled a change in materials.

Within each group of respondents, the identified changes were totalled in each category and the average rating on the four point scale was calculated. The eight factors which could be assigned to each change by the respondents were listed and totalled to provide an indication of how frequently each of these factors was seen to be significant in each of the four categories of change.

When this was done for each of the five respondent groups, an aggregate response was calculated by combining the data from four of the groups (the INT.1. group was left out to avoid biasing the aggregate data with double responses from this group). The aggregate data was thus a measure of the project taken from all groups at the same point in time. The assignment of the eight factors in the aggregate data was of particular interest.

Comparisons of the distribution of changes among the four categories and the assignment of the eight factors to account for those changes were made between the following pairs of groups:

PRIM. * RANDOM

PRIM. * ADMIN.

INT.2. * RANDOM

INT.2. * ADMIN.

Since the intermediate teachers were the only sample group which completed the questionnaire twice, once immediately following their training sessions and again three months later at the completion of the project, any change in their perception of what was happening to their school's science program was likely to be valuable from a research point of view. As a result, these two groups were also compared, i.e.

INT.1 * INT.2

The ratings for each change on the four point scale were collected and examined.

Since the nature of this study is exploratory, the questions asked are broad in scope and aimed at finding direction for further work. CHI-square was used to determine the significance of the findings in chapter four.

Timeline

The time of this study was as follows:

May-June 1987	-develop model, acquire funding, recruit participants, set dates.
July-August	-develop program, acquire materials, arrange release time.
September-December	-training sessions for intermediate teachers. -develop program for primary.
September-March	-training sessions for principals.
January 1988	-survey intermediate teachers, (INT.1)

January-March	-training sessions for primary teachers.
March	-survey all four groups.
	-ADMIN.
	-PRIM.
	-RANDOM
	-INT.2.
	-analysis of data,
	-writing of report.

Summary

The purpose of this study was to evaluate an in-service model for elementary school teachers in the particular subject area of science. The research problem in this study was twofold. First, an attempt was made to identify changes in the science program at the school level which occurred during the period of the study and secondly to have those identified changes attributed by the participants to eight particular features of the in-service model.

The identification of changes and the assignment of contributing factors was done by five respondent groups. Each respondent group consisted of up to ten participants including the intermediate level teachers (INT.1.and INT.2. groups), the primary level teachers (PRIM.), the school principals (ADMIN.), and the randomly selected classroom teachers (RANDOM.).

The eight factors which were assigned as contributing to each identified change were selected by the author based on research and experience. The collected data reflects the goal-free model of evaluation in that the specificity of the questions was left quite open and respondents were encouraged to determine for themselves what changes were noteworthy and significant.

CHAPTER FOUR

RESULTS

Introduction

The data collected through the questionnaires and interviews is presented in this chapter. The presentation and analysis of the data collected from the primary teachers compared to the data collected from the principals and randomly selected teachers is organized under the heading "Primary Responses". The presentation and analysis of the data collected from the intermediate teachers compared to the data collected from the principals and randomly selected teachers is organized under the heading "Intermediate Responses". The presentation and analysis of the data collected from the intermediate teachers at two different points in time is organized under the heading "Intermediate Responses over Time". The presentation and analysis of the aggregate data is organized under the heading "Aggregate Responses".

The analysis of each set of data includes an inspection of the distribution of the three categories of identified changes: materials, methods, and beliefs, as well as a statistical confirmation (CHI-square) that the distribution of the assignment of the eight factors is not random within each of the categories. The average rating (on the four point scale) of each change within a category is also indicated.

Conclusions and recommendations based on these data will be presented in the next chapter.

<u>Primary Responses</u>

The data collected from the primary teachers' group is presented in Table 1. Most of the identified changes were distributed among the three categories of materials, methods and beliefs. The distribution was fairly even between materials and methods but was lower in beliefs than in either of the other two categories.

Table 1

The Effects of the In-Service Project as Perceived by the

Primary (PRIM.) Group n=10

Change in:	No.	Avge.	1	2	3	4	5	6	7	8
			Assignment of Factors							
Materials:	33	3.7	21	16	21	16	17	28	6	9
n*=134										
Methods:	38	3.6	15	17	24	10	8	34	9	18
n*=135										
Beliefs:	24	3.6	11	12	12	10	8	21	3	14
n*=91										
Other:	5	3.8	1	3	2	2	1	5	2	1
Totals:	100		48	48	59	38	34	88	20	42
n*=377										

Where n is the number of respondents in the group and where n* is the number of assignments of factors in a category or total.

Using CHI-square, it was found that materials were significant at alpha $<.01$, methods were significant at alpha $<.001$, beliefs were significant at alpha $<.02$, and totals were significant at alpha $<.001$.

The data collected from the principals' group is presented in Table 2. Most of the identified changes were distributed among the three categories of materials, methods and beliefs. The distribution was fairly even and high in the categories of materials and methods, slightly lower in beliefs and significantly lower in other.

Using CHI-square, it was found that materials were significant at alpha $<.005$, methods were significant at alpha $<.001$, beliefs were significant at alpha $<.02$, and totals were significant at alpha $<.001$.

Inspection of Table 1 and Table 2 indicates that the primary

Table 2

The Effects of the In-Service Project as Perceived by the

Principal (ADMIN) Group n=10

Change in:	No.	Avge.	Assignment of Factors							
			1	2	3	4	5	6	7	8
Materials:	33	3.5	21	25	25	23	16	22	6	5
n*=143										
Methods:	34	3.8	25	28	27	19	18	21	3	1
n*=142										
Beliefs:	23	3.9	17	16	16	15	15	16	5	2
n*=102										
Other:	15	4.0	11	11	10	12	11	8	1	3
Totals:	105		74	80	78	69	60	67	15	11
n*=454										

Where n is the number of respondents in the group and where n* is the number of assignments of factors in a category or total.

teachers' group and the principals' group identified many changes and that both of these groups found these changes to be occurring in the same categories to approximately the same extent. It is noteworthy that while the primary teachers single out 'the effects of having a long-term integrated program of in-service' as the primary factor to which the changes can be attributed,

the principals attribute the changes to a relatively even balance of the first six factors with an emphasis on 'the commitment of the school to improving the science program', and 'the leadership skills of the in-service participants'.

The data collected from the randomly selected classroom teachers' group is presented in Table 3. Most of the identified changes were distributed among the three categories of materials, methods and beliefs. The distribution was fairly even in the three categories of materials, methods, and beliefs and significantly lower in other.

Using CHI-square, it was found that materials were significant at alpha $<.03$, methods were significant at alpha $<.005$, beliefs were significant at alpha $<.05$, and totals were significant at alpha $<.001$.

Inspection of Table 1 and Table 3 indicates that although the group of randomly selected teachers was small (6), they assigned the identified changes to the three categories of materials, methods, and beliefs in the same order as did the primary teachers. The randomly selected teachers, like the principals, did not attribute these identifed changes to 'the long-term integrated program of in-service', as the primary

teachers did, but rather, they recognized the first three factors:'the creation of a team within the school dedicated to improving the science program', 'the commitment of the school to

Table 3

The Effects of the In-Service Project as Perceived by the Randomly Selected (RANDOM.) Group n=6

Change in:	No.	Avge.	Assignment of Factors 1	2	3	4	5	6	7	8
Materials:	16	3.7	12	7	8	4	5	6	2	3
n*=47										
Methods:	18	3.7	10	18	11	7	5	6	2	3
n*=62										
Beliefs:	14	3.7	11	11	9	4	6	2	1	3
n*=43										
Other:	1	3.0	2	2	0	0	0	3	0	0
Totals:	49		35	38	28	15	16	17	5	9
n*=163										

Where n is the number of respondents in the group and where n* is the number of assignments of factors in a category or total.

improving the science program', and 'the leadership skills of the in-service participants'.

Intermediate Responses

The data collected from the second intermediate teachers' group is presented in Table 4. Most of the identified changes were distributed among the three categories of materials, methods and beliefs. The distribution was fairly even and high in the categories of materials and methods, slightly lower in beliefs and significantly lower in other.

Using CHI-square, it was found that materials were significant at alpha $<.001$, methods were significant at alpha $<.001$, beliefs were significant at alpha $<.001$, and totals were significant at alpha $<.001$.

Table 4

The Effects of the In-Service Project as Perceived by the

Intermediate (INT.2.) Group n=8

Change in:	No.	Avge.	1	2	3	4	5	6	7	8
			Assignment of Factors							
Materials:	26	3.8	15	16	5	5	12	21	0	0
n*=74										
Methods:	22	3.5	10	15	9	12	4	19	0	3
n*=72										
Beliefs:	16	3.7	12	14	7	8	6	16	0	0
n*=63										
Other:	9	3.4	3	7	3	2	2	2	0	0
Totals:	73		40	52	24	27	24	58	0	3
n*=228										

Where n is the number of respondents in the group and where n* is the number of assignments of factors in a category or total.

Inspection of Table 2 and Table 4 indicates that the intermediate teachers and the principals identified more changes in both materials and methods than in beliefs or other. The attribution of these changes to specific factors is most different with factor number six, 'the effects of having a long term integrated program of in-service'. To the teachers, this was the most important factor and both groups rated factor two very highly, 'the commitment of the school to improving the science program'.

Inspection of Table 4 and Table 3 indicates that while both the intermediate teachers and the randomly selected teachers identified more changes in both materials and methods than in beliefs or other, the randomly selected teachers attributed these changes to the first three factors: 'the creation of a team within the school dedicated to improving the science program', 'the commitment of the school to improving the science program', and 'the leadership skills of the in-service participants', but the intermediate teachers attributed more changes to factor six, 'the effects of having a long-term integrated program of in-service', than to any other factor. Factors one and two, 'the creation of a team within the school dedicated to improving the science program' and 'the commitment of the school to improving the science program', also were significantly recognized by the intermediate teachers.

Intermediate Responses Over Time

The data collected from the first intermediate teachers' group is presented in Table 5. Most of the identified changes were distributed among the three categories of materials, methods and beliefs. The distribution was high for methods, lower for materials and lower still for beliefs and other.

Using CHI-square, it was found that materials were significant at alpha $<.001$, methods were significant at alpha $<.001$, beliefs were significant at alpha $<.01$, and totals were significant at alpha $<.001$.

Table 5

The Effects of the In-Service Project as Perceived by the

Intermediate 1 (INT.1.) Group n=9

Change in:	No.	Avge.	Assignment of Factors 1	2	3	4	5	6	7	8
Materials:	27	3.4	8	14	6	5	11	15	0	0
n*=59										
Methods:	34	3.3	8	15	12	6	9	18	0	3
n*=71										
Beliefs:	21	3.7	5	8	6	5	8	13	0	1
n*=46										
Other:	15	3.4	3	8	3	2	3	6	0	0
Totals:	97		24	45	27	17	34	52	0	4
n*=203										

Where n is the number of respondents in the group and where n* is the number of assignments of factors in a category or total.

Inspection of Table 4 and Table 5 indicates that the intermediate teachers at both points in time recognized more changes in the categories of materials and methods than in the categories of beliefs and other. The INT.1 group attributed these changes to factors two, five, and six, 'the commitment of the school to improving the science program', 'the involvement of the principal', and 'the effects of having a long-term integrated program of in-service'; while the INT.2 group attributed them to factors one, two, and six, 'the creation of a team within the school dedicated to improving the science program', 'the commitment of the school to improving the science program', and 'the effects of having a long-term integrated program of in-service'.

It may also be noteworthy that changes attributable to 'a network of support among participant schools', declined during the period between the surveys.

Aggregate Responses

The aggregate data collected from the four groups surveyed in March (excluding INT1) is presented in Table 6. Most of the identified changes were distributed among the three categories of materials, methods and beliefs. The distribution was highest for methods, lower for materials and lower still for beliefs and other.

Using CHI-square, it was found that materials were significant at alpha $<.001$, methods were significant at alpha $<.001$, beliefs were significant at alpha $<.001$, and totals were significant at alpha $<.001$.

The two most frequently assigned of the eight factors were, 'the commitment of the school to improving the science program' and 'the effects of having a long-term integrated program of in-service'. The two least frequently assigned were, 'the impetus created by the curriculum review process' and 'the effects of a network of support among participant schools'.

Table 6

The Effects of the In-Service Project as Perceived by the

The Aggregate of Four Groups (PRIM, ADMIN,RANDOM,and INT2)

n=10+10+6+8=34

			Assignment of Factors							
Change in:	No.	Avge.	1	2	3	4	5	6	7	8
Materials:	108	3.7	69	64	59	48	50	77	14	17
n*=398										
Methods:	112	3.7	60	78	71	48	35	80	14	25
n*=411										
Beliefs:	77	3.7	51	53	44	37	35	55	9	19
n*=303										
Other:	30	3.8	17	23	15	16	14	18	3	4
Totals:	327		197	218	189	149	134	230	40	65
n*=1222										

Where n is the number of respondents in the group and where n* is the number of assignments of factors in a category or total.

Summary

This chapter has presented the results of this research study. The collected data has been presented in a series of tables with some brief commentary on each. The distribution of the identified changes among the three categories from all groups has been quite consistent. Most identified changes are in the categories of materials or methods and the remainder are in the category of beliefs or other. The eight factors which were assigned by the subjects to account for the changes were not equally distributed but clustered as outlined in the commentary. The next chapter will summarize these results and provide conclusions and recommendations for further study.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to evaluate a model of in-service training for elementary school teachers in the subject area of science. To achieve this purpose, teachers were asked to identify changes which occurred during the in-service project and to record these changes in the categories of: materials, methods, beliefs, and other. Participant teachers were then asked to consider eight factors which might be contributory to the changes. These factors were then assigned to each of the changes as the participants thought appropriate.

This chapter will summarize the results of this study and provide some conclusions and recommendations for futher study in this area,

Summary of Results

As indicated in chapter four, the respondents to the questionnaires recognized a large number of changes in the schools' science programs during the course of this study. These teachers not only identified these changes but rated them on a four point scale as to their effect on the schools' science programs and categorized them into changes in materials, changes in methods, changes in beliefs, and other. They then assigned up to eight factors to each of the changes in an attempt to indicate which of the eight factors contributed to that specific change. The factors were selected by the author from research and experience before the study began.

The first result is that changes were more frequently identified in the categories of materials and methods than in the category of beliefs. This is consistent with expectations as beliefs are more difficult to change over a short term. As Fullan and Park (1981) point out, "...there is considerable socio-psychological evidence to support the view that beliefs are learned through experience." (p.9). Perhaps with more experience over time the participants in this study will be able to identify more changes in their beliefs.

In comparing the responses of the primary teachers with those of the principals, teachers credited changes to the in-service program much more frequently than the principals did. The principals tended to focus on the factors operating at the school level such as the commitment of the school to improving the science program, the leadership skills of the teachers who participated in the in-services, and the creation of a team at the school level.

The randomly selected teachers did not recognize as many changes, but focussed their credit on the same school based factors. This is to be expected since the randomly selected teachers had not had direct exposure to the outside factors.

A comparison of the intermediate teachers group to the principals' indicates that these teachers, like the primary teachers, identified the in-service program as the primary factor in contributing to the identified changes. A comparison of the intermediate teachers' responses with those of the randomly selected teachers indicated that the randomly selected teachers like the principals tended to credit changes to factors at the school level.

The intermediate teachers completed two sets of questionnaires, one immediately after their in-service sessions and the second two months later at the conclusion of the program. In comparing their responses at the two points in time, one notable difference emerges. The first group identified the participation of the principal as a factor, the later group replaced this factor with the creation of a team at the school level. One might speculate that the initial impetus for change may have come from the principal, but the ongoing commitment required the involvement of teachers in the particular school.

The aggregate data of all responses collected at the conclusion of the project provides some useful generalizations. The most frequently recognized factor contributing to the identified changes was 'the effects of having a long-term integrated program of science in-service'. The next three ranking factors were school based. They were, in order of frequency: 'the commitment of the school to improving the science program', 'the creation of a team within the school dedicated to improving the science program', and 'the leadership skills of the in-service participants'.

Factors which were infrequently assigned by the participants were: 'the impetus created by the curriculum review process' and 'the effects of a network of support among participant schools'. The first of these may be attributed to a lack of knowledge on the part of the participants as to how critical the curriculum review process was in allowing this project to proceed (see chapter one). The second has been commented on by many of the participants who have indicated that the network is just beginning to grow and should be very helpful in creating change over the longer term.

A brief note on the lack of rigorous statistics is necessary. Although CHI-square was used to confirm that the distribution of the assignment of the eight factors was not random, the employment of statistical methods was stopped there. This study is preliminary in nature. The sample sizes are very small and the sizes of the respondent groups vary from six to ten. These limitations precluded a rigorous statistical treatment of the collected data.

In summary, this study has found that the most significant factor in producing change in a school's science program is 'the effect of having a long-term integrated program of science in-service'.

Conclusions

The important conclusion that the results of this study seem to indicate is that models of in-service for teachers must be more than half-day, one event "packages" of knowledge delivered to teachers with no preparation and no follow-up. It has been shown that a program of in-service spread over many months which integrates the theory, the knowledge, the skills, the materials, and the values of a curriculum can be effective in creating changes at the school level. It is also suggested in the collected data that the responsibility for creating change can be shifted from the outside giver of in-service training to the insiders, the teachers in the particular school.

Although to this point, nothing has been said about the nature of the identified changes in the schools' science programs, except for their classification into changes in materials, methods, and beliefs, the reader is recommended to peruse appendix C where all of the identified changes are listed.

<u>Practical Applications</u>

The following recommendations have been determined as a result of this study:

1.) Providers of in-service training for teachers are advised to consider the in-service as a <u>program</u> of study and to allow enough time to present the program as an integrated whole.

2.) School divisions which are facing retraining of professional staff must find ways of providing reasonable amounts of time for the retraining to occur.

3.) Where genuine change is sought, individuals at the school level must be identified to take some general responsibility for implementing the change.

4.) Meaningful change does not have to be specified in advance. This suggests thst goals for in-services do not have to be explicitly stated in order to generate meaningful results.

Research Implications

The following suggestions for future research are presented as a result of this research study:

1.) A longitudinal study of the effects of this type of in-service program should be done to determine whether or not the anticipated changes in beliefs will qualitatively if not quantitatively overtake the changes in materials and methods over a longer period of time. It is quite possible that a change in the beliefs of a teacher or group of teachers may have far more important long-term outcomes. This study could also measure the lasting effects of some of the identified changes.

2.) Research needs to be done to determine the optimum amount of time needed to create a functional team at the school level for the implementation of a curriculum.

3.) Research needs to be done to determine the best time arrangements for in-service sessions when these sessions are to be spread over a long period of time.

4.) Replication of this study would provide more confidence in the generalizability of the conclusions.

5.) A detailed analysis of the specific changes which were identified should provide some indications of what types of outcomes could be expected in a replication.

Summary

This final chapter has presented a summary of results, conclusions, practical applications and research implications regarding this study of the evaluation of a model of in-service science training of elementary school teachers. These findings have been presented in an effort to further enhance the understanding of the change process in schools as it relates to the in-service training of teachers. This research study has provided pertinent indicators of factors which may make in-service more effective.

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APPENDIX A

PARTICIPANTS' CONSENT LETTER

230 Foxmeadow Drive
Winnipeg, Manitoba
R3P 1T4

Dear

I am undertaking a study of the effect of in-service training on school programs as part of an M.Ed. thesis with the University of Manitoba. Specifically, this study will identify changes in the school science program and examine the effect of eight variables on those changes.

As a participant in this research, you will be asked to complete a questionnaire. The time required will be approximately one hour. All of your responses will remain strictly confidential and only aggregate or group data will be reported. Your anonymity is assured. At the conclusion of the research you will receive a written report of the findings.

It is hoped that through this research, in-service training of teachers can be made more effective and more useful. As a participant you will be contributing to the goals.

Please indicate your consent to participate by your signature below. Your consent here does not negate your right to withdraw from the study if you change your mind. If you would like any further information about this research, please feel free to contact me at 488-2923 (residence).

Thank you.

Yours truly,

R. Banister

R. Banister

Signature of consent: ____________________________

RB/eds

APPENDIX B

SAMPLE QUESTIONNAIRE

ID CODE: ________________

PART 1

Your school has been involved in an in-service project in science this year. Four groups of teachers are being asked to complete this questionnaire to determine the effectiveness of this model of teacher in-service training. Please indicate to which of the four groups you belong.

Principal: _____

Intermediate Participating Teacher: _____

Primary Participating Teacher: _____

Randomly Selected Classroom Teacher: _____

On the following pages you will be asked to identify changes which have occurred in the science program in your school. The changes may be for the better, for the worse, or neither. You will be asked to categorize the changes you have noticed as changes in MATERIALS, changes in METHODS and changes in BELIEFS. There will be a fourth category for changes which do not fit into any of the first three categories.

The following definitions may help to clarify the meaning of these terms.

MATERIALS refers to teaching materials, textbooks, resource books, manipulative materials, consumable supplies,and science equipment.

METHODS refers to teaching methodology, classroom management, grouping of students, use of space inside and outside of the classroom, field tripping, project work, science fairing, stucturing of lessons or units, adherence to the curriculum,and evaluation techniques.

BELIEFS refers to teachers' understanding of how the program is structured and organized, the nature of science and science education, the components of a good science program, and the wllingness and confidence to teach science effectively.

Identify changes in the MATERIALS used in the science program in your school during the course of this project. For now, ignore the numbers on the right-hand side of the page.

<u>CHANGE</u>

1.	1 2 3 4
2.	1 2 3 4
3.	1 2 3 4
4.	1 2 3 4
5.	1 2 3 4
6.	1 2 3 4

Now, identify changes in METHODS in the science program in your school.

<u>CHANGE</u>

1. 1 2 3 4

2. 1 2 3 4

3. 1 2 3 4

4. 1 2 3 4

5. 1 2 3 4

6. 1 2 3 4

Now, identify changes in teachers' BELIEFS in the science program in your school.

CHANGE

1.	1 2 3 4
2.	1 2 3 4
3.	1 2 3 4
4.	1 2 3 4
5.	1 2 3 4
6.	1 2 3 4

Now identify any changes you have noticed which do not fit into the preceding three categories.

<u>CHANGE</u>

1. 1 2 3 4

2. 1 2 3 4

3. 1 2 3 4

4. 1 2 3 4

5. 1 2 3 4

6. 1 2 3 4

Please now go back and rate each identified change on the following four point scale. Circle the appropriate number to the right of each change you identified.

1.-this change is definitely detrimental to the science program
2.-this change is likely detrimental to the science program
3.-this change is likely beneficial to the science program
4.-this change is definitely beneficial to the science program

PART 2

In part one you were asked to identify some changes in your school's science program and indicate whether you feel these changes are beneficial or detrimental. Part of this study is aimed at attempting to find out which variables are responsible for changes in science programs.

I am particularly interested in the following eight variables;

1.-the creation of a team within the school dedicated to improving the science program.

2.-the commitment of the school to improving the science program

3.-the leadership skills of the in service participants.

4.-the quality and quantity of in school support by a science consultant

5.-the involvement of the principal

6.-the effects of having long-term integrated program of science in service

7.-the impetus created by the curriculum review process

8.-the effects of a network of support among participant schools.

Please indicate on the following page which of these factors that you think have had a significant effect on each change you identified in part one. For each change, please check off as many of the factors as you think have been significant on the line for each change.

At this point, no attempt is being made to quantify the strength of an effect. All I want to know is whether or not you think a variable has had a significant effect.

In some cases, you may wish to indicate variables which have had a negative effect on a particular change. If this is so, circle the checkmark which indicates the negative variable.

I.D.Code: _______

	Factors Affecting							
	TEAM 1	COMMITMENT 2	LEADERSHIP 3	CONSULTANT 4	PRINCIPAL 5	IN-SERVICE 6	REVIEW 7	NETWORK 8
Materials								
1.								
2.								
3.								
4.								
5.								
6.								
Methods								
1.								
2.								
3.								
4.								
5.								
6.								
Beliefs								
1.								
2.								
3.								
4.								
5.								
6.								
Other								
1.								
2.								
3.								
4.								
5.								
6.								

APPENDIX C

CHANGES WHICH WERE IDENTIFIED IN SCHOOLS' SCIENCE PROGRAMS

IDENTIFIED CHANGES IN SCHOOLS' SCIENCE PROGRAMS

PART 1 CHANGES IN MATERIALS

A. PRINCIPALS

Teachers are using handouts.

Sharing of materials is evident.

Teachers are discussing new materials.

Displays of new materials are evident.

Less reliance on the cupboard materials of old.

Less emphasis on texts.

More junk materials in evidence.

More project work begun.

Significant increase in consumable materials.

More staff ordering and/or using plants, pets in room.

(On-going, long term.)

Let's hear it for the magnifying glass!

More interest in materials available.

More books being required and sought.

Requests for material other than what is presently available.

More "living or alive" components - e.g., animals, insects, etc.

In first half - budget restraints were a hindrance.

No call for class sets of texts.

More existing materials used.

More usage of everyday household materials.

Request increase for budget and petty cash to buy materials.

Co-operative planning of materials, borrowing-sharing.

Teachers who went to Inservice returned with new material to be shared with teachers.

Science equipment was more thoroughly checked through.

Science materials and equipment was ordered in relation to science curriculum suggestions.

More "hands on" material used - wood, cardboard, water, string, etc.

More science resource books used.

More reference to the curriculum instead of science text books.

Teachers are now more cognizant of the new material available and what type of material to look for.

Using magazine Science & Children.

More resource books.

More science equipment.

Better access to Science room (each teacher now has a key.

Greater demand for Science equipment.

B.PRIMARY TEACHERS

New literature shared.

Materials shared.

Materials displayed.

Materials discussed.

Science cupboard filled with a variety of materials

Consumable items purchased.

Teacher-Resource material on order.

Use of plants and animals in classrooms.

Resource books increased.

Manipulative materials, e.g., plasticine, drinking straws, balloons.

Science equipment, e.g., beakers, aquarium, magnifying glass, etc.

Consumable supplies, e.g., vinegar, baking soda, mothballs, drinking cups, etc.

Have acquired new recommended resource books.

Started to collect manipulative materials in the classroom.

Materials more visible in room for kids, i.e, magnifying glass, shells, magnets, etc.

Aquarium set-up.

Books (teacher) brought out of storage.

Increased use of materials in teaching science.

More attention given to the Science cupboard.

More materials in classrooms.

Better Science budget.

New Science resources in the school.

Science cupboard has been cleaned out and organized.

Materials received at inservice passed around to teachers at the appropriate grade level.

One or two new resource books ordered and received.

Science cupboard reorganized.

Resource books introduced to primary and intermediate teachers. (Film list, trade books, unit plans.)

New Science resource books on order for primary teachers.

Materials and equipment will be ordered in the next week or two.

Ordered a few teacher use Science books for Professional Development library.

Spoke to intermediate Science representative re ordering of new materials.

I personally went through the Science cupboard to see what was there.

Brought many more "hands-on" materials into my classroom.

C. INTERMEDIATE TEACHERS 1.

No changes in materials used except for an increase of questions relating to the where-abouts of articles directed at me.

Keys to science room requested for each teacher. Done.

Certain texts ordered. (no results yet)

More material has been borrowed from the science cupboard. This would indicate that teachers are more concerned with making their program "hands-on."

Teachers are asking for resource ideas on how best to implement the curriculum.

New Science reference books/materials have been ordered for the library.

Many more books have been ordered at all levels.

More science equipment is being used and therefore replaced and other materials purchased.

Requests are coming from other staff members for materials not used before.

Many more of specific materials are being ordered to allow for class activities.

Science storage cupboard has been re-organized, cleaned, stock was taken. Consumable and non-consumable supplies have been ordered. This hasn't been done for 4 to 5 years.

Print materials received during in-service (i.e, unit plans, articles, activities) have been shared with intermediate staff.

Ordered print materials that emphasize activity-based inquiry Science. No textbooks have been ordered. All monies have been used for appropriate resource material.

Greater awareness of what materials are in the school - what are broken, etc.

Resource books obtained from inservice.

Consumable supplies purchased so that more "individual experiments" can be done.

Use of textbooks discouraged.

The reference materials (from the in-service/s) are being utilized by the intermediate teachers.

Textbooks - removed from desks. Only used infrequently as a reference - no longer read page by page.

Resource books - I have more of my own books now. More are being ordered into the library already.

Science cupboards already have a good supply of manipulative materials, consumable materials and equipment. Greater use is being made of them by my class.

Complete set of 5/13 books bought for school.

Teacher agrees to give $ 20.00 of book money to buy ----- science kits.

Proper use of curriculum guide leading to better understanding of unit structure K-6.

Personal books and material received from project shared in school.

Personal - overall greater awareness of science material to apply to teachilng.

Reading of Science and Children increased.

D.INTERMEDIATE TEACHERS 2.

Teachers are using the science cupboard more. This indicates more hands-on Science.

Teachers are integrating Science with Mathematics example - Dinosaur study.

Teachers are borrowing the prepared units (done in the course.)

Science cupboards have been stocked with appropriate material.

Some materials were bought in a local department store, e.g., paper plates, balloons, marbles, cups, etc. etc. (consumables) for the first time in many years.

New teacher resource material on order. Books ordered have a definite slant toward hands-on inquiry approach.

Appropriate articles on sciencing were duplicated and distributed.

Books and materials ordered.

Keys for science room distributed.

Resource books obtained from in-service.

Consumable supplies purchased.

Use of textbooks discouraged.

Miscellaneous materials located for various experiments.

More science materials are being used, therefore, more are being ordered.

More resource books are being bought re: activities to be done.

Requests for materials not used before.

More people aware of own needs for activities and searching out Science cupboards.

Print materials have been bought (ESS and EYE plus other thematic materials.

Sharing of materials between classrooms due to recognition of need to pool energy in gathering materials.

More people using textbooks with activity base.

More student activity books as opposed to textbooks with assignments.

Child-centred materials as opposed to teacher directed.

A rabbit.

There is greater use of "hands-on" materials.

Less use of textbooks.

Greater use of supplementary materials (resource books) from the library.

E.RANDOMLY SELECTED TEACHERS

Exposure to new resource books.

We are more aware now of the Science materials available to us.

Keys to the Science equipment room were given to each teacher on staff.

Books shared.

Money pooled.

Materials shared.

Materials observed.

New materials discussed.

Science corner in the classroom.

Use of Science Room equipment.

Resource books.

Manipulative materials.

Consumable supplies.

Science equipment.

Handouts.

Resource books.

PART 2 CHANGES IN METHODS

A. PRINCIPALS

Teachers more involved in teaching Science.

Some people who were doing nothing, are doing something.

At Intermediate, a hit - more "hands-on".

Using or trying to incorporate a more hands-on approach to teaching Science.

Children handling material more, instead of teacher demonstration.

All levels participated in Science Fair.

More hands on experimenting has been used by kids in the classroom.

More project work and experimenting.

Most of the teachers using activity based "hands-on" approach to Science.

Experimenting in "concept areas" rather than teaching from text.

Allowing students some ownership in activities.

Written work required, but at a much lesser degree than previous.

Co-operative planning involving staff - far more apparent.

More activity based.

Other teachers becoming more interested.

Future Professional Development planned.

More hands on activities being tried.

More student activities being inquired about.

More teacher sharing ideas and collaboration being undertaken.

Appears to be considerable attention being paid to observation.

Students are active, i.e., they employ senses to experience.

Much less use of text.

Increase in requests for field trips.

More grouping.

Noisier.

Projects.

Discussion.

Grade level organizational groups have been formed.

Teachers discuss the hands-on approach to science.

A beginning has been made at long-term planning.

There has been a facilitation of the integration of subject topics.

B.PRIMARY TEACHERS

Re-organized classroom's physical space.

Booked three (3) field trips for near future.

Began a Science Journal with students.

Started a new Integrated Science Unit - using many activity based lessons.

Shared information received at inservice with many teachers.

My classroom has been re-organized in order to enable students to do more activity-based science and math.

I will attempt to design my program in order to model science teaching methods to other teachers.

Moved in my classroom to an activity-based Science program.

Science area designated in the classroom.

Collection of materials and preparation of two (2) units (one for each grade) from curriculum guide.

Grouping of children.

Switch from worksheets to more manipulating of objects.

My methodology has become more inquiry, student directed.

Science centre set up in classroom.

Field trip arranged to Touch the Universe.

Three (3) groups of children entered the school Science Fair. First time ever from my room.

My focus is on Science and how to integrate Language Arts into it (etc.). For example: using Science to motivate a Language Arts activity.

I've always used curriculum, but my understanding of how flexible it can be has grown.

I have become better at evaluation as I now know what to look for. I have started using Science journals.

Re-arranging the classroom to provide more space.

More hands-on activities.

Greater student involvement - less teacher directed.

Using a greater variety of activities from new resources that apply to the curriculum.

Teaching methodology, e.g., doing more simple experiments, instead of merely teaching for content.

Grouping of students (large or small groups, according to the type of activity which is being done.)

Science Fairing.

Structuring of Units of Lesson.

Better use of the Curriculum Guide.

Better use of the space inside the classroom.

Field trips (one around the neighbourhood and one to the Museum.)

Use of Science space within the classroom (shelves, tables) i.e, organization of Science Centre.

Grouping of students (student tables (large) - replacing desks intermediate class.

More hands-on approach to Science in some of the classrooms.

Utilized the Museum of Man and Nature as a resource recently.

Long term planning begun.

Integration of subject matter facilitated.

Hands-on Science discussed.

Helping grade-level groups form.

C. INTERMEDIATE TEACHERS 1.

Focus on specific process skills - one per unit.

Desire to use Inquiry Approach and attempt to move further right on continuum.

Set up of unit plans with defined goals - time limits to be applied.

Let children do as much as possible.

Greater ability to plan an organized unit.

Reorganize Science materials.

Teaching methodology - change to inquiry based.

Much more activity.

Classroom management - attempts being made to group students for activities.

More Science away from the desks. Some outside the classroom and outside the school.

Field trips - same. One or two per year.

Project works - more small projects.

Science Fair - no change - always was enthusiastic about it.

Units - more fully developed and more pre-planning going into the smooth development of a unit.

Adherence to the curriculum - always adhered very closely - feel more comfortable with it now; and also I feel I can ignore some activities and find others from other sources.

Evaluation techniques - evaluation used to be based on written project work and a factual knowledge test at the end of a unit.

The Science Fair is open to more than one class, more teachers wanting to "experiment" with student directed activities.

Increased use of evaluation of processes rather than evaluation of subject matter.

Increase in "hands on Science" rather than "worksheet" Science.

Plans for systematizing materials by four intermediate teachers.

Periodic meetings to discuss use of materials.

In my classroom I'm trying to provide the children with a more hands-on activity based approach Science. I've tried to stay away from boardwork.

I have acquired a variety of live animals in the classroom (garter snake; gerbils, hamsters, guinea pig). Children are involved in the care and handling of animals.

In many of our Science classes I have been grouping the children in pairs or more. Most of their project work has been done this way.

I have been using observation techniques more often in my evaluation process.

Other staff members are also trying to provide their children with a more hands-on activity based Science program.

In order to see changes in methods and beliefs among the other teachers on staff, I think here has to be a greater passage of time. Teachers as a whole, generally warm-up to new ideas and methods slowly. Perhaps this survey should be taken in June or even September, 1988.

More hands on activities are taking place.

There are few lecture lessons.

There are fewer model displays and more student initiated work.

Teachers are encouraging students to experiment with their ideas for their Science project first and then later to do research.

Teachers are asking about suggestions on how to make units more "hands-on."

The idea of doing mini-projects was introduced and carried out in one class.

The idea of a "wonder page" was introduced and teachers plan to implement it next year.

Better preparation for museum field trips.

A little more hands-on activities one grade 6 class.

D.INTERMEDIATE TEACHERS 2.

Methodology has changed - units are built on activities.

Much greater use of small group activities - variety in grouping.

It is acceptable now to have a Science class in some location other than the classroom.

Project work now allows for individual students to use their own interests and take projects where they want to take them.

The lessons and units are not so closely tied to the curriculum guide. The same concepts are covered, but there are supplementary activities.

Science Fair this year has many more quality projects.

Evaluation techniques have changed drastically. More day to day evaluation. More evaluation of process.

Activity based.

Lots more small group activities.

Much more movement thoughout the school.

Extension of instructional space to outside the classroom.

Attention to process more than content.

Many more activities taking place in classrooms.

More awareness of using Science activities with Language Arts.

Less lecture style and more activity oriented Science.

Increased use of evaluation of process rather than subject matter.

Increased "hands-on Science" rather than "worksheet" Science.

More hands-on activities.

Some Science is being taught where previously there was none.

Personally in my classroom, the kids are more involved with a hands--on approach to Science.

We have done more field-tripping. We made a trip out to Sandilands forest reserve. I have a trip planned to Oak Hammock Marsh this May and plans to take in the program on reptiles offered at the zoo.

E.RANDOMLY SELECTED TEACHERS

Grouping of Students.

Structuring of lessons (use of materials).

Evaluation (process).

Teaching methodology.

Project work.

Science Fair.

Structure of lessons.

More experienced-based Science activities, more observation, more experimentation, a lot more prediction.

Long term planning.

Curriculum integration.

Discussion.

Pod groupings.

Unit sharing.

There has been an increase in "hands-on" Science education .

Using space outside classroom.

More "hands-on" activities.

Less teacher direction.

Finding more activities that fit with the curriculum.

PART 3 CHANGES IN BELIEFS

A. PRINCIPALS

Initial nervousness of some staff is reducing.

Hands-on is being recognized as an affective motivator for skill-centred subjects.

Teachers are talking more about their Science programs.

More discussion about Science among staff.

Less tension re change in outlook re Science.

Awareness of components of good science.

Willingness to take a chance.

Not sure! Maybe too early to tell

Commitment is genuine.

Has been an ongoing belief that "activity-based" Science is fundamental.

Teachers are moving towards teaching process rather than facts.

Teachers are feeling that they do not need to be experts to work through the curriculum.

More activity based.

Integrated with other areas.

Learning through doing as good or better than teaching in traditional way.

Students can have ownership to their learning.

Teachers returning have shared their newly acquired knowledge and has spawned a new surge for Science.

Teachers are asking for in-services.

Teachers are willing to experiment.

That children need concrete materials, even at the Grade 6 level.

That Science is a way of problem investigation and materials - handling - not just content.

The teachers are more conscientious of the emphasis of "process learning" rather than "content learning".

More aware of the curriculum and what it consists of.

Know how to go about planning a science unit.

Too early to assess.

B.PRIMARY TEACHERS

Small minority of teachers seemed initially nervous of change. In the long run it could go either way. There are not enough teachers in this category to have a critical effect.

People are more aware and are talking about science more.

Some teachers are beginning to realize how effective hands-on teaching can be as a motivator and language generator.

Curiousity among staff in regards to science program has risen.

Willingness to teach Science effectively - but confidence is shakey still.

The components of a good science program.

Ease of integration with other subjects.

Teacher's understanding of the Nature of Science.

A greater belief that Science needs to be taught with hands on experiences.

I have a better understanding of what "Science" education is.

I now know the components of a good science lesson and program.

My confidence has increased tremendously in my ability to teach Science.

More curiousity and interest in the hands-on approach to Science.

Administration more interested in promoting Science.

More confidence in my ability to teach Science.

More awareness of what the Science program is supposed to be.

More knowledge of available resources.

More willingness to approach 'Science' and get the program started.

Better understanding of how to make a good Science program in the classroom.

I feel more comfortable with the Guide.

Willingness to share my knowledge and information.

I am now "excited" about Science.

C.INTERMEDIATE TEACHERS 1.

As a direct result of my influence (I believe), one teacher has begun teaching Science this year.

Hands-on activities have been stressed. (Whether or not this is happening, I don't know yet.

There is more of an inclination towards the belief that the scientific processes are more important than content.

Belief that it is more important to cover all the processes in a year than it is to cover all the content.

Belief that the results of an experiment are less important than having thought through the experiment.

More teachers are asking about how to do activities.

There is more awareness of what curriculum has to offer.

A curiousity has inspired activities.

Non Science minded staff are willing to try non-threatening activities.

To be honest, there probably hasn't been that much change in beliefs among teachers. As mentioned, some teachers have approached me for ideas and suggestions which indicates a desire to change methodology, etc., therefore, some must be into inquiry-based Science education. Change here will be a longer process.

Some apprehension among two teachers.

Considerable enthusiasm among three teachers.

Better knowledge of the nature of Science education.

More willing to teach Science effectively.

Not necessarily a change, but a confirmation that they are really doing Science.

Structure and organization of the program - I was familiar with the curriculum guide.

Nature of Science and Science education. Here I was exposed to totally new ideas.

Components of the Science Program. A big change here. Use of "hands-on materials." Fewer teacher demonstrations. More open-ended questions - no longer bothered about the "right answer."

Confidence in teaching Science has really increased.

Willingness to direct extra money to improve Science program.

Make Science time during every day.

Belief doing is better than watching self. (Unable to measure others.)

D.INTERMEDIATE TEACHERS 2.

Teachers have a greater understanding of the Science curriculum and of activity based Science.

Curiousity among the staff in regards to Science has arisen.

Have had discussions with some staff members on inquiry-based Science. Most members seem to think that's the direction they'd like to go.

Some degree of acceptance that more hands-on activities are needed.

Better knowledge of the nature of Science education.

More willing to teach Science effectively.

Willingness to share ideas.

Teachers are more relaxed and confident with activities.

Science is being integrated into Language Arts Fair as a workshop (activity).

Great interest in finding resource material to support activity-based Science.

Student's set the pace of inquiry (discovery).

Busy, noisy, active classrooms are learning places.

Willingness to accept other resources.

Confidence in philosophy effected through the interaction with print material (they like ESS + EYE, etc.)

Recognize need to make materials more accessible.

E.RANDOMLY SELECTED TEACHERS

Very important that the Science program is activity based.

Teachers are trying to implement more into their

Science program.

Concerns regarding long term planning.

Increased confidence in teaching Science.

More aware of the benefit of using E.S.S. when developing themes.

Realization that "REAL" Science is by "doing" (hands-on) and not just reading.

Realization that observing, testing and hypothesizing is "exciting" for students.

Science is a priority for one of our Whole School Professional Development days.

Better awareness of Science and Science education.

Structure and organization.

Components.

Teach effectively.

Components of Science program.

Willingness to teach.

PART 4 OTHER CHANGES

A.PRINCIPALS

Heightened interest.

More awareness.

Now able to locate a contact person.

The staff will be planning a science hands-on Fair Field Day.

Teaches working in pairs to discuss science materials needed - a team approach.

Teachers bringing ideas re: curriculum to principal for school-wide use.

Teachers initiating change in classroom seating patterns.

Teachers who participated in inservices have formed a network with other teachers.

Re-focus on "Science" rather than other major subjects.

Can't think of any.

Interest of other staff.

Carry-over of hands-on to other areas.

More junk collection/use.

Fewer questions about texts/buying aparatus.

Changes in staff/pupil vocabulary.

B.PRIMARY TEACHERS

I feel motivated.

Awareness of vast resources available to us.

We have established a support network.

The kids have become much more excited and interested in learning.

Awareness of the weighted importance of Science as a subject - staff comments. Curriculum Review plus Professional Development.

C. INTERMEDIATE TEACHERS 1.

Greater awareness by library to focus money and books in area of Science.

Greater willingness to share ideas by self and other staff in area of Science.

Children should have more control and direction in their own work.

Looking less for "correct answer."

Plan to have more plants and animals in the school - fish tank is being ordered.

VCR - Wonderstruck and Nature of Things being taped and shown to class - not on a regular basis - but to encourage viewing of such shows.

More communication in staff room relating to Science rather than complaining about the youngsters.

Science seems to be a priority, with staff and students a general feeling of excitement.

Those who expected pre made unit plans, super structured lessons and teacher directed activities are disappointed.

More willing to share ideas.

One change which hopefully will be instrumental in the "re-thinking" of one's beliefs and methods in Science education will be the planning of a school inservice in May.

Teachers asking me for informal advice on how to present units.

Administration asking me to do short in-school inservice to update teachers on developments.

Interest on the part of teachers to become involved in the Science Fair.

Interest in holding a Science olympics.

D. INTERMEDIATE TEACHERS 2.

The segregated nature of the school (Alternative/ Regular) has diminished significantly.

Motivation, insight and direction comes from teachers, not from above.

The team atmosphere since she finished, has moved Science into the forefront.

Children more interested in the "hands-on" approach.

More time needed to "get things ready."

Higher "noise" level.

Somewhat more hectic for the teacher to keep track of what everyone is doing and really learning.

Teachers talking Science - sharing ideas.

Teachers as a group seem to be less concerned about the "right" answers and the "right" way of doing Science.

E.RANDOMLY SELECTED TEACHERS

Teacher's knowledge of Science ..... plus why things work or behave in certain ways.

APPENDIX D

THESIS PROPOSAL APPROVAL

University of Manitoba
Faculty of Education

THESIS/PRACTICUM PROPOSAL APPROVAL

Section 1 *(to be completed by the Examining Committee)*

This is to certify that

(Mr., Mrs., Miss, Ms.) Mr. Ronald N. Banister

has successfully completed the oral examination of his/her thesis/practicum proposal and that the undersigned give their approval for the candidate to proceed with the thesis research or practicum project (without reservation/with the attached reservation(s)).

The working title of the thesis/practicum is: Evaluation of an In Service Training Model in Elementary School Science

Dated September 21 1987 Sylvia Leith Advisor

Eric MacPherson Examiner

Joan Irvine Examiner

Section II *(to be completed by the Department Head)*

I, Sylvia Leith Head of the Department of Curriculum: Mathematics and Natural Sciences acknowledge that the thesis/practicum proposal of the above-named student has been approved (without reservation/with the attached reservation(s)) and that, where appropriate, the proposal has received approval from the Faculty of Education Ethics Review Committee. *(Department Head to attach copy of ethics approval notification.)*

Signature

Date

APPENDIX E

ETHICS COMMITTEE APPROVAL

ETHICAL APPROVAL OF RESEARCH AND EXPERIMENT DEVELOPMENT PROJECTS INVOLVING HUMAN SUBJECTS

This form is to be completed in accordance with the Faculty of Education policy on ethical review. This policy requires that Committee members take into account the relevant standards of the discipline concerned as well as, where appropriate, the standards specified by certain external funding bodies.

Project identification

(to be filled in by investigator)

Investigator(s) RONALD N. BANISTER 0041057

Title Evaluation of an In-Service Training Movel in Elementary School Science.

If applicant is a student, name the faculty member supervising the proposed research

Dr. S. Leith

This is to certify that the Review Committee has examined the research and experimental development project indicated above and concludes that the research meets the appropriate standards of ethical conduct in research with human subjects.

Date: Dec 2, 1987 Signature of Chairperson:

APPENDIX F

PERMISSION FROM PARTICIPATING SCHOOL DIVISION

February 10, 1988

Mr. Ron Banister
Science Consultant

Dear Ron:

RE: REQUEST TO CONDUCT RESEARCH

This will confirm that the and the Superintendent's Department have indicated that they have no objection to your conducting the research project in the inservicing of teachers.

You are requested to inform the staff that they are under no obligation to participate and that if they do choose to participate, they will do so on their own time.

It is also requested that a copy of your research results be submitted to the Superintendent's Department.

Yours sincerely,