This is to certify that the

dissertation entitled

The Implementation Stage in the Change Process of Selected Industrial Arts Curriculum Innovations: An Investigation and Analysis

presented by

Stephan Albert Kelly

has been accepted towards fulfillment
of the requirements for

PhD degree in Education

Major professor

Date April 17, 1986

THE IMPLEMENTATION STAGE IN THE CHANGE PROCESS OF SELECTED INDUSTRIAL ARTS CURRICULUM INNOVATIONS: AN INVESTIGATION AND ANALYSIS

by

Stephan Albert Kelly

A DISSERTATION

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

DOCTOR OF PHILOSOPHY

College of Education

1986

ABSTRACT

THE IMPLEMENTATION STAGE IN THE CHANGE PROCESS OF SELECTED INDUSTRIAL ARTS CURRICULUM INNOVATIONS: AN INVESTIGATION AND ANALYSIS

By

Stephan Albert Kelly

This study was designed to analyze selected industrial arts curriculum innovations in terms of their degree of conformity with advocated educational change principles during program implementation. The selected industrial arts curriculum innovations include the Industrial Arts Curriculum Project (IACP), the Industriology program, the Partnership Vocational Education Project, and the American Industry Project. Additionally, the study was designed to recommend a set of educational change principles to the industrial arts profession as a guide for the development and implementation of industrial arts and technology education curriculum innovations.

Two survey instruments were developed to collect data, questionnaires, and semi-structured interviews. The questionnaires are based on five educational change principles that are reported by the Educational Testing Service (ETS) (1980) and are supported by Rogers (1983), Havelock (1969), and Zaltman (1977). Rogers' (1983) five innovation characteristics which include relative advantage,

compatability, complexity, trialability, and observability, are also incorporated into the questionnaires. The questionnaires were pilot tested and validated.

Semi-structured interviews of the program developers were designed and conducted to collect additional data concerning program implementation. Data from the questionnaires and the interviews are compared across program developers and industrial arts curriculum innovations.

Major Findings

1. Four educational change principles and five innovation characteristics were present during the implementation of the industrial arts curriculum innovations.
2. The same two industrial arts curriculum innovations that demonstrated a high degree of conformity with the educational change principles also demonstrated a high degree of conformity with the innovation characteristics.
3. The same two industrial arts curriculum innovations that demonstrated a low degree of conformity with the educational change principles also demonstrated a low degree of conformity with the innovation characteristics.

Stephan Albert Kelly

Conclusions

1. Four educational change principles and five innovation characteristics should be incorporated into the implementation stage of industrial arts and technology education curriculum innovations by program developers.
2. The perspectives of the implementers concerning program implementation are more important than the perspectives of the program developers and should be accounted for during the implementation of industrial arts and technology education curriculum innovations.
3. Implementers of industrial arts and technology education curriculum innovations should develop a feeling of ownership of the new programs.
4. Adequate printed materials of industrial arts and technology education curriculum innovations should be available to the implementers before program implementation.
5. Program developers of industrial arts and technology education curriculum innovations should document and maintain accurate records of the implementation of the new programs.

ACKNOWLEDGMENTS

Numerous persons aided the researcher during this study and deserve recognition. Dr. Rex Ray, the researcher's major advisor, deserves special thanks for his encouragement and guidance. Dr. George Ferns also deserves thanks for serving on the doctoral committee and for his thoughtful contributions. Dr. Samuel Moore and Dr. Daniel Kruger, too, deserve thanks for serving on the doctoral committee. The professional and educational wisdom imparted by these scholars will remain with the researcher. Gratitude is also extended to Dr. C. Blair MacLean, the researcher's initial major advisor. His guidance and assistance started the researcher on a successful and challenging doctoral program.

Thanks are extended to all participants in the study; without them the study was not possible. To the program developers who gave of their valuable time and experience, a special thanks is extended. These program developers include: Dr. Jack Kirby, Dr. Eugene Flug, Dr. Donald Lux, Dr. Ernest Minelli, and Dr. Lewis Yoho. The contributions of the implementers from the industrial arts programs included in the study are also greatly appreciated.

Two people contributed valuable information regarding the implementers from the industrial arts curriculum innovations included in the study. Their efforts are appreciated and are recognized here: Dr. James Bensen, Dean of the School of Industry and Technology, University of Wisconsin-Stout, Menomonie, Wisconsin; and Dr. James Buffer, The Ohio State University, Columbus, Ohio.

Several persons contributed to the pilot testing of the questionnaires that were used to collect data and deserve thanks. These persons include Dr. Everett M. Rogers, Dr. John Suehr, and Dr. Thomas Pavlak. The teachers in the Battle Creek Public Schools who participated in the pilot testing of the questionnaires also deserve special recognition.

The administration of the Battle Creek Public Schools, Battle Creek, Michigan, deserves special recognition and thanks. The researcher was able to finance a portion of the doctoral studies due to the generosity of the A.O. Jones Fund--a special fund, administered by the Battle Creek Public Schools, available to Battle Creek teachers for advanced professional studies. Without this financial aid, completion of the doctorate would have been difficult, if not impossible.

Sincere appreciation is given for the following persons who aided in the editing, typing, and formatting of the dissertation. To Gloria Miller, whose patience and expertise in English assisted the researcher, many thanks. Many thanks to Don Miller, too, for his thoughtful contributions when it was difficult to think of the right word. Sue Green aided in the typing of the dissertation, and her time and assistance are greatly appreciated.

The researcher also wants to extend a special thank you to his wife, Susan, and his four children, Elissa, Patrick, Theresa, and Tammi, for giving their time. Many times it was a sacrifice of love to forego the family in order to complete the doctoral degree.

Finally, the researcher wants to make a special dedication to a group of persons who gave the researcher, in his formative years, the initiative and determination to pursue excellence in all endeavors. This dissertation is warmly dedicated to the staff at the Ohio Veterans' Childrens' Home (formerly the Ohio Soldiers' and Sailors' Orphans' Home), Xenia, Ohio, who raised and educated the researcher. Their kind and loving efforts were the foundation for the success of many of the Home graduates.

TABLE OF CONTENTS

Chapter Page

Chapter | Page

LIST OF TABLES

Table		Page

LIST OF FIGURES

Figure | Page

CHAPTER I

INTRODUCTION TO THE STUDY

The Problem

This study was designed to analyze selected industrial arts curriculum innovations developed for the secondary schools, in terms of their degree of conformity with educational change principles as advocated by experts in the field of educational change (Rogers, 1983; Havelock, 1973; Zaltman, et al, 1977). The study was also designed to recommend to the industrial arts profession a set of educational change principles, based on principles supported by the data from the study, which can be used as a guide in the development and implementation of future industrial arts programs.

More specifically, the study was designed to:

1. Review and record:

    a. several selected industrial arts programs developed during the 1960's (review of each program's basic philosophy, goals and objectives, and content and methodology),

b. theories and models of the change process as developed by leading educational change experts, with emphasis on principles of the change process and a measure used to determine the success of innovations,

c. the pattern or structure of the change process and principles of educational change utilized by the selected industrial arts programs.

2. Compare and analyze principles of the change process advocated by leading educational change experts with those principles supported by the data from the selected industrial arts programs.

3. Recommend to the industrial arts profession a set of educational change principles which can be used as a guide in the development and implementation of future industrial arts programs.

Background and Significance of the Study

During a period of approximately ten years, from the early 1960's to the early 1970's, the industrial arts profession experienced a "boom" of curriculum innovations. Some of these innovations are in existence today, while many have long since been abandoned. However, one should not conclude that only the best of the innovations survived.

Cochran (1970) provided the industrial arts profession with an overview of recent curriculum innovations of the period. These include curriculum projects grouped by four categories: (1) integrative programs, (2) interpretation of industry programs, (3) occupational family programs, and (4) technology-oriented programs. In all, twenty innovations are reviewed concerning their development, objectives, and organizational structure. These programs are not evaluated as to how successful they are in obtaining their stated goals. Also, no attempt is made to establish what guidelines or principles are followed in terms of educational change.

A study by Cochran (1968) was a major source of motivation to undertake the present study. Cochran's research focuses on current programs in industrial arts and the main purpose is to "compare and analyze selected contemporary programs in industrial education in an attempt to determine the common elements, basic directions, and their significance to the field" (Cochran, 1968, p. 8). This study was conducted fifteen years ago. However, in the intervening years some of the programs have flourished while others have stagnated.

A recommendation by Cochran is "Individual evaluative studies should be undertaken (by outside agencies or individuals) to evaluate the success of implementing the programs in the secondary schools" (Cochran, 1968, p. 219).

In this study, Rogers' (1983) rate of adoption of an innovation was used to determine the presence of five innovation characteristics that include relative advantage, compatability, complexity, trialability, and observability.

A member of the researcher's doctoral committee suggested that little research has been done on the success or failure of these innovative industrial arts programs. It was also suggested that the demise of one or more of the innovative programs did not necessarily indicate that the innovation itself is bad; rather, other factors may have contributed to the success or failure of the innovation.

Recommendations by the American Vocational Association (AVA) (1968) in the publication, A Guide to Improving Instruction in Industrial Arts, provided further motivation and support for this study. As part of the evaluation of industrial arts programs, a major concern of the AVA is that of determining the major future goals and objectives of industrial arts instruction. But more important to this study is the concern by the AVA for the various means of implementing desired changes in the program when it states:

> Another important role of evaluation in curriculum development and improvement centers around the effectiveness of the various means of implementation to bring about the desired changes. Although a given program of evaluation utilizing research may have determined and established certain goals and objectives and may have initiated a program to meet these goals and objectives, there must be a continual appraisal to determine whether the goals and objectives are

> constantly being met and whether or not the most effective means available are being utilized. (p.63)

The researcher's own doctoral studies were another source of motivation in that the concept of change theory was prevalent throughout courses in the major area of interest, industrial education, and the cognate area, labor and industrial relations. Behavioral science literature, which is paramount to labor and industrial relations, is replete with change theory as evidenced by such experts as Lewin (1951), Argyris (1970), R. Lippitt, Watson, and Westley (1958), and G. Lippitt (1969). Change theory from behavioral science literature is included in this study to provide a broader, stronger base for the change theories and principles as advocated by educational change experts.

The results of this study are intended to be used as a guide for the development and implementation of industrial arts curriculum innovations by present and future developers. A complete study would include evidence of educational change principles and then would make recommendations--this study includes both. The industrial arts profession needs guiding principles of educational change which can be derived by synthesizing various industrial arts programs and the ways in which they are developed and implemented.

Research Questions

Research questions are appropriate for this study as it was a historical, descriptive study, instead of an experimental study. As part of the design of this study stated previously, answers were sought to the following questions:

1. What does the literature on change theory reveal about principles of educational change? In particular, what theories, models, and principles of educational change are advocated by leading educational change experts?
2. Were principles of educational change utilized by the innovators of each program as they attempted to implement them into the schools? If so, which principles were used and how common are they among the programs?
3. To what degree did the selected industrial arts programs conform to educational change principles as advocated by educational change experts?
4. To what degree were innovation characteristics present during the implementation of the selected industrial arts programs?
5. What is the current status of the seven selected industrial arts programs studied by Cochran (1968)? These include:

a. the Functions of Industry program,

b. the Industriology program,

c. the American Industry Project,

d. the Industrial Arts Curriculum Project (IACP),

e. the Partnership Vocational Education Project,

f. the Orchestrated Systems program,

g. the Galaxy Plan.

Research Methodology

To meet the purposes of the study, the first step was a thorough review of the literature concerning educational change. Not only were the theories and models of the leading educational change experts reviewed, but the principles of educational change that are advocated by the experts were also reviewed. The theories and research findings from the behavioral science field were also reviewed and are included in the literature review to provide support for the recommendation of a set of educational change principles to the industrial arts profession.

Next, the identification, selection, and review of the innovative industrial arts programs that are included in the study were completed. Specific criteria are identified that were used to include industrial arts programs in the study. Each program was reviewed according to a specified process.

The development and pilot testing of survey instruments to collect data were the next steps in the study. Five educational change principles and five innovation characteristics that were used as a basis for the development of two questionnaires are reviewed. One questionnaire was developed for the program developers and one was developed for the implementers from the industrial arts programs. Both questionnaires were designed to record the perspectives of the change process by program developers and the implementers at the time of program implementation.

Next, the two-stage pilot test of the survey instruments was conducted. For the first stage of the pilot test, educational change experts not included in this study were asked to complete and critique the questionnaires. Mean scores for the questionnaire items were then calculated from the data of the pilot test. Only those questionnaire items with mean scores of 3.00 or above are included in the final design of the questionnaires.

A one-way analysis of variance (ANOVA), which was computed for the educational change principles and the innovation characteristics, is also included in the discussion. This statistical analysis was performed to insure that the questionnaire items are actually measuring the existence of the educational change principles and the innovation characteristics that were present during the implementation of the industrial arts programs.

Following the first stage of the pilot test of the questionnaires, the second stage of the pilot test was conducted. Several teachers not included in the study were asked to complete and critique the questionnaires. This part of the pilot test was conducted to insure that questionnaire items were concise and easily understood by respondents. The questionnaires were revised after the two-stage pilot test and then distributed.

The next step in the study was the semi-structured interviews with the program developers. The interviews were designed to allow the program developers to explain in more depth the extent of the change process during program implementation.

Since this research was a historical, descriptive study, the discussion of the data includes descriptive statistics. Two sources of data were identified and are interpreted: the responses of the program developers to questionnaire items, and the responses of the implementers to questionnaire items. Descriptive statistics that were computed from the data include the mean, median, and standard deviation for each industrial arts program.

A thorough examination and discussion of the data are included, such as, lack of or strong support for one or more educational change principles among programs, or lack of or strong support for one or more of the innovation characteristics among programs. Additionally, the total mean scores of the programs are represented graphically to compare the degree of conformity with the educational change principles and innovation characteristics.

Definition of Terms

The following terms are defined for the purposes of the study.

1. Industrial education--that part of education which is concerned with the industrial sector of our society; industrial arts education, industrial-vocational education, and industrial-technical education are included.
2. Industrial arts education--"those phases of general education that deal with industry--its organization, materials, occupations, processes and products--and with the problems resulting from the industrial and technological nature of our society" (Wilber, 1967, p. 2).
3. Vocational education--"is a special-interest education designed for occupational preparation, involving the development of attitudes, understandings, and skills which will enable the student to adjust more adequately to the duties and responsibilities of an ethical citizen and worker

in his chosen field" (Giachino, and Gallington, 1967, p. 95).

4. Industrial arts curriculum innovation-- includes any industrial arts program reviewed by Cochran and which is grouped into one of four types of programs: (1) interpretation of industry, (2) occupational family, (3) integrative, or (4) technology-oriented (Cochran, 1968).

5. Educational change principle--an essential guideline that a change agent should follow in any change effort, and which leads to the most effective use of knowledge (Zaltman, 1977, p.311).

6. Innovation characteristic--an attribute of change that helps to determine the rate of adoption of the change; five attributes are common; relative advantage, compatability, complexity, trialability, and observability (Rogers, 1983, p. 35).

7. Implementers--the original teachers from the industrial arts curriculum innovations that are included in this study.

8. Innovator--one who develops and/or directs a planned change/planned innovation.

9. Innovation--any change which represents something new to the people being changed; a benefit to people changed is implied.

10. Planned change/planned innovation--change or

innovation which would be more likely to be accomplished through a deliberate process.

11. Change agent--a person who facilitates planned change or an innovation.
12. Client/client system--a person, group, organization, or community which the change agent chooses to serve.

Definitions #8 through #12 are from Havelock (1969).

Assumptions and Limitations

Assumptions

The following is a list of basic assumptions used in this study.

1. It is assumed that the developers of the seven selected industrial arts curriculum innovations, as reviewed by Cochran (1968), played a major role in the development and implementation of their respective programs.
2. The responses of the program developers to the questionnaire items and semi-structured interviews are assumed to be accurate.
3. The responses of the implementers to the questionnaire items are assumed to be accurate.
4. The works of the selected educational change experts are assumed to be representative of the

best of the field.

5. It is assumed that those industrial arts programs that demonstrated a greater degree of conformity with advocated educational change principles also demonstrated a greater degree of the presence of innovation characteristics.

Limitations

1. The interpretation of the results of this study is confined to the industrial arts curriculum innovations included in the study.
2. It is recognized that the guiding theory of educational change and the educational change principles utilized by the program developers may or may not have conformed strictly to those advocated by leading educational change experts. Rather, the programs were examined for evidence of change principles utilized and then are compared with those of the experts.
3. The field of educational change has numerous experts with various theories, models, and principles of change. There are too many authors to include all of them in the study; therefore, a decision was made to narrow the field and include the works of three leading educational change

experts. These experts include Everett M. Rogers, Ronald G. Havelock, and Gerald Zaltman. The works and research of other educational change experts are included when they supported the findings of Rogers, Havelock, and Zaltman.

4. It is recognized that accurate recollection of past events by the program developers and the implementers was difficult. Also, bias was certainly possible on the part of the respondents to questionnaire items and interview questions. Through the use of two types of survey instruments, questionnaires and semi-structured interviews, both memory loss and bias were minimized.
5. Finally, this study is limited to the seven programs of industrial arts previously reviewed by Cochran (1968). It is beyond the scope and design of this study to include additional programs.

Summary and Organization of the Remainder of the Study

This chapter included a description and outline of the purpose, significance, methodology, and limitations of the study. Additionally, pertinent background information was included and specific terms were defined.

Chapter II includes a review of the literature of the change process and includes the writings of Rogers, Havelock, and Zaltman. Literature from the behavioral science field is added to support these educational change experts. Additionally, the selected programs of industrial arts are reviewed in terms of basic purposes, designs, and implementation efforts.

Chapter III includes a discussion of the research methodology used in the study. Included in the explanation are the five research questions, the population and sample of the study, the development and pilot testing of survey instruments, data collection, and data presentation and statistical analysis.

The presentation and statistical analysis of the data that were collected are included in Chapter IV. Principles of educational change, which are evident among the programs, are compared with those principles advocated by Rogers, Havelock, and Zaltman. The five research questions are stated and answered with the presentation and interpretation of the data.

Chapter V includes a summary of the findings from the study and a discussion of the final conclusions. A set of educational change principles that is supported by the data, is recommended to the industrial arts profession. These principles are recommended as a guide for the development and implementation of future industrial arts programs. Additional recommendations for the industrial arts profession and for further research follow the conclusions of the study. A section entitled Researcher's Observations and Comments concludes the study.

CHAPTER II

REVIEW OF THE LITERATURE

SECTION A: REVIEW OF THE LITERATURE CONCERNING CHANGE: THEORIES, MODELS, AND PRINCIPLES OF CHANGE

Introduction

Chapter II includes a review of the literature concerning change and is divided into two sections. Section A includes a review of the literature from the behavioral science field. The change theories and models of Rogers, Havelock, and Zaltman are also included in Section A. Section B includes a review of the literature concerning the selected industrial arts programs.

The field of educational change is replete with theorists; however, it was impossible to include every theory, model, and principle of change. It was necessary to narrow the list of theorists to those whose theories, models, and principles of educational change: (1) are extensively reported in the literature, (2) are relatively current (within the past ten years), and (3) are readily accepted in the education profession. Three theorists were identified from the criteria and include Everett M. Rogers, Ronald G. Havelock, and Gerald Zaltman.

Behavioral Science Literature Concerning Change

Edgar F. Huse

As in the educational field, behavioral science has many theorists concerned with change. It is important initially, however, to distinguish between change and managed or planned change. Huse (1980) describes change as "...something that happens to an organization, a group, or an individual. Managed change, on the other hand, involves the active participation of the organization, group, or individual in making things happen that are in the best interests of both the individual and the organization" (p. 83).

Huse (1980) also categorizes change into four different types. These include:

(1) Outside pressure, directed toward the total organization, can include a wide variety of tactics, including mass demonstrations and civil disobedience.

(2) Organization development, directed toward the total organization, can include such techniques as team development, confrontation meetings, work design, goal setting and other tactics.

(3) People change, directed more toward the individual within the organization, can include many of the same techniques used in organization development.

(4) Analysis for the top, directed toward the total organization, emphasizes achieving technological and structural change by persuading the top managers to accept and implement a proposal (pp. 84-85).

Behavioral science literature concerning models of change is evidenced by three types: (1) planned change models, (2) intervention theory and method, and (3) action research (Huse, 1980). All three models are important and are used extensively in organization development efforts. However, only the planned change models are included here, as they best demonstrate the similarity between change efforts in the behavioral science field and the educational field.

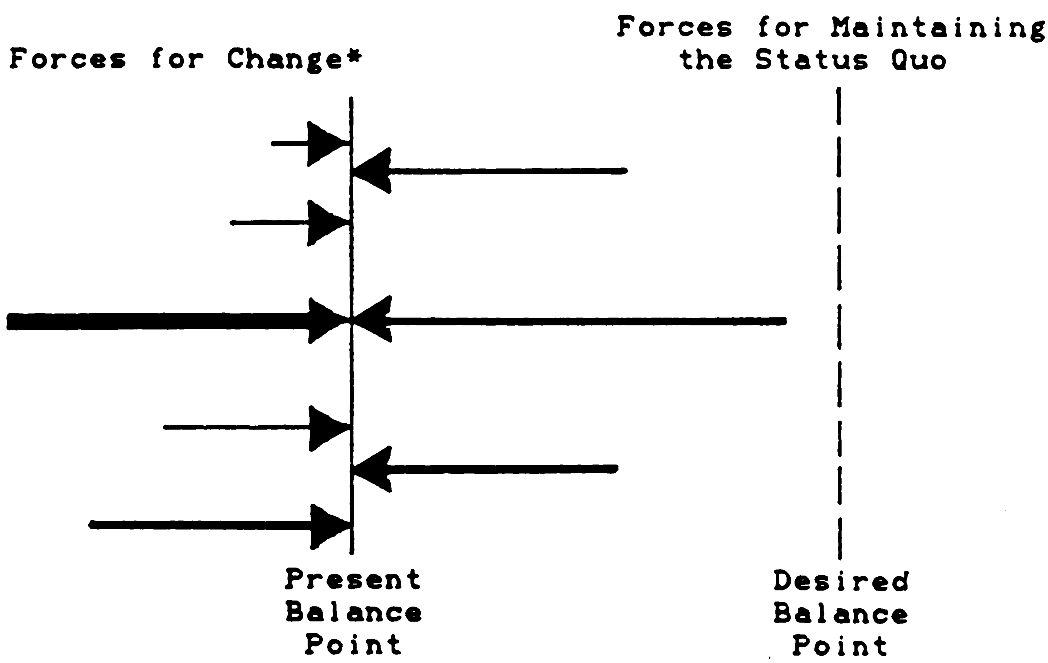
Kurt Lewin

Force-Field Analysis

One of the earliest and most prominent writers of change in the behavioral science field is Kurt Lewin (1951), who developed the force-field analysis to illustrate the concept of change. The force-field analysis depicts two basic forces at work which influence change. The first is the force or forces for change--those factors or variables which contribute to change taking place. The second is the force or forces which attempt to maintain the status quo.

A shifting of the balance of either force results in change. This shifting of the balance between the two forces is possible by either increasing or decreasing the variables of either force. However, decreasing the variables of the forces for maintaining the status quo is preferrable as this lessens the tension and conflict that is characteristic of change. Fig. II.1 further illustrates Lewin's force-field analysis.

Fig. II.1. Lewin's Force-Field Analysis (1951)



*Note: Size of arrows indicates relative strength.

Change Model

In addition to the force-field analysis, Lewin (1951) describes change as a three-step procedure. The three steps include: (1) unfreezing the organization or situation, (2) moving to a new level, and (3) refreezing the organization or situation.

To unfreeze the organization or situation involves reducing those factors which act to maintain the status quo. Such things as: (1) providing new and accurate information, (2) reducing the strength of current values, attitudes, and behaviors, and (3) reducing the level of distrust and fear of change, help to unfreeze an organization or situation.

The next step in Lewin's change process, moving to a new level, requires the development of new values, attitudes, and behaviors which is accomplished through the identification and internalization of new values, attitudes, and behaviors, or by a change in the structure of the organization. Rewards for internalization of the newer values, attitudes, and behaviors are typical motivators for moving to a higher level. A change in the structure of the organization is a possible course of action.

Finally, refreezing the organization or situation requires stabilization of the newly acquired values, attitudes, and behaviors. Stabilization is possible through the use of supporting mechanisms or services.

R. Lippitt, J. Watson, and B. Westley

Five-Step Change Model

A model of change by R. Lippitt, J. Watson, and B. Westley (1958) is similar to Lewin's three-step model; however, their model is expanded to include five steps. These include:

1. Development of need for change (unfreezing).
2. Establishment of a change relationship.
3. Working toward change (moving).
4. Generalization and stabilization of change (freezing).
5. Achieving a terminal relationship (p. 130).

A significant difference is evident between Lewin's model of change and R. Lippitt, Watson, and Westley's model; the later's model utilizes the services and expertise of consultants or change agents. These consultants or change agents are individuals who work outside the organization and who help the organization understand the need for change.

There are two underlying principles associated with the R. Lippitt, Watson, and Westley model of change. Infomation is shared freely and openly between the client organization and the change agent, and information is helpful only when it is translated into action.

Seven-Step Change Model

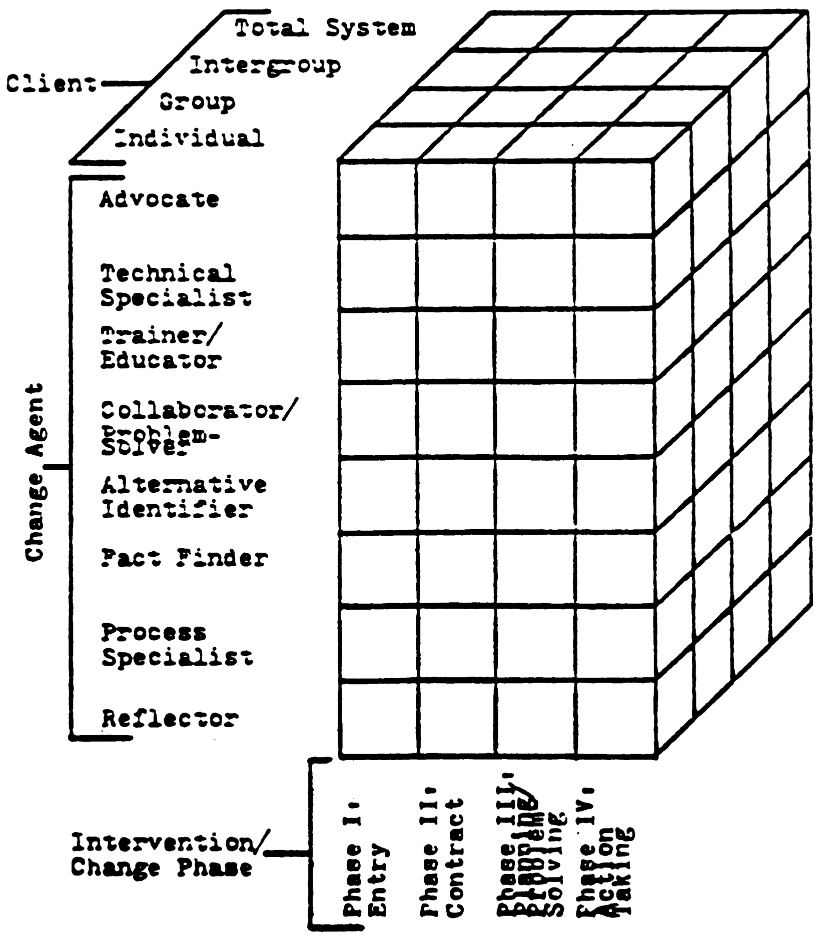
A refined model of change developed by R. Lippitt, Watson, and Westley (Kolb, and Frohman, 1970) includes a seven-step change process:

1. scouting--change agent and client system jointly exploring,
2. entry--development of a mutual contract and mutual experience,
3. diagnosis--identification of specific improvement goals,
4. planning--identification of action steps and possible resistance to changes,
5. action--implementation of action steps,
6. stabilization and evaluation--evaluation to determine success of change and need for further action or termination,
7. termination--leaving the system or stopping one project and beginning another (pp. 51-65).

Ron Lippitt, and Gordon Lippitt

Ronald Lippitt and Gordon Lippitt (1975a, 1975b) extend and further describe the change agent concept in the change process with a revised model. This model depicts the change process in terms of the change agent, the client, and the phase (of the change process). In this model, change agents are described as internal or external; clients are listed by unit of change; and four phases of change are enumerated. Fig. II.2 aids in the understanding of this model.

Fig. II.2. The R. Lippitt and G. Lippitt Change Model (1975a, 1975b) Used with permission.



A more recent publication by Gordon Lippitt and Ronald Lippitt (1978) further delineates and expands the change process theory. This version includes: contact and entry, formulation of a contract and establishment of a helping relationship, problem identification and diagnostic analysis, contract completion--continuity, support, and termination. This model is very similar to Gordon Lippitt's (1973) seven phases of the change process.

Gordon Lippitt

Gordon Lippitt, a noted consultant and behavioral science expert, writes extensively about change. Lippitt (1982) developed both concepts and guidelines concerning planned change in his latest publication. Basic to the idea of planned change, according to Lippitt (1982), is "a need to recognize that change always involves a process of confrontation...[and] must recognize that planned change can take place in four different areas; and that all four undoubtedly are required in almost any planned change effort that is meaningful and maintained" (p.54). The four areas include:

Knowledge change area: generalization about the change experience, cognitive or conceptual understanding about the change,

Skill change area: the incorporation of new ways of performing through practice of the changed behavior,

Attitude change area: the adoption of new feelings through experiencing success with them,

Values change area: the adoption and rearrangement of one's beliefs (G. Lippitt, 1982, p. 54).

Lippitt (1982) also suggests that there are several common elements to any planned change effort. These elements include advocacy, time, collaboration and cooperation, system approach, interrelationship of change programs, and change involves both emotionality and rationality (pp. 59-60).

According to Lippitt, the first step towards change is advocacy. An individual, group, or groups must push for and persevere in securing change.

Time must be considered in any change effort. Change does not occur quickly with individuals, groups, or organizations; change proceeds slowly in small increments. Changes in education are exemplary of this slow process as even small changes take years to show evidence of acceptance and implementation.

Power persons or forces within an organization need to be involved with any change effort and their support secured if any change is to be permanent. This requires their collaboration and cooperation. Lippitt (1982) also explains the system approach element in any planned change effort: "The interrelationships between subparts of any change situation must be understood or the change effort will end in futility" (pp. 59-60).

A single change effort, according to Lippitt (1982), cannot stand alone; it is important that the change be integrated into other interdependent activities of the system (pp. 59-60). This is the element of interrelationship of change programs.

Finally, any change effort affects and involves feelings, emotions, and values on the part of the people being changed. Individuals need to experience and cope with their feelings, emotions, and values associated with the change effort, if it is to be accepted and implemented. This is part of the implementation and follow through of a change effort. Lippitt (1982) refers to this when he said, "many (change) efforts fail because there is not sufficiently effective implementation and 'follow through.' This is usually the weakest part of planned change" (pp. 59-60).

According to Lippitt, understanding and planning for change is insufficient; managing change is also important. Lippitt (1982) provides the field with several guidelines or principles when managing a change effort. These guidelines or principles are aimed at reducing the resistance to change. Reducing the resistance to change is in compliance with and supportive of the shifting the balance of forces in

Lewin's force-field analysis. It is preferrable to lessen or reduce the forces against change rather than increase the forces for change. These guidelines or principles include:

1. involve individuals in planning for change,
2. provide accurate and complete information concerning the change,
3. give employees/individuals a chance to air their objections,
4. always take group norms and habits into account,
5. make only essential changes,
6. provide adequate motivation (i.e. meaningful reward, relationship of contribution to the total effort, importance of contribution, initial success, opportunity to grow, appropriate involvement in key decision making),
7. develop a trusting work climate,
8. learn to use the problem-solving approach (pp. 68-69).

Additional Behavioral Science Change Theorists

Goodwin Watson

Goodwin Watson (1966) reports about studies on lessening resistance to change and the findings support the guidelines or principles provided by G. Lippitt. In the same article, Watson suggests several useful steps to overcoming resistance to change.

Kenneth Benne, and Max Birnbaum

Kenneth Benne and Max Birnbaum (1960) formulated several principles as a strategy for effecting change. As with G. Lippitt's work, Benne and Birnbaum's work relies extensively on Lewin's force-field analysis.

Edgar F. Huse

Finally, Huse (1980, pp. 118-123) expanded on Mann's (1957) seven principles of change and categorizes them into three groups: (1) factors increasing resistance to change, (2) consequences of resistance to change, and (3) factors decreasing resistance to change.

Selected Educational Change Theorists

Everett M. Rogers

Everett M. Rogers, a noted and prolific writer about change and diffusion of innovations, is considered to be an expert in the field of educational change. Two volumes were published by Rogers (1962, 1971) that addresses the concepts, theories, models, and principles of educational change. A review of the material from these writings, coupled with numerous individual articles by Rogers and others, are included in this section.

Rogers (1971) summarizes the importance of understanding change and the diffusion of innovations when he states:

> The phenomenal rate at which innovations are being invented, developed, and spread makes it important to look at how these new ideas effect (or fail to affect) the existing social order....To bridge the gap (between what is known and what is effectively put to use) we must understand how new ideas spread from their source to potential receivers and understand the factors affecting the adoption of such innovations (p. 1).

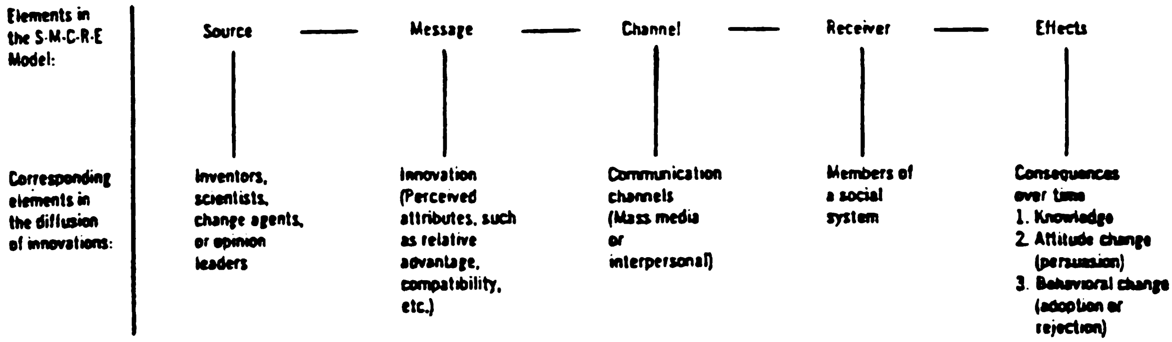
This same theme interested writers of change for years, and as Tarde (1903) notes, "We need to learn why, if 100 different innovations are conceived simultaneously, ten will spread while ninety will be forgotten" (p. 140).

The S - M - C - R - E Model

Attempting to understand change and diffusion of innovations, Rogers (1971) proposes and describes a simple linear model of communication, the S - M - C - R - E model. Fig. II.3 depicts this model.

Fig. II.3. Rogers' S - M - C - R - E Model (p. 20)

Used with permission.



The "S" in the model refers to the source in the diffusion of innovations, i.e., change agents, opinion leaders, etc. The "M" or message is the innovation itself, whether it is a new curriculum program, a new hybrid seed corn, or a different medical practice or drug. Communication channels, such as mass media and interpersonal forms, are represented by the "C" in the model; through these and other channels the innovation is sent or transmitted to the receiver or the "R" in the model. The "E" is the effects of the innovation and are "changes in knowledge, attitude, and overt behavior (adoption or rejection)" (Rogers, 1971, p. 19).

Four elements are crucial in Roger's (1962) analysis of the diffusion of innovations: (1) the innovation, (2) its communication, (3) in a social system, and (4) over time (p. 12). However, there is evidence that the diffusion of innovations is not a simple, easy process. There is a time lag involved. Consequently, "a considerable time lag exists from the introduction of a new idea to its widespread adoption" (Rogers, 1971, p. 16). Ross (1958) notes this time lag when he states, "In spite of Americans' generally favorable attitude toward science and technology, a considerable time lag is required before an innovation reaches wide acceptance....About 50 years elapsed after development of a new educational practice before its adoption by all public schools" (p. 2). This educational practice referred to by Ross is the development and acceptance of the kindergarten in the 1930's and 1940's. Additional studies (Carlson, 1965) demonstrate that it required about five or six years for schools to adopt modern math in the 1960's.

Rogers (1962) notes that all innovations are not equal in terms of their analysis. "Researchers have tended to regard all innovations as equivalent units from the viewpoint of analysis. This is an oversimplification, and a dangerous one. One evidence that all innovations are not equivalent units is that some new products fail while others succeed" (pp. 121-122).

<u>Characteristics of Innovations</u>

Rogers (1983) analyzed innovations and lists five attributes or characteristics of innovations. These include:

1. relative advantage--the degree to which an innovation is superior to ideas it supercedes,
2. compatability--the degree to which an innovation is consistent with existing values and past experiences,
3. complexity--the degree to which an innovation is relatively difficult to understand and use,
4. trialability--the degree to which an innovation may be experimented with on a trial basis,
5. observability--the degree to which the results of an innovation are visible to others (pp. 210-232).

These five attributes are used by Rogers and other experts to determine an innovation's rate of adoption or "the relative speed with which an innovation is adopted by members of a social system. It is generally measured as the number of individuals who adopt a new idea in a specified period" (Rogers, 1983, p. 232).

As measures of success, these attributes combine with several other variables to determine an innovation's rate of adoption. However, the relative advantage of an innovation is one of the biggest predictors of the rate of adoption.

It is usually expressed in several terms:

1. economic factors--profitability, low initial cost, or cost reduction,
2. social--prestige factors,
3. satisfaction or a decrease in discomfort,
4. convenience--savings in time or effort,
5. immediacy of rewards (Rogers, 1983, pp. 213-218).

Additionally, Rogers (1983) cites the use of incentives, such as cash payments, to speed the rate of adoption. Rogers (1983) also warns that it is the receiver's or client's perception of the innovation's attributes that affect the rate of adoption, not the change agent's perception.

Model of the Adoption Process

According to Rogers (1962), individuals involved with an innovation go through an adoption process. "The adoption process is the mental process through which an individual passes from first hearing about an innovation to final adoption" (p. 17). This adoption process, originally proposed by a committee of sociologists (North Central Rural, 1955), consists of five stages: (1) awareness, (2) interest, (3) evaluation, (4) trial, and (5) adoption.

In the awareness stage the individual is exposed to the innovation but does not have complete information about it.

It is the function of the awareness stage to motivate the individual to seek additional information regarding the innovation.

During the interest stage the individual actively seeks information about the innovation. Judgment of the innovation at this point is suspended or delayed until later stages in the adoption process.

The individual mentally applies the innovation to his/her present and future situation during the evaluation stage. A decision is made to either try the innovation or to reject it. Rogers points out that in this stage of the adoption process there is a certain amount of risk involved if the individual is to accept or adopt the innovation. Risks include: (1) ostracism by co-workers and/or being labeled a deviant, (2) inability to cope with the innovation or adapt it to the individual's situation, (3) results of the innovation are equal to or inferior to traditional practice, and (4) resources may be inadequate to sustain the innovation. Reinforcement is needed during this critical stage in the form of peer advice and complete, accurate information regarding the innovation.

The trial stage of the adoption process finds the individual using the innovation on a limited or small-scale basis. Judgments are now made of the usefulness and utility of the innovation; the results of the innovation are important to whether the individual accepts or rejects the innovation. Finally, characteristic of the adoption stage, the individual either decides to continue use of the innovation or it is rejected.

There are numerous criticisms of this five-stage model of the adoption process: (1) adoption is the implied end result, (2) a strict sequential order of the phases is not always true, and (3) the end result is final rejection after initial adoption. Additionally, theorists disagree as to how many stages encompass the adoption process; models range from two stages to eight stages.

Revised Model of the Adoption Process

Rogers (1971) proposes a more recent four-stage model of the adoption process:

1. knowledge--the individual is exposed to the innovation's existence and gains some understanding of how it works.
2. persuasion--the individual forms a favorable or unfavorable attitude toward the innovation.
3. decision--the individual engages in activities which lead to a choice to adopt or reject the innovation.
4. confirmation--the individual seeks reinforcement for the innovation-decision he had made, but he may reverse his previous decision if exposed to

conflicting messages about the innovation (pp. 101-103).

According to Rogers, the social system has an influence on the individual's perspective of change. A traditional social system views change differently than a more modern social system. Rogers (1971) states, "individuals in social systems with modern norms view change favorably, predisposing them to adopt new ideas more rapidly than individuals in traditional systems" (p.32).

Strategies for Planned Change

When dealing with change, Rogers (1969) reports several useful guidelines or strategies for planned change which are supported by research. These strategies include: (1) cultural fit, (2) client participation, (3) client's evaluation ability, and (4) opinion leaders (pp. 169-194).

Cultural fit refers to the degree to which an innovation is compatible with the system's cultural beliefs, attitudes, and values. The more successful change programs/innovations consider and utilize this important element. Less successful innovations fail because they "seek to swim against the tide of clients' cultural values. As the discrepancey between existing and advocated positions increases, resistance to change is likely to increase" (Rogers, 1969, p. 187).

It is extremely important to include the client in the planning of an innovation. According to Rogers' guidelines, this involvement: helps to insure that the clients' unique needs are considered in planning the change program, it increases client commitment to decisions which are made as a result of their participation in the decision-making processes, and it helps legitimize collective innovation decisions.

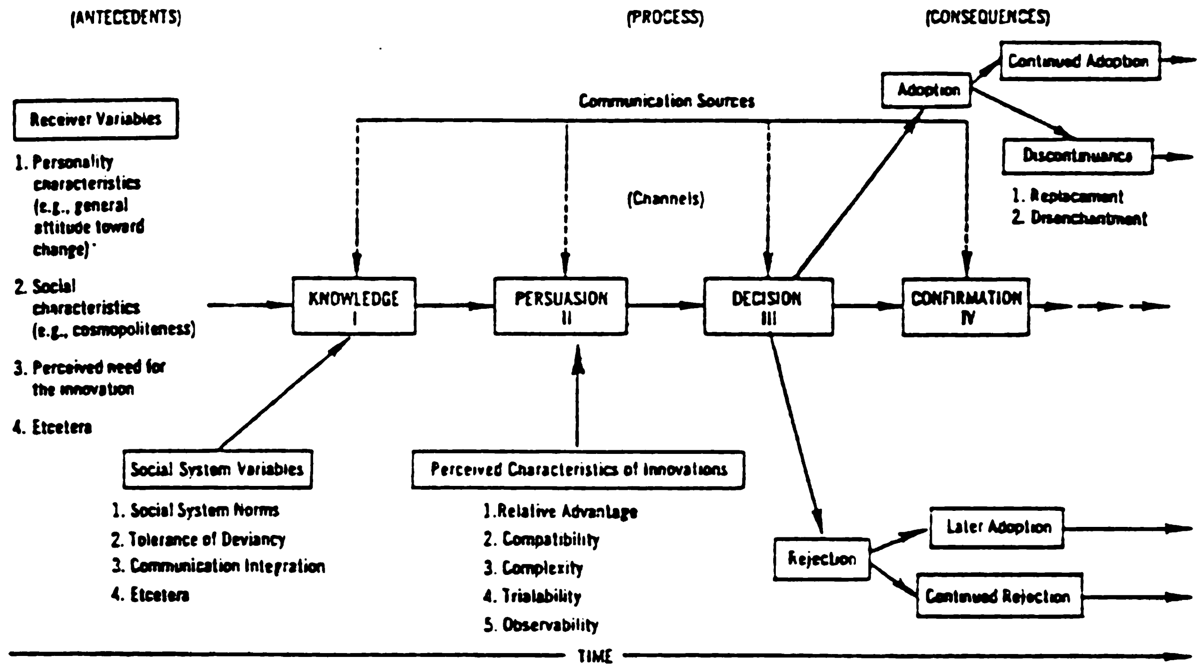
Rogers believes the underlying strategy of a change agent is to improve the client's ability to seek information, consider alternatives, and evaluate and adopt or reject new ideas. In short, a change agent helps to develop a client's self-reliance and self-renewing behavior. If properly done, a change agent works to lessen the client's dependency: this leads to eventual termination of support to the client by the change agent.

Finally, opinion leaders are sought out and focused on; as a result, this increases the rate of adoption. "Opinion leadership is the degree to which an individual is able to informally influence other individual's attitudes or overt behavior in a desired way with relative frequency....a type of informal leadership" (Rogers, 1971, p. 35). When a few opinion leaders are focused on, the change agent can "communicate the innovation....and then let word-of-mouth communication channels spread the new idea from there" (Rogers, 1969, p. 188). Additional benefits of working through opinion leaders are that they provide protection of local sponsorship, they provide sanctions for new ideas, and they improve the credibility of ideas and innovations.

Rogers (1971) summarizes his theory of change and diffusion of innovations with a paradigm of the innovation-decision process. Three major divisions of the model are: (1) antecedents--those variables present in the situation prior to the introduction of the innovation (e.g., the individual's personality traits, social characteristics, strength of the perceived need for the innovation, etc.), (2) process, and (3) consequences (pp. 103-104).

Additionally, the social system's norms, whether traditional or modern, influence the individual's decisions. Several outcomes of the paradigm are possible and are depicted in Fig. II.4: adoption for continued use, discontinuance, rejection--with later adoption, and continued rejection.

Fig. II.4. Rogers' Paradigm of the Innovation-Decision Process (1971, p. 102) Used with permission.



Finally, Rogers (1971) lists over 100 generalizations relating to change and the diffusion of innovations. Each generalization is accompanied by empirical diffusion studies which either support it or do not support it.

Ronald G. Havelock

Ronald G. Havelock (1969) reviewed over 4,000 studies that are concerned with the dissemination and utilization of scientific knowledge (referred to as D & U). Fields of knowledge included in the review are: education (largest percentage of studies), agriculture, communication, mental health, basic and applied science, technology, medicine, law, public health, administration, and social welfare.

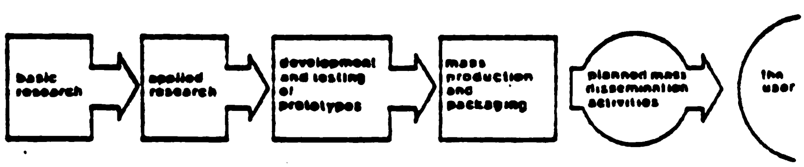
One result of the review is that three principle models of D & U are identified: a research, development, and diffusion model, a social interaction model, and a problem solving model. Additionally, Havelock developed and proposes a linkage model of D & U which incorporates essential elements of the other three models. Each of these models is briefly explained here.

The Research, Development, and Diffusion Model

The research, development, and diffusion model of D & U begins with the formation of knowledge. Once a body of knowledge is developed, packaged, and evaluated, it is then diffused to the consumer. New knowledge or information is the starting point in this model, not the consumer and his/her needs or problems. Havelock (1969) explains that "research starts as a set of facts and theories about the nature of the universe, knowledge which can only be made useful to men through an extensive process of development. In development, basic theories and data are used to generate ideas for useful products and services, and these ideas are then turned into prototypes which have to be tested and redesigned and retested before they represent anything that is truly useful to the bulk of humanity. Once knowledge has passed through this development phase it is ready to be mass produced and diffused to all the members of society for whom it might be useful" (pp. 2.41-2.42).

Five assumptions are inherent in the R & D model. The model assumes there is a rational sequence in the evaluation and application of an innovation. It also assumes that large-scale, long-range planning takes place, as well as a division and coordination of labor. It also assumes that the procedure sells itself to the client. Finally, proponents of the model assume that there is a high initial cost prior to any dissemination (Havelock, 1972). The research, development, and diffusion model is illustrated in Fig. II.5.

Fig. II.5. Havelock's Research, Development, and Diffusion Model (1969, p. 11.6) Used with permission.



The Social Interaction Model

Another model, the social interaction model, places emphasis on the process by which an innovation is diffused through a social system. Much of this model is based on the research of Lewin, R. Lippitt, and others in group dynamics. An important element of this model is that change is predictable if opinion leaders and their effect upon the group are identified.

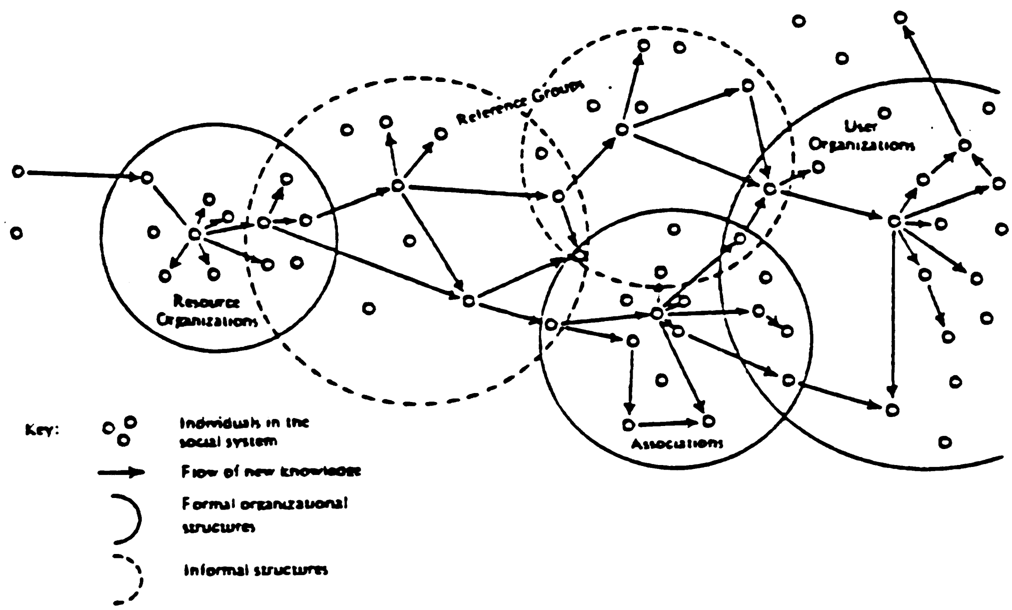
According to Havelock (1972), empirical research tends to support five generalizations about the process of innovation diffusion:

1. that the individual user or adopter belongs to a network of social relations, which largely influence his adoption behavior,
2. that his place in the network (centrality, peripherality, isolation) is a good predictor of his rate of acceptance of new ideas,
3. that informal personal contact is a vital part of the influence and adoption process,
4. that group membership and reference group identifications are major predictors of individual adoption,
5. that the rate of diffusion through a social system follows a predictable S-curve pattern (very slow beginning followed in turn by a late-adopter or

"laggard" period) (p. 15).

The social interaction model is depicted in Fig. II.6.

Fig. II.6. Havelock's Social Interaction Model (1969, p. 11.8) Used with permission.



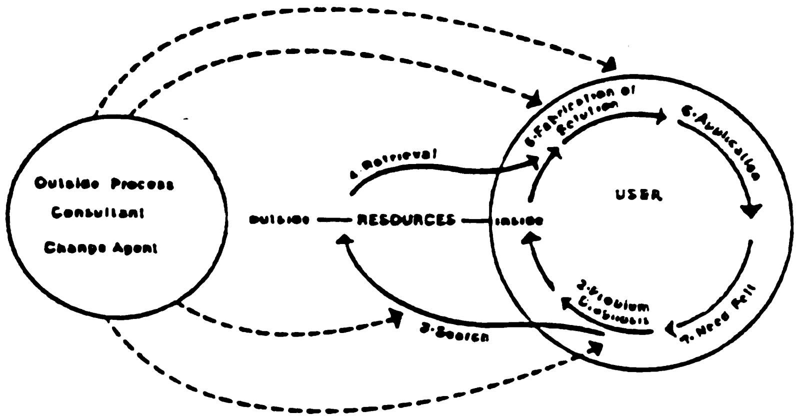
The Problem-Solving Model

A third model, the problem-solving model, focuses on the receiver or user in solving problems. The following sequence is typical of the model. The user identifies a felt need. That need is translated into a problem statement and diagnosis. The user conducts a search and retrieval of ideas and information which assists in the selection of the innovation. The user adapts the innovation by trying it out and evaluating its effectiveness of satisfying the felt need. The role of the change agent in this model is consultative or collaborative rather than directive or authoritative.

At least five points are stressed by advocates of the problem-solving model. "First, that <u>user need</u> is the paramount consideration and the only acceptable value-stance for the change agent. Second, that <u>diagnosis</u> of need always has to be an integral part of the total process. Third, that the outside change agent should be <u>non-directive</u>, rarely, if ever, violating the integrity of the user by placing himself in a directive or expert status. Fourth, that the <u>internal</u> resources, i.e., those resources already existing and easily accessible within the client system, itself, should always be fully utilized. Fifth, that <u>self-applied innovation</u> will have the strongest user commitment and the best chances for long-term survival" (Havelock, 1972, pp. 6-7).

The problem-solving model is shown in Fig. II.7.

Fig. II.7. Havelock's Problem-Solving Model
(1969, p. 11.12) Used with permission.



The Linkage Model

The fourth and final model, the linkage model (Havelock, 1969), is a synthesis of the three earlier models. Havelock's intention is to combine the three models to produce a model free of the weaknesses of each but to retain the strengths. Gephart (Havelock, 1972) acknowledges Havelock's intention when he states, "RD & D concentrates on the nature of the innovation and the work necessary to develop and diffuse it....S-I (social interaction model) concentrates on the network through which information spreads. The P-S (problem-solving model) focuses on the adopter or utilizer of knowledge with an intensity not displayed in the other three. The linkage model seems to emphasize factors that must be considered within and among the research component, the communication network, and the user....By merging these four models, a more comprehensive system is represented" (pp. 25-26).

The linkage model which appears in Fig. II.8, focuses on the user as a problem-solver and it begins when the user recognizes a felt need. Following the pattern of the P-S model, the user identifies alternative solutions which are evaluated through a systematic search procedure. It is during this part of the process that the user links up with outside resource groups to gain additional information and alternatives.

Linkage is not a simple two-person interaction process. The resource group simulates the user's felt need-reduction process and causes the user to search and secure linkage of its own with more expert resources and specialists. The resource group, by simulating the user, develops a degree of empathy for the user and vice versa.

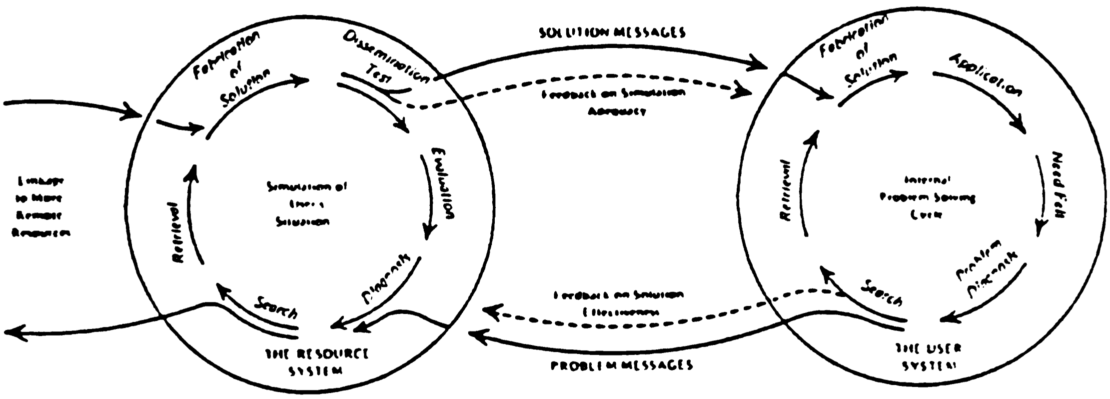
Havelock (1969) describes the linkage model:

> Linkage is seen as a series of two-way interaction processes which connect user systems with various resource systems including basic and applied research development, and practice. Senders and receivers can achieve successful linkage only if they exchange messages in two-way interaction and continuously make the effort to simulate each other's problem solving behavior. Hence, the resource systems must appreciate the user's internal needs and problem solving patterns, and the user, in turn, must be able to appreciate the invention, solution formulation and evaluation processes of the resource systems. This type of collaborative interaction will not only make solutions more relevant and effective but will build relationships of trust, mutual perceptions by user and

resource persons that the other is truly concerned, will listen, and will be able to provide useful information. These trust relations over time can become channels for the rapid, effective, and efficient transfer of information (p. iv).

Fig. II.8. Havelock's Linkage Model (1969, p. 11.16)

Used with permission.



D & U Process Factors

Additionally, Havelock (1969) identifies and describes seven factors that help to explain the D & U process. These include:

1. Linkage--the number, variety, and mutuality of resource system-user system contacts, degree of interrelatedness, collaborative relationships.
2. Structure--the degree of systematic organization

and coordination:

a. of the resource system,

b. of the user system,

c. of the dissemination-utilization strategy.

3. Openness-the belief that change is desirable and possible; willingness and readiness to accept outside help; willingness and readiness to listen to needs of others and to give help; social climate favorable to change.
4. Capacity--the capability to retrieve and marshall diverse resources. Highly correlated with this capacity factor are: wealth, power, size, centrality, intelligence, education, experience, cosmopoliteness, mobility and the number and diversity of existing linkages.
5. Reward--the frequency, immediacy, amount, mutuality of, planning and structuring of positive reinforcements.
6. Proximity--nearness in time, place, and content; familiarity, similarity, recency.
7. Synergy--the number, variety, frequency, and persistance of forces that can be mobilized to produce a knowledge utilization effect (p. v).

Linkage Model Propositions

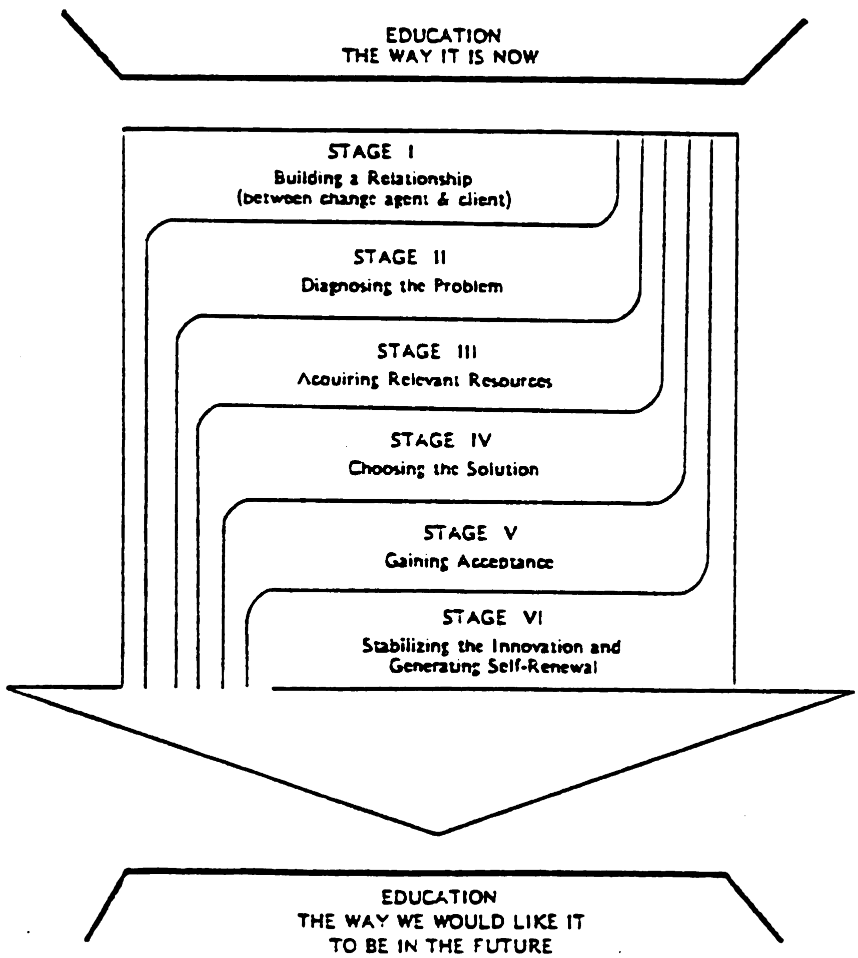
From the linkage model of the dissemination and utilization of scientific knowledge, several propositions are listed by Havelock (1972). These include:

1. To be truly helpful and useful, resource persons must be able to simulate the user's problem-solving processes.
2. To derive help from resource persons (and resource systems) the user must be able to simulate resource system processes, e.g., to appreciate research knowledge, he must understand how research knowledge is generated and validated.
3. Effective utilization requires reciprocal feedback.
4. Resource systems need to develop reciprocal and collaborative relationships not only with a variety of potential users but also with a large diverse group of other resource systems.
5. Users need to develop reciprocal and collaborative relations with a variety of resource systems (cosmopoliteness).
6. A willingness to listen to new ideas (openness) is an important prerequisite to change. This applies both to resource persons and users (pp. 26-28).

Finally, Havelock (1973) proposes a six-stage model of the D & U process: (1) building a relationship,

(2) diagnosing the problem, (3) acquiring relevant resources, (4) choosing the solution, (5) gaining acceptance, and (6) stabilizing the innovation and generating self-renewal. The model is shown in Fig. II.9.

Fig. II.9. Havelock's Six-Stage Model of the Diffusion and Utilization Process (1973, p. 11) Used with permission.



Gerald Zaltman

Preceding Gerald Zaltman's model of change, Zaltman, Florio, and Sikorski (1977) reviewed and classified models of educational change. Zaltman's own model of change, the proactive/interactive change model, is a synthesis of change models and attempts to alleviate the criticisms of earlier models.

The Zaltman, Duncan, and Holbek Change Model

The Zaltman, Duncan, and Holbek model (1973), an organizational change model, is relevant and, therefore is included in the discussion. Basically, this model consists of two stages, initiation and implementation. Each stage has several substages:

Initiation

1. Knowledge-awareness
2. Attitude formation
3. Decision

Implementation

1. Initial implementation
2. Continued-sustained implementation (pp. 56-57)

The authors recognize, however, that the innovation process does not necessarily follow a neat, orderly pattern. The nature of the organization and innovation contributes to a circular rather than a linear pattern. Zaltman et al. (1977) found that five organizational characteristics affect the model: (1) complexity, (2) formalization, (3) centralization, (4) inter-personal relations, and (5) the ability to deal with conflict (pp. 57-58).

Two important implications are evident from the discussion of the Zaltman, Duncan, and Holbek model. The first, as described by Zaltman et al. (1977) is that "organizational characteristics which facilitate introduction of innovations, may make implementation difficult, and characteristics favoring easy implementation may make initiation difficult" (p. 59).

Secondly, there is a distinction between initiation and implementation. Initiation did not predispose implementation. Many educational innovations are initiated but die due to the lack of teacher commitment or inadequate financial resources. Therefore, implementation does not occur. It is necessary to utilize follow-through mechanisms to assure sustained implementation of the innovation. "A follow-through approach that has experienced success is one that requires the users of an innovation or change to report periodically on various aspects of its use, such as volume of use, degree of success, and sources of problems" (Zaltman et al., 1977, p. 59).

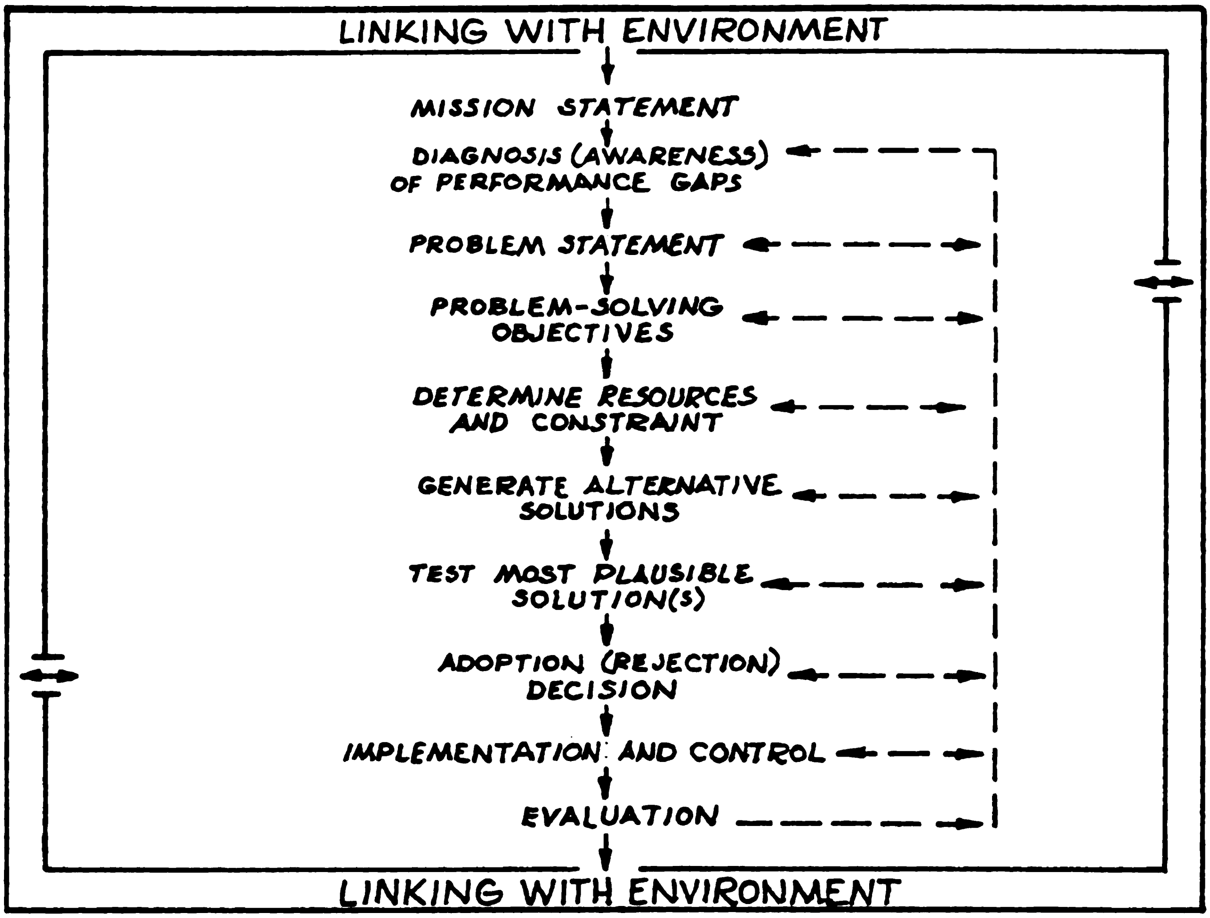
Proactive/Interactive Change Model

A more recent and eclectic model of change is promoted by Zaltman (1977). This model is the proactive/interactive change model, or P/ICM. Zaltman (1977) explains that "the Proactive/Interactive Change Model...is based on the assumption that change can be initiated through internal forces and that educational systems can be self-renewing...organizational planning presupposes an internally initiated change process, as opposed to having outsiders plan for the organization" (p. 139). Fig. II.10 illustrates the model and it is followed by a brief explanation.

Several points are made by Zaltman concerning the proactive/interactive change model. First, the dotted lines in the model represent flexibility; flexibility is the potential direct feedback and recycling from any one stage to any other stage. This is to "...expand a diagnosis, increase awareness of resources and/or constraints, generate alternatives, try to test different or revised innovations, or make additional need assessments" (Zaltman et al., 1977, p.140).

Second, although need assessment is vital during several of the stages, it is particularly relevant during the problem-solving objective stage. Information regarding the availability of certain resources is important. These

Fig. II.10. Zaltman's Proactive/Interactive Change Model (1977, p. 141) Used with permission.



resources include: (1) knowledge/information resources, (2) human resources, (3) material/technology resources, and (4) power/authority resources (Zaltman et al., 1977, p. 155).

Third, several stages in the model are turnkey phases: generate alternative solutions, test most plausible solution(s), adoption (rejection) decision, and implementation and control. These turnkey phases are attempts to include other critical people in the latter stages of planning and decision making. According to

Zaltman et al. (1977), "turnkey phases represent the need for transition in the planning and decision-making efforts....The movement from a decision to adopt to a commitment to change calls for a much greater depth of involvement....This is specifically designed to close the gaps between adoption and implementation" (p. 140).

Linking is yet another feature of Zaltman's proactive/interactive change model. There is a need as the process unfolds, to activate relationships with individuals, to connect with information resources, and to make ties with other resources at the disposal of the organization. These are either the formal or informal type of resources within the organization's environment. "A linking network will be a valuable tool for the development of an inventory of resources and constraints: aids, barriers, external innovations, resistance, and other forces for and against change both within and without the organization" (Zaltman et al., 1977, p. 142).

The last three stages of Zaltman's proactive/ interactive change model, the adoption (rejection) decision stage, the implementation and control stage, and the evaluation stage, are particularly relevant to this study. These three stages are focused on and additional elements of the model are emphasized.

Throughout the model, decision-making is a constant part of the process. Decisions are made as to the problem confronting the organization, who should be included in the planning, and what alternative solutions are available to the organization. A decision is made whether to adopt (or reject) the innovation. This decision is made based on information available to those involved with the change.

Also from the model, it is important to know who is involved with the decision-making and how decisions are made. Zaltman et al. (1977) notes, "The manner in which decisions are made and the people involved in such adoption decisions are critical to the planned change process...movement from adoption to implementation of innovations requires that the significant actors involved in the implementation of innovations be included in the decisions to adopt those innovations or change strategies" (p. 172).

Barriers to Change

Several barriers to successful implementation of change are identified by Gross, Giacquinta, and Bernstein (1971). These include: (1) lack of clarity, (2) lack of capability, (3) lack of compatability, (4) lack of feedback, (5) lack of commitment.

Several elements or strategies are proposed by Zaltman et al. (1977) to overcome these barriers. These include: (1) an instructional period, (2) a training period,

(3) adequate material and equipment support, (4) a feeling of ownership and commitment for the change, (5) adjustment of organizational arrangements to fit the change, and (6) provision for feedback data on both the change and the effort to implement it (p. 174).

The control most useful during the innovation process is feedback with the process and the product. This permitts "refreezing" of the organization with the innovation. Stufflebeam (1967) records several types of feedback and include: (1) context feedback, (2) input feedback, (3) process feedback, and (4) product feedback (pp. 126-133).

Finally, evaluation of educational innovations are hampered by an assumption; verbal adoption of an innovation indicates the implementation of the innovation. This false assumption is noted by Gross, Giacquinta, and Bernstein (1971) and it leads to incorrect assessments of the impact of changes. Zaltman et al. (1977) responds, "This first step of the evaluation process is to determine what is being evaluated....The evaluators of the planned-change efforts must determine whether they are evaluating the product of an implemented change or whether they are evaluating the ability of the organization to change from its previous way of doing things" (p. 177). Zaltman's proactive/interactive change model provides feedback loops from the evaluation stage to all other stages. This feedback allows individuals using the model to assess, identify, and resolve problems encountered on a continuing basis.

Dimensions of Innovations

Zaltman concurs with Rogers concerning the attributes or dimensions of innovations and the rate of adoption of an innovation. According to Zaltman (1973) there are several dimensions of innovations evident in research. These include:

1. cost--financial (initial and continuing) and social,
2. returns to the investment,
3. efficiency--time savings and avoidance of discomfort,
4. risk and uncertainty,
5. communicability--the ability to diffuse an innovation,
6. compatibility--the similarity of an innovation to an existing product, technique, etc.
7. complexity--innovation concepts and its implementation,
8. perceived relative advantage--what the innovation can do that other products, techniques, etc. can not do (pp. 100-105).

Attributes of Innovations

Recent research reveals several new concepts of the attributes of innovations according to Zaltman. Among the new attributes are:

1. terminality--a point in time beyond which the adoption of an innovation becomes less rewarding, useless, or even impossible,
2. divisibility--the ability to try or to implement the innovation on a trial basis,
3. commitment--attitudinal and behavioral acceptance of the innovation,
4. impact upon interpersonal relations,
5. publicness versus privateness,
6. the size of the decision-making body,
7. the number of gatekeepers and the gateway capacity,
8. number of nodes--checkpoints through which an innovation passes,
9. susceptibility to successive modifications,
10. ego-involvement--the extent to which a person's beliefs and values are affected by an innovation (Zaltman, 1973, pp. 106-111).

Zaltman (1973) summarizes the proactive/interactive change model:

> The Proactive/Interactive Change Model is a suggested planning and changing process for viable open systems....Rather than continually reacting to environmental forces, the educational institution can direct

> and shape the course of system and environmental relationships....The system is open to input from its members and from external sources....The process is flexible in that the planners are free to move about the various stages of planning as the situation demands....The process is based on human and organization linkages in order to increase resources available for planning, organization development, and change or innovation (p. 144).

Over 478 principles concerning educational innovations are listed by Zaltman et al. (1977) and Zaltman and Duncan (1977). Although all of these principles are important in the change process, certain principles are more relevant to this study than others. After review, forty-four of the more relevant change principles are grouped according to one of four categories: (1) principles concerned with the change agent and client, (2) principles concerned with resistance to change, (3) principles concerned with change strategy, and (4) principles concerned with the implementation phase of the change process.

Additional Change Theory Literature

John I. Goodlad

A recent study of schooling conducted by John I. Goodlad (1984) focuses on change in the public schools and is discussed in his book entitled, A Place Called School. Reporting on Goodlad's findings, Tye and Tye (1984) indicate that innovation and change in the public schools are doomed to failure; educational organizations refuse to accept the realities of what it takes to effect lasting change (pp. 319-322).

Goodlad (1984) proposes that to change schools, the schools must first be viewed and understood as they now exist. The study involves thirty-eight schools (1,016 classrooms) from which data were collected from "8,624 parents, 1,350 teachers, and 17,163 students" (p. 18). Pertinent information is obtained about how teachers teach, how parents/teachers/students view their schools, and what is taught in the schools.

The findings of Goodlad's (1984) study indicate that "teachers are normally isolated from one another, that little in the environment or circumstances of teaching encourage deviation from conventional practice, and that teachers do not often come together in their schools to discuss curricular and instructional changes" (Tye, and Tye, 1984, p. 319). Although no principles of effective change are explicit from the study, Goodlad describes the inability of schools to implement and sustain change.

Tye and Tye (1984) conclude from Goodlad's data that "The improvement of schooling is a systemic problem that must be approached at a variety of points and with a variety of strategies. Recognizing the existence of and intervening in the pattern of social interaction is one obvious strategy. For example, reformers might try to: identify opinion leaders in a school and enlist their support, do a much better job of in-service education, improve teachers' ability to evaluate new ideas, and allow faculties to choose for themselves the projects through which they will participate in improving their schools" (p. 319). These suggestions are congruent with the theories, models, and principles of effective educational change as proposed by Rogers, Havelock, and Zaltman.

Industrial Arts Research

James E. LaPorte

A review of the literature in industrial arts education reveals research that is concerned with educational change or dimensions of innovations. One study in particular is a doctoral dissertation by James E. LaPorte (1980) entitled, "The Degree of Utilization of Industrial Arts Curriculum Project Materials Relative to Their Perceived Attributes, Teacher Characteristics, and Teacher Concerns." The focus of the study is on the utilization of instructional materials that were developed through the Industrial Arts Curriculum Project (IACP). Primarily, the study was designed to determine what might account for the variability in the degree of utilization of the IACP materials.

As a result of the development of three independent variables, LaPorte hypothesizes that a relationship exists between the degree of utilization of the IACP materials and the three independent variables. These variables include: (1) a set of fourteen teacher characteristics, (2) a set of five statements derived from Rogers' (1983) attributes of innovations, and (3) the "Stages of Concern Questionnaire" (University of Texas at Austin).

A major conclusion from the study indicates that the teacher characteristics and Rogers' attributes of innovations account for a statistically-significant proportion of the variance in the degree of utilization of IACP materials. However, according to LaPorte (1980), "a prediction of how much of the program was being utilized based on this information [teacher characteristics and Rogers' attributes of innovations] would not be very accurate" (p. 201).

LaPorte's (1980) study and its conclusions are pertinent to this study as a dimension of educational change is investigated. Also, the design of the study includes Rogers' five attributes of innovations and the results indicate a significant relationship between the attributes and the degree of utilization of the IACP materials. These results tend to support the design of this study and the use of Rogers' attributes of innovations for the development of survey instruments.

John R. Wright

Another study in industrial arts education that was conducted and is concerned with change and innovation is John R. Wright's (1976) study entitled, "Determining Special Functionaries Which Provided Support for Curriculum Innovation, Diffusion, and Adoption in Industrial Arts at Hundred High School, Hundred, W. VA." Wright assisted Hundred High School as a consultant in the implementation and adoption of a new industrial arts curriculum innovation called Project Open. The innovation was a shift from the traditional industrial arts curriculum to one of a technology-based curriculum. The change agent, Wright, provided curriculum consultant services and in-service training after he developed a three phase plan for change.

The relevance of Wright's study to the present study is that Wright developed his three phase plan for change patterned after Rogers' change model. Additionally, Wright identified the opinion leaders, innovators, and communicators in both the formal and informal organizational structure by using a sociometric instrument known as CATIJ (Bernard, and Killworth, 1973). Wright (1976) describes the results when he states that "the consultant [Wright] had intuitively made the correct decisions in soliciting the support of influentials within the system. It also revealed that the removal of the consultant from the school would not upset the interaction support system developed by the teacher innovators" (pp. 212-213).

Related Educational Change Theory Literature

A review of related literature in education indicates that several studies are pertinent to the present study. Fliegel, Kivlin, and Sekhon (1968) studied the correlation of the initial cost and the adoption rate of an innovation. After controlling for fourteen other attributes, they found that a positive +.43 correlation exists. They also found that continuing cost and the adoption rate have a partial negative correlation of -.24. Fliegel et al. (1968) explains that there is a cost-quality relationship which states that the more expensive an innovation, the higher its perceived quality.

Fliegel et al. (1968) also studied the social cost of innovations and their adoption rates in the United States and in a developing country. The correlation in the developing country is a positive +.46, while in the U.S. only a positive +.13. Social cost is in the form of ridicule, ostracism, or even exclusion from a group and constitutes a strong factor not to adopt in the U.S.

Carlson (1965) applied Rogers' five characteristics of innovations (relative advantage, complexity, compatibility, trialability, and observability) to six educational innovations. However, there is very little agreement among the educators who participated in the study.

Conversely, Rogers (1983) reports on the research evidence that supports or does not support generalizations about the rate of adoption of innovations. The relative advantage and compatibility of an innovation is supported by sixty-seven per cent of the research, trialability and observability is supported by sixty-nine per cent and seventy-eight per cent respectively, while the complexity of an innovation is supported by fifty-six per cent.

Finally, Holloway (1977) asked school principals and teachers to predict the rate of adoption of educational innovations by using Rogers' five characteristics of innovations. The results indicate that there is general support for the characteristics while a sixth characteristic emerged, the status-conferring aspect of educational innovations. The strongest support is indicated for the characteristics of relative advantage, compatibility, and complexity. There is lesser support for trialability and observability.

Related Behavioral Science Change Theory Literature

In a study of six new products entering the market, Ostlund (1969) found that product perception factors (similar to Rogers' five characteristics of innovations) are more successful in predicting innovativeness than the usual factors of venturesomeness, cosmopolitanism, social integration, and demographic/socioeconomic variables. In decreasing order of importance, the product perception factors are, relative advantage, compatibility, perceived risk, divisibility, complexity, and communicability.

Myers and Marquis (1969) researched and identified several innovation characteristics in industry. These include: (1) point of origin--seventy-seven per cent of all innovations are initiated within the firm instead of outside it, (2) new and modified items--approximately two-thirds of the innovations are new items, and (3) product, component, and process innovations.

Findings of the Educational Testing Service (ETS)

A review of the literature concerning change theory is not complete unless the findings of the Educational Testing Service (ETS) are included. The ETS (1980) conducted a literature review for the Michigan Department of Education to identify "those variables that research has shown to be associated with academic achievement" ("Variables that Make a Difference," p. 1). Three primary variables/sources were identified and studied. These include documents cataloged in the ERIC system, recent educational periodicals, and research studies on school effectiveness. To be included in the review, a study had to be an empirical study where data were collected, presented, and analyzed. Opinion reports are excluded from the review.

One result of the literature review by the ETS is an annotated bibliography which contains more than one hundred studies. Each study includes a brief critique of the methodology used. Another result of the review is an overview which consists of a "series of principles, each focusing on a variable that influences achievement" ("Variables that Make a Difference," 1980, p. 2).

Educational Change Principles

A third result of the review by the ETS is the identification of a set of educational change principles that is drawn from the research. These educational change principles parallel those by Rogers, Havelock, and Zaltman and are valuable in the design of the questionnaires used in this study. The principles reviewed by the ETS (1980) are included here.

1. Meaningful change occurs as a process, not as an event.

   In studies of projects where change was successfully implemented, the minimum time span was two years. Knowing that change will not be accomplished instantly or even in a brief time span is necessary to avoid premature disappointment and discouragement. Installation of a new program or procedure seems to be more successful when local staff have an opportunity to manipulate and refine the program to more precisely fit the local situations and personnel. This process helps building acceptance and ownership of a new program.

2. <u>Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.</u>

Direct, personal intervention gets the change process started, links users to the most appropriate new knowledge and products, and guides and reassures users at key points as the change or innovation is adopted. Direct intervention should be distributed over a considerable period of time (two or more years) with more frequent contacts during the initial stages. Contacts should focus on key administrative and instructional leaders who can help get others interested in the proposed change. On-site assistance invariably involves more than simply communicating the technical and procedural details regarding the use of the new knowledge and practices.

3. <u>Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.</u>

This principle refers to all participants in the change process, from high level administrators to aides in the classroom. The change strategies in the literature stood in sharp contrast to the typical approach to educational change, e.g., the 'top down' method. The staff must progress through an initiation stage in which they become aware of and interested in the change. As this unfolds, use and commitment decisions are made and the change begins. Change by fiat or decree is likely to be problematic.

4. <u>Administrators play a crucial role in supporting the utilization process of the new method or idea.</u>

Administrative involvement and enthusiasm is required to set the process of change in motion. Since most changes happen in the school building, the school principal occupies an especially important administrative function in the change process, in terms of establishment of change orientation, creation of incentives for participation and support of implementation efforts by the staff.

5. Material resources at the 'how to' level are needed, particularly when change involves organization or instruction.

There are descriptive materials; such as printed matter, visual displays, and other forms of information designed to communicate what the new knowledge, product, or practice is, and how it will be used. Then there are instructional materials which encompasses the subject matter of education; the workbooks, lesson plans, games, study units, tests, etc., which make up the 'what' of curriculum and instruction.

Rationale for the Use of the Educational Change Principles from the Educational Testing Service (ETS) as the Basis for the Development of Questionnaires

This study reviews and records numerous principles of educational change. It was necessary to limit the number of educational change principles to a significant few to be compatible with the research design of the study. In reducing the number of educational change principles, it was evident that several principles proposed by Rogers, Havelock, and Zaltman have similar meanings. Also, several of the proposed principles can be grouped or categorized with one or more of the five educational change principles as reported by the ETS.

After review, the five educational change principles reported by the ETS (1980) are representative of the principles proposed by Rogers, Havelock, and Zaltman. These principles were the basis of the development of the questionnaires that are described in Chapter III. The five educational change principles are:

1. Meaningful change occurs as a process, not as an event.
2. Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.
3. Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.
4. Administrators play a crucial role in supporting the utilization process of the new method or idea.
5. Material resources at the "how to" level are needed, particularly when change involves organization or instruction.

From the review of educational change literature, there is general agreement among the educational change experts that the rate of adoption of an innovation is a reasonable measurement of its success. The rate of adoption is the relative speed of the acceptance and use of an innovation by an organization (Rogers, 1983).

Rogers' five innovation characteristics generate the most support from the literature as a means of evaluating an innovation's rate of adoption. These include relative advantage, compatibility, complexity, trialability, and observability.

SECTION B: REVIEW OF SELECTED INDUSTRIAL ARTS PROGRAMS

Significant movements and events preceding the invention, development, and implementation of the seven selected industrial arts programs in this study are reported by Bennett (1926, 1937), Barlow (1967), and Cochran (1970). It is not necessary to include this information here. It is sufficient to say that there existed a dissatisfaction with the status quo of industrial arts programs among professionals during the 1960's and 1970's. Each industrial arts program that is reviewed here is a response to this dissatisfaction.

The seven selected industrial arts programs are reviewed according to the following sequence: (1) basic program development, (2) basic program design, and (3) implementation efforts. Alot of the material that was studied by the researcher includes personal documents, notes, and writings of the program developers that were never published.

The Functions of Industry Program

In an attempt to improve the industrial teacher education program at Wayne State University, Detroit, Michigan, both Willard Bateson and Jacob Stern needed to develop a sound philosophical base. The result is a plan that classified all product producing activities of industry into four major functions: research, development, planning for manufacturing or producing a product, and manufacturing. Additionally, all service activities connected with the products are classified as diagnosis, correction, and testing (Bateson, and Stern, 1963).

Objectives for the program are based on the understanding of the relationship of the individual to the industrial complex (Bateson, and Stern, 1962). Industry is defined as "the social institution whose role it is to produce and service the products which man requires to satisfy his material needs" (Bateson, and Stern, 1963, p. 12). Basic objectives of the program include: vocational guidance, initial preparation, placement, continuing education for job security, and preparation for advancement (Cochran, 1970. p. 43).

A three-year program that was developed for the high school includes the first two years that are concerned with goods production activities. The students engage in continuous or mass production, unit production and in planning for manufacturing. Central to the program is the theme that students are able to study and experience industry in its entirety. The third year of the program is devoted to goods-servicing activities. Typical activities in this year are the servicing or repairing of automobiles and appliances.

Bateson and Stern publicized the program with several professional journal articles and presentations. Stern's doctoral dissertation in 1964 studied and validated one aspect of the Functions of Industry concept. Additionally, all courses in the department of industrial arts education at Wayne State University, Detroit, Michigan, were restructured along the Functions of Industry concept.

Plans were made to develop a proposal to implement the program; however, funding was never obtained. Several schools experimented with the concept and the results were reported (Barella, and Stoper, 1969; Miller, 1980; Lutz, 1967).

Several principles that were used to implement the Functions of Industry program are reported by Cochran (1970). These include:

1. each student should have experience in each of the functions,
2. the student must be involved in concrete experiences directly related to modern industry,
3. there must be flexibility within the program itself

> and the school to accommodate the wide range of capabilities--individual differences--of the students that should be in the program (p. 45).

The Industriology Program

The Industriology concept is a result of informal discussions among staff members at the University of Wisconsin, Platteville, Wisconsin (formerly Wisconsin State University, Platteville, Wisconsin), concerning the limited industrial arts programs in many area schools. Jack Kirby and George Brown believed students enrolled in these limited industrial arts programs were "disadvantaged;" they were not receiving an adequate and accurate perspective of modern industry.

A proposal was prepared by Kirby (1967) and presented to the U.S. Office of Education as a Prospective Teacher Fellowship Program during the 1966-1967 school year. Additional fellowship programs were funded in succeeding years to further explore the concept. Total funding for the concept over several years exceeded $556,000. Additional funds from the State amounted to $43,000 (Industriology, 1971). The fellowship program intended "to provide the experienced industrial arts teacher with the course offerings and practical experiences necessary to enable him to conduct an instructional program of industrial arts that will better meet the needs of his students--a program that is both broad and varied as well as high quality" (Kirby, 1967, p. 4).

Briefly, Industriology is the science or study of industry. Although simple in definition, Industriology is actually broad and comprehensive. The concept includes areas of industry such as product development and design, internal finance and office services, manufacturing or processing, marketing, industrial relations, and purchasing (Industriology, 1975, p. 1).

A second thrust of the concept is the variety of industries studied; four classifications are used: raw materials or extracting, manufacturing, distribution, and service industries. Industriology also includes a study of the history and development of industry (Industriology, 1975, p. 1).

Several objectives were developed and guided the development of the Industriology concept. Four phases encompass the concept and are explained by Jackman (1968). Phase I, the development and structure of industry, is appropriate for grades seven, eight, and/or nine and introduces students to modern industry. Phase II, basic activities and processes of industry, grades nine, ten, or eleven, expands on the earlier experiences of students. Phase III, modern industries, grades ten, eleven, or twelve, approximates conventional industrial arts courses but allows for in-depth study of an industry. Phase IV, vocational occupational guidance, grades eleven, or twelve, enables students to study industry from an occupational point of view (pp. 3-4).

Several years ago, the program developers included in this study were interviewed about their programs. An important and pertinent question was asked of all program developers, "To what extent have you been able to implement this program in the public schools" (Roundtable, 1970, pp. 24-69)? Jack Kirby, the program developer of the Industriology Project replied, "It has been implemented in a few schools through graduate fellowship programs. A few other schools are also cooperating in using the program" (Roundtable, 1970, p. 26).

The fellowship program referred to above is the "Experienced Teacher Fellowship Program." Earlier in this section, the aim of the fellowship was stated--basically, to upgrade experienced teachers so they in turn could conduct appropriate instruction for students. According to Kirby (1968), "The heart of the Experienced Teacher Program, however, has been the internship phase. This has involved twelve cooperating industrial arts laboratory facilities in order to 'try-out' and experiment with some of the activities for the Industriology concept" (p. 2). The experienced teachers worked in teams of two--one on the University of Wisconsin, Platteville campus and the other teaching in the cooperating school.

In a letter to cooperating schools, Kirby (1968) informed and updated administrators concerning the Experienced Teacher Fellowship Program. Several facets were enumerated: (1) orientation of teachers to the Industriology concept--three courses taken, (2) additional course work which focused on teaching the concept--five courses, (3) teaching situation in a Platteville area school, and (4) wrap-up and additional course work at the University of Wisconsin, Platteville campus.

From the fellowship program, numerous instructional and informative materials were produced: study guides, teaching plans and activity sheets, information and job assignment sheets, and an instructional aids list and bibliography. In addition, a narrated color slide series was developed of the Industriology Project.

The graduate program at the University of Wisconsin, Platteville, included eight courses related to the Industriology concept. In addition, the undergraduate program in industrial arts education included five courses concerned with the Industriology concept to prepare prospective teachers to teach the Science of Industry--Industriology (Industriology, 1971).

The American Industry Project

The American Industy Project started with a small grant of $7,900 in 1964 from the U.S. Office of Education. Wesley L. Face used the grant to review the literature for concept formation. Face was supported by William J. Michells, promoter of the Minnesota Plan for industrial arts and president of the University of Wisconsin--Stout, at Menomonie, Wisconsin (formerly Stout State University). A need was identified to prepare flexible and adaptable teachers of industrial arts.

The review resulted in a second grant from the Ford Foundation of $65,000 and "the focus was directed to the development and implementation of a program at the secondary school level" (Cochran, 1970, p. 39). An eight-week summer workshop for industrial arts teachers was organized to refine the structure of concepts and substitute new courses with the American Industry emphasis in place of conventional industrial arts courses.

Continuous evaluation and revision of the program took place as it was field-tested in selected schools during the 1964-1965 school year. A third grant totaling over $700,000 for a five year period was requested and obtained from the U.S. Office of Education. The additional funds were used to further develop curriculum materials and establish development and pilot programs (Cochran, 1970, p. 39).

Basic objectives for the program are derived from the Educational Policies Commission (1961) which reduced the seven Cardinal Principles of Education in 1961 to the development of the rational powers of man. Objectives of the program are to develop an understanding of those concepts that apply directly to industry and to develop the ability to solve problems related to industry (Face, and Flug, 1968).

An analysis of industry resulted in thirteen concept areas common to all industries. These include: communication, transportation, finance, property, research, procurement, relationships, marketing, management, production, materials, processes, and energy. Three levels were developed to implement the American Industry Project. Level I, eighth grade, focuses on a broad understanding of industry and allows for solving simple problems related to industry. Level II, ninth or tenth grade, concentrates on an in-depth understanding of the concepts of industry with experience in recognizing and solving complex problems. Level III, eleventh or twelfth grade, stresses problem solving skills within a concept area chosen by the student.

As mentioned earlier, several schools field tested the American Industry program. According to Flug (Roundtable, 1970),

> During development stages the number of schools and teachers involved was deliberately limited. Eight teams of teachers and supervisors have introduced the

> first level program into Portland, OR; Grand Junction, CO; Salt Lake City, UT; Cleveland Heights, OH and 10 other centers in Wisconsin and Minnesota. Nova High School, Fort Lauderdale, FL, now has 10 eighth grade sections in American Industry (p. 26).

Other efforts to implement the program include: (1) a summer EPDA institute to prepare teacher trainers, (2) in-service teacher training programs, (3) a joint undergraduate major [at the University of Wisconsin-Stout, Menomonie, Wisconsin] which included blocks of American Industry content, and (4) a master's level program with concentration in American Industry (Roundtable, 1970).

Additionally, a consortium of colleges and universities worked with the University of Wisconsin-Stout, Menomonie to continue refinement of the existing programs. Several of the teacher trainers were trained at the University of Wisconsin-Stout, Menomonie and with supporting staff, conducted institutes for secondary teachers (Roundtable, 1970, pp. 26-68).

Flug (Roundtable, 1970) reports success of implementation of the program in a variety of industrial arts facilities ranging from unit shops to general shops. With regard to staff preparation, Flug (Roundtable, 1970) states, "We have found it very important that staff undergo a training period in order to become acquainted with the curriculum materials. It has also proved important to sensitize the teacher to the many opportunities for conceptual teaching that he often overlooks" (p. 69).

The Industrial Arts Curriculum Project (IACP)

Although the Industrial Arts Curriculum Project, or IACP, was a joint effort of The Ohio State University, Columbus, Ohio and the University of Illinois, Urbana, Illinois, it was officially administered by The Ohio State University Research Foundation. Headed initially by Edward R. Towers, a proposal was prepared by Donald G. Lux, Willis E. Ray, Jacob Stern, and Edward R. Towers and submitted to the U.S. Office of Education with the intent to "develop, refine, and institutionalize a new and relevant two-year instructional program in industrial arts for junior high school age students" (Buffer, Lux, and Ray, 1971, p. xiv).

The conception and development of the IACP was spurred by several pressures or forces. First, there was a growing concern of the irrelevancy of the traditional industrial arts curriculum of the time. It was thought that the selected course offerings of woods, metals, and drafting, did not represent industry accurately and did not give students an overview of our technological society.

A second force was the impetus of the Vocational Education Act of 1963; several other educational proposals were approved and funded including the American Industry Project at the University of Wisconsin-Stout, Menomonie, Wisconsin. A third and most influential force was the request by the Cincinnati Public Schools, Cincinnati, Ohio, to "stop 'talking' about ideal educational programs and to develop a better educational curriculum for industrial arts education" (Buffer, Lux, and Ray, 1971, p. 17).

After an eighteen-month period for the development of a rationale and structure of industrial arts subject matter, funds were approved covering December 1, 1966, through June 30, 1969. A project extension was granted for the time period July 1, 1969, through August 31, 1971. Total funding for the two time periods exceeded $1.5 million. In addition, the eighteen-month developmental period was funded for $237,550 (Buffer, Lux, and Ray, 1971, p. 8). Total U.S. Office of Education appropriations, however, actually exceeded $2 million by the end of the project.

Several interested publics aided the IACP in addition to the funding by the U.S. Office of Education. Some donated financial support while others donated the time and expertise of consultants, specialists, or committees. Some of these publics include the Ohio Joint Industry Council of Contractors and Building Trades Union, the American Society of Civil Engineers, and the Society of Manufacturing Engineers.

The IACP was divided into three time segments with Phase I from June 1, 1965, to November 30, 1966. The objectives of this period are:

1. to conceptualize a structure of industry as a basis

for content in industrial arts,

2. to translate this structure into a syllabus which outlines a junior high school program of industrial arts education (Buffer, Lux, and Ray, 1971, p. 4).

The second phase of the project was from December 1, 1966, to June 30, 1969, and the objectives during this period are:

1. to design an effective two-year articulated program of study for industrial arts in grades 7, 8, and 9,
2. to develop teaching materials which can be used successfully in existing schools, with representative industrial arts teachers, and with pupils of all ability levels,
3. to install and evaluate the effectiveness of the program materials in three field centers and twelve schools in FY 1968, and six field centers and twenty-four schools in FY 1969 (Buffer, Lux, and Ray, 1971, p. 5).

The third and final phase was from July 1, 1969, to August 31, 1971, and includes the following objectives:

1. to complete the partially completed developmental cycle of a two-year articulated program of industrial technology for the junior high school,
2. to design and implement a dissemination program that will insure maximum impact on school practice (Buffer, Lux, and Ray, 1971, p. 5).

The IACP is a two-year course sequence for junior high school age students. The first phase or course, usually in the seventh or eighth grade, is the World of Construction. According to Cochran (1970), "students study a set of sequential practices common to the building of any structure, whether it is a road, bridge, building, or tunnel. Such practices are first conceptualized and then performed by the students to increase their understanding of how men produce and service constructed projects" (p. 79).

The World of Manufacturing is the second phase of the IACP and is usually in the eighth or ninth grade. Cochran (1970) states, "it (IACP) is directed at the development of an understanding of how the managed production system produces and services manufactured goods. Students have an opportunity to become familiar with the basic industrial patterns common to many manufacturing processes through the study of ways of planning, organizing, and controlling production systems" (p. 79).

As previously mentioned, the IACP was conceived as a result of a request by the Cincinnati Public Schools to upgrade instruction in industrial arts. An eighteen-month massive research and development effort ensued and was guided by the following:

1. a rationale and structure for the derivation of subject matter for industrial arts would be developed,

2. the rationale would be used as a referent to structure a discipline approach to curriculum development; that is, the IACP instructional program would be based on a logically derived body of knowledge,
3. the first attempt at curriculum development would begin with the junior high school program, since it is at this level where the greatest number of children study industrial arts on a required basis,
4. the development efforts focused on the preparation of a two-year instructional sequence,
5. the program could be effectively and efficiently implemented in the junior high school curriculum,
6. the final product would be monetarily competitive with other available programs in industrial arts,
7. the product was to be completed during a six-year period (Buffer, Lux, and Ray, 1971, p. 7).

The research and development phase culminated in the formation and operation of field evaluation centers.

> The Field Evaluation Centers were created for the purpose of field testing and evaluating the total IACP instructional system in the public schools....Therefore, the utilization of evaluation centers was an innovative practice and provided the IACP staff with a national laboratory where the efficacy of the teaching-learning system could be assessed (Buffer, Lux, and Ray, 1971, pp. 69-70).

An additional purpose of the field evaluation centers "involved the initial phases of dissemination--getting people acquainted with the IACP across the country rather than limiting the project to the Columbus, Ohio area" (Buffer, Lux, and Ray, 1971, p. 71).

Three field evaluation centers were formed in selected schools during the 1967-1968 school year and an additional three centers the following year. These centers are geographically dispersed and include schools in Ohio, Florida, New Jersey, California, Texas, and Illinois.

Once the development and initial testing of the IACP were accomplished, dissemination of the project became paramount. The dissemination took several forms: brochures, meetings, lectures, newsletters, correspondences, and telephone conversations. Two other methods of dissemination were employed: the field evaluation and demonstration centers in the schools and the selection and utilization of a commercial publisher.

The demonstration centers differed from the field evaluation centers in that they were established after them and were to "help local school systems participate in this dissemination phase of IACP...to permit schools to use, to review objectively, and to evaluate the work and potential of the IACP in a setting independent of the IACP staff and to establish IACP model programs in as many states as possible" (Buffer, Lux, and Ray, 1971, p. 173). As a participating school and demonstration center, the following standards were established for the teachers:

1. be interested in and committed to change in industrial arts,
2. be teaching junior high school or equivalent classes,
3. be willing to participate in a four-week teacher preparation program at The Ohio State University during the summer preceding the start of the IACP in their school (Buffer, Lux, and Ray, 1971, p. 174).

Additionally, each demonstration center was encouraged to establish an advisory committee to provide guidance.

Buffer illustrates the typical process by which a demonstration center was established:

1. general orientation to IACP by project representative to interested group (educators, administrators, board of education, community groups),
2. decision by board of education (or other decision-making body) to participate in IACP,
3. identification of IACP teachers and schools,
4. orientation of student body to IACP,
5. teacher preparation,
6. program begins,
7. formation of local advisory committee,
8. periodic meetings of all instructional and administrative staff involved in demonstration

program,

9. IACP staff visits (4 per year),

10. program evaluation (Buffer, Lux, and Ray, 1971, pp. 174-175).

Several demonstration centers were established during the first and second years of the IACP. This permitted a diversity of settings in which to examine the organization and operation of the program. Seven demonstration centers were started during the 1969-1970 school year and are geographically dispersed. An additional six schools were added as demonstration centers the following year.

A unique and innovative feature of the IACP is the selection of a commercial publisher to assist in the dissemination of the program materials. Careful and thorough consideration was given to several publishers; the final choice is McKnight & McKnight Publishing Company. A five-year limited copyright contract was awarded to McKnight & McKnight and even today "the publisher has assumed a leadership role in diffusing information to agents of educational change" (Buffer, Lux, and Ray, 1971, p. 186).

One of the IACP's major objectives, the development of teacher education programs, is successful as The Ohio State University instituted an undergraduate program to prepare teachers of industrial technology. Additionally, several teacher education workshops were held to assist teachers in the field. The success and magnitude of the combined efforts of the IACP staff and McKnight & McKnight Publishing Company are expressed by Buffer et al. (1971),

> A geographic network of teacher education workshops (were established) in 16 educational institutions to prepare more than 500 construction teachers during the summer of 1970. This network or teacher education workshops experienced phenomenal growth during the 1971 summer school period with 45 colleges and universities offering 72 workshops in construction and manufacturing. The 1971 workshop groups were functioning in industrial arts teacher education institutions, in 28 states and in Canada, with an estimated 1,900 participants (p. 191).

The IACP program also spurred research and graduate studies. "During the life span of the IACP, over fifty graduate research associates were employed and 22 men received a doctorate in industrial arts education....Approximately 60% of the dissertations produced during the project years related directly to or were outgrouths of, project concerns" (Buffer, Lux, and Ray, 1971, p. 204).

Although the initial IACP project is over, many schools throughout the country continue with the two-year course sequence, or an adaptation of them. Interested persons or schools may still obtain information concerning the program and how to implement it by contacting The Ohio State University or McKnight & McKnight Publishing Company. In a letter to the researcher of this study, Lux illustrates how extensive the teacher in-service effort still is today. Lux states, "for example, we [IACP] provided in-service education for faculty from over 100 colleges and universities who in turn offered workshops for over 7,000 prospective teachers of construction and manufacturing." (Lux, 1983).

The Partnership Vocational Education Project

The Partnership Vocational Education Project (PVEP), developed by Ernest L. Minelli and a project planning staff at Central Michigan University, Mount Pleasant, Michigan, in 1965, is a result of two forces. The first was the revision of the American Vocational Association's (AVA) A Guide to Improving Instruction in Industrial Arts (1968). This guide focuses on industry as a study of the total structure and process of American industry. This guide assists the profession by describing the general philosophy and structure of industrial arts education and how it could help prepare youth for the future. The second force was the increasing concern for correlating or integrating the activities of industrial arts with other school subjects to make both more meaningful.

A proposal was written and submitted to the Ford Foundation for approval. The proposal included fourteen schools in Michigan and was supported by a grant totaling more than $496,000 for five years. Additional financial support for the project was a result of investment of excess funds during the first three years of operation and the contributions of Central Michigan University, the partnership schools, the community colleges, and the partnership industries. These contributions included such items as project staff salary, recruitment services, office space, supplies and materials, travel, participating teacher salaries, and intern salaries. For example, for the fourth year of the project (Review of Contributions, 1969), 1968-1969, the following contributions are recorded:

Contributions by Central Michigan University	$106,619
Contributions by partnership schools	$379,969
Contributions by community colleges	$ 37,391
Contributions by partnership industries	$ 50,784
Total contributions	$574,763

In addition, donations of supplies and equipment from partnership industries to the program totaled more than $82,469 for the same year (Review of Contributions, 1969).

The basic design of the Partnership Vocational Education Project establishes a partnership with the university, the participating schools, the community colleges, and the local industries. "This new program was designed to improve the quality of industrial-technical education courses, the quality of instruction, the articulation from one phase of education to another, and the application of knowledge through correlation of industrial-technical subjects with other academic areas"

(Final Narrative Report, 1971, p. 3). Specific purposes of the Partnership Vocational Education Project are also included in a Final Narrative Report (1971).

The high school plan of the program is designed for the following instructional needs (Final Narrative Report, 1971), "(1) the students who may not enter the labor force after graduation, (2) those students planning to pursue advanced study and careers in an area of technology or applied science, and (3) the reluctant or slow learner, the culturally deprived, and/or the prospective drop-out, who will be entering the labor force before graduation or immediately after" (p. 14). Since the junior high school level is not included in the program, students in the ninth and tenth grades participate in the study of "American Industry" (this program was described earlier in this study). This educational plan allows the students the opportunity and experience of the total concept of American industry.

During the eleventh and twelfth grades of this program, the students take a two-year sequence of four major courses in the subject areas of English, science, mathematics, and industrial-technical education. Minelli (Final Narrative Report, 1971) describes the planning during the eleventh and twelfth grades:

> The natural relationship of each major subject to the other is drawn out and used for constant reinforcement. The inter-relationships between the

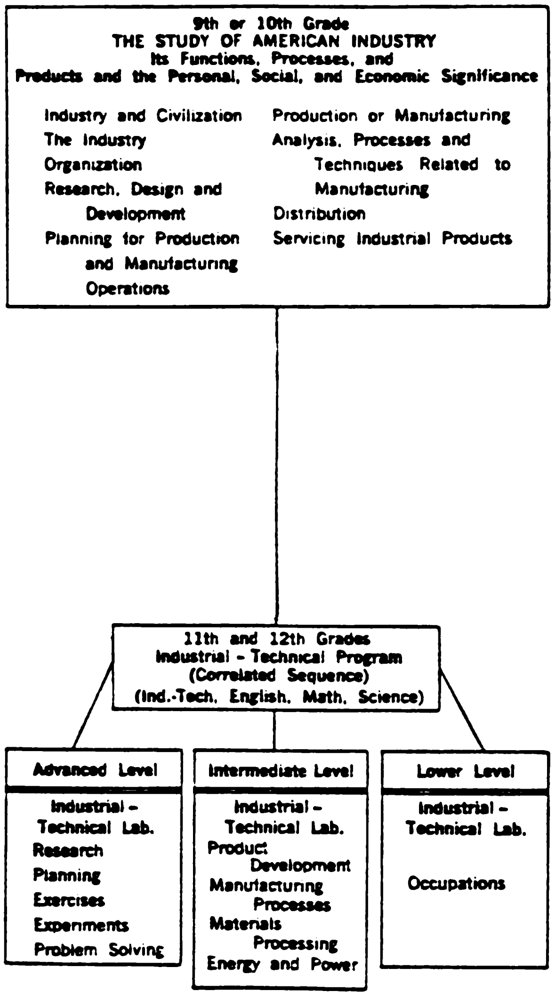
> subjects are taught as an addition to the objectives of the courses themselves. Team teaching is an integral feature of the program. Teachers from the four major subject areas function as a planning team to organize the content and evaluate the students' work (p. 17).

The basic structure of the high school plan is depicted in Fig. II.11.

Efforts to implement the Partnership Vocation Education Project into the schools came about quickly once funds were approved. Initial efforts at implementation actually took place during the development of the project; several schools were invited to participate in the project. Arrangements were then made to allow the project staff to present the new program to the administration of each school. After initial presentation, those schools still interested made additional arrangements to inform the district's directors and teachers.

The correlated sequence concept, coordination of industrial-technical activities with other academic areas, resulted in the formation of interdisciplinary teams of teachers. These teams include a teacher from the following areas: English, math, science, and industrial arts.

Fig. II.11. The Secondary School Level Curriculum Used in the Partnership Vocational Education Project (Cochran, 1970, p. 32) Used with permission.



A directory was printed during each year of the project and it lists the following information: (1) participating schools and contact person, (2) names and daily schedules of participating teachers, (3) total school enrollment and student enrollment in the new program, and (4) the time, day, and location for the team conference period. The total student enrollment in the new program during the first year was 311 while most teams met daily for approximately an hour to discuss, critique, and plan the progress of the program.

The project staff at Central Michigan University paralleled the teams in the schools to provide guidance and assistance throughout the duration of the program. Included on the project staff were an administrative and project director, an administrative assistant, a curriculum supervisor, a project evaluator, and a curriculum specialist in each of the four areas--English, math, science, and industrial arts.

An eight-week summer workshop for the inter-disciplinary teams was developed and arranged to train the participating teachers. Objectives of the workshop listed in the Final Narrative Report (1971) are "to become familiar with the new Partnership Vocational Education Project and to become aware of the concepts involved and their applications; to better understand the world of work and the impact of technology on education and our society; to discuss change and new approaches for teaching; to coordinate information and insights gained; to relate course work practically to classroom teaching; and to develop curricular materials for classroom teaching for the coming fall" (pp. 24-25).

Additional in-service training was characteristic of the new program. Minelli describes the in-service efforts:

> On-campus workshops, conferences, visits, seminars, regional evening meetings are examples of the input processes provided.
>
> One two-day conferences for each of the first four years for the Partnership School teachers, counselors, and administrator was provided and proved to be most helpful. Likewise, one-day conferences for the participating school administrators provided new dimensions for the partnership program.
>
> Each year a one-day conference on campus with industrialists provided further contributions to program improvement.
>
> Community college personnel were invited to the campus for one-day conferences....Full-day conferences were held for supervising teachers of interns....In addition, university funded workshops were held during the Project period....The Project's staff made numerous regularly scheduled visitations to the participating schools and industries (Final Narrative Report, 1971, pp. 29-31).

Additional implementation efforts occurred during the remaining five years of the project according to the project proposal. These efforts include: two two-week workshops to accommodate changes in teacher personnel in the interdisciplinary approach to learning and teaching, and for the teachers responsible for the study of "American Industry, " implementation of the community college program, development and implementation of the industry internship program, and development and implementation of the university program and teacher education (Final Narrative Report, 1971, pp. 25-29).

The Orchestrated Systems Approach to Industrial Arts

As with other new programs of industrial arts during the same period, the Orchestrated Systems Approach developed as a result of disfavor with the conventional program. There was concern for what should or should not be included in industrial arts. According to Cochran (1970), "Programs seemed to have been developed without basis for selection of content. As a result, many industrial education programs were built around particular strengths or desires of individual teachers" (p. 52).

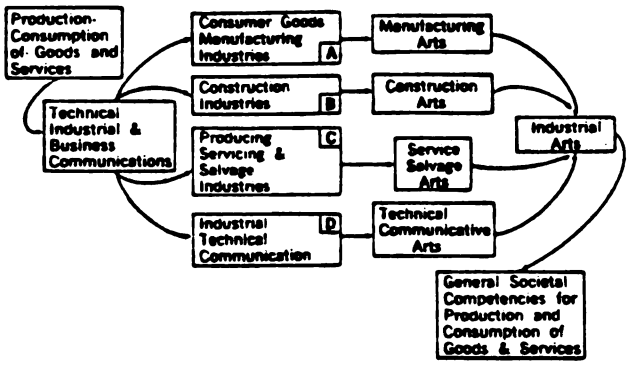
Lewis W. Yoho, Indiana State University, questioned what was being taught in industrial arts and began a search to determine the basis for content selection. Yoho departed from the commonly accepted assumption; the human being is basically an "inheritor"--this inheritance may be acquired through the identification and predetermination of content for acquisition. Instead, Yoho (1969) proposes that "the human being is basically a creator and that he must construct new knowledge and experience" (p. 9). Yoho's program thus emphasizes the student's ability to create while utilizing current concepts and knowledges.

The potential for creative effort is seen in the industrial environment (product producing); systems analysis is applied to the "human-life system" and recorded as models. Successive models, known as SNAP MAPS (Systems Network Analysis Process), were developed by Yoho "to isolate and identify the specific content and experience related to production of goods and services" (Cochran, 1970, p. 52). Major goals are also identified for the Orchestrated Systems Approach.

The Orchestrated Systems Approach is arranged into four levels of systems models. According to Yoho (1969), this modeling process provides for the "identification of specific content which applies in a skeleton-flesh relationship and thereby circumvents the traditional approach involving the preparation of the content inventory and the selection from the inventory to prepare courses with logically arranged content" (p. 23).

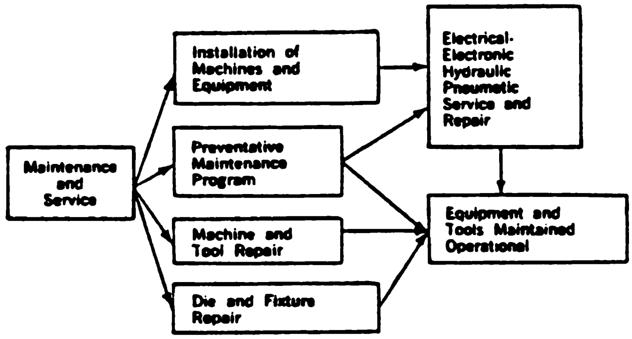
The first level depicts education and key goal gradient toward the pursuit of the "good life." The second level is concerned with the production and consumption of industrial goods and services and its relation to achieving the "good life." Fig. II.12 illustrates the general competencies which all society members should develop with regards to the industrial environment.

Fig. II.12. A Second-Level SNAP Map of Production of Goods and Services (Cochran, 1970, p. 54) Used with permission.



The third level is a breakdown of the four major areas identified in Fig. II.12 labeled as A, B, C, and D. The fourth level models are used to identify specific units and they reveal the differences important to industrial arts, industrial-vocational, and industrial-technical education (Cochran, 1970, pp. 53-54). Fig. II.13 depicts the maintenance and service areas at this level.

Fig. II.13. A Fourth-Level SNAP Map of Maintenance and Service (Cochran, 1970, p. 55) Used with permission.



Finally, Yoho (1969) adds "The fourth level models provide direction for design of specialized environments (via industry) and the fifth and sixth levels are productive of instructional content" (p. 23).

The realization of the theory and implementation of the Orchestrated Systems Approach into practice was the formation and operation of the Continuum Educational Enterprises (C.E.E.) at Indiana State University, Terre Haute, Indiana.

> This title refers to a manufacturing company which has been established within the School of Technology for educational purposes. This student-operated and student-managed company looks to private industry for examples of modes of operation and seeks to include and perform all the service, communication, and manufacturing functions of its conterpart in the real business world (Svendsen, 1970, p. 1).

A proposal was prepared by Yoho (1966) and presented to the ESSO Education Foundation Program, New York, to obtain funds for pilot testing of the C.E.E. Estimated expenditures exceeded $41,500 and included one school year and a summer session.

Efforts to implement the Orchestrated Systems Approach in the public schools initially were directed at four school corporations in Indiana and the Job Corps program at Camp Atterbury. Additionally, three schools in Illinois experimented with the program. According to Yoho, "Variations of the program are developing in the public schools. Public school programs result from teachers who gained experience as students in the program or from supervisors who observed and studied the program enough to make certain adaptations. The program should not be extended into high schools or junior high schools without adequate understanding and full commitment on the basis of the understanding" (Yoho, undated, p. 3).

Additional efforts to implement the program into the public schools include the development of the "Guidelines for Organizing and Teaching an Educational-Industrial Enterprise in the Secondary Schools" (Svendsen, and Trippiedi, 1972). This publication is an overview of the manufacturing enterprise representative of the Orchestrated Systems Approach. Included in the handbook are: (1) essentials of the learning system enterprise, (2) a model of the enterprise approach, (3) preparing people for acceptance of a new program, (4) a general strategy for initiating change, (5) getting started in an enterprise program, (6) typical teaching situations with potential for enterprise organization, (7) student activities during the beginning of the semester, and (8) evaluation techniques (Svendsen, and Trippiedi, 1972, pp. 4-21).

Consideration for the implementation process of the program is evident in the section related to preparing people for acceptance of a new program. Svendsen and Trippiedi (1972) state,

> We suggest that curriculum change should come about through several stages of development rather than as a radical change in one move. It is first recommended that the individual or group interested in setting up a new program prepare a rationale for the new program and write materials to present to the administration and other groups concerned with industrial arts (pp. 11-12).

Nineteen activities are listed in the publication which the teacher can enlist to secure acceptance of the new program. Some of these activities include:

1. informally talk with the principal...about the possibility of using an enterprise approach in industrial arts,
2. enlist the aid of colleagues to organize plans for a new program and assist in selling the program,
3. orient the current industrial arts classes to the purposes of the enterprise program and encourage feedback from the students,
4. mail a brief explanation of the program to the parents,

5. enlist support of [the] Chamber of Commerce and from [the] Junior Chamber of Commerce (Svendsen, and Trippiedi, 1972, pp. 11-12).

Additional evidence which supports the concern for the change process is the section of the publication concerned with a general strategy for initiating change. Several guidelines, adapted from the work of Gillie (1971), are presented.

1. An innovative idea should be altered from its original form to fit the values and experiences of those persons who are going to accept the program.
2. The opinion leaders should be identified and guided into believing that the innovation is important to the institution and its members.
3. The intended users of the innovation must clearly understand the nature of it, and must appreciate the need for its incorporation. Acceptance in the absence of commitment to the innovation is much like passive resistance and can prevent the success of the new idea.
4. A major purpose of an innovation is to enhance the competence of the institutional members. It should not be felt that the promotion of the innovation itself is the foremost objective.
5. Social consequences associated with the adoption of

the innovation should be carefully anticipated (pp. 14-15).

Finally, in a letter to an interested graduate student in 1978, Yoho alludes to the current status of the program. "In regard to current status, the term Orchestrated Systems is descriptive of the theory but programs operate under different titles, for example, the teacher education program operates a 'Manufacturing Enterprise' described as 'An Implementation of Orchestrated Systems;' and our professional programs operate a 'SIMCO (Simulated Industrial Manufacturing Company)--an Implementation of Orchestrated Systems'." (Yoho, 1974).

Yoho (1978) made additional comments about the Orchestrated Systems Approach and they include: (1) failure of the team teaching concept--especially when the program was exported to the public schools, and (2) inadequate instructional materials--reduced the chance of success of the program. Yoho recognizes the limitations of the program when he states,

> I remain conviced that the theory is right but our implementation is incomplete and suffers unfortunate failures. The theory awaits ambitious young researchers to perfect the implementation and develop the instructional materials that are compatible with the theory (1974).

The Galaxy Plan for Career Preparation

The Galaxy Plan evolved from discussions concerning, "automation, cybermetrics, space technology, the ever-widening diversity of industry and commerce, and the acceleration of change" (Cochran, 1970, p. 60). In 1958, several Detroit educators, Roland Fraser, Arthur J. Elges, and Carl H. Turnquist, were concerned with these topics and also questioned: the basic rationale of industrial arts education, the use of trade analysis in content selection, and the programs that were taught in the comprehensive secondary schools in the Detroit public schools.

The result of this concern was the development of the Galaxy Plan for Career Preparation (1968), one element in a three-pronged approach for a total educational system. The other two prongs include basic disciplines and personal development. A suggested outline of the three-pronged approach is given by Turnquist:

1. Basic education
    - 1.1 Language
    - 1.2 Mathematics
    - 1.3 Social Studies
    - 1.4 Science
2. Personal development
    - 2.1 Psychology

Self-image

Family

Psychology

Social attitudes

Supervision acceptance

Respect for work

2.2 Health

2.3 Creative and cultural art

3. Career preparation

3.1 An exploration of career galaxies and clusters

3.2 Selection of a family of occupations

3.3 Depth training in a specific occupation (Galaxy Plan for Career Preparation, 1968, p. 3).

Three basic objectives guided the program developer of the Galaxy Plan and include:

1. to provide each student with a more efficient opportunity to learn about the world or work,
2. to provide each student with a better opportunity through actual laboratory experiences to chose the career he would like to follow,
3. to provide every student (including full-time college bound and general students) with a manipulative skill that would be of immediate value to an employer (Cochran, 1970, p. 60).

The occupational groups of the Galaxy Plan are categorized into four major clusters and include materials and processes, visual communications, energy and propulsion, and personal services. Phase I of the Galaxy Plan is at the junior high school level. The students are rotated through the four major clusters on a semester basis which provides exploratory experiences. Phase II of the plan is in the ninth and tenth grades and includes a more in-depth study of the major clusters. Phase III is at the eleventh and twelfth grades and requires the students, with counselor and parental assistance, to choose a specific cluster in which to specialize (Cochran, 1970, p. 61). Throughout all three phases, the students are grouped according to interests and potentials: professional, technical, trade preparation, and occupational preparation (Galaxy Plan for Career Preparation, 1968, pp. 7-8).

Summary

Section A of Chapter II reviewed and included change theory from the behavioral science field, the educational field, and research in industrial arts education. Several theories and models of change experts from the behavioral science field were included.

Additionally, three educational change theorists were selected from the broad field of educational change and their research reported. These theorists include

Everett M. Rogers, Ronald G. Havelock, and Gerald Zaltman. The pattern of investigation and reporting of each theorist included: (1) the educational change theory advocated, (2) the model of educational change developed, and (3) evidence of proposed principles of educational change.

Additional information and research pertinent to educational change was included in the literature review where appropriate. The literature review concluded with research findings by the Educational Testing Service (ETS) concerning change. Five principles of educational change were reported.

As part of the design of the study, principles of educational change were extracted from the literature review. These principles include the five principles by the ETS as they were deemed to be representative of the numerous principles advocated by Rogers, Havelock, and Zaltman. The principles were used as the basis for the development of survey instruments designed to uncover evidence of educational change principles utilized in the implementation of the seven industrial arts programs. The five principles include:

1. Meaningful change occurs as a process, not as an event.
2. Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.

3. Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.
4. Administrators play a crucial role in supporting the utilization process of the new method or idea.
5. Material resources at the "how to" level are needed, particularly when change involves organization or instruction.

Additionally, the design of the survey instruments also incorporated Rogers' (1983) five characteristics of innovations and includes relative advantage, compatability, complexity, trialability, and observability.

Section B of Chapter II reviewed several programs of industrial arts that were developed during the 1960's. These programs include:

1. the Functions of Industry Program,
2. the Industriology Program,
3. the American Industry Program,
4. the Industrial Arts Curriculum Project (IACP),
5. the Partnership Vocational Education Project,
6. the Orchestrated Systems Approach,
7. the Galaxy Plan.

Additionally, each program was reviewed in terms of basic program development, design, and implementation efforts.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

Chapter III includes a discussion of the research methodology employed in the study and includes: (1) the research questions, (2) the population and sample of the study, (3) the development and pilot testing of survey instruments, (4) data collection, and (5) data presentation and statistical analysis.

Research Questions

The research methodology was designed to answer the research questions stated in Chapter I. These research questions are:

1. What does the literature on change theory reveal about principles of educational change? In particular, what theories, models, and principles of educational change are advocated by leading educational change experts?
2. Were principles of educational change utilized by

the innovators of each program as they attempted to implement them into the schools? If so, which principles were used and how common are they among the programs?

3. To what degree did the selected industrial arts programs conform to educational change principles as advocated by educational change experts?
4. To what degree were innovation characteristics present during the implementation of the selected industrial arts programs?
5. What is the current status of the seven selected industrial arts programs studied by Cochran? These include:
    a. the Functions of Industry program,
    b. the Industriology program,
    c. the American Industry Project,
    d. the Industrial Arts Curriculum Project (IACP),
    e. the Partnership Vocational Education Project,
    f. the Orchestrated Systems program,
    g. the Galaxy Plan.

This study is a historical descriptive study of selected industrial arts programs developed and implemented during the 1960's and 1970's. However, the study is synthesis research, too. The industrial arts programs were scrutinized for evidence of advocated educational change principles during program implementation.

A research design by Miller (1968) was helpful in designing the present study. To clarify and illustrate the steps involved in this study, a diagram and explanation follows. See Fig. III.1.

Population

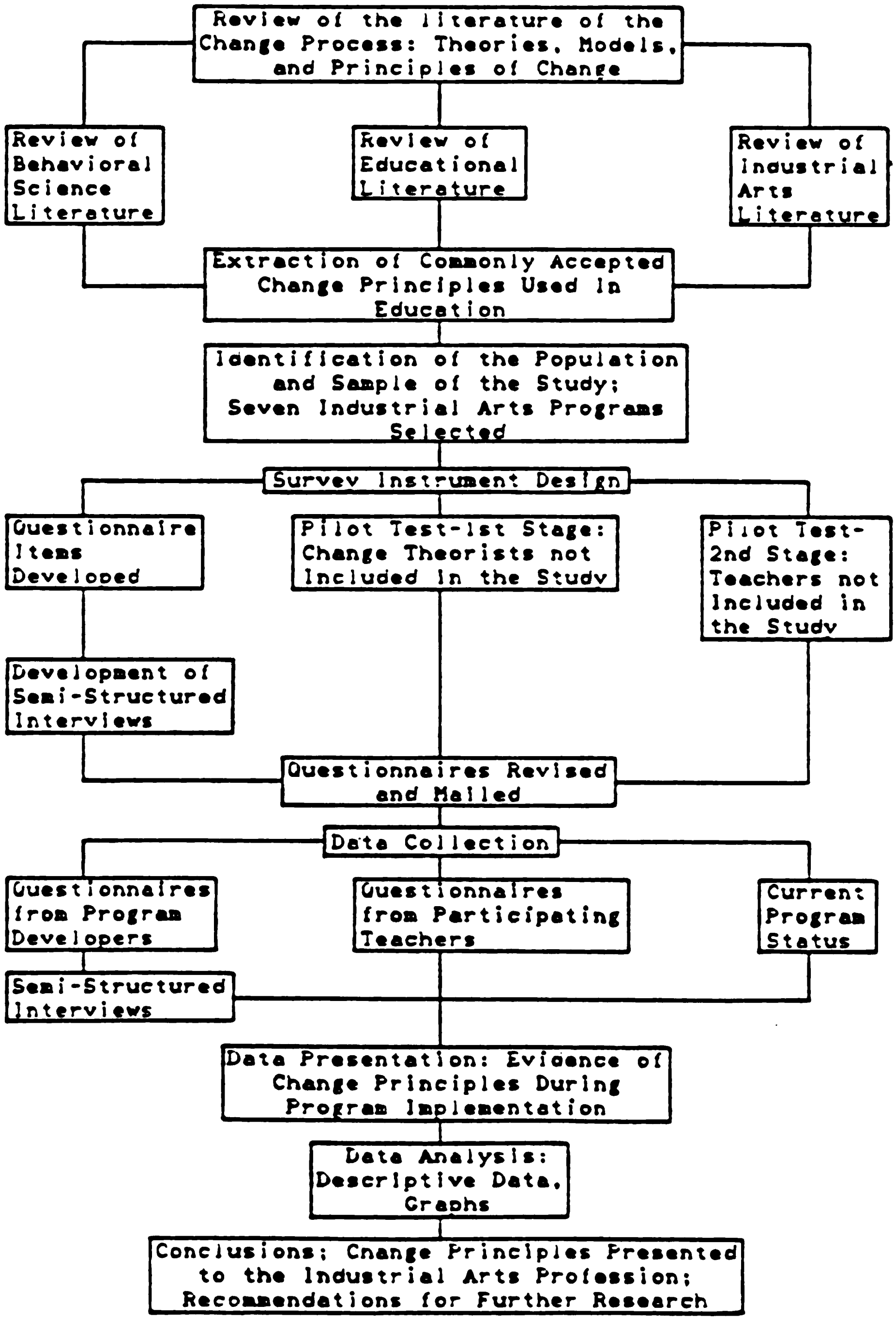
Population Defined and Identified

The population of the study is defined as all industrial arts curriculum innovations developed and implemented during the years 1960-1968, and that are included in a study by Cochran (1968). This time period was selected as more industrial arts curriculum innovations were developed and implemented during this period than in any other period.

Sample of the Study Defined and Identified

From a review of the industrial arts programs during this period, several programs are identified for inclusion in the study. The programs were selected according to the following criteria and constitute the sample of the study: (1) each program is included in a previous study by Cochran (1968), (2) the program developers or innovators are

Fig. III.1. Basic Design of the Study



available for participation, and (3) printed materials concerning each program are available and accessable.

Seven industrial arts programs were identified as the sample of the study (n=7). These programs include: (1) the Functions of Industry program, (2) the Industriology program, (3) the American Industry Project, (4) the Industrial Arts Curriculum Project (IACP), (5) the Partnership Vocational Education Project, (6) the Orchestrated Systems program, and (7) the Galaxy Plan. The sample also includes the program developers and the implementers from the industrial arts programs.

There were concerns that printed materials of each program and the program developers were not available for inclusion in the study. Consequently, the researcher contacted as many of the program developers as possible to ascertain their availability, their willingness to participate in the study, and the availability of printed materials concerning the industrial arts programs.

Six of the seven program developers agreed to participate in the study. One program developer, Carl H. Turnquist from the Galaxy Plan, Detroit, Michigan, is deceased. Although there are no data from this program developer, the data from the implementers involved with the Galaxy Plan are included in the Appendices.

The following is a list of program developers included in the study, the programs they developed, and the university with which they were associated at the time of program development and implementation.

Innovator	Program	University
Willard Bateson	Functions of Industry program	Wayne State University Detroit, Michigan
Jack Kirby	Industriology program	University of Wisconsin, Platteville-- Platteville, Wisconsin
Eugene Flug	American Industry Project	University of Wisconsin-Stout, Menomonie, Wisconsin
Donald Lux	Industrial Arts Curriculum Project (IACP)	The Ohio State University Columbus, Ohio
Ernest Minelli	Partnership Vocational Education Project	Central Michigan University Mount Pleasant, Michigan
Lewis Yoho	Orchestrated Systems program	Indiana State University Terre Haute, Indiana

Concerns were also voiced about the accessability and availability of the implementers from each industrial arts program. Because of attrition, e.g., deaths, retirements, and job changes, it was possible that many of the implementers involved with the initial implementation of the industrial arts programs were not available.

To ascertain the availability and willingness of the implementers to participate in the study, lists were compiled for each program. Each list contains the names, addresses, and telephone numbers of the implementers from each program. In all, 150 implementers were contacted by mail and of these, ninety-nine were returned with no forwarding addresses. No further attempts were made to contact these implementers due to time and cost restraints. Fifty-one of the implementers did agree to participate in the study. A final list was made and the identities coded for confidentiality of the implementers who agreed to participate.

Development of Survey Instruments

Questionnaire Development

As previously stated, two questionnaires were developed to collect data for the study. The first questionnaire is for the program developers and it was designed to record each innovator's perception of program implementation. The second questionnaire is for the implementers of each program, and it records their perceptions of program implementation. The two types of questionnaires were designed to record the presence of educational change principles and innovation characteristics during program implementation.

The foundation of the questionnaires for the program developers and the implementers was the five educational change principles reported by the Educational Testing Service (ETS) and Rogers' five innovation characteristics. These principles and innovation characteristics were presented in Chapter II and are supported by research from Rogers, Havelock, Zaltman, and other educational change experts. The educational change principles that were used in the development of the questionnaires are the following:

1. meaningful change occurs as a process, not as an event,
2. direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful,
3. continuous personal participation of the implementing staff is needed to firmly root and sustain the change,
4. administrators play a crucial role in supporting the utilization process of the new method or idea,
5. material resources at the "how to" level are needed, particularly when change involves organization or instruction.

The five innovation characteristics incorporated into the questionnaires are relative advantage, compatibility, complexity, trialability, and observability. In all, fifty-four statements were initially written for the questionnaires, but this number was later reduced to forty-eight.

Both questionnaires were developed using the same process; however, they are worded differently so they would be understood by the two types of respondents, program developers and implementers. The process of development was as follows. Several statements were written which reflect the five educational change principles reported by the Educational Testing Service (ETS). Additionally, several more statements were written which reflect Rogers' five innovation characteristics that measure the rate of adoption of an innovation.

A forced-choice design is used for responses to the statements. Participants were instructed to select one response for each statement. The following are the possible responses to the statements which comprise the questionnaires: 1--not representative, 2--slightly representative, 3--usually representative, and 4--highly representative. The combined list of statements was then reviewed and critiqued.

Pilot Test of Questionnaires--First Stage

Once the questionnaires were critiqued and revised, they were then pilot tested. The pilot test was done in two stages to validate the questionnaires. The design of the first stage of the pilot test was to determine the degree that the forty-eight items are related to the five educational change principles and the five innovation characteristics.

A cover letter accompanied the questionnaires and explained how to complete and return them. A sample cover letter appears in Appendix D. The questionnaires were sent to four change experts and they were asked to complete and return them. The change experts include an educational change theorist, a professor of educational administration, a professor of behavioral science, and a behavioral science doctoral student.

For the pilot test and the final questionnaires, an acceptance level for questionnaire item mean scores was set. This acceptance level is 3.00 out of a possible 4.00. Mean scores or higher were retained while mean scores below 3.00 were eliminated from the questionnaires.

Results of the First Stage of the Pilot Test

The overall response to the questionnaires from the pilot test indicates that the instrument, as a whole, is "usually representative" of the five educational change principles and the five innovation characteristics. The range of possible responses on the questionnaires is "highly representative," "usually representative," "slightly representative," and "not representative." The respective weights of the responses are four, three, two, and one.

The mean responses to questionnaire items from the first part of the pilot test were then calculated. Four of the original fifty-four items on the Educational Change Principles Survey (ECPS) had means below 2.00. Since an acceptance level of 3.00 was set previously, these four items were eliminated from the final questionnaire to the program developers and the implementers.

Additionally, two of the four statements associated with change principle #1--meaningful change occurs as a process, not as an event, had means of 2.50 or lower. These low mean scores lowered the mean for all of the statements associated with change principle #1 to 2.80. Therefore, these two statements were also eliminated from the final questionnaire. After eliminating the two statements, the mean for the remainder of the statments associated with change principle #1 is 3.00. Mean scores for the other four change principles are 3.00 or higher.

A total of six statements had mean scores below 3.00 and were eliminated from the questionnaires. All other statements achieved a rating of "slightly representative" or better. The mean scores for the five educational change principles from the first stage of the pilot test are shown in Table III.1. Note that all mean scores and the total mean score exceed 3.00.

Table III.1. Mean Responses of the Educational Change Principles from the Pilot Test of Questionnaires

Principle		$\bar{x}$
1. change as a process		3.12
2. direct, personal intervention by the innovator		3.20
3. continuous participation by the implementing staff		3.46
4. role of administrators		3.50
5. material resources		3.00
	Total =	3.25

A one-way analysis of variance (ANOVA) was computed using the five educational change principles as the factors and the four participants in the pilot study as the replicates. Calculations were made using the mean scores of the participants. A slight discrepancy in mean scores is due to the fact that some participants did not respond to all items. The results of the one-way analysis of variance (ANOVA) for the educational change principles is shown in Table III.2.

Table III.2. One-Way Analysis of Variance (ANOVA) of the Educational Change Principles from the Pilot Test of Questionnaires

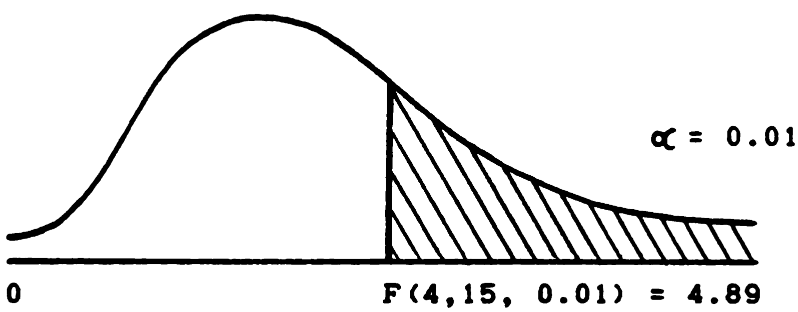
Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F
Between	4	0.857	0.214	0.895
Within	15	3.595	0.239	...
Total	19	4.452	...	...

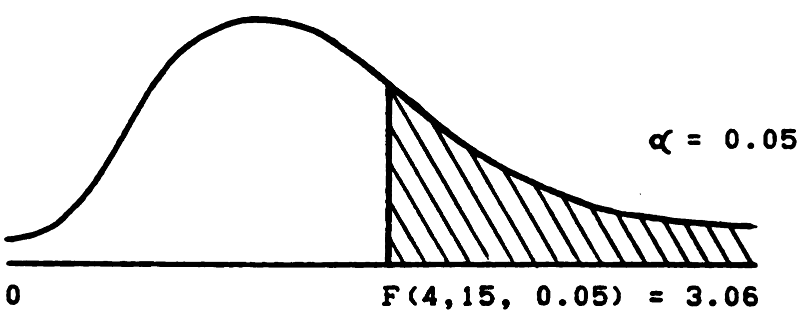
$$Ho: \bar{x}_1 = \bar{x}_2 = \bar{x}_3 = \bar{x}_4 = \bar{x}_5$$

$$Ha: \bar{x}_1 \neq \bar{x}_2 \neq \bar{x}_3 \neq \bar{x}_4 \neq \bar{x}_5$$

$\alpha = 0.01$ If Ho is false, then $F \geq 4.89$.

$\alpha = 0.05$ If Ho is false, then $F \geq 3.06$.





Since the computed F value of 0.895 is out of the rejection region at both the 0.01 and 0.05 levels of significance, the decision is to fail to reject the null hypothesis. The conclusion is that the data suggest that the factors are measuring the same concept, the existence of educational change principles. However, the items were designed to measure what is theorized as five principles of educational change. Thus, the principles and their corresponding statements were retained for the final design of the questionnaires.

In a similar manner, the mean scores for the five innovation characteristics from the first stage of the pilot test are shown in Table III.3. Note once again that all mean scores for the innovation characteristics and the total mean score exceed 3.00. The mean score for innovation characteristic-B, compatability, is high due to the fact that one participant did not respond to the statements related to that characteristic.

Table III.3. Mean Responses of the Innovation Characteristics from the Pilot Test of Questionnaires

Innovation Characteristic		$\bar{x}$
A.	relative advantage	3.25
B.	compatability	3.70
C.	complexity	3.20
D.	trialability	3.30
E.	observability	3.50
	Total =	3.39

A one-way analysis of variance (ANOVA) was computed using the five innovation characteristics as the factors and the four participants in the pilot study as the replicates. Calculations were made using the mean scores of the participants. A slight discrepancy in mean scores is due to the fact that some participants did not respond to all items. The results of the one-way analysis of variance (ANOVA) for the five innovation characteristics are shown in Table III.4.

Table III.4. One-Way Analysis of Variance (ANOVA) of the Innovation Characteristics from the Pilot Test of Questionnaires

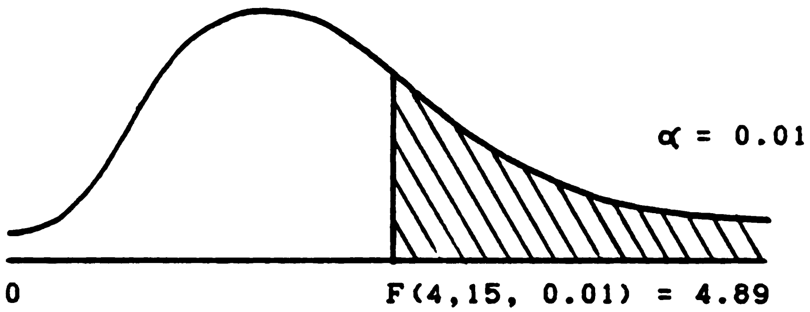
Sources of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F
Between	4	1.02	0.255	0.321
Within	15	11.88	0.792	...
Total	19	12.90	...	...

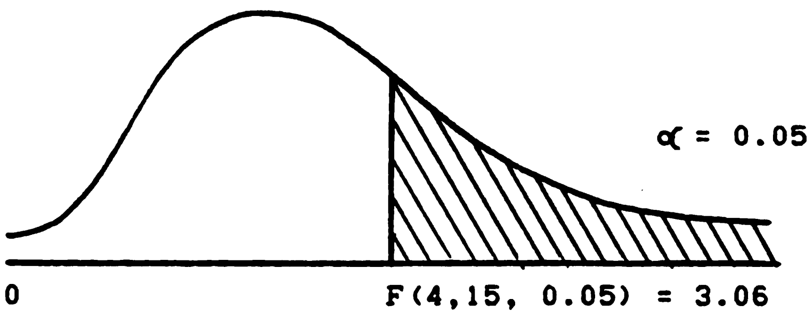
$$Ho: \bar{x}_1 = \bar{x}_2 = \bar{x}_3 = \bar{x}_4 = \bar{x}_5$$

$$Ha: \bar{x}_1 \neq \bar{x}_2 \neq \bar{x}_3 \neq \bar{x}_4 \neq \bar{x}_5$$

$\alpha = 0.01$ If Ho is false, then $F \geq 4.89$.

$\alpha = 0.05$ If Ho is false, then $F \geq 3.06$.





Since the computed F value of 0.321 is out of the rejection region at both the 0.01 and 0.05 levels of significance, the decision is to fail to reject the null hypothesis. The conclusion is that the data suggest the factors are measuring the same concept, the existence of innovation characteristics. As with the educational change principles, the items were designed to measure what is theorized as five innovation characteristics. Thus, the five innovation characteristics were retained for the final design of the questionnaires.

Pilot Test of Questionnaires--Second Stage

For the second stage of the pilot test, the revised questionnaires were given to several teachers not included in the study who had experienced the implementation of an educational innovation. This second stage of the pilot test was designed to remove unnecessary jargon and confusion in the questionnaires and to refine the language to make it concise.

Instead of mailing the questionnaires to the teachers, the researcher personally visited and reviewed the questionnaires with them. The responses of the teachers concerning the content and clarity of the statements helped to refine the questionnaires. After both stages of the pilot test were completed, the list of statements for the questionnaires was revised.

Final Design of the Questionnaires

Each of the forty-eight statements which comprise the questionnaires was randomly assigned a position in the order of the final design. A table of random numbers was consulted to aid in the assignment of statements to the questionnaires. This random assignment of the statements was necessary to reduce bias during the completion of the questionnaries by the respondents. The final design of the questionnaires is entitled the Educational Change Principles Survey (ECPS).

Semi-Structured Interviews

The second type of survey instrument that was developed and used to collect data is the semi-structured interview. The semi-structured interviews of the program developers were designed to allow them to explain in more depth the implementation of the industrial arts programs. Several open-ended questions relating to the industrial arts programs and their implementation were formulated, critiqued, and revised. In all, seven questions comprise the semi-structured interviews and each program developer was asked the same set of questions. A copy of the seven questions used for the sem-structured interviews appears in

Appendix J.

Data Collection

Following the final design of the ECPS, they were printed and mailed to the two groups of respondents, the program developers and the implementers. Cover letters that described the details of completing and returning the questionnaires were included. Also included with the questionnaires were stamped, addressed envelopes for the respondents to return the completed questionnaires. A copy of the cover letter and a copy of the ECPS are included in Appendix E and F.

Both groups of respondents, the program developers and the implementers, were given forty-eight hours to complete and return the ECPS. After the forty-eight hour time period, late respondents were contacted by mail or telephone and encouraged to complete and return the questionnaires.

This follow-up procedure was successful as five of the six questionnaires from the program developers were returned. One program developer returned an incomplete questionnaire which made it invalid to be included with the rest of the data. Additionally, all fifty-one of the implementers who agreed to participate in the study returned valid questionnaires.

The program developers were contacted and arrangements made for the semi-structured interviews after the questionnaires were returned. Permission was obtained from the program developers to tape record the interviews. The data recorded from the interviews were later edited for important points concerning the implementation of the industrial arts programs. The edited data from the semi-structured interviews appear in Appendix K.

Data Presentation and Statistical Analysis

Data Presentation

The descriptive data from the questionnaires are presented in different forms. Tables of descriptive data are used to compare the industrial arts programs, the five educational change principles, and the five innovation characteristics. Separate tables are used, also, for the comparison of program developers' responses to the ECPS and those of the implementers.

Bar graphs are used to further illustrate the comparison of the data from the program developers, implementers, and the industrial arts programs. Only those tables and bar graphs that are relevant to the discussion of the data are included in the text. The additional tables of the data appear in Appendix G. H, and I.

Statistical Analysis

Descriptive statistics were calculated and are reported concerning the data from the questionnaires. These data include the mean, standard deviation, variance (where appropriate), minimum and maximum score, kurtosis, and skewness. As was mentioned, these descriptive data were calculated for the program developers, the implementers, the five educational change principles, the five innovation characteristics, and the industrial arts programs.

The important descriptive statistic is the mean as it indicates the presence or absence of the five educational change principles and the five innovation characteristics. An acceptance level of 3.00 out of a possible 4.00 was previously set for the means. Mean scores of 3.00 or above indicate the presence of the educational change principles or innovation characteristics, while mean scores below 3.00 indicate the absence of them.

Summary of Chapter III

Chapter III included a description of the research methodology used in the study. Included in the explanation were the research questions, the population and sample of the study, the development and pilot testing of survey instruments, data collection, and data presentation and statistical analysis.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

Introduction

Chapter IV presents the data that were collected from the program developers and the implementers via questionnaires. The presentation of the data also includes the edited responses of the program developers to the interview questions.

To determine the existence of the educational change principles and the innovation characteristics during program implementation, an acceptance level of 3.00 out of a possible 4.00 was set for mean scores from the questionnaires. Mean scores of 3.00 or higher indicate the presence of educational change principles or innovation characteristics during program implementation, while mean scores below 3.00 indicate the absence of them.

The mean scores are presented in table and bar graph forms. However, only those tables and bar graphs are used and described in the text that best depict the data and that help to answer the research questions of the study. All other tables that present descriptive statistics of the data are included in Appendix G, H, and I.

As a result of data collection, three of the seven selected industrial arts programs were deemed invalid for the study. The program developer from the Functions of Industry program returned an incomplete questionnaire. Although this developer initially agreed to participate in the study, he later declined when he received the cover letter and the questionnaire. The explanation given by the program developer was that the Functions of Industry program never achieved full development and implementation into the schools.

There are two other reasons that invalidated the data from the Functions of Industry program. One reason is that only one implementer associated with the program was located and was willing to participate in the study. Although the implementer returned a completed questionnaire, very few implications or conclusions can be made based on the data from one respondent. The second reason is that due to the incomplete questionnaire and the explanation given by the program developer, no semi-structured interview was arranged or conducted. Therefore, the data from the Functions of Industry program and the discussion of the data are eliminated from the remainder of the study.

Similarly, the data and analysis of the data from the Orchestrated Systems program were deemed invalid and are eliminated from the remainder of the study. However, the program developer from the Orchestrated Systems program did return a completed questionnaire and was interviewed. It was discovered that, as in the case of the Functions of Industry program, the Orchestrated Systems program never achieved complete development and implementation into the schools.

Additionally, it is emphasized that it was impossible to obtain data from the program developer of the Galaxy Plan as he is deceased. Because these data were not collected, the data collected from the implementers that were associated with the Galaxy Plan are also invalid and are eliminated from the study. Still, four implementers who were associated with the Galaxy Plan returned a completed questionnaire.

Although the data and the analysis of the data from the Functions of Industry program, the Orchestrated Systems program, and the Galaxy Plan are invalid for the study and are not discussed in the text, the data are included in the Appendices. The data from these programs are not interpreted and conclusions are not made. These data are useful, however, in the understanding of the change process associated with these programs.

The remainder of this chapter is organized to answer the research questions stated in Chapter I. These research questions are:

1. What does the literature on change theory reveal about principles of educational change? In particular, what theories, models, and principles of educational change are advocated by leading educational change experts?
2. Were principles of educational change utilized by the innovators of each program as they attempted to implement them into the schools? If so, which principles were used and how common are they among the programs?
3. To what degree did the selected industrial arts programs conform to educational change principles as advocated by educational change experts?
4. To what degree were innovation characteristics present during the implementation of the selected industrial arts programs?
5. What is the current status of the seven selected industrial arts programs studied by Cochran (1968)?

For the remainder of this chapter, each of the research questions is stated and the data presented which relates to that question. A discussion and interpretation of the data are included. Condensed forms of tables and bar graphs are used to compare and illustrate the data. Additional tables are included in Appendix G, H, and I. A summary of the data from the study is included at the end of Chapter IV.

Research Question #1

What does the literature on change theory reveal about principles of educational change? In particular, what theories, models, and principles of educational change are advocated by leading educational change experts?

Chapter II included a review of the literature concerning change theory and this review aids in answering research question #1. A summary of the review of change theory literature is included here. A more detailed explanation of change theory literature can be obtained by reviewing Section A of Chapter II.

After narrowing the field of educational change theorists to Rogers, Havelock, and Zaltman, it was discovered that each theorist advocates a particular change theory and model. Also, each theorist proposes numerous principles of educational change.

Rogers (1971) proposes a paradigm of the innovation-diffusion process. The model is based on three major components and include antecedents, the process, and the consequences. Several outcomes are possible and are explicit in the model: (1) adoption for continued use, (2) discontinuance, (3) rejection--with later adoption, and (4) continued rejection.

Several innovation characteristics were studied that are listed by Rogers (1983). These innovation characteristics are used to determine an innovations's rate of adoption. These innovation characteristics include relative advantage, compatability, complexity, trialability, and observability. Finally, Rogers (1971) lists over 100 generalizations related to change and the diffusion of innovations.

Havelock (1969) reviewed studies concerned with the dissemination and utilization of scientific knowledge (known as D & U). From this review, Havelock (1969) depicts three basic change models that are evident in the research. The three models include the research, development, and diffusion model; the social interaction model; and the problem-solving model. Since Havelock recognizes flaws in each model's ability to explain the dissemination and utilization process of scientific knowledge, he proposes a fourth model, the linkage model. This fourth model attempts to combine the strengths of the first three models but to eliminate the weaknesses.

Several factors of the dissemination and utilization process are listed and described by Havelock (1969). Also, Havelock (1973) proposes a six-stage model of the dissemination and utilization process of scientific knowledge. Finally, numerous principles of change are given by Havelock (1972).

After several different models of change were reviewed by Zaltman, Zaltman (1977) advocates an eclectic model of change, the proactive/interactive change model. In this model, Zaltman assumes that change is initiated internally and that organizations can be self-renewing. As does Rogers and Havelock, Zaltman (1977) proposes numerous principles of educational change.

Because it was impractical to include in this study all of the numerous change principles advocated by Rogers, Havelock, and Zaltman, all of the principles were reviewed. The more relevant change principles were extracted and are grouped with the five educational change principles reported by the Educational Testing Service (ETS) (1980).

The five educational change principles reported by the ETS (1980) and Rogers' (1980) five innovation characteristics were the foundation of the development of survey instruments, questionnaires and semi-structured interviews. The five educational change principles reported by the ETS (1980) include the following.

1. Meaningful change occurs as a process, not as an event.
2. Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.
3. Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.

4. Administrators play a crucial role in supporting the utilization process of the new method or idea.
5. Material resources at the "how to" level are needed, particularly when change involves organization or instruction.

Research Question #2

Were principles of educational change utilized by the innovators of each program as they attempted to implement them into the schools? If so, which principles were used and how common are they among the programs?

To answer research question #2, it was necessary to calculate mean scores of the educational change principles from the program developers and the implementers. Mean scores of the educational change principles are used to determine the presence or absence of the principles. Mean scores of 3.00 or above indicate the presence of the educational change principles, while mean scores below 3.00 indicate the absence of them.

The mean scores of the educational change principles from the program developers are shown in Table IV.1. The following code is used for the five educational change principles as shown in the data tables.

C.P.#1. Meaningful change occurs as a process, not as an event.

C.P.#2. Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.

C.P.#3. Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.

C.P.#4. Administrators play a crucial role in supporting the utilization process of the new method or idea.

C.P.#5. Material resources at the "how to" level are needed, particularly when change involves organization or instruction.

Table IV.1. Comparison of Mean Scores of Educational Change Principles by Program Developers

	Educational Change Principles					
Program	$\bar{x}$ C.P. #1	$\bar{x}$ C.P. #2	$\bar{x}$ C.P. #3	$\bar{x}$ C.P. #4	$\bar{x}$ C.P. #5	Total Program $\bar{x}$
Industriology	3.00	3.33	3.12	3.16	2.50	3.02
American Industry Project	4.00	3.66	3.50	3.50	3.33	3.59
Industrial Arts Curriculum Project (IACP)	3.75	3.88	3.50	3.50	2.66	3.45
Partnership Vocational Education Project	2.50	3.44	2.62	3.50	3.83	3.17
Total Change Principle $\bar{x}$ =	3.31	3.57	3.18	3.41	3.08	

A review of the data from Table IV.1 indicates that the total mean scores of the program developers across all five educational change principles are above the acceptance level of 3.00 for all four industrial arts programs. The highest total mean score is 3.59 for the American Industry Project program developer and the lowest mean score is 3.02 for the Industriology program developer. Additionally, total mean scores of the five educational change principles across the industrial arts programs above the 3.00 acceptance level are shown in the table. The highest total mean score is 3.57 for educational change principle #2 and the lowest mean score is 3.08 for educational change principle #5.

The data from Table IV.1 suggest that all five of the educational change principles were present during program implementation. However, a closer look at individual mean scores for the five educational change principles demonstrates that all five principles were not present during program implementation for all of the programs. Only the mean scores for the five educational change principles from the American Industry Project are above the 3.00 acceptance level. The Industriology program has a mean score of 2.50 for change principle #5, which indicates the principle was absent during program implementation.

Similarly, the Industrial Arts Curriculum Project (IACP) has a low mean score of 2.66 for change principle #5. Two mean scores are below the 3.00 acceptance level for two principles from the Partnership Vocational Education Project. These are 2.50 for change principle #1 and 2.62 for change principle #3. These low mean scores indicate the absence of these educational change principles during program implementation.

The data in Table IV.2 are arranged similar to Table IV.1. A review of these data shows that the total mean scores of the implementers are above the 3.00 acceptance level for two of the four industrial arts programs across the educational change principles. The Industrial Arts Curriculum Project (IACP) has a total mean score of 3.27 and the Industriology program a 3.12. The total mean socres for the Partnership Vocational Education Project and the American Industry Project are below 3.00.

Interestingly, only change principle #5 has a total mean score below the 3.00 acceptance level. All other mean scores for the educational change principles are above 3.00.

As with the data from the program developers, the data concerning the presence or absence of educational change principles from the implementers are initially contradictory. The total mean scores of the programs and the educational change principles seem to suggest that many of the educational change principles were present during program implementation. A closer look at individual mean scores for the educational change principles across programs reveals that this is not true.

Table IV.2. Comparison of Mean Scores of Educational Change Principles by Implementers

Program	Educational Change Principles $\bar{x}$ C.P. #1	$\bar{x}$ C.P #2	$\bar{x}$ C.P. #3	$\bar{x}$ C.P. #4	$\bar{x}$ C.P. #5	Total Program $\bar{x}$
Industriology	3.20	3.33	3.27	3.23	2.60	3.12
American Industry Project	2.90	2.82	2.80	2.80	2.33	2.73
Industrial Arts Curriculum Project (IACP)	3.54	3.45	3.13	3.38	2.88	3.27
Partnership Vocational Education Project	2.85	2.91	2.87	2.80	2.30	2.74
Total Change Principle $\bar{x}$ =	3.12	3.12	3.01	3.05	2.52	

Change principle #5 is the only mean score below the 3.00 acceptance level for the Industriology program and the Industrial Arts Curriculum Project (IACP). All other mean scores for these two programs are above the 3.00 acceptance level, which indicate their presence during program implementation. None of the mean scores, however, are above the 3.00 acceptance level for the five educational change principles from the American Industry Project or the

Partnership Vocational Education Project. These low mean scores indicate the absence of the educational change principles during program implementation.

It is interesting and revealing to compare the mean scores of the five educational change principles from the program developers with those of the implementers. A comparison of the data in Table IV.1 on page 141 and Table IV.2 on page 144 indicates that both the program developer and the implementers from the Industriology program agree that only change principle #5 was absent during program implementation. Mean scores from the program developer and the implementers for change principle #5 are below the 3.00 acceptance level. The data suggest that the program developer and implementers agree that the remaining educational change principles were present during program implementation.

For the American Industry Project, the data in Table IV.1 and Table IV.2 suggest that the program developer and the implementers disagree as to the presence or absence of the five educational change principles during program implementation. Mean scores for all five of the educational change principles from the program developer are above the 3.00 acceptance level, while all mean scores for all five of the principles from the implementers are below the 3.00 acceptance level. The data suggest that the program developer thought that all five educational change principles were present during program implementation, while the implementers thought they were absent.

As with the data from the Industriology program, the data in Table IV.1 and Table IV.2 suggest that the program developer and the implementers from the Industrial Arts Curriculum Project (IACP) are in agreement as to the presence or absence of the educational change principles during program implementation. Mean scores from the program developer and the implementers for change principle #5 are below the 3.00 acceptance level. These low mean scores indicate the absence of educational change principle #5 during program implementation. All other mean scores from the program developer and the implementers for the remaining principles are above the 3.00 acceptance level, an indication that these principles were present during program implementation.

The data in Table IV.1 and Table IV.2 suggest that the program developer and the implementers from the Partnership Vocational Education Project agree only on the absence of two educational change principles during program implementation. These two are change principle #1 and change principle #3. Mean scores from the program developer and the implementers for these two principles are below the 3.00 acceptance level, an indication that they were absent during program implementation.

The program developer and the implementers from the

Partnership Vocational Education Project, however, disagree as to the presence or absence of educational change principles #2, #4, and #5 during program implementation. The program developer's mean scores for these three principles are above the 3.00 acceptance level, while the mean scores from the implementers for the same three principles are below the 3.00 acceptance level. These data suggest that the program developer thought that the three principles were present during program implementation while the implementers thought they were absent.

A third table, Table IV.3, compares the mean scores of the educational change principles by industrial arts programs. The mean scores reported in Table IV.3 are calculated from the mean scores for the program developers and the implementers across the industrial arts programs. These data, since they include data from the program developers and the implementers, are a more accurate indication of the presence or absence of the educational change principles during program implementation.

From a review of the data in Table IV.3, all but one of the educational change principle mean scores for the Industriology program are above the 3.00 acceptance level. Educational change principle #5 has a mean score of 2.58--an indication that this principle was absent during program implementation. Because all other mean scores for the remaining principles are above the 3.00 acceptance level,

Table IV.3. <u>Comparison of Mean Scores of Educational Change Principles by Industrial Arts Programs</u> (includes mean scores from program developers and implementers)

Program	$\bar{x}$ C.P. #1	$\bar{x}$ C.P. #2	$\bar{x}$ C.P. #3	$\bar{x}$ C.P. #4	$\bar{x}$ C.P. #5	Total Program $\bar{x}$
	Educational Change Principles					
Industriology	3.16	3.33	3.25	3.22	2.58	3.10
American Industry Project	2.97	2.87	2.86	2.84	2.39	2.78
Industrial Arts Curriculum Project (IACP)	3.55	3.47	3.15	3.39	2.87	3.28
Partnership Vocational Education Project	2.79	3.00	2.83	2.91	2.55	2.81
Total Change Principle $\bar{x}$ =	3.11	3.16	3.02	3.09	2.59	

the data suggest that these principles were present during program implementation.

The data from Table IV.3 indicate that none of the mean scores for the educational change principles from the American Industry Project are above the 3.00 acceptance level. These low mean scores suggest that none of the principles were present during program implementation. The highest mean score is 2.97 for change principle #1, and the lowest mean score is 2.39 for change principle #5. It was noted earlier that the program developer and the implementers from the American Industry Project disagree as to the presence or absence of the principles during program implementation. The program developer thought that the principles were present while the implementers thought they were absent.

Only change principle #5 has a mean score below the 3.00 acceptance level from the Industrial Arts Curriculum Project (IACP) as indicated in Table IV.3. This low mean score indicates that this educational change principle was absent during program implementation. All other mean scores for the remaining principles from the Industrial Arts Curriculum Project (IACP) are above the 3.00 acceptance level. These high mean scores indicate that these principles were present during program implementation.

From a review of the data in Table IV.3, only change principle #2 has a mean score above the 3.00 acceptance level for the Partnership Vocational Education Project. This high mean score indicates that this educational change principle #2 was present during program implementation. All other mean scores for the remaining principles from the Partnership Vocational Education Project are below the 3.00 acceptance level, an indication that they were absent during program implementation.

Finally, a review of the data from Table IV.3 reveals which educational change principles were present or absent during program implementation. First, the mean scores for change principle #1 are above the 3.00 level for the Industriology program and the Industrial Arts Curriculum Project (IACP). These high mean scores indicate the presence of change principle #1 during the implementation of these two programs.

Second, only the American Industry Project has a mean score below the 3.00 acceptance level for change principle #2, an indication of its absence during program implementation. All mean scores for the remaining industrial arts programs for change principle #2 are above the 3.00 acceptance level, which suggest that change principle #2 was present during the implementation of these industrial arts programs.

Third, Table IV.3 also indicates that two of the four program mean scores for educational change principle #3 are above the 3.00 acceptance level. The Industriology program mean score for this principle is 3.25, and the Industrial Arts Curriculum Project (IACP) has a mean score of 3.15. These mean scores indicate that change principle #3 was present during the implementation of these two programs. The other two program mean scores for this principle are below the 3.00 acceptance level, an indication that change principle #3 was absent during the implementation of the

American Industry Project and the Partnership Vocational Education Project.

Fourth, again from the data in Table IV.3, change principle #4 has a mean score above the 3.00 acceptance level from the Industriology program and the Industrial Arts Curriculum Project (IACP). These data suggest that change principle #4 was present during the implementation of these two programs. Because the mean scores for change principle #4 from the American Industry Project and the Partnership Vocational Education Project are below the 3.00 acceptance level, these data indicate that this principle was absent during the implementation of these two programs.

Fifth, Table IV.3 indicates that all four program mean scores for change principle #5 are below the 3.00 acceptance level. The highest mean score is 2.87 from the Industrial Arts Curriculum Project (IACP), and the lowest mean score is 2.39 from the American Industry Project. These low mean scores for change principle #5 indicate that this principle was absent during the implementation of the four industrial arts programs.

Rank Order of the Industrial Arts Programs Based on the Presence of Educational Change Principles

It is possible to rank order the industrial arts programs based on the data in Table IV.3. The total mean scores for the programs indicate a degree of conformity or presence of the educational change principles during program implementation. A higher total mean score for each program indicates a greater conformity or presence of the educational change principles. The following is the ranking of the industrial arts programs. They are ranked from the greatest to least degree of conformity with the educational change principles during program implementation.

Rank	Industrial Arts Programs	Total Program $\bar{x}$
1.	Industrial Arts Curriculum Project (IACP)	3.28
2.	Industriology Program	3.10
3.	Partnership Vocational Education Project	2.81
4.	American Industry Project	2.78

Rank Order of the Educational Change Principles

In a similar manner, it is possible to rank order the educational change principles based on the data in Table IV.3. Higher total mean scores for the educational change principles indicate a greater degree of the presence of the principles during program implementation. The ranking from greatest to least degree of the presence of the principles is as follows.

Rank	Educational Change Principles	Total Program $\bar{x}$
1.	C.P.#2--Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.	3.16
2.	C.P.#1--Meaningful change occurs as a process, not as an event.	3.11
3.	C.P.#4--Administrators play a crucial role in supporting the utilization process of the new method or idea.	3.09
4.	C.P.#3--Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.	3.02
5.	C.P.#5--Material resources at the "how to" level are needed, particularly when change involves organization or instruction.	2.59

Summary

Table IV.4 was developed to summarize the data related to research question #2. The presence or absence of the educational change principles during the implementation of the industrial arts programs is indicated in Table IV.4. The data in Table IV.4 include the data from the program developers and the implementers. Four of the five educational change principles were utilized during program implementation. According to the data, only change principle #5 was not present during program implementation.

Table IV.4. Presence or Absence of Educational Change Principles During Program Implementation

Program	Educational Change Principles C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5	Total Present
1. Industrial Arts Curriculum Project (IACP)	Pr	Pr	Pr	Pr	Ab	4
2. Industriology	Pr	Pr	Pr	Pr	Ab	4
3. Partnership Vocational Education Project	Ab	Pr	Ab	Ab	Ab	1
4. American Industry Project	Ab	Ab	Ab	Ab	Ab	0
Total Change Principles Present	2	3	2	2	0	9

"Pr" indicates presence during program implementation.

"Ab" indicates absence during program implementation.

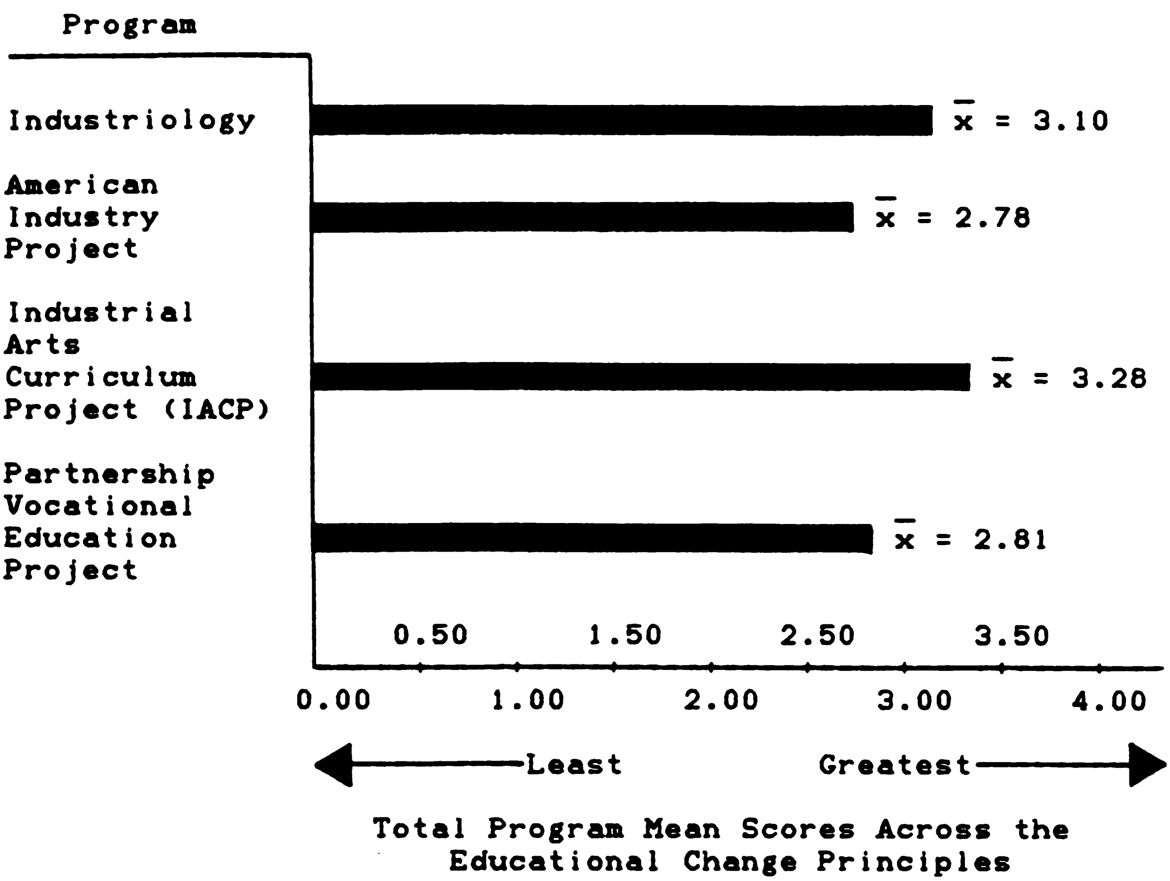
Research Question #3

To what degree did the selected industrial arts programs conform to educational change principles as advocated by educational change experts?

Briefly, the four industrial arts programs with valid data did conform to principles of educational change. However, there is a difference in the degree or intensity of that conformity. The presence or absence of the educational change principles during program implementation is indicated in Tables IV.1-IV.4. The data from the tables also indicate the degree of conformity of the industrial arts programs with the educational change principles. This degree of conformity is indicated by the total mean scores of the programs across the educational change principles.

The degree of conformity is illustrated graphically in Fig. IV.1 to compare the four industrial arts programs. Complete or total comformity of the programs with the educational change principles is indicated with a total mean score of 4.00, while complete or total non-conformity is indicated by a total mean score of 0.00. As is evident from Fig. IV.1, the Industrial Arts Curriculum Project (IACP) has the greatest degree of conformity with a total mean score of 3.28. The American Industry Project has the least degree of conformity with a total mean score of 2.78.

Fig. IV.1. Comparison of the Degree of Conformity with Educational Change Principles During Program Implementation (includes total mean scores of the program developers and implementers)



Research Question #4

To what degree were innovation characteristics present during program implementation of the selected industrial arts programs?

The mean scores for the innovation characteristics from the program developers and the implementers were calculated and are reported here. As with the educational change principles, an acceptance level of 3.00 out of a possible 4.00 was set for mean scores. Mean scores of 3.00 or higher indicate that particular innovation characteristics were present during program implementation. Mean scores below 3.00 indicate the absence of other innovation characteristics during program implementation. The mean scores of the innovation characteristics from the program developers are shown in Table IV.5.

From Table IV.5, all total mean scores from the program developers for the innovation characteristics are above the 3.00 acceptance level. Also, all total mean scores from the innovation characteristics across the programs are above the 3.00 acceptance level. These data suggest that all five of the innovation characteristics were present during program implementation.

A closer look at Table IV.5 reveals that two mean scores for two of the innovation characteristics are below

Table IV.5. Comparison of Mean Scores of Innovation Characteristics by Program Developers

	Innovation Characteristics					
Program	$\bar{x}$ I.C. #1	$\bar{x}$ I.C. #2	$\bar{x}$ I.C. #3	$\bar{x}$ I.C. #4	$\bar{x}$ I.C. #5	Total Program $\bar{x}$
Industriology	2.40	3.00	3.40	3.00	3.50	3.06
American Industry Project	3.20	3.00	3.40	4.00	3.50	3.42
Industrial Arts Curriculum Project (IACP)	3.40	3.50	3.80	3.00	4.00	3.54
Partnership Vocational Education Project	3.80	3.00	2.80	4.00	4.00	3.52
Total Innovation Characteristic $\bar{x}$ =	3.20	3.12	3.35	3.50	3.75	

The following code is used for the data from the five innovation characteristics that appear in the data tables.

I.C.#1. Relative advantage.

I.C.#2. Compatability.

I.C.#3. Complexity.

I.C.#4. Trialability.

I.C.#5. Observability.

the 3.00 acceptance level. Innovation characteristic #1, from the Industriology program, has a mean score of 2.40 and innovation characteristic #3, from the Partnership Vocational Education Project, has a mean score of 2.80. These low mean scores indicate the absence of these two innovation characteristics during program implementation. All other mean scores for the remaining innovation characteristics from the program developers are above the 3.00 acceptance level, an indication that these innovation characteristics were present during program implementation.

The mean scores of the innovation characteristics from the implementers are shown in Table IV.6. These data are arranged similar to the data in Table IV.5. Two of the four total mean scores from the programs for the innovation characteristics are above the 3.00 acceptance level. These are a 3.33 total mean score for the implementers from the Industrial Arts Curriculum Project (IACP) and a 3.05 total mean score for the implementers from the Industriology program. These data suggest that the innovation characteristics were present during the implementation of these two programs. The total mean scores for the implementers from the American Industry Project and the Partnership Vocational Education Project across the innovation characteristics are below the 3.00 acceptance level. These data indicate that the innovation characteristics were absent during the implementation of these two programs.

A review of Table IV.6 also indicates that only two of the five total mean scores from the innovation characteristics across the programs are above the 3.00 acceptance level. Innovation characteristic #3 has a total mean score of 3.20, and innovation characteristic #5 has a total mean score of 3.19. The data suggest that these two innovation characteristics were present during the implementation of the four industrial arts programs. All other total mean scores from the remaining innovation characteristics across the programs are below the 3.00 acceptance level. These data suggest that these innovation characteristics were absent during program implementation.

From Table IV.6, the data from the implementers indicate which innovation characteristics were present or absent during the implementation of each program. Mean scores for innovation characteristics #2, #3, and #5 are above the 3.00 acceptance level from the Industriology program. All of the mean scores for the innovation characteristics from the Industrial Arts Curriculum Project (IACP) are above the 3.00 acceptance level. Also, only the mean score for innovation characteristic #5 from the Partnership Vocational Education Project is above 3.00. These data suggest that these particular innovation characteristics were present during the implementation of these programs.

Table IV.6. Comparison of Mean Scores of Innovation Characteristics by Implementers

Program	Innovation Characteristics $\bar{x}$ I.C. #1	$\bar{x}$ I.C. #2	$\bar{x}$ I.C. #3	$\bar{x}$ I.C. #4	$\bar{x}$ I.C. #5	Total Program $\bar{x}$
Industriology	2.88	3.30	3.40	2.40	3.30	3.05
American Industry Project	2.33	2.56	3.01	2.25	2.87	2.60
Industrial Arts Curriculum Project (IACP)	3.26	3.00	3.62	3.31	3.50	3.33
Partnership Vocational Education Project	2.52	2.80	2.80	2.60	3.10	2.76
Total Innovation Characteristic $\bar{x}$ =	2.74	2.91	3.20	2.64	3.19	

All other mean scores for the remaining innovation characteristics from the implementers across the programs are below the 3.00 acceptance level. These low mean scores indicate that these particular innovation characteristics were absent during program implementation. It is interesting to note that all mean scores for the five innovation characteristics from the American Industry Project are below the 3.00 acceptance level, an indication that they were absent during the implementation of the program.

Another table, Table IV.7, compares the mean scores of the innovation characteristics by industrial arts programs. The mean scores that are reported in Table IV.7 were calculated from the mean scores of the program developers and the implementers from the programs. These data, since they include data from the program developers and the implementers, are a more accurate indication of the presence or absence of the innovation characteristics during program implementation.

The data from Table IV.7 suggest that innovation characteristics were present during program implementation for two of the four industrial arts programs. The total mean score for the Industrial Arts Curriculum Project (IACP) is a 3.34 and the total mean score for the Industriology program is a 3.05. Both of these are above the 3.00 acceptance level. However, two of the five mean scores for the innovation characteristics from the Industriology program are below 3.00. These low mean scores are for innovation characteristics #1 and #4, an indication that they were absent during program implementation. All of the mean scores for the innovation characteristics from the Industrial Arts Curriculum Project (IACP) are above the 3.00 acceptance level. These data suggest that all of the innovation characteristics were present during the implementation of the Industrial Arts Curriculum Project (IACP).

Table IV.7. Comparison of Mean Scores of Innovation Characteristics by Industrial Arts Programs (includes mean scores from program developers and implementers)

Program	$\bar{x}$ I.C. #1	$\bar{x}$ I.C. #2	$\bar{x}$ I.C. #3	$\bar{x}$ I.C. #4	$\bar{x}$ I.C. #5	Total Program $\bar{x}$
Industriology	2.80	3.25	3.40	2.50	3.33	3.05
American Industry Project	2.38	2.58	3.03	2.35	2.91	2.65
Industrial Arts Curriculum Project (IACP)	3.27	3.02	3.63	3.29	3.52	3.34
Partnership Vocational Education Project	2.73	2.83	2.80	2.83	3.25	2.88
Total Innovation Characteristic $\bar{x}$ =	2.79	2.92	3.21	2.74	3.25	

Only one mean score for the innovation characteristics from the American Industry Project and the Partnership Vocational Education Project are above the 3.00 acceptance level. These mean scores are for innovation characteristic #3--3.03 from the American Industry Project and for innovation characteristic #5--3.25 from the Partnership Vocational Education Project. These data suggest that only these particular innovation characteristics were present during the implementation of these two programs.

Finally, from the data in Table IV.7, only the mean scores for innovation characteristics #3 and #5 across programs are above the 3.00 acceptance level. Innovation characteristic #3 has a total mean score of 3.21, while innovation characteristic #5 has a total mean score of 3.25. These data indicate that these two particular innovation characteristics were present during program implementation. All other total mean scores for the remaining innovation characteristics are below 3.00, an indication that these innovation characteristics were absent during program implementation.

Rank Order of the Industrial Arts Programs Based on the Presence of Innovation Characteristics

It is possible to rank order the industrial arts programs based on the data in Table IV.7. The total mean scores for the programs indicate a degree of conformity or presence of the innovation characteristics during program implementation. A higher total mean score for each program indicates a greater conformity or presence of the innovation characteristics. The ranking of the industrial arts programs from greatest to least degree of conformity or presence of innovation characteristics is as follows.

Rank	Industrial Arts Program	Total Program $\bar{x}$
1.	Industrial Arts Curriculum Project (IACP)	3.34
2.	Industriology Program	3.05
3.	Partnership Vocational Education Project	2.88
4.	American Industry Project	2.65

Rank Order of the Innovation Characteristics

In a similar manner, it is possible to rank order the innovation characteristics based on the data in Table IV.7. Higher total mean scores indicate a greater degree of conformity or the presence of the innovation characteristics during program implementation. The ranking from greatest to least degree of conformity or the presence of innovation characteristics during program implementation is as follows.

Rank	Innovation Characteristic	Total Program $\bar{x}$
1.	I.C.#5--Observability	3.25
2.	I.C.#3--Complexity	3.21
3.	I.C.#2--Compatability	2.92
4.	I.C.#1--Relative advantage	2.79
5.	I.C.#4--Trialability	2.74

Summary

Table IV.8 was developed to summarize the data that relates to research question #4. The presence or absence of the innovation characteristics during the implementation of the industrial arts programs is indicated in Table IV.8. The data in Table IV.8 includes the data from the program developers and the implementers.

From a review of Table IV.8, it is apparent that the five innovation characteristics were not present to the same degree or intensity for each individual program. Innovation characteristics #3, complexity, was present during the implementation of three of the industrial arts programs. Innovation characteristic #5, observability, was also present during the implementation of three of the programs. Innovation characteristic #2, compatability, was present during the implementation of two industrial arts programs.

Table IV.8. Presence or Absence of Innovation Characteristics During Program Implementation

Program	Innovation Characteristics					
	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5	Total Present
1. Industrial Arts Curriculum Project (IACP)	Pr	Pr	Pr	Pr	Pr	5
2. Industriology	Ab	Pr	Pr	Ab	Pr	3
3. Partnership Vocational Education Project	Ab	Ab	Ab	Ab	Pr	1
4. American Industry Project	Ab	Ab	Pr	Ab	Ab	1
Total Innovation Characteristics Present	1	2	3	1	3	10

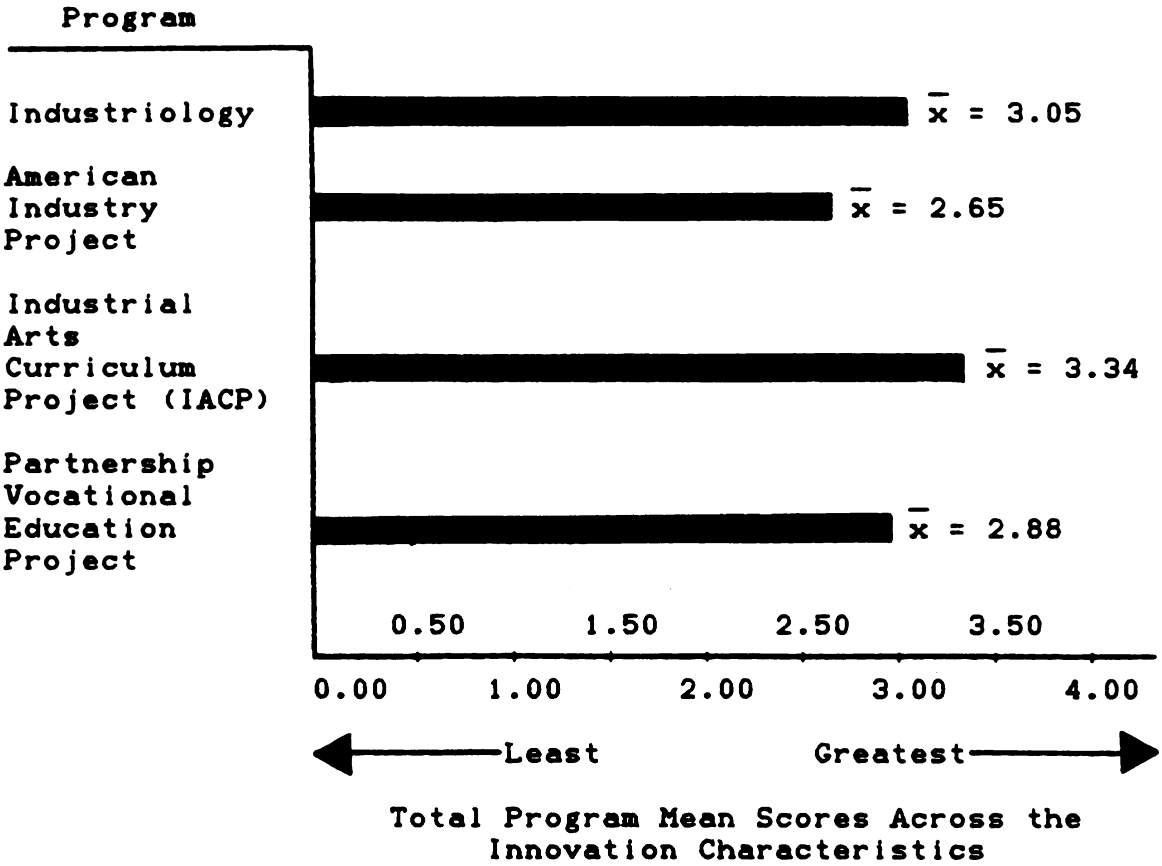
"Pr" indicates presence during program implementation.

"Ab" indicates absence during program implementation.

Finally, innovation characteristics #1 and #4, relative advantage and trialability respectively, were only present during the implementation of one program.

Fig. IV. 2 illustrates graphically the degree of conformity or the presence of innovation characteristics during program implementation. Complete or total conformity of the innovation characteristics is indicated with a total mean score of 4.00, while complete or total non-conformity is indicated with a total mean score of 0.00. From Fig. IV.2, the Industrial Arts Curriculum Project (IACP) demonstrates the greatest degree of conformity with the innovation characteristics during program implementation with a total mean score of 3.34. The American Industry Project demonstrates the least degree of conformity with a total mean score of 2.65.

Fig. IV.2. <u>Comparison of the Degree of Conformity or Presence of Innovation Characteristics During Program Implementation</u> (includes total mean scores of the program developers and implementers)



Research Question #5

What is the current status of the seven selected industrial arts programs studied by Cochran (1968)?

It was necessary to include in the study an edited version of the total responses of the program developers from the semi-structured interviews in order to answer research question #5. The semi-structured interviews were designed to allow the program developers to explain in more depth the implementation process of the industrial arts programs. The program developers were asked a set of questions and their responses recorded on audio tape. The interview questions appear in Appendix J. The data from the tapes were reviewed and edited. The edited version of the responses from the program developers is quite lengthy and appears in Appendix K.

From the edited version of the responses from the program developers, the data were further condensed and arranged in table form. The condensed form of the data from the semi-structured interviews is shown in Table IV.9. These data are helpful in answering research question #5.

Question #3 of the set of interview questions is relevant to research question #5 of this study and is discussed first. Question #3 of the set of interview questions is stated as the following.

How successful has the industrial arts program been?

A. How many of the original pilot schools are still using the industrial arts curriculum innovation?

B. How many schools are presently using the industrial arts curriculum innovation or an adaptation of the program?

From Question #3--Part A in Table IV.9, there are no actual figures available as to how many of the original pilot schools are still using the industrial arts programs. The program developer from the Industriology program surmises that all twelve pilot schools' curriculums still reflect that program. The other three program developers are no longer associated with their respective programs; and thus, they only speculate as to how many pilot schools are still using the programs. Additionally, time and cost constraints prevented the researcher from securing actual figures of the pilot schools that are still using the industrial arts programs.

Actual figures are also difficult to obtain concerning Question #3--Part B in Table IV.9. No actual figures are given by the program developers concerning how many schools are presently using the industrial arts programs. However, the program developer from the Industrial Arts Curriculum Project (IACP) alludes to how wide-spread the program has become. According to this program developer, every middle school aged child in Columbus, Ohio, now has some experience

Table IV.9. Edited Responses of the Industrial Arts Program Developers from the Semi-Structured Interviews

Interview Questions	Industrial Arts Curriculum Project (IACP)	Industriology Program	Partnership Vocational Education Project	American Industry Project
#1 Explicit change theory/model present?	YES- Clark and Guba model used	NO- Visited and worked with industry	NO- Used "seat of the pants" approach	YES- Benninghouse model used
#2 Change theory/ model successful?	YES- Missing link in the model: "staying power"	No formal model used; changing people was successful	No formal model used; marketing of program was emphasized	YES- Reception by schools was good
#3 Successfulness of the implementation of the program?				
A. How many of the pilot schools are still using the program?	Figures were not available	12 pilot schools still reflect the program	Figures were not available	Figures were not available
B. How many schools are presently using the program?	Middle schools in Columbus, Ohio still use the program; 1,200 schools ordered sets of materials; 7,000 teachers were trained	Figures were not available	Figures were not available	State adoption in Arizona and Alaska; also in the military-dependent schools in Japan

Table IV.9.--Continued

Interview Questions	Industrial Arts Curriculum Project (IACP)	Industriology Program	Partnership Vocational Education Project	American Industry Project
#4 What were the sources of resistance?	1.Revolution instead of evolution. 2.Definite allotted amount of time for the program. 3.Physical plant changes.	1.Lack of understanding of the program's concept and content by the teachers. 2.Work needed to make change happen. 3.Fear of losing part of the industrial arts curriculum.	1.Teachers were reluctant to accept the philosophy. 2.Team teaching concept had problems. 3.Title of the program turned people off (vocational). 4.Correlation concept.	1.Leadership in the profession. 2.Teachers in the field 3.Administrators afraid of losing activity.
#5 Would you make any changes in your implementation strategy?	Be more flexible with time commitment	More time and funding	Build into the program a longer term commitment-no heavy investment of time or resources	Obtain the support of gatekeepers
#6 Any recommendations to the industrial arts profession?	The program is a legitimate comprehensive review of construction and manufacturing	Technology needs to be included and sold to the schools; need to put forth the effort for change	Teachers must have a well-rounded background in math, science, and communications	Develop better in-service for the teachers in the field; overhaul teacher education
#7 Any additional comments?	The program provides "form utility"	Program caused people to think and things to happen	Program tried to change the teachers and industrial arts curriculum through methodology	Program was the leverage to change the curriculum in industrial arts

with construction and manufacturing. Also, over 1,200 schools purchased at least a classroom set of program texts and materials from McKnight & McKnight Publishing Company. These 1,200 schools are an indication to the program developer concerning the adoption of the Industrial Arts Curriculum Project (IACP). Finally, over 7,000 teachers were trained to teach construction and/or manufacturing as part of the IACP. The impact that these 7,000 teachers have on the industrial arts curriculum in the schools is difficult to estimate (Lux, 1985).

From the data presented previously concerning research question #5, it is difficult to ascertain the actual current status of the industrial arts programs in the study. No actual figures are available concerning how many pilot schools are still using the programs, or how many schools are presently using the programs. From the data in Table IV.9, no definite conclusions are made regarding research question #5. Therefore, the answer to research question #5 is left for further research.

Reflections of the Program Developers

The following are the condensed responses of the program developers to the remaining interview questions. These condensed responses appear in Table IV.9 on pages 172-173, while the complete edited responses are in Appendix K.

Both program developers from the Industrial Arts Curriculum Project (IACP) and the American Industry Project state that they used an explicit change model during the development and implementation of their programs. These same two program developers also state that the change model they used was successful. The other two program developers did not use a change model.

All of the program developers describe several sources of resistance to their programs. The program developer from the Partnership Vocational Education Project lists four sources of resistance, while the other program developers list three sources. A common source of resistance to the programs appears to have been the lack of understanding of the programs, or a reluctance on the part of the implementers to accept the philosophies of the programs. Another source of resistance that is common was the fear of losing activity or the fear of losing part of the industrial arts curriculum.

The program developers describe the changes they would make in the implementation strategy of their respective programs. The program developer from the Industrial Arts Curriculum Project (IACP) states that he would be more flexible with the time commitment. The Industriology program developer would take more time and would obtain funding. The program developer from the Partnership Vocational Education Project would build into the program a longer term commitment. The American Industry Project program developer would obtain the support of the gatekeepers or influential persons within the organization.

All of the program developers give recommendations to the industrial arts profession based on their experiences with the implementation of their programs. Interesting and challenging recommendations include: (1) technology needs to be included and sold to the schools, (2) change requires effort, (3) teachers must have well-rounded backgrounds in math, science, and communications, (4) a need exists to develop better in-service for teachers, and (5) teacher education needs overhauling.

Finally, the program developers emphasize important points concerning their respective programs. Form utility, or the ability to alter the shape or design of objects, is a result of the Industrial Arts Curriculum Project (IACP) according to its program developer. The program developers from the Industriology program and the American Industry Project state that their programs caused people to think (about curriculum reform), and the programs were the impetus for change in the industrial arts curriculum. According to the program developer from the Partnership Vocational Education Project, the program tried to change teachers and the industrial arts curriculum through methodology.

Summary of the Data Presented in Chapter IV

Chapter IV presented the data from the questionnaires and the semi-structured interviews, and answered the five research questions stated in Chapter I. The data were presented and interpreted by the use of tables, graphs, and written explanations. The data were edited or condensed to concisely answer the research questions. Additional data are included in the Appendices for further reference. The following are summaries of the data concerning the five research questions.

Research Question #1

What does the literature on change theory reveal about principles of educational change? In particular, what theories, models, and principles of educational change are advocated by leading educational change experts?

Leading experts of educational change include Rogers, Havelock, and Zaltman. Rogers (1971) proposes a paradigm of the innovation-diffusion process. The model consists of three major components, and four outcomes are possible. Rogers (1983) also lists several innovation characteristics, and these include relative advantage, compatability, complexity, trialability, and observability. Finally, Rogers (1971) lists over 100 generalizations related to change.

Havelock (1969) proposes a model of change that is called the linkage model. This model attempts to eliminate the flaws of earlier change models but also attempts to retain the strengths. Havelock (1972) also advocates numerous principles of educational change.

Zaltman (1977) proposes an eclectic model of change, the proactive/interactive change model. Change is initiated internally and organizations are self-renewing in Zaltman's model. As does Rogers and Havelock, Zaltman (1977) advocates numerous educational change principles.

The Educational Testing Service (ETS) (1980) reviewed research concerning change and reports five basic principles of educational change. These principles reported by the ETS (1980) are found to be representative of the numerous change principles advocated by Rogers, Havelock, and Zaltman and, thus, were the basis for the development of questionnaires used in the study. The five educational change principles include the following.

1. Meaningful change occurs as a process, not as an event.
2. Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.
3. Continuous personal participation of the implementing staff is needed to firmly root and

sustain the change.

4. Administrators play a crucial role in supporting the utilization process of the new method or idea.
5. Material resources at the "how to" level are needed, particularly when change involves organization or instruction.

Research Question #2

Were principles of educational change utilized by the innovators of each program as they attempted to implement them into the schools? If so, which principles were used and how common are they among the programs?

The data in Table IV.4 on page 154 reveals the answer to this question. The data from the Industrial Arts Curriculum Project (IACP) and the Industriology program suggest that four of the five educational change principles were present during program implementation. These include change principles #1, #2, #3, and #4 for both programs. The data suggest that change principle #5 was absent during the implementation of the four industrial arts programs.

The data suggest that only change principle #2 was present during the implementation of the Partnership Vocational Education Project. According to the data in Table IV.4, none of the five educational change principles were present during the implementation of the American

Industry Project.

Research Question #3

To what degree did the seven selected industrial arts programs conform to educational change principles as advocated by educational change experts?

The four industrial arts programs with valid data varied in the degree of conformity with advocated principles of educational change. The degree of conformity is expressed as a total mean score for the programs, which includes the total mean scores from the program developers and implementers. The programs are rank ordered from the greatest degree of conformity to the least degree of conformity. This rank order is as follows: (1) the Industrial Arts Curriculum Project (IACP), (2) the Industriology program, (3) the Partnership Vocational Education Project, and (4) the American Industry Project.

Research Question #4

To what degree were innovation characteristics present during the implementation of the selected industrial arts programs?

The data in Table IV.8 on page 167 reveals the answer to this question. The data from the industrial arts programs suggest all five innovation characteristics were not present for each individual program. Innovation characteristic #3 and #5, complexity and observability respectively, were present during the implementation of three of the programs. Innovation characteristic #2, compatability, was present during the implementation of two programs. Innovation characteristics #1 and #4, relative advantage and trialability respectively, were only present during the implementation of one program.

The data suggest that all five innovation characteristics were present during the implementation of the Industrial Arts Curriculum Project (IACP). The innovation characteristics of compatability, complexity, and observability were present during the implementation of the Industriology program. The American Industry Project demonstrated the presence of complexity, while the Partnership Vocational Education Project demonstrated the presence of observability during program implementation.

The four industrial arts programs with valid data varied in the degree of conformity with the innovation characteristics. The degree of conformity is expressed as a total mean score for the programs, which includes the total mean scores from the program developers and implementers. The programs are rank ordered from the greatest degree of conformity to the least degree of conformity with the innovation characteristics. This rank order is as follows:

(1) the Industrial Arts Curriculum Project (IACP), (2) the Industriology program, (3) the Partnership Vocational Education Project, and (4) the American Industry Project.

Research Question #5

What is the current status of the seven selected industrial arts programs studied by Cochran (1968)?

Actual figures of the number of pilot schools still using the industrial arts programs were not available for inclusion in this study. This is true, also, for the schools that adopted (or adapted) the programs and are currently using them. Table IV.9 on pages 172-173 and the edited responses of the program developers in Appendix K are inconclusive regarding the current status of the industrial arts programs. Only estimations and speculations concerning the current status of the industrial arts programs are possible as a result of the data. Therefore, the answer to research question #5 is left for additional research.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study was designed to analyze selected industrial arts curriculum innovations developed for the secondary schools, in terms of their degree of conformity with principles of educational change as advocated by change experts. Additionally, this study was designed to recommend a set of educational change principles to the industrial arts profession, based on principles supported by the data, which can be used as a guide in the development and implementation of future industrial arts programs.

Five research questions were listed in Chapter I that are compatible with the design of the study. The five research questions include the following.

1. What does the literature on change theory reveal about principles of educational change? In particular, what theories, models, and principles of educational change are advocated by leading

educational change experts?

2. Were principles of educational change utilized by the innovators of each program as they attempted to implement them into the schools? If so, which principles were used and how common are they among the programs?

3. To what degree did the selected industrial arts programs conform to educational change principles as advocated by educational change experts?

4. To what degree were innovation characteristics present during the implementation of the selected industrial arts programs?

5. What is the current status of the seven selected industrial arts programs studied by Cochran (1968)?

A review of the literature was included in Chapter II concerning the change process and it included the theories and models of three selected chance experts: Everett M. Rogers, Ronald G. Havelock, and Gerald Zaltman. Literature from the behavioral science field was included to provide additional support for the theories and models of the three change experts. Additionally, the selected programs of industrial arts were reviewed in terms of basic purposes, designs, and implementation efforts.

The research methodology used in the study was described in Chapter III. A diagram was included which clarified the direction of the study. Included in the discussion were the five research questions, the population and sample of the study, the development and pilot testing of survey instruments, data collection, and data presentation and statistical analysis.

The presentation and statistical analysis of the data that were collected were included in Chapter IV. Principles of educational change, which were evident among the programs, were compared with those principles advocated by Rogers, Havelock, and Zaltman. The five research questions were stated and answered with the presentation and interpretation of the data.

The preceding chapters provided supporting data that are related to the five research questions. These data were the basis for the findings, conclusions, and recommendations that are included in this chapter, Chapter V. A section entitled Researcher's Observations and Comments is included at the end of this chapter which includes a discussion of additional information concerning the study. This information is considered pertinent to the study, but lacks sufficient data to be included in the conclusions of the study.

Findings

The following are the findings from the study.

1. A significant body of literature exists concerning change theory. The theories of Rogers (1983), Havelock (1969), and Zaltman (1977) represent the best of the field. These change theory experts advocate numerous principles of educational change that are similar in nature to those reported by the Educational Testing Service (ETS) (1980).

2. Principles of educational change were utilized in varying degrees by the program developers during the implementation of the industrial arts programs. The following are the educational change principles that were common during program implementation.

   C.P.#1--Meaningful change occurs as a process, not as an event.

   C.P.#2--Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.

   C.P.#3--Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.

   C.P.#4--Administrators play a crucial role in the utilization process of the new method or idea.

3. Change principle #5 was absent during the implementation of the industrial arts programs. This principle is stated as:

Material resources at the "how to" level are needed when change involves organization or instruction.

4. The following are the educational change principles that were present during the implementation of each industrial arts program: the Industrial Arts Curriculum Project (IACP)--change principles #1, #2, #3, and #4; the Industriology program--change principles #1, #2, #3, and #4; the Partnership Vocational Education Project--change principle #2.
5. None of the educational change principles were present during the implementation of the American Industry Project.
6. The total mean scores for the industrial arts programs across the educational change principles were used to determine the degree of conformity with the principles. The following is the ranking of the programs from the greatest to least degree of conformity with the educational change principles: the Industrial Arts Curriculum Project (IACP), the Industriology program, the Partnership Vocational Education Project, and the American Industry Project.
7. Innovation characteristics were present in varying degrees during the implementation of the industrial arts programs, and include the following:

I.C.#1--relative advantage, I.C.#2--compatability, I.C.#3--complexity, I.C.#4--trialability, I.C.#5--observability.

8. The following are the innovation characteristics that were present during the implementation of each industrial arts program: the Industrial Arts Curriculum Project (IACP)--innovation characteristics #1-#5; the Industriology program--innovation characteristics #2,#3, and #5; the Partnership Vocational Education Project--innovation characteristic #5; the American Industry Project--innovation characteristic #3.

9. The total mean scores across the innovation characteristics from the programs were used to determine the presence of the innovation characteristics. The following is the ranking of the programs from greatest to least degree of the presence of innovation characteristics: the Industrial Arts Curriculum Project (IACP), the Industriology program, the Partnership Vocational Education Project, and the American Industry Project.

10. There is close agreement between the perspectives of the program developer and the implementers from the Industrial Arts Curriculum Project (IACP) concerning program implementation. Both the program

developer and the implementers rate the presence of educational change principles and innovation characteristics very high--an indication that the principles and innovation characteristics were present during program implementation.

11. There is some agreement between the perspectives of the program developers and the implementers from the Industriology program. The program developer and implementers agree on the presence of the same four educational change principles, but agree on the presence of only three of the innovation characteristics.

12. There is a difference of opinion between the program developer and the implementers from the American Industry Project concerning their perspectives of program implementation. This difference of opinion is also true for the Partnership Vocational Education Project. The program developers rate the presence of educational change principles and innovation characteristics very high, which indicates their presence during program implementation. The implementers, however, rate them very low, which indicates they were not present. It is apparent that the program developers and the implementers view the implementation <u>process</u> differently. This difference of opinion between the

program developers and the implementers concerning program implementation and the subsequent lack of the rate of adoption is evident in the literature concerning change. According to Rogers (1983), curriculum innovations that are more successfully implemented and adopted (or adapted) are those that are viewed more positively by the teachers (implementers). The perspectives of the teachers (implementers) concerning the innovations are considered more important and are more closely related to the implementation and adoption (or adaption) of curriculum innovations than those of the program developers.

13. The same two programs that demonstrated a high degree of conformity with the educational change principles also demonstrated a high degree of conformity with the innovation characteristics. These programs are the Industrial Arts Curriculum Project (IACP) and the Industriology program.
14. The same two programs that demonstrated a low degree of conformity with the educational change principles also demonstrated a low degree of conformity with the innovation characteristics. These programs are the Partnership Vocational Education Project and the American Industry Project.
15. The current status of the industrial arts programs

that are included in this study could not be determined.

Conclusions of the Study

The following conclusions relate specifically to the five research questions in the study.

1. The following four educational change principles should be incorporated into the implementation strategy of future industrial arts curriculum innovations by program developers.

   C.P.#1--Meaningful change occurs as a process, not as an event.

   C.P.#2--Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.

   C.P.#3--Continuous, personal participation of the implementing staff is needed to firmly root and sustain the change.

   C.P.#4--Administrators play a crucial role in the utilization process of the new method or idea.

2. To insure the implementation of future industrial arts curriculum innovations, program developers should incorporate the five innovation characteristics into their implementation strategies. The five innovation characteristics include: I.C.#1--relative advantage, I.C.#2--compatability, I.C.#3--complexity, I.C.#4--trialability,

and I.C.#5--observability.

3. For future industrial arts curriculum innovations, the perspectives of the implementers or teachers concerning program implementation should be considered more important than the perspectives of the program developers. Failure to recognize the importance of the perspectives of the implementers may lead to the absence of the educational change principles and innovation characteristics during program implementation.
4. Closely related to the perspectives of the implementers concerning program implementation is the feeling of ownership by the implementers. The implementers or teachers should feel that the curriculum innovation is theirs. They should be included in the design, development, and implementation of the curriculum innovation. Curriculum change that is designed, packaged, and implemented without the efforts of the implementers is destined to fail.
5. Program developers of future industrial arts curriculum innovations should provide adequate printed materials for the implementers concerning the curriculum change before program implementation.
6. It is important that program developers document and maintain precise records and accurate accounts of

future industrial arts curriculum innovations. It was difficult to trace and retrieve information concerning the industrial arts curriculum innovations included in this study. It will be beneficial to future program developers to have accurate records of past curriculum efforts; pitfalls and problems concerning program implementation will be avoided.

Recommendations

Recommendations of Educational Change Principles

The following recommendations of educational change principles are made to the industrial arts profession. It is recommended that the educational change principles be used as a guide by the industrial arts profession for the implementation of future industrial arts curriculum innovations.

Recommendation #1

Change Principle #1--Meaningful change occurs as a process, not as an event.

Program developers and implementers involved with the implementation of future industrial arts curriculum innovations should recognize that change is best accomplished over a period of time. Program developers and implementers should develop and utilize a workable schedule to insure that the change is managed.

With the current emphasis towards technology education in industrial arts, change principles #1 is particularly important. It will require a significant period of time to implement and sustain technology education. Changes in small increments should be sought rather than massive mandated changes.

Recommendation #2

Change Principle #2--Direct, personal intervention is by far the most potent technical support resource, and may even be necessary for change to be successful.

Program developers of future industrial arts curriculum innovations should be actively involved with the implementation process. Program developers should assist the implementers by giving instructional sessions, working with the implementers on-site, talking with and maintaining positive relations with the administrative staff and other key individuals, and should provide linkage with additional resources.

Implementers of technology education will require substantial assistance from program developers. For example, teaching concepts and content of technology education will be unfamiliar to the implementers. It is recommended that program developers of technology education provide necessary training and printed information.

Recommendation #3

Change Principle #3--Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.

The implementers of industrial arts curriculum innovations should be involved with the development, implementation, and dissemination of the programs. The program developers should allow the implementers to develop goals and objectives, teaching content and methods, and instructional materials. Decisions regarding what will be included in the program should also be made by the implementers.

It is recommended that implementers of technology education be involved with the development, implementation, and administration of the program. Implementers should make the necessary decisions regarding how technology education is implemented into the schools.

Recommendation #4

Change Principle #4--Administrators play a crucial role in the utilization process of the new method or idea.

Administrators should be visible supporters of future industrial arts curriculum innovations. Administrators should attend training sessions of the new program, visit and observe the new program in the classroom, provide financial support, and promote the new program to the board of education and the community via presentations and newsletters.

To properly promote technology education, administrators should first become knowledgeable of the new curriculum innovation. It is recommended that administrators attend planning and training sessions with the implementers of technology education.

Recommendations of Innovation Characteristics

As with the recommendations of educational change principles, the following innovation characteristics are recommended to the industrial arts profession.

Recommendation #5

Innovation Characteristic #1: relative advantage--the degree to which an innovation is superior to ideas it supercedes.

Future program developers of industrial arts and technology education should provide convincing evidence to the implementers that the new curriculum change is better than the present program. The program developers should allow the implementers to experiment with the curriculum innovation on a trial basis. Also, the implementers should observe and talk with other teachers who have implemented the new program.

Recommendation #6

Innovation Characteristic #2: compatability--the degree to which an innovation is consistent with existing values and past experiences.

It is recommended that program developers of industrial arts and technology education stress to the implementers how the new program is consistent with their existing values and past experiences. The aim should be to reduce the forces against the curriculum change rather than to increase the forces for the curriculum change.

Recommendation #7

Innovation Characteristic #3: complexity--the degree to which an innovation is relatively difficult to understand and use.

Program developers of industrial arts and technology education should provide adequate printed materials concerning the new program. Instructional sessions should be provided for the implementers with ample opportunity to air grievances and differences. Role playing and experimental use of the new program by the implementers should alleviate fears and doubts of the new program.

Recommendation #8

Innovation Characteristic #4: trialability--the degree to which an innovation may be experimented with on a trial basis.

The implementers of a new industrial arts or technology education program should be allowed to experiment with and try out the new program. Fears related to the new program should be dispelled and replaced with confidence in teaching the new program. Efforts should be made to make the trial situation of the new program by the implementers similar to the actual teaching situation of the new program. Program developers should be ready to answer questions, provide actual teaching assistance, and to provide supportive resources.

Recommendation #9

Innovation Characteristic #5: observability--the degree to which the results of an innovation are visible to others.

It is recommended that program developers of industrial arts and technology education allow school officials and the community to view the new program. Presentations should be made to boards of education and to civic and industrial organizations. Also, program developers should arrange open houses at which the community can view the operation of the new program.

Other Recommendations

Recommendation #10

Change theory involves much more than the implementation stage in the change process that was investigated in this study. Program developers in industrial arts and technology education should be knowledgeable of change theory by reviewing the most recent research. The findings from change theory research will be beneficial in the development and implementation of industrial arts and technology education curriculum innovations.

Recommendation #11

According to Rogers (1983), the program developer's perspective of the implementation stage in the change process should be secondary to the perspectives of the implementers. Program developers in industrial arts and technology education should be knowledgeable of how the implementers view the implementation of a particular curriculum innovation. The perspectives of the implementers should be obtained by periodic assessment and by allowing the implementers to air complaints and concerns.

Recommendations for Additional Research

Recommendation #12

The basic design of this study should be replicated by investigating more recent industrial arts and technology education curriculum innovations. The data concerning the implementation of more recent industrial arts and technology education programs will enhance this study and increase the knowledge base of change theory.

Recommendation #13

The instrument used in this study to gather data concerning the implementation of the industrial arts curriculum innovations, the Educational Change Principles Survey (ECPS), requires further testing of validity and reliability. Additional studies should:

A. investigate and verify the link between the principles of educational change advocated by Rogers, Havelock, Zaltman, and the Educational Testing Service (ETS),

B. develop additional support for the educational change principles that are recommended in this study, by linking them with the theories and principles advocated by other leading change theory experts, both in the field of education and behavioral science.

Recommendation #14

Studies should be conducted using an experimental design with the educational change principles and innovation characteristics. Data from experimental studies will lend further support to the principles of educational change recommended in this study. Experimental studies will also establish a causal relationship between the educational change principles and the innovation characteristics.

Recommendation #15

Studies should be conducted to determine by what process and to what degree industrial arts and technology education curriculum innovations are adopted (or adapted). Innovations are constantly refined over time and can be totally different from what is initially implemented. This information will be valuable to program developers, change agents, and others involved in the change process.

Recommendation #16

Lux (1985) suggested during a personal interview with the researcher that industrial arts curriculum innovations tend to revert to type after a period of time. Lux refers to an innovation's ability to retain new concepts, techniques, and practices as "staying power." Studies should be conducted to investigate the "staying power" of different industrial arts and technology education curriculum innovations. It will be beneficial to those involved with change in the industrial arts and technology education profession, to know what factors cause an innovation to be retained longer by individuals or organizations.

Researcher's Observations and Comments

Several concerns or issues are discussed in this section that are pertinent to the study, but lack sufficient data to include them in the conclusions. The following are concerns of the researcher that are related to the study: problems or difficulties encountered during the study, the absence of change principle #5 during program implmentation, the apparent relationship between the presence of educational change principles and the presence of innovation characteristics, and adoption (or adaption) of the industrial arts programs.

1. One difficulty encountered by the researcher was locating the implementers of the industrial arts programs. The researcher was able to locate the addresses of some of the implementers via ERIC files documents. Other addresses of implementers were located because of the assistance of personnel at the

universities where each program originated. Some addresses of the implementers were located in long-forgotten file cabinets located in archives or crowded storage rooms. Finally, some addresses of implementers were located by following-up on old telephone number listings.

2. Another difficulty encountered was arranging and conducting the semi-structured interviews of the program developers. Program developers are located in Michigan, Ohio, Indiana, and Wisconsin. It was necessary to arrange the interviews to reduce travel time and expense by the researcher. This interview schedule was further complicated by weather conditions as all of the interviews were conducted during February, 1985. The resulting arrangement of interviews was three trips.

3. The data from the study did not indicate the presence of educational change principle #5 during program implementation. This principle is stated as:

> material resources at the "how to" level are needed, particular when change involves organization or instruction.

However, the materials that were reviewed by the researcher from the industrial arts programs were substantial and include text books, study guides, modules, lesson plans, and a color slide series.

Additionally, personal documents and hand-written notes by the program developers appear to suggest that material resources were available to the implementers. Two explanations are possible for this apparent contradiction of the presence or absence of educational change principle #5 during program implementation. One, the Educational Change Principles Survey (ECPS) is not adequately designed to determine the presence or absence of change principle #5. Two, the number of the total responses to this change principle from the questionnaires is too small compared to the total number of responses that are possible.

4. The data tends to suggest that a direct relationship exists between the presence or absence of educational change principles and the presence or absence of innovation characteristics. This direct relationship is that when a greater presence of educational change principles exists, a greater presence of innovation characteristics exists, too. The data also tends to suggest that when fewer educational change principles exists, fewer innovation characteristics exists, too. The Industrial Arts Curriculum Project (IACP) and the Industriology program both demonstrated the presence of several educational change principles and several innovation characteristics, while most of the educational change

principles and innovation characteristics were absent during the implementation of the Partnership Vocational Education Project and the American Industry Project.

5. The data also tend to suggest that a closer agreement between the program developer and the implementers is possible when the following are present during program implementation: when a change theory and model are utilized; when there is evidence of several educational change principles; and when there is evidence of several innovation characteristics. The Industrial Arts Curriculum Project (IACP) demonstrated evidence of a change theory and model, evidence of the presence of several educational change principles, and evidence of the presence of several innovation characteristics. The Industriology program also demonstrated evidence of the presence of several educational change principles and innovation characteristics.

6. Similarly, the data also tend to suggest that a disagreement between the program developer and the implementers is possible. The following conditions appear to be necessary for this disagreement: when no change theory or model are utilized; when there is little or no evidence of educational change principles; and when there is little or no evidence of innovation characteristics. The Partnership Vocational Education

Project demonstrated no evidence of a change theory and model and little evidence of the presence of educational change principles and innovation characteristics. The American Industry Project also demonstrated little evidence of the presence of educational change principles and innovation characteristics.

7. The industrial arts programs that are included in this study were developed and implemented into the schools several years ago. Program developers today have access to past knowledge and expertise concerning change theory, and the advantage of access to the latest developments in the field. Since more change theory research is now at the disposal of today's program developers, more recent curriculum innovations are likely to relect this increased knowledge.

8. Very few of the curriculum innovations reviewed in the change theory literature, which include the four industrial arts programs in this study, are totally adopted. Industrial arts curriculum innovations are prone to adaptation. Rather, bits and pieces are used from the original curriculum innovations while other parts are discarded. Also, the original curriculum innovations change over the ensuing years to reflect the prevailing philosophy or emphasis of a particular school or teacher.

APPENDICES

APPENDIX A

LETTER SENT TO IMPLEMENTERS INVITING PARICIPATION IN THE STUDY

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

Dear

I am an industrial arts teacher in Battle Creek, Michigan, and a doctoral student at Michigan State University, East Lansing, Michigan. I am currently working on my dissertation entitled, "The Implementation Stage in the Change Process of Selected Industrial Arts Curriculum Innovations: An Investigation and Analysis." Briefly, the study is designed to ascertain the strength of existence of commonly accepted educational change principles and innovation characteristics during the implementation of several industrial arts curriculum innovations.

My purpose for writing is to ask for your participation in the study. My review of the literature indicates that you were involved with the introduction and teaching of the ____, into the schools. Your knowledge of and experience with this industrial arts curriculum innovation would be beneficial to the study and to the industrial arts profession. The results of the study are intended to help guide the industrial arts profession in implementing or introducing future curriculum innovations into the schools.

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

Your participation in the study includes completing and returning a questionnaire pertaining to the industrial arts curriculum innovation with which you were involved. It requires approximately 20-30 minutes to complete the questionnaire. Your responses will be kept confidential.

I have enclosed a stamped, addressed card for you to indicate your preference for participation in the study. Please check the YES box if you wish to participate, and check the NO box if you do not wish to participate. Also, please indicate if you want a copy of the abstract of the study when the study is completed. Finally, write your complete mailing address were indicated if it is different than the address on the envelope. Mail the stamped, addressed card at the earliest convenience and I will send the questionnaire as soon as I have all participants recorded.

Thank you for your time and best wishes for continued success.

Cordially,

Stephan A. Kelly
enclosure

APPENDIX B

LETTER SENT TO PROGRAM DEVELOPERS INVITING PARTICIPATION IN THE STUDY

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

October 3, 1983

Dear

This past June I called you concerning your possible participation in a doctoral study. The study includes seven programs of industrial education that were developed by you and other industrial education innovators during the 1960's. These seven programs were included in a study by Leslie H. Cochran in 1968. This letter is being sent to formally ask for your participation in the study as the doctoral proposal has been approved.

A portion of my literature review focuses on the INITIAL implementation phase of your program, the ____________________ ____________________, into the schools. As a result, I am in need of written materials concerning this crucial time period. These materials may be brochures, letters, memorandums, pamphlets, etc. More specifically, the materials might include: planning grant proposals, progress reports to the funding agency and to the profession, correspondences between the staff of the program and the pilot schools, minutes or records of meetings with the staff of the pilot schools, minutes or records of meetings of the industrial education program staff, copies and notes of speeches given by program staff, etc. These are just a few examples but any and all materials written just after program development, during initial implementation, and at the completion of pilot school testing are pertinent.

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

Additionally, I need to obtain a list of the initial pilot schools and the contact person(s) in the pilot schools that were involved with your program. My literature review to date has not divulged this information.

At the completion of the literature review, I will mail you a questionnaire pertaining to the initial implementation phase of your industrial education program. Following this, I will contact you concerning a follow-up interview.

Your help in obtaining this information is appreciated. If there are any costs involved for obtaining any or all materials, please let me know. Thank you for your help and participation in the study. I look forward to your reply.

Respectfully yours,

Stephan A. Kelly

APPENDIX C

FOLLOW-UP LETTER TO PROGRAM DEVELOPERS EXPLAINING THE PROGRESS OF THE STUDY

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

September 20, 1984

Dear

One of my reasons for writing is to bring you up-to-date concerning my doctoral dissertation entitled, "The Implementation Stage in the Change Process of Selected Industrial Arts Curriculum Innovations: An Investigation and Analysis." It was about a year ago that I formally asked for your participation in the study. Since that time I have received and reviewed numerous materials relating to your program, ____ ____________, and the other six programs included in the study.

I am currently developing a questionnaire, which when completed and pilot tested, will be sent to you. Also, I will contact you after the questionnaire has been completed and returned to arrange a follow-up interview.

A second reason for writing is to ask your assistance in obtaining the names and addresses of the pilot schools and participants in the initial introduction of your program. This information is vital to the study as each participant will also be sent a questionnaire. My literature review to date has not divulged this information. I am aware that some pilot school participants may no longer be available for inclusion in the study.

I apologize for the delay in the study and thank you for your patience and participation.

Cordially,

Stephan A. Kelly

APPENDIX D

SAMPLE COVER LETTER TO PARTICIPANTS OF THE QUESTIONNAIRE PILOT STUDY

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

Dear

First, let me thank you for taking time to review the statements which comprise the questionnaire for my dissertation. Your review will add validity to the instrument and credibility to the study.

As I mentioned in our recent telephone conversation, I am an industrial arts teacher in Battle Creek, Michigan, and a doctoral student at Michigan State University, East Lansing, Michigan. I am currently working on my dissertation entitled, "The Implementation Stage in the Change Process of Selected Industrial Arts Curriculum Innovations: An Investigation and Analysis."

Briefly, the study is designed to ascertain the strength of existence of commonly accepted educational change principles and innovation characteristics during the implementation of several industrial arts curriculum innovations. The change principles and innovation characteristics that are used for the development of questionnaires are a result of a review of the literature concerning change. The research of three prominent change theorists are used extensively in the study and include Everett M. Rogers, Ronald G. Havelock, and Gerald Zaltman.

BATTLE CREEK PUBLIC SCHOOLS

Battle Creek, Michigan 49016

W.K.Kellogg Junior High School
60 West Van Buren

Area Code 616
965-9655

To complete the review, please refer to the instructions that are enclosed with the questionnaire. As mentioned in the instructions, please return the scored form in the stamped, addressed envelope and mail at the earliest convenience.

Once again, thank you for reviewing the questionnaire.

Respectfully yours,

Stephan A. Kelly
Enclosure

APPENDIX E

INSTRUCTIONS FOR COMPLETING THE EDUCATIONAL CHANGE PRINCIPLES SURVEY (ECPS)

INSTRUCTIONS FOR RESPONDING TO THE EDUCATIONAL CHANGE PRINCIPLES SURVEY

1. Your participation as a respondent to the EDUCATIONAL CHANGE PRINCIPLES SURVEY (ECPS) is greatly appreciated.

2. Before attempting to respond to the ECPS, it is vital to the study that you attempt to remember the events associated with the INITIAL introduction of the Industrial Arts Curriculum Project into the schools.

3. It is important that your responses to the ECPS represent your own individual perceptions based on your past involvement with the Industrial Arts Curriculum Project. It is recommended that you complete the ECPS, without prior discussion with others that were involved with the program, preferably in private and quiet surroundings. All information will be treated confidentially and anonymously. Approximate respondent time is twenty(20) minutes; however, there is no time limit.

4. Use a pencil and mark each response by drawing a circle around the number which you perceive best represents your experiences with the Industrial Arts Curriculum Project. If you must erase an answer, erase completely and remark your choice.

5. EXAMPLE OF MARKING ONE ITEM:

Factor	HIGHLY	USUALLY	SLIGHTLY	NOT
1. After one semester, the participating teacher adapted the new program to the classroom.	4	3	2	1

(Note: The circle around the "4" will indicate that your perception of the statement is that it was "highly representative" of the Industrial Arts Curriculum Project.)

6. Upon completion of your responses to all ECPS items, place the ECPS and this instruction sheet in the stamped, addressed envelope and SEAL the envelope flap. DO NOT put your name or other markings on the ECPS or envelope.

7. It is highly desirable that you complete the ECPS at your very earliest opportunity and mail it within 24 hours, and if delayed, within 48 hours.

APPENDIX F

EDUCATIONAL CHANGE PRINCIPLES SURVEY (ECPS)

Educational Change Principles Survey

Factors	HIGHLY	USUALLY	SLIGHTLY	NOT
1. After one semester, the participating teacher adapted the new program to the classroom.	4	3	2	1
2. The teaching techniques used in the new program were simple and easily mastered by the participating teacher.	4	3	2	1
3. Key administrators from the participating school worked with the program staff to identify and resolve conflict related to the new program.	4	3	2	1
4. The results of the new program were noted by the key administrators from the participating school.	4	3	2	1
5. The new program was consistent with the participating teacher's previous experiences of teaching industrial arts.	4	3	2	1
6. The program developer received the support of key administrators from the participating school.	4	3	2	1
7. The participating teacher preferred using the new program instead of the previous industrial arts program.	4	3	2	1

	HIGHLY	USUALLY	SLIGHTLY	NOT
8. Key administrators from the participating school were kept informed of the new program's progress by the program developer.	4	3	2	1
9. Key administrators from the participating school demonstrated a positive attitude towards the new program.	4	3	2	1
10. Instructional aids used by the participating teacher in the new program were simple and easy to use.	4	3	2	1
11. Communication between the program developer and the participating teacher was clear and concise.	4	3	2	1
12. While using the new program, a more efficient use of time and effort was experienced by the participating teacher.	4	3	2	1
13. The participating teacher utilized university or college library materials related to the new program.	4	3	2	1
14. The participating teacher was provided with audio-visual materials (i.e., transparencies, charts, filmstrips) to use in the classroom.	4	3	2	1
15. Key administrators from the participating school approved financial support for the new program.	4	3	2	1
16. The goals and objectives of the new program were clear and concise to the participating teacher.	4	3	2	1

	HIGHLY	USUALLY	SLIGHTLY	NOT
17. The new program was introduced to key administrators from the participating school by the program developer.	4	3	2	1
18. The participating teacher assisted in the development of audio-visual materials for the new program.	4	3	2	1
19. Key administrators from the participating school were knowledgeable of the new program's goals, objectives, and content.	4	3	2	1
20. The participating teacher assisted in the development of instructional materials for the new program.	4	3	2	1
21. The new program's daily lesson plans and/or instructions were clear and concise to the participating teacher.	4	3	2	1
22. The program developer personally conducted training sessions for the participating teacher.	4	3	2	1
23. It required more than 24 calendar months to introduce the program into the participating school.	4	3	2	1
24. Verbal communication between the program developer and the participating teacher was direct and personal.	4	3	2	1
25. The new program was consistent with the participating teacher's philosophy of industrial arts.	4	3	2	1

		HIGHLY	USUALLY	SLIGHTLY	NOT
26.	Training for the participating teacher included in-service sessions conducted by the program staff.	4	3	2	1
27.	The participating teacher was permitted to use the new program on an experimental basis.	4	3	2	1
28.	The results of the new program in the participating school were publicized in the local community.	4	3	2	1
29.	The program developer made frequent personal contacts with key administrators from the participating school.	4	3	2	1
30.	Printed materials concerning the new program were clear and concise to the participating teacher.	4	3	2	1
31.	The participating teacher was permitted to critique and recommend changes related to the new program.	4	3	2	1
32.	The participating teacher was provided with instructional materials (i.e., lesson plans, workbooks) related to the new program to use in the classroom.	4	3	2	1
33.	In meeting the educational objectives of industrial arts, the new program was superior to the previous industrial arts program.	4	3	2	1
34.	The program developer made frequent in-school personal contacts with the participating teacher.	4	3	2	1

	HIGHLY	USUALLY	SLIGHTLY	NOT
35. The participating teacher received a list of potential suppliers of consumable materials necessary for the new program.	4	3	2	1
36. The program developer communicated with the participating teacher via letters, memoranda, or telephone conversations.	4	3	2	1
37. Key administrators from the participating school worked with the program developer to create incentives and rewards for the participating teacher.	4	3	2	1
38. Auxiliary sources of information related to the new program were made available to the participating teacher by the program developer.	4	3	2	1
39. Key administrators from the participating school were consulted in the planning and decision-making related to the new program.	4	3	2	1
40. The initial costs for introducing the new program into the participating school were low compared to the initial costs of the previous industrial arts program.	4	3	2	1
41. Before the new program was introduced into the participating school, the participating teacher read descriptive materials about the new program.	4	3	2	1

	HIGHLY	USUALLY	SLIGHTLY	NOT
42. Before the new program was introduced into the participating school, the participating teacher visited other schools and viewed the new program in operation.	4	3	2	1
43. The continuing costs of the new program in the participating school were lower than the continuing costs of the previous industrial arts program.	4	3	2	1
44. The participating teacher attended a majority of the training sessions for the new program.	4	3	2	1
45. Key administrators from the participating school attended a majority of the training sessions for the new program.	4	3	2	1
46. Key administrators from the participating school were permitted to critique and recommend changes related to the new program.	4	3	2	1
47. The participating teacher was consulted in the planning and decision-making related to the new program.	4	3	2	1
48. In addition to the key administrators, other influential persons in the participating school were identified by the program developer.	4	3	2	1

APPENDIX G

DATA TABLES OF THE EDUCATIONAL CHANGE PRINCIPLES ACROSS INDUSTRIAL ARTS PROGRAMS

Code for Industrial Arts Programs throughout Data Tables:

I.A.C.P.	=	Industrial Arts Curriculum Project (IACP)
A.I.P.	=	American Industry Project
G.P.	=	Galaxy Plan
O.S.	=	Orchestrated Systems Program
F. Indust.	=	Functions of Industry Program
Indust.	=	Industriology Program
P.V.E.P.	=	Partnership Vocational Education Project

Table G-1. Change principle #1: Meaningful change occurs as a process, not as an event.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.55	.44	.19
DEVELOPER	1	3.75	0	0
IMPLEMENTER	16	3.54	.45	.21
A.I.P.	17	2.97	.94	.88
DEVELOPER	1	4.00	0	0
IMPLEMENTER	16	2.90	.93	.87
G.P.	4	2.37	.62	.39
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.37	.62	.39
O.S.	5	2.55	.44	.20
DEVELOPER	1	2.00	0	0
IMPLEMENTER	4	2.68	.37	.14
F.INDUST.	1	3.75	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.75	0	0
INDUST.	6	3.16	.30	.09
DEVELOPER	1	3.00	0	0
IMPLEMENTER	5	3.20	.32	.10
P.V.E.P.	6	2.79	.43	.18
DEVELOPER	1	2.50	0	0
IMPLEMENTER	5	2.85	.45	.20
TOTAL	56	3.08	.72	.53

Table G-2. Change Principle #2: Direct, personal intervention is by far the most potent support resource and may even be necessary for change to be successful.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.47	.26	.07
DEVELOPER	1	3.88	0	0
IMPLEMENTER	16	3.45	.25	.06
A.I.P.	17	2.87	.87	.75
DEVELOPER	1	3.66	0	0
IMPLEMENTER	16	2.82	.87	.76
G.P.	4	2.80	.41	.17
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.80	.41	.17
O.S.	5	2.70	.66	.44
DEVELOPER	1	2.11	0	0
IMPLEMENTER	4	2.94	.63	.40
F. INDUST.	1	3.66	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.66	0	0
INDUST.	6	3.33	.44	.19
DEVELOPER	1	3.33	0	0
IMPLEMENTER	5	3.33	.49	.24
P.V.E.P.	6	3.00	.64	.41
DEVELOPER	1	3.44	0	0
IMPLEMENTER	5	2.91	.67	.45
TOTAL	56	3.12	.65	.42

Table G-3. Change Principle #3: Continuous personal participation of the implementing staff is needed to firmly root and sustain the change.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.15	.50	.25
DEVELOPER	1	3.50	0	0
IMPLEMENTER	16	3.13	.51	.26
A.I.P.	17	2.86	.80	.64
DEVELOPER	1	3.50	0	0
IMPLEMENTER	16	2.80	.80	.65
G.P.	4	2.71	.69	.48
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.71	.69	.48
O.S.	5	2.55	.28	.08
DEVELOPER	1	2.62	0	0
IMPLEMENTER	4	2.53	.32	.10
F.INDUST.	1	3.12	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.12	0	0
INDUST.	6	3.25	.13	.01
DEVELOPER	1	3.12	0	0
IMPLEMENTER	5	3.27	.13	.01
P.V.E.P.	6	2.83	.73	.54
DEVELOPER	1	2.62	0	0
IMPLEMENTER	5	2.87	.81	.66
TOTAL	56	2.95	.62	.39

Table G-4. Change Principle #4: Administrators play a crucial role in supporting the utilization process of the new method or idea.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.39	.42	.18
DEVELOPER	1	3.50	0	0
IMPLEMENTER	16	3.38	.43	.19
A.I.P.	17	2.84	.90	.81
DEVELOPER	1	3.50	0	0
IMPLEMENTER	16	2.80	.91	.83
G.P.	4	2.12	.53	.28
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.12	.53	.28
O.S.	5	2.80	.49	.24
DEVELOPER	1	2.66	0	0
IMPLEMENTER	4	2.83	.56	.31
F.INDUST.	1	3.16	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.16	0	0
INDUST.	6	3.22	.40	.16
DEVELOPER	1	3.16	0	0
IMPLEMENTER	5	3.23	.45	.20
P.V.E.P.	6	2.91	.59	.35
DEVELOPER	1	3.50	0	0
IMPLEMENTER	5	2.80	.58	.33
TOTAL	56	3.00	.69	.48

Table G-5. Change Principle #5: Material resources at the 'how to' level are needed, particularly when change involves organization or instruction.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	2.87	.54	.29
DEVELOPER	1	2.66	0	0
IMPLEMENTER	16	2.88	.56	.31
A.I.P.	17	2.39	.74	.56
DEVELOPER	1	3.33	0	0
IMPLEMENTER	16	2.33	.73	.53
G.P.	4	2.16	.82	.68
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.16	.82	.68
O.S.	5	2.03	.68	.46
DEVELOPER	1	1.66	0	0
IMPLEMENTER	4	2.12	.75	.56
F.INDUST.	1	2.66	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	2.66	0	0
INDUST.	6	2.58	.62	.38
DEVELOPER	1	2.50	0	0
IMPLEMENTER	5	2.60	.69	.48
P.V.E.P.	6	2.55	.96	.94
DEVELOPER	1	3.83	0	0
IMPLEMENTER	5	2.30	.82	.68
TOTAL	56	2.53	.71	.51

APPENDIX H

DATA TABLES OF THE INNOVATION CHARACTERISTICS ACROSS INDUSTRIAL ARTS PROGRAMS

Table H-1. Innovation Characteristic #1: Relative advantage is the degree to which an innovation is superior to ideas it supercedes.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.27	.59	.34
DEVELOPER	1	3.40	0	0
IMPLEMENTER	16	3.26	.60	.37
A.I.P.	17	2.38	.74	.55
DEVELOPER	1	3.20	0	0
IMPLEMENTER	16	2.33	.74	.54
G.P.	4	2.65	.66	.43
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.65	.66	.43
O.S.	5	2.12	.41	.17
DEVELOPER	1	1.60	0	0
IMPLEMENTER	4	2.25	.34	.11
F.INDUST.	1	3.00	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.00	0	0
INDUST.	6	2.80	.72	.52
DEVELOPER	1	2.40	0	0
IMPLEMENTER	5	2.88	.78	.61
P.V.E.P.	6	2.73	.90	.82
DEVELOPER	1	3.80	0	0
IMPLEMENTER	5	2.52	.83	.69
TOTAL	56	2.74	.76	.58

Table H-2. Innovation Characteristic #2: Compatability is the degree to which an innovation is consistent with existing values and past experiences.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.02	.79	.63
DEVELOPER	1	3.50	0	0
IMPLEMENTER	16	3.00	.81	.66
A.I.P.	17	2.58	.95	.91
DEVELOPER	1	3.00	0	0
IMPLEMENTER	16	2.56	.98	.96
G.P.	4	2.75	1.19	1.41
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.75	1.19	1.41
O.S.	5	2.00	1.27	1.62
DEVELOPER	1	2.50	0	0
IMPLEMENTER	4	1.87	1.43	2.06
F.INDUST.	1	2.00	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	2.00	0	0
INDUST.	6	3.25	.52	.27
DEVELOPER	1	3.00	0	0
IMPLEMENTER	5	3.30	.57	.32
P.V.E.P.	6	2.83	.68	.46
DEVELOPER	1	3.00	0	0
IMPLEMENTER	5	2.80	.75	.57
TOTAL	56	2.76	.91	.83

Table H-3. Innovation Characteristic #3: Complexity is the degree to which an innovation is relatively difficult to understand and use.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.63	.26	.07
DEVELOPER	1	3.80	0	0
IMPLEMENTER	16	3.62	.27	.07
A.I.P.	17	3.03	.88	.78
DEVELOPER	1	3.40	0	0
IMPLEMENTER	16	3.01	.90	.82
G.P.	4	3.00	.51	.26
DEVELOPER	0	0	0	0
IMPLEMENTER	4	3.00	.51	.26
O.S.	5	2.28	.86	.75
DEVELOPER	1	1.80	0	0
IMPLEMENTER	4	2.40	.95	.90
F.INDUST.	1	3.40	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.40	0	0
INDUST.	6	3.40	.33	.11
DEVELOPER	1	3.40	0	0
IMPLEMENTER	5	3.40	.37	.14
P.V.E.P.	6	2.80	.55	.30
DEVELOPER	1	2.80	0	0
IMPLEMENTER	5	2.80	.61	.38
TOTAL	56	3.16	.72	.52

Table H-4. Innovation Characteristic #4: Trialability is the degree to which an innovation may be experimented with on a trial basis.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.29	.77	.59
DEVELOPER	1	3.00	0	0
IMPLEMENTER	16	3.31	.79	.62
A.I.P.	17	2.35	1.16	1.36
DEVELOPER	1	4.00	0	0
IMPLEMENTER	16	2.25	1.12	1.26
G.P.	4	2.50	1.00	1.00
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.50	1.00	1.00
O.S.	5	1.80	.83	.70
DEVELOPER	1	2.00	0	0
IMPLEMENTER	4	1.75	.95	.91
F.INDUST.	1	4.00	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	4.00	0	0
INDUST.	6	2.50	.54	.30
DEVELOPER	1	3.00	0	0
IMPLEMENTER	5	2.40	.54	.30
P.V.E.P.	6	2.83	1.60	2.56
DEVELOPER	1	4.00	0	0
IMPLEMENTER	5	2.60	1.67	2.80
TOTAL	56	2.69	1.09	1.19

Table H-5. Innovation Characteristic #5: Observability is the degree to which the results of an innovation are visible to others.

Variable	N	$\bar{x}$	s	s^2
I.A.C.P.	17	3.52	.57	.32
DEVELOPER	1	4.00	0	0
IMPLEMENTER	16	3.50	.57	.33
A.I.P.	17	2.91	.83	.69
DEVELOPER	1	3.50	0	0
IMPLEMENTER	16	2.87	.84	.71
G.P.	4	2.62	.47	.22
DEVELOPER	0	0	0	0
IMPLEMENTER	4	2.62	.47	.22
O.S.	5	2.80	.67	.45
DEVELOPER	1	2.50	0	0
IMPLEMENTER	4	2.87	.75	.56
F.INDUST.	1	3.00	0	0
DEVELOPER	0	0	0	0
IMPLEMENTER	1	3.00	0	0
INDUST.	6	3.33	.51	.26
DEVELOPER	1	3.50	0	0
IMPLEMENTER	5	3.30	.57	.32
P.V.E.P.	6	3.25	.88	.77
DEVELOPER	1	4.00	0	0
IMPLEMENTER	5	3.10	.89	.80
TOTAL	56	3.15	.73	.53

APPENDIX I

DATA TABLES OF THE RESPONSES OF THE IMPLEMENTERS FROM THE INDUSTRIAL ARTS PROGRAMS ACROSS EDUCATIONAL CHANGE PRINCIPLES AND INNOVATION CHARACTERISTICS

Table I-1. Implementer's Scores for Educational Change Principles from the Functions of Industry Program.

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	1	1	1	1	1
$\bar{x}$	3.75	3.66	3.12	3.16	2.66
s	.00	.00	.00	.00	.00
s^2	.00	.00	.00	.00	.00
Minimum	3.75	3.66	3.12	3.16	2.66
Maximum	3.75	3.66	3.12	3.16	2.66
Kurtosis	.00	.00	.00	.00	.00
Skewness	.00	.00	.00	.00	.00

Table I-2. Implementer's Scores for Innovation Characteristics from the Functions of Industry Program.

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	1	1	1	1	1
$\bar{x}$	3.00	2.00	3.40	4.00	3.00
s	.00	.00	.00	.00	.00
s^2	.00	.00	.00	.00	.00
Minimum	3.00	2.00	3.40	4.00	3.00
Maximum	3.00	2.00	3.40	4.00	3.00
Kurtosis	.00	.00	.00	.00	.00
Skewness	.00	.00	.00	.00	.00

Table I-3. Implementers' Scores for Educational Change Principles from the Industriology Program.

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	5	5	5	5	5
$\bar{x}$	3.20	3.33	3.27	3.23	2.60
s	.32	.49	.13	.45	.69
s^2	.10	.24	.01	.20	.48
Minimum	3.00	2.77	3.12	2.66	1.66
Maximum	3.75	4.00	3.37	3.83	3.33
Kurtosis	2.66	-1.48	-3.33	- .68	-1.57
Skewness	1.71	.41	- .60	.18	- .39

Table I-4. Implementers' Scores for Innovation Characteristics from the Industriology Program.

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	5	5	5	5	5
$\bar{x}$	2.88	3.30	3.40	2.40	3.30
s	.78	.57	.37	.54	.57
s^2	.61	.32	.14	.30	.32
Minimum	1.60	2.50	2.80	2.00	2.50
Maximum	3.60	4.00	3.80	3.00	4.00
Kurtosis	2.10	- .17	2.00	-3.33	- .17
Skewness	-1.37	- .40	-1.14	.60	- .40

Table I-5. Implementers' Scores for Educational Change Principles from the American Industry Program.

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	16	16	16	16	16
$\bar{x}$	2.90	2.82	2.82	2.80	2.33
s	.93	.87	.81	.91	.73
s^2	.87	.76	.65	.83	.53
Minimum	.00	.00	.00	.00	.00
Maximum	4.00	3.77	3.50	3.83	3.00
Kurtosis	6.10	7.47	11.23	5.61	6.79
Skewness	-2.07	-2.38	-3.12	-2.03	-2.28

Table I-6. Implementers' Scores for Innovation Characteristics from the American Industry Program.

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	16	16	16	16	16
$\bar{x}$	2.33	2.56	3.01	2.25	2.87
s	.74	.98	.90	1.12	.84
s^2	.54	.96	.82	1.26	.71
Minimum	.00	.00	.00	.00	.00
Maximum	3.20	4.00	4.00	4.00	3.50
Kurtosis	6.58	2.27	8.64	- .39	9.70
Skewness	-2.17	-1.40	-2.61	- .24	-2.84

Table I-7. Implementers' Scores for Educational Change Principles from the Industrial Arts Curriculum Project (IACP).

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	16	16	16	16	16
$\bar{x}$	3.54	3.45	3.13	3.38	2.88
s	.45	.25	.51	.43	.56
s^2	.21	.06	.26	.19	.31
Minimum	2.50	3.11	2.50	2.66	1.83
Maximum	4.00	4.00	4.00	4.00	4.00
Kurtosis	.45	- .31	-1.12	- .74	- .02
Skewness	- .98	.51	.23	- .21	.11

Table I-8. Implementers' Scores for Innovation Characteristics from the Industrial Arts Curriculum Project (IACP).

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	16	16	16	16	16
$\bar{x}$	3.26	3.00	3.62	3.31	3.50
s	.61	.81	.27	.79	.57
s^2	.37	.66	.07	.62	.33
Minimum	1.80	1.00	3.20	2.00	2.00
Maximum	4.00	4.00	4.00	4.00	4.00
Kurtosis	.67	.88	-1.36	-1.00	2.12
Skewness	- .90	-1.05	.29	- .66	-1.48

Table I-9. Implementers' Scores for Educational Change Principles from the Partnership Vocational Education Project.

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	5	5	5	5	5
$\bar{x}$	2.85	2.91	2.87	2.80	2.30
s	.45	.67	.81	.58	.82
s^2	.20	.45	.66	.33	.68
Minimum	2.25	2.11	1.87	2.00	1.16
Maximum	3.25	3.66	3.62	3.50	3.00
Kurtosis	-2.23	-2.50	-2.88	- .64	-2.12
Skewness	- .56	- .16	- .54	- .31	- .78

Table I-10. Implementers' Scores for Innovation Characteristics from the Partnership Vocational Education Project.

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	5	5	5	5	5
$\bar{x}$	2.52	2.80	2.80	2.60	3.10
s	.83	.75	.61	1.67	.89
s^2	.69	.57	.38	2.80	.80
Minimum	1.60	2.00	2.00	.00	2.00
Maximum	3.60	4.00	3.40	4.00	4.00
Kurtosis	-1.73	1.45	-1.98	.53	-2.32
Skewness	.15	1.11	- .25	-1.08	- .05

Table I-11. Implementers' Scores for Educational Change Principles from the Orchestrated Systems Program.

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	4	4	4	4	4
$\bar{x}$	2.68	2.94	2.53	2.83	2.12
s	.37	.63	.32	.56	.75
s^2	.14	.40	.10	.31	.56
Minimum	2.50	2.22	2.25	2.50	1.50
Maximum	3.25	3.77	3.00	3.66	3.00
Kurtosis	4.00	1.64	2.23	3.57	-3.90
Skewness	2.00	.51	1.44	1.88	.37

Table I-12. Implementers' Scores for Innovation Characteristics from the Orchestrated Systems Program.

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	4	4	4	4	4
$\bar{x}$	2.25	1.85	2.40	1.75	2.87
s	.34	1.43	.95	.95	.75
s^2	.11	2.06	.90	.91	.56
Minimum	1.80	1.00	1.40	1.00	2.50
Maximum	2.60	4.00	3.40	3.00	4.00
Kurtosis	.34	3.41	-4.33	-1.28	4.00
Skewness	- .75	1.84	.00	.85	2.00

Table I-13. Implementers' Scores for Educational Change Principles from the Galaxy Plan.

Variable	C.P. #1	C.P. #2	C.P. #3	C.P. #4	C.P. #5
N	4	4	4	4	4
$\bar{x}$	2.37	2.80	2.71	2.12	2.16
s	.62	.41	.69	.53	.82
s^2	.39	.17	.48	.28	.68
Minimum	1.75	2.22	2.25	1.33	1.16
Maximum	3.25	3.22	3.75	3.61	3.16
Kurtosis	2.22	2.22	3.57	3.61	.71
Skewness	1.12	-1.12	1.87	-1.86	.00

Table I-14. Implementers' Scores for Innovation Characteristics from the Galaxy Plan.

Variable	I.C. #1	I.C. #2	I.C. #3	I.C. #4	I.C. #5
N	4	4	4	4	4
$\bar{x}$	2.65	2.75	3.00	2.50	2.62
s	.66	1.19	.51	1.00	- .85
s^2	.43	1.41	.26	1.00	.22
Minimum	2.20	1.00	2.40	1.00	2.00
Maximum	3.60	3.50	3.60	3.00	3.00
Kurtosis	2.17	3.13	-1.20	4.00	-1.28
Skewness	1.56	-1.77	.00	-2.00	- .85

APPENDIX J

QUESTIONS WHICH COMPRISE THE SEMI-STRUCTURED INTERVIEWS OF THE PROGRAM DEVELOPERS

The following are the questions which comprise the semi-structured interviews of the program developers.

1. Was there a change theory and/or change model that guided you, the program developer, and program staff when the industrial arts curriculum innovation was implemented into the schools? If so, would you explain the change theory or change model?

2. If a change theory or change model was used by you, the program developer, how successful was the theory and/or model?

3. How successful has the industrial arts curriculum innovation been?
   a. How many of the original pilot schools are still using the industrial arts curriculum innovation?
   b. How many schools are presently using the industrial arts curriculum innovation or an adaptation of the program?

4. What source(s) of resistance to the industrial arts curriculum innovation were present at the time of program implementation?

5. If you could, what changes in the implementation strategy of the industrial arts curriculum innovation would you make?

6. Several innovations are presently being introduced into the industrial arts curriculum, i.e., robotics, technology education, computer-aided-drafting and computer-aided-manufacturing, laser technology, and fibre optics, to name a few. In light of your experiences with the implementation of a new industrial arts curriculum innovation, what are your recommendations to the industrial arts profession that might improve the chances of the successful implementation of these innovations and future innovations?

7. Is there anything not covered by the questionnaire or this interview concerning the implementation of your particular industrial arts curriculum innovation that you would like to explain?

APPENDIX K

EDITED RESPONSES OF THE PROGRAM DEVELOPERS FROM THE SEMI-STRUCTURED INTERVIEWS

Question #1: Was there a change theory and/or change model that guided you, the program developer, and program staff when the industrial arts curriculum innovation was implemented into the schools? If so, would you explain the change theory or change model?

Industrial Arts Curriculum Project:

"...there is one published by Clark and Guba....it has as major components....at least some of them [components] are [at] a research stage where you attempt to develop some basis for what it is you are trying to do....and then a design and development phase. They [Clark and Guba] differentiate between design and development, but incorporate the two. Then [there is] an experimentation [phase] and an adoption/adaptation [phase] where people try the experimental product and then adapt and fit it to a use. We [I.A.C.P. staff] pretty much went down through that sequence, that is to say, we came up with a new conceptualization of what the subject matter was and very deliberately designed an instructional program. That instructional design was developed and experimented with for four or five years" (Lux, 1985).

American Industry Program:

"We had a chance to look at alot of the work that was being done....in the science and math [disciplines] and we spent time visiting a number of curriculum projects. We got some notion of how to proceed in a formal sense....[also] some ideas on contacting administration, how to draw them into the project, and [forming] advisory teams. We did not use a [change] model that we adopted from anyone....[However], Benninghouse, from Michigan State University's communications department, was brought in and talked to our teachers about change" (Flug, 1985).

Orchestrated Systems Program:

"I would not say that we had a change model....we had a program model which represented significant changes. But to separate the program from the concept of change and to try to design a change model, I can not say that we [Orchestrated Systems staff] did that. The model that we used was more content and method for teaching" (Yoho, 1985).

Industriology Program:

"The program was an attempt to broaden the industrial arts or industrial education program to study industry.... We had prospective teachers, teachers who had never taught before, involved [in the program].... Consequently, what we had them do ....was study industry....[and] expand on the concept that we were developing....We visited alot of industries and sat down and talked with them [industrial workers] to make sure we really understood that industry....We felt that if we were going to have a program that was going to focus on industry, we had to have the contact come from industry.

We took the next step and got an experienced teacher program where we brought the experienced teachers in and had both of those groups [prospective and experienced teachers] on campus during a whole summer....In that summer with the experienced teachers, we oriented them to the program, as well as related what we had done with the prospective teachers, and then began to develop some curriculum materials" (Kirby, 1985).

The Partnership Vocational Education Program:

"Our program came about the same time that other programs were emerging [as] there was a change in the philosophy of industrial arts....There was a new movement taking place in the discipline and we [the Partnership Vocational Education Program staff] were part of it....It [the development of the Partnership Vocational Education Program] was all by the seat of our pants. There was no philosophy behind change other than what was [an] emerging trend....We did not get into any organizational patterns....I suspect we used our own intuition more than any thing else" (Minelli, 1985).

Question #2: If a change theory or change model was used by you, the program developer, how successful was the theory and/or model?

Industrial Arts Curriculum Project:

"There was only one problem, in my mind, with the scheme that we followed....We have gathered some evidence now, fifteen years down the road, that there is a missing link in the change idea....I do not think that very many people know much about....the staying power phenomenon. Innovations tend to revert to type. There is a phenomenon operating there that when the teacher transfers the support systems lost, the administration changes, whatever happens for a variety of reasons, they (teachers) go to back to the old ways of woodworking, drawing, and metalworking. There is a memory effect there that is just tremendously powerful....I do not think people have accounted for that in their rationale for change adequately. The [Clark and Guba] model does not speak to the continuation" (Lux, 1985).

The American Industry Program:

"I think we did well with it [Benninghouse's ideas and suggestions on change] and right from the start we had good reception in the schools. We did not choose teachers who we did not feel were open to change....We chose people who were open, creative, and were good teachers" (Flug, 1985).

The Orchestrated Systems Program:

No formal change theory and/or model was used.

The Industriology Program:

"That is a hard question to answer because we really do not know. From the standpoint of what happened with the people in the program, I would say it was very successful. How well it has worked with others across the United States, we do not know. We never had the means or time to follow-up on it" (Kirby, 1985).

The Partnership Vocational Education Project:

"If change took place, it was simply because we orchestrated our delivery, our sales and makerting of our program. We really marketed our program. The strategy that we used would have been those who were receptive to change, those that did not resist change, who were looking for something new....something innovative, something that would suggest that they were change agents....We were not operating from any particular design" (Minelli, 1985).

Question #3: How successful has the industrial arts curriculum innovation been? How many of the original pilot schools are still using the industrial arts curriculum innovation? How many schools are presently using the industrial arts curriculum innovation or an adaptation of the program?

Industrial Arts Curriculum Project:

"It is true, as of this afternoon, every male and female middle school-age child in Columbus, Ohio, has some experience with construction and/or manufacturing. In the sixth, seventh, and eighth grades, they [students] do have every year contact with organized study of construction and manufacturing. There is an instance where it [I.A.C.P.] is in place in total and a really outstanding, very modified program. There is no difficulty seeing it's parentage or where it came from.

I really can not tell you what the situation is in Long Beach, Austin, Dade County, Chicago/Evanston Township, or Trenton/New Brunswick. I know it is not to the extent that it is in Columbus. There has been a large turnover of personnel....many of the people have long been gone.

Through these 125 cooperating institutions, we have trained over 7,000 teachers. In addition, what we did as a measure of adoption, if a school adopted as much as a classroom set [of I.A.C.P. curriculum materials], we assumed that it was not for the purposes of seeing what it was. Based on that, McKnight's [official publisher of I.A.C.P. materials] had purchase orders from 1,200 school buildings that purchased more than a classroom set....At least 1,200 school buildings are teaching construction and manufacturing....We presume that most of those [teachers] were people in that 7,000 that attended the workshops.

On a far broader basis, there is no question whatsoever, that there is nothing [that has] ever been done that has impacted the field nearly as much on a comprehensive basis....Bits and pieces of the program [I.A.C.P.] are evident almost everywhere, in every school building that you walk into....We helped create a readiness for change that was beyond any other curriculum development effort. And, in fact, we caused increments of change very broadly in the field" (Lux, 1985).

The American Industry Program:

"One of the sayings that we became accustomed to using was that the further away you get from home, the stronger the project is supported. So we had state adoption [of the American Industry Project] in Arizona and Alaska....and we had it also [American Industry Project] in Japan....in the military-dependent schools.

What has happened here at Stout [University of Wisconsin-Stout, Menomonie] is that they have changed their laboratories and we do not have machine shop anymore....There is a machine shop taught but it is part of a materials and processes area. What they have done is to go to conceptual organizations....I do not think there have been any new involvements that the institution has been involved in....since I left that project [American Industry Project]. I am completely out-of-touch with it and where it is. You [the interviewer] know more about that than I do. I have not been involved with the project directly since 1973" (Flug, 1985).

The Orchestrated Systems Program:

"I think the main success has been the units that individual teachers still incorporate into their instructional program but from the standpoint of it being a totally new program as Greenfield High School was, it has reverted. From that standpoint, you could say that it did not succeed....From all the letters that I kept getting and request for materials, I assumed there was still alot of interest. At the university [Indiana State University, Terre Haute, Indiana], we did build the facility [for the Orchestrated Systems Program].

Our concept was....experience this [the Orchestrated Systems Program], and then your career, if it is adaptable to it, you can adapt....adopt and adapt. Many of them [teachers] did that in terms of units of instruction rather than total program....I expect that the university [Indiana State University, Terre Haute, Indiana] has done more in keeping it [the Orchestrated Systems Program] than what the schools out in the community have....There are some remnants out there yet....I have been away from it [the Orchestrated Systems Program] for so long that I do not know" (Yoho, 1985).

The Industriology Program:

"I would say it has [spread], it depends on the individuals. Of the twelve cooperating schools that we had....all of the programs still reflect some influence of the [Industriology] program....Our approach was let's take what we have been doing in industrial arts that is good, throw out some things that are not so good....let's bring in some other things that broaden and expand the program....Our hope [was for] schools to broaden and expand their programs....Obviously, the entire program was not exactly as you would hope it would work out.

I do not have any hard data that I can use [for widespead adoption], but we spread the word [about the Industriology Program] at national conventions and at workshops....To what extent people used the [curriculum] materials, we did not follow-up on it....Once we got the federal programs out of the way, it kind of fell off....We [the University of Wisconsin, Platteville, Wisconsin] have a course on our program that is required of our teachers called Industriology....We still teach it [Industriology] in our program" (Kirby, 1985).

The Partnership Vocational Education Project:

"Once I left the department, I removed myself totally....divorced myself from the program. All the people that worked with me on the project are retired now....If I were to speculate....if you found anything in the schools now, it would be a version. They might have accepted the philosophy....Even the department [at Central Michigan University, Mt. Pleasant, Michigan] is not doing what they were doing back then" (Minelli, 1985).

Question #4: What source(s) of resistance to the industrial arts curriculum innovation were present at the time of program implementation?

Industrial Arts Curriculum Project:

"The resistance was centered....in just the fact that we were suggesting something that did not look very much like whatever they [industrial arts teachers] had been doing before. It was not a slight increment of change we were asking for....We really were asking not for an increment of evolution, but we were asking for revolution. That is a little different order of business.

Another major resistance was that we were asking for five periods a week, all year long, for two years....We were not trying to satisfy all the needs in the world....We thought that if there was a substantial interest in a required middle-school [or] junior high school industrial arts comprehensive orientation to how people change their environment....then we had something to offer them. We were asking for revolution and doing it on a substantial time commitment basis.

The third [source of resistance] and last is that we asked for physical plant adaptation....We asked them [teachers] to pile the workbenches up in construction....get them [the workbenches] out of the way. You have got to have the floor space....It was a serious objection on the facilities....There was some physical problems, tools and lab facility problems" (Lux, 1985).

The American Industry Program:

"I think they [sources of resistance] came from a number of different directions. One [source of resistance] is from leadership in the field, people who had been a part of developing industrial arts....The other was from people who had been teaching for some time in the field....The teacher who had been out there in the field some time was resistant. The younger teachers were more open to it [the American Industry Program]....Other resistance, [came from] some administrators who were afraid of losing activity. When they found out what was happening in the program, they became very supportive" (Flug, 1985).

The Orchestrated Systems Program:

"...We did not have a full-blown program through which we were running a group of teachers. It was the individual's choice....[to take] enough of the [university] classes that dealt with this [the Orchestrated Systems concept]" (Yoho, 1985).

The Industriology Program:

"...Two things were the biggest resistance. One is [as stated by a typical industrial arts teacher], 'I do not know anything about industry, I just know woodworking.' There was a problem with people, particularly out in their schools, that said all they were taught was a little woodworking, a little metalworking, and drafting. Now you are telling us to teach about industry. A significant point of resistance was the teachers lack of the Industriology concept and content.

The other [source of resistance] was, 'Gee, that is going to be alot of work.' There was no question, there was going to be alot of work. Any time you do something different it takes work.

A third thing that we ran into [was], 'You want us to teach Industriology. What are we going to throw out in order to put that in?' Sure, you are adding things, but there are some things typically we duplicate....This is not vocational education, this is general education. Therefore, we can eliminate alot of that repetition" (Kirby, 1985).

The Partnership Vocational Education Project:

"Philosophically, some people [industrial arts teachers] just did not want to accept the change in terms of moving away from the manual training or manual arts concept.

Then you had the team teaching [concept]....With the exception of the teachers that agreed to be in our project, most of them in the high schools did not want that [team teaching]....We go into our classroom, we close the door behind us, and we teach our students in a closed vacuum. With the kind of program I am talking about [the P.V.E.P.], everybody exposed....their shortcomings.

There were those....teacher educators [who] felt that because of its title, we were vocational [education]....We were not, we were general education....The title of the program may have turned some people off....they just rejected it.

There were people who resisted correlation [the concept of integration of academic and industrial arts subject matter] because it meant scheduling your time....It meant more planning and work. That was a feature of the program that caused resistance.

I did not find resistance from those who invited me in [to give a presentation] or those who put me on a program.... It was [from] those that resisted the change in the philosophy of industrial arts....The industrial arts teacher that was more of a 'T. & I.' [trade and industry] teacher, would have resisted the whole thing" (Minelli, 1985).

Question #5: If you could, what changes in the implementation strategy of the industrial arts curriculum innovation would you make?

Industrial Arts Curriculum Project:

"I probably would not be so adamant about the time commitment. We were extremely inflexible. On a scale of 1 to 10, 10 being most inflexible, we were probably 8's or 9's....I think now I would try to be more on the lower or middle end of the scale...2's or 3's....That would have helped us alot" (Lux, 1985).

The American Industry Program:

"I would make sure that I had the institutional legitimizers [gatekeepers], if not behind me, informed all the way along. I think that is an advisory group that has to be in close contact with the innovator" (Flug, 1985).

The Orchestrated Systems Program:

"I did not go for funding early....If I would go back, I would try for the funding to produce the instructional materials to give it [the program] a better chance. If students who were to become teachers would have had the materials in hand, they could have done much more with it" (Yoho, 1985).

The Industriology Program:

"We wrote another proposal that....included two cooperating teachers in the schools, instead of one....Unfortunatley, that did not get funded....Obviously we would have liked to have had more time and money to develop more of the whole concept. We were really excited about the modules....What we had in mind was a stack of modules, and you the teacher, would take the ones you wanted to use in your particular situation" (Kirby, 1985).

The Partnership Vocational Education Project:

"The marketing of the program, I probably would not change. What I would change would be building into the program a longer term commitment. I do not mean asking the schools to commit to it. I would modify the program so that they [the schools] could carry on the program without these extra resources, making it easier for them to carry on the program....Without the resources that we [the P.V.E.P. staff] had, there would have been no way for us to go into the schools and launch the kind of program I am talking about....I would have designed something that would not have required the heavy investment of time and resources" (Minelli, 1985).

Question #6: Several innovations are presently being introduced into the industrial arts curriculum, i.e., robotics, technology education, computer-aided-drafting and computer-aided- manufacturing, laser technology, and fibre optics to name a few. In light of your experiences with the implementation of a new industrial arts curriculum innovation, what are your recommendations to the industrial arts profession that might improve the chances of the successful implementation of these innovations and future innovations?

Industrial Arts Curriculum Project:

"All of those innovations and any that I can anticipate, would fit naturally and without any interruptions into what we were doing....I think we do have a legitimate comprehensive review of construction and manufacturing....whatever they [the construction and manufacturing industries] do, for us to reflect this, we will have to do it too. I see that as no problem whatsoever in what we are doing" (Lux, 1985).

The American Industry Program:

"If there is anything true going on in our world it is that [the world] is always changing and you need to have teachers develop coping strategies for change. It is not good enough to simply work on the pre-service teacher, the teacher who is in the college....If you want to have a significant effect on education in any field, where it is at is with the teacher in service. If you concentrate your attention simply on the college prep programs....you are not going to have an effect for fifteen years or more. You have to work at in-service education. I would like to see the schools....develop a much closer relationship with the universities....I think we have got alot to do in terms of overhauling the whole thing in teacher education.

In terms of adaptation of change, I do not think there is any question that the professional organization has a real role to play here. I think industrial arts has done a fine job at that" (Flug, 1985).

The Orchestrated Systems Program:

"Had the....ideal laboratory facilities for the Orchestrated Systems....been developed, these would have been naturals....to fit in that environment of creating, improving, and bringing a dynamic system to a greater and greater efficiency....Back at that time, many of the things you are talking about now were those future concepts. Now they are becoming the state of the art. There will be other future concepts that somebody is going to find and discover" (Yoho, 1985).

The Industriology Program:

"It [the innovations] still have to be sold to somebody....that this is what ought to be happening....New technologies that need to be included....begin to focus on the fact that we are dealing with technology. If we are dealing with it, then we have to include the latest in technology in our programs.

But then we run into....schools that are happy with what it is they are doing. Why should they change?....They [the schools] may be a little short-sighted in their view....Three or four years from now they may not have the students....[It] may be because their programs are not attracting [the students], they have not kept up, they are doing the same old things. The biggest problem is that....you have to put forth some effort. Alot of people are not willing to do that" (Kirby, 1985).

The Partnership Vocational Education Project:

"One feature that we had in ours [the Orchestrated Systems Program] which placed a heavy emphasis on the sciences and mathematics, is required to be successful with what we are dealing with now....To be successful teachers of industrial arts, you have got to have a well-rounded background in math and science, and even in communications" (Minelli, 1985).

Question #7: Is there anything not covered by the questionnaire or this interview concerning the implementation of your industrial arts curriculum innovation that you would like to explain?

Industrial Arts Curriculum Project:

"Of all the things that people misunderstand of what we were trying to do....[one] causes the most misunderstanding. They say, 'Why did you just touch construction and manufacturing?' The rationale simply is....as you look around....there are two major classifications of things or objects; the God-given or natural....and the ones that we have processed....Following that logic, [what] are the ways that you provide that form utility, as the economists call it....The answer is by constructing or manufacturing it....I have never heard a successful challenge to that logic" (Lux, 1985).

The American Industry Project:

"Success is a relative term....In the early stage of the project....we had an idea that had alot of merit. But we [were] not going to feel bad if we did not have 100 million adoptions. If we can influence the field enough to start thinking about industry as being something worth studying in its entirety....then we feel we have accomplished something worthwhile. We [the American Industry Project] were part of the leverage that was taking place by curriculum projects that started about the same time" (Flug, 1985).

The Orchestrated Systems Program:

"If you follow the systems models....you will see four areas to deal with. One was manufacturing, one was construction, one was communications, and one was service. The service [area] seemed to be different here. My concept was that once you produced something in the manufacturing or construction arena/environment, then there was a growing....industry in the servicing of those products. This [the service area] is a big enough area that no one else would even admit it would be a part of the program. That area [the service area] is one that I would have liked to have seen developed more" (Yoho, 1985).

The Industriology Program:

"It is a little hard to say how widespread this program [the Industriology Program] has been....If nothing else ever happens with these programs [those industrial education curriculum innovations reviewed by Cochran], they have had an impact. They have caused people to think about what we are doing and in many instances, they have caused things to happen" (Kirby, 1985).

The Partnership Vocational Education Program:

"We tried to make a change in the teacher....We tried to bring about a change in the curriculum primarily through methodology and not necessarily through content" (Minelli, 1985).

BIBLIOGRAPHY

BIBLIOGRAPHY

A galaxy plan for career preparation. Department of Vocational Education of the Detroit Public Schools, 1968.

A guide to improving instruction in industrial arts. American Vocational Association, Inc., Washington, D.C., 1968.

A letter to the researcher from Donald G. Lux, The Ohio State University, September 28, 1983.

American industry: A new direction for industrial arts. _Man/Society/Technology_, 1971, _30_, No. 8, 246-267.

Argyris, C. _Intervention theory and method._ Reading, Maine: Addison-Wesley, 1970.

Barella, R.V., & Stoper, R.L. The Parma approach--probing a new orbit in junior-high industrial arts. _School Shop_, 1969, _28_, No. 6, 45-48.

Barlow, M.L. _History of industrial education in the United States._ Peoria, Illinois: Charles A. Bennett Co., Inc., 1967.

Bateson, W.M., & Stern, J. Functions of industry: Basis for vocational guidance. _School Shop_, 1962, _21_, No. 7, 7-22.

Bateson, W.M., & Stern, J. The functions of industry as the basis for industrial education programs. Journal of Industrial Teacher Education, 1963, 1, No. 1.

Bernard, H.R., & Killworth, P.D. On the social structure of an ocean-going research vessel and other important things. Social Science Research II, 1973, 145-184.

Benne, K.D., & Birnbaum, M. Change does not have to be haphazard. The School Review, 1960, 68, No. 3, 283-293.

Bennett, C.A. History of manual and industrial education up to 1870. Peoria, Illinois: Charles A. Bennett Co., Inc., 1926.

Bennett, C.A. History of manual and industrial education 1870 to 1917. Peoria, Illinois: Charles A. Bennett Co., Inc., 1967.

Bennis, W.G., Benne, K.D., Chin, R., & Corey, K.E. The planning of change. New York: Holt, Rinehart and Winston, 1976.

Betts, M.R. Extent and method of implementation of selected innovative programs in the undergraduate industrial arts teacher education curriculum (Doctoral dissertation, Arizona State University, 1974). Dissertation Abstracts International, 1974, 35, 3482A.

Brown, G., Jackman, D., Kirby, J., & O'Neill, J. Industriology: The science of industry. Paper presented at the American Industrial Arts Association Convention, Minneapolis, Minnesota, May, 1968.

Buffer, J.J., Lux, D.G., & Ray, W.E. *A junior high school industrial technology curriculum project: A final evaluation of the Industrial Arts Curriculum Project (IACP), 1965-1971.* The Ohio State Research Foundation, Columbus, Ohio, August, 1971.

Carlson, R.D. Strategies for educational change: Some needed research on the diffusion of innovations. Paper presented at the Conference on Strategies for Educational Change, Washington, D.C.: U.S. Office of Education, 1965.

Caron, M.A. Teacher professionalism and organizational style: Their effect on the adoption of the industrial arts curriculum project materials in junior high school industrial arts programs in Ohio (Doctoral dissertation, The Ohio State University, 1975). *Dissertation Abstracts International*, 1975, *36*, 1348A.

Cochran, L.H. A comparison of selected contemporary programs in industrial education (Doctoral dissertation, Wayne State University, 1968). *Dissertation Abstracts International*, 1969, *30*, 993A. (University Microfilms order No. 69-14, 664)

Cochran, L.H. Charting the changing directions of industrial education (Part I). *School Shop*, 1969, *29*, No. 1, 47-50.

Cochran, L.H. Charting the changing directions of industrial education (Part II). *School Shop*, 1969, *29*, No. 2, 53-56.

Cochran, L.H. Innovation: A new direction for industrial arts. *Industrial Arts and Vocational Education*, 1969, *58*, No. 10, 22-24.

Cochran, L.H. *Innovative programs in industrial education.* Bloomington, Illinois: McKnight & McKnight Publishing Co., 1970.

Cochran, L.H. A closer look at selected contemporary programs in industrial education. _Journal of Industrial Teacher Education_, 1970, _7_, No. 2, 40-49.

Contemporary approaches to teaching the industrial arts. _Evaluation guidelines for contemporary industrial arts programs_. 16th Yearbook of the American Council of Industrial Arts Teacher Education, 1967, 13-28.

Curriculum Programs in Action, Their Administration and Evaluation: Report of a Conference Devoted to Description, Demonstration, and Evaluative Discussion of Innovative Programs in Vocational-Technical Education. San Francisco, California: San Francisco State College, 1966.

DeSimone, D.V. Technology and change: Education imperatives or technology is our own thing. _Education in a Technological Society_, 1970 (December), 28-34.

Dessler, G. _Organization theory: Integrating structure and behavior_. New Jersey: Prentice-Hall, Inc., 1980.

Duffy, J.W. Conceptualizing the functions of industry. _The Journal of Industrial Arts Education_, 1970, _29_, No. 17, 10-17.

Dugger, W.E., Jr., & Buffer, J.J. A comparison of cognitive achievement performance of industrial arts curriculum project students, conventionally-taught industrial arts students, and non-industrial arts students. _Journal of Industrial Teacher Education_, 1972, _10_, No. 1, 38-47.

Educational Policies Commission. The central purpose of American education. Washington, D.C.: National Education Association, 1961.

Educational Testing Service, ESEA I Evaluation Assistance Center, Evanston, Illinois, October, 1980.

Evans, R.N., & Herr, E.L. Foundations of vocational education. Columbus, Ohio: Charles E. Merrill Publishing Co., 1978.

Face, W.L., & Flug, E.R. The conceptual study of American industry. Improving instruction in industrial education, Twelfth Annual Industrial Education Conference, Stout State University, Menomonie, Wisconsin, October, 1968.

Face, W.L., Flug, E.R., & Swanson, R.S. Conceptual approach to American industry. Approaches and Procedures in Industrial Arts, 14th Yearbook of the American Council on Industrial Arts Teacher Education, 1965, 60-72.

Flug, E.R. Roundtable: Comparing programs in industrial education, Industrial Arts and Vocational Education, 1970, 59, No. 1, 24-69.

Flug, E.R. Personal interview. Wisconsin State University-Stout, Menomonie, Wisconsin, February 22, 1985.

Flug, E.R., & Nelson, O. The Establishment of American Industry as a Transitional Subject between General and Vocational Education and Appendixes. Final Report. Menomonie, Wisconsin, Stout State University, 1971.

Ferrett, S.K. The implementation of a staff development program for part-time faculty in a community college based on Havelock's theoretical model of the change process: A case study (Doctoral dissertation, Michigan State University, 1975). Dissertation Abstracts International, 1976, 37, 3292A. (University Microfilms order No. 76-27, 093)

Final narrative report. The Partnership Vocational Education Project, Central Michigan University, Mount Pleasant, Michigan, 1971.

Functions of industry. Statesboro, Georgia, Georgia Southern College, 1971.

Gemmill, P.R. The determination and comparison of personality characteristics and selected teaching motives of industrial arts curriculum project, Maryland Plan, and traditional industrial arts teachers (Doctoral dissertation, University of Maryland, 1976). Dissertation Abstracts International, 1976, 38, 1940A. (University Microfilms order No. 77-22503)

Gillie, A.C. Diffusion of knowledge, research findings and innovative practices in educational institutions. Journal of Industrial Teacher Education, Winter, 1971.

Goodlad, J.I. The dynamics of educational change: Toward responsive schools. New York: McGraw-Hill Book Co., 1975.

Goodlad, J.I. A place called school. New York: McGraw-Hill Book Co., 1984.

Gross, N., Giacquinta, J.G., & Bernstein, M. Implementing organizational innovations: A sociological analysis of planned educational change. New York: Basic Books, 1971.

Havelock, R.G. Planning for innovation: A comparative study of the literature on the dissemination and utilization of scientific knowledge. Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, 1969.

Havelock, R.G. Planning for innovation through dissemination and utilization of knowledge. Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, 1971.

Havelock, R.G. Knowledge utilization and dissemination: A bibliography. Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, 1972.

Havelock, R.G. The change agent's guide to innovation in education. New Jersey: Educational Technology Publication, 1973a.

Havelock, R.G. Resource linkage in innovative educational problem-solving: Ideal vs. actual. Journal of Research and Development in Education, 1973b, 6, No. 4, 76-87.

Havelock, R.G. Five case studies of educational innovation at the school district level. Educational Innovation in the United States (Vol. 1). Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, 1974a.

Havelock, R.G. Models of the innovation process in U.S. school districts. Paper presented at the American Educational Research Association annual meeting (59th, Chicago, Illinois, April 15-19, 1974b).

Havelock, R.G. Massachusetts Educational Innovators in Action: The Process for the Product. Chelmsford, Massachusetts: Merrimack Education Center, 1976.

Havelock, R.G. Information professionals as change agents. Drexel Library Quarterly, 1977, 13, No. 2, 48-61.

Havelock, R.G. Implementing Change in Occupational Education. A Compendium of Resource Papers. Research Publication No. 78-2. New York: State University of New York, Ithaca, 1978.

Havelock, R.G., & Havelock, M.C. Training for change agents. Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, 1973.

Havelock, R.G. & Havelock, M.C. Case Study of the Merrimack Education Center. Chelmsford, Massachusetts: Merrimack Education Center, 1974.

Havelock, R.G. & Havelock, M.C. Project Linker. Case Study of the Merrimack Education Center. Local Information Network of Knowledge for Educational Renewal (Linker). Final Report. Chelmsford, Massachusetts: Merrimack Education Center, 1974.

Havelock, R.G., Havelock, M.C., & Markowitz, E.A. The national survey: The substance and the process. Educational Innovation in the United States (Vol. 1). Ann Arbor, Michigan: Center for Research on Utilization of Scientific Knowledge, 1973.

Havelock, R.G., & Huberman, A.M. Solving educational problems. New York: Praeger, 1978.

Householder, D. Review and evaluation of curriculum development in industrial arts education. Bloomington, Illinois: McKnight & McKnight Publishing Co., 1972.

Householder, D. Curriculum movements of the 1960's. Industrial Arts Education: Retrospect, Prospect, 28th Yearbook of the American Council on Industrial Arts Teacher Education, 1979, 114-131.

Huse, E.F. Organization development and change. St. Paul, Minnesota: West Publishing Co., 1980.

Industriology--The Science of Industry. Platteville, Wisconsin, Wisconsin State University--Platteville, color slide series, 1973.

Industriology--The Science of Industry. Department of Industrial Education, University of Wisconsin, Platteville, Wisconsin, teacher guide, 1975.

Jackman, D. Industriology--The science of industry. Paper presented at the American Industrial Arts Association Convention, Minneapolis, Minnesota, May, 1968.

Katz, E., Levin, M.L., & Hamilton, H. Traditions of research on the diffusion of innovation. American Sociological Review, 1963, 28, No. 2, 237-252.

Kirby, J. Industriology for disadvantaged youth. A proposal to the U.S. Office of Education for the Experienced Teacher Fellowship Program, 1965.

Kirby, J. A proposal to the U.S. Office of Education for the experienced teacher fellowship program. Wisconsin State University, Platteville, Wisconsin, 1967.

Kirby, J. Letter to cooperating schools concerning the Industriology concept and Experienced Teacher Fellowship Program, Wisconsin State University, Platteville, Wisconsin, January, 1968.

Kirby, J. Industriology--The science of industry. Paper presented at the American Industrial Arts Association Convention, Minneapolis, Minnesota, May, 1968.

Kirby, J. Personal interview. Wisconsin State University-Platteville, Platteville, Wisconsin, February 23, 1985.

Kolb, D., & Frohman, A. An organization development approach to consulting. _Sloan Management Review_, 1970, _12_, No. 1, 51-65.

LaPorte, J.E. The degree of utilization of industrial arts curriculum project materials relative to their perceived attributes, teacher characteristics, and teacher concerns (Doctoral dissertation, The Ohio State University, 1980). _Dissertation Abstracts International_, 1980, _41_, 4315A. (University Microfilms order No. 8107356)

Layton, E. Education, technology, and human values. _Education in a Technological Society_. 1970, (December), 46-64.

Lewin, K. _Field theory in social science_. New York: Harper & Row, 1951.

Lippitt, G.L. Overcoming people's suspicion of change. _Nation's Cities_. 1965, _3_, 15-17.

Lippitt, G.L. Managing change: Six ways to turn resistance into acceptance. _Supervisory Management_, August, 1966.

Lippitt, G.L. _Organization renewal: Achieving viability in a changing world_. New York: Appleton-Century-Crofts, 1969.

Lippitt, G.L. _Visualizing change: Model building and the change process_. Fairfax, Virginia: NTL Learning Resources Corporation, Inc., 1973.

Lippitt, G.L. Organization renewal. Second edition. New Jersey: Prentice-Hall, Inc., 1982.

Lippitt, G.L., & Lippitt, R. The consulting process in action. LaJolla, California: University Associates, Inc., 1978.

Lippitt, R. The use of social research to improve social practice. American Journal of Orthopsychiatry, 1965, 35, No. 4, 663-669.

Lippitt, R., & Lippitt, G.L. Consulting process in action. Training and Development Journal (Part I), 1975a, 29, No. 5, 48-54; Training and Development Journal (Part II), 1975b, 29, 6, 38-44.

Lippitt, R., Watson, J., & Westley, B. The dynamics of planned change. New York: Harcourt, Brace and World, 1958.

Lowen, W. Technology, education and society. Education in a Technological Society. 1970, (December), 35-45.

Lutz, R.J. Functions of industry in action. School Shop, 1967, 25, No. 10.

Lux, D.G. A call for action. Theory into Practice, 1970, 9, No. 5, 309-312.

Lux, D.G. IACP. School Shop, 1973, 32, No. 8, 49-78.

Lux, D.G. The development of the industrial arts curriculum project. *Industrial Arts Education: Retrospect, Prospect*, 28th Yearbook of the American Council on Industrial Arts Teacher Education, 1979, 149-168.

Lux, D.G. Personal interview. The Ohio State University, Columbus, Ohio, February 15, 1985.

Lux, D.G., & Ray, W.E. The industrial arts curriculum project. *American Vocational Journal*, 1969, *44*, No. 3, 61-62.

Mann, F. Studying and creating change: A means to understanding social organizations. Research in Industrial Human Relations, Industrial Relations Research Association, 1957, Publication No. 17, 146-147.

Mason, E.E. *Industrial Arts Curriculum Improvements: A Change Agent's Guide*. Columbus, Ohio: The Ohio State University, 1971.

McClea, K.R. *The Galaxy Plan in Industrial Education. (Materials) Developed in the Experienced Teacher Fellowship Program*. Detroit, Michigan: Wayne State University, 1968.

Miller, P.L. Change agent strategies: A study of the Michigan-Ohio regional educational laboratory (Doctoral dissertation, Michigan State University, 1968). *Dissertation Abstracts International*, 1968, *29*, 1684A. (University Microfilms order No. 68-17, 112)

Miller, P.W. Functions of industry revisited. *School Shop*, May, 1980.

Miller, R., & Smalley, L.H. *Selected readings for industrial arts*. Bloomington, Illinois: McKnight & McKnight Publishing Co., 1963.

Minelli, E.L. The Partnership Vocational Education Project, a new program in industrial-technical education. Mount Pleasant, Michigan: Central Michigan University, 1965.

Minelli, E.L. Personal interview. Central Michigan University, Mount Pleasant, Michigan, February 27, 1985.

Mohan, H.D. Leadership in industrial arts--a situational perspective. Industrial Arts Education: Retrospect, Prospect, 28th Yearbook of the American Council on Industrial Arts Teacher Education, 1979, 348-360.

Morrish, I. Aspects of educational change. New York: John Wiley & Sons, 1976.

North Central Rural Sociology Subcommittee for the Study of Diffusion of Farm Practices, How farm people accept new ideas. Ames, Iowa: Iowa Agricultural Extension Service, Special Report, 1955, 15.

Olson, D.W. Industry vs Technology--an issue for industrial arts. School Shop, 1969, 29, No. 1, 86-92.

Peter, R.F. American industry program. School Shop, 1973, 32, No. 8, 68-72.

Review of contributions by Central Michigan University and the partnership schools, community colleges, and industries for the fourth year of the program, 1968-1969. The Partnership Vocational Education Project, Central Michigan University, Mount Pleasant, Michigan, 1969.

Rogers, E.M. Diffusion of innovations. New York: The Free Press, 1962.

Rogers, E.M. Change agent, clients, and change. *Modernization among peasants: The impact of communication.* New York: Holt, Rinehart and Winston, 1969, 169-194.

Rogers, E.M. *Diffusion of innovations.* Third edition. New York: The Free Press, 1983.

Rogers, E.M. (with F.F. Shoemaker). *Communication of innovations: A cross-cultural approach.* New York: The Free Press, 1971.

Ross, D.H. Administration for adaptability: *A source book drawing together the results of more than 150 individual studies related to the question of why and how schools improve.* New York: Metropolitan School Study Council, 1958.

Roundtable: Comparing programs in industrial education. *Industrial Arts and Vocational Education,* January, 1970.

Sarbaugh, L.W. *Intercultural communication.* New Jersey: Hayden Book Company, Inc., 1979.

Schmandt, J. Technology and social purpose. *Education in a Technological Society.* 1970, (December), 1-17.

Sieber, S.D. Images of the practitioner and strategies of educational change. *Sociology of Education.* 1972, *45* (Fall), 362-385.

Stern, J. The functions of good-producing industrial establishments: A validation of selected elements in a definition of industry as a framework for curriculum in industrial education (Doctoral dissertation, Wayne State University, 1964).

Straubel, J.H. The future of man in a technological society. Education in a Technological Society. 1970, (December), 18-27.

Stufflebeam, D.L. The use and abuse of evaluation in Title III. Theory into Practice, 1967, 6, 126-133.

Svendsen, E. Overview of educational values of C.E.E. Indiana State University, Terre Haute, Indiana, 1970.

Svendsen, E., & Trippiedi, L.R. Guidelines for organizing and teaching an educational--industrial enterprise in the secondary schools. Indiana State University, Terre Haute, Indiana, January, 1972.

Tarde, G., tr. Parsons, E.C. The laws of imitation. New York: Holt, 1903.

Taylor, J.B. Introducing social innovation. The Journal of Applied Behavioral Science, 1970, 6, No. 1, 69-77.

The industrial arts curriculum project. The Journal of Industrial Arts Education, 1969, September-October, 10-26.

Trocki, F.R. Determining important variables predictive of students' decisions to adopt or reject a curriculum innovation in industrial arts at Paden City High School, Paden City, West Virginia (Doctoral dissertation, West Virginia University, 1977). Dissertation Abstracts International, 1977, 38, 4629A.

Tye, K.A. Changing our schools: The realities. Technical Report No. 30, A Study of Schooling, Los Angeles, California: Laboratory in School and Community Education, Graduate School of Education, University of California, 1981.

Tye, K.A., & Tye, B.B. Teacher isolation and school reform. Phi Delta Kappan, 1984, January, 319-322.

Watson, G. Resistance to change. SEC Newsletter, 1966, 1, No. 7, 5.

Wilber, G.O., & Pendered, N.C. Industrial education in general education. Scranton, Pennsylvannia: International Textbook Co., 1967.

Wright, J.R. Determining special functionaries which provided support for curriculum innovation, diffusion, and adoption in industrial arts at Hundred High School, Hundred, W. VA. (Doctoral dissertation, West Virginia University, 1976). Dissertation Abstracts International. 1976, 37, 2032A. (University Microfilms order No. 76-22444)

Yoho, L.W. A letter to a graduate student, July, 1978.

Yoho, L.W. Frontier industrial arts programs. Orchestrated Systems Approach, Indiana State University, Terre Haute, Indiana, undated material.

Yoho, L.W. The pilot development of Orchestrated Industrial Training Systems' models, laboratories, and instructional content as a new framework for industrial education. Indiana State University, Terre Haute, Indiana. Proposal submitted to ESSO Education Foundation Special Program, New York, 1966.

Yoho, L.W. The "Orchestrated System" Approach to Industrial Education (Industrial Arts--Technical--Vocational). Terre Haute, Indiana: Indiana State University, 1967.

Yoho, L.W. The systems analysis approach to industrial arts content. Paper presented at the American Council on Industrial Arts Teacher Education, American Industrial Arts Convention, Las Vegas, Nevada, April, 1969a.

Yoho, L.W. Systems concepts with implications for industrial and technical education. Journal of Industrial Teacher Education, 1969b, 6, No. 2, 5-19.

Yoho, L.W. Personal interview. Terre Haute, Indiana, February 16, 1985.

Zaltman, G. Processes and phenomena of social change. New York: John Wiley & Sons, 1973.

Zaltman, G., Duncan, R., & Holbeck, J. Innovation and organizations. New York: Wiley InterScience, 1973.

Zaltman, G., & Duncan, R. Strategies for planned change. New York: John Wiley & Sons, 1977.

Zaltman, G., Florio, D.H., & Sikorski, L.A. Dynamic educational change. New York: The Free Press, 1977.

Zaltman, G., Kotler, P., & Kaufman, I. Creating social change. New York: Holt, Rinehart and Winston, Inc., 1972.

Ziegler, J.T. Industrial arts curriculum development efforts of the 1970's. Industrial Arts Education: Retrospect, Prospect, 28th Yearbook of the American Council on Industrial Arts Teacher Education, 1979, 169-187.