73-5420

KUEHL, Henry William, 1927-
A STUDY OF THE FACTORS WHICH INFLUENCED MICHIGAN INDUSTRIAL ARTS TEACHERS' SELECTION OF INSTRUCTIONAL UNITS.

Michigan State University, Ed.D., 1972
Education, industrial

University Microfilms, A XEROX Company, Ann Arbor, Michigan

A STUDY OF THE FACTORS WHICH INFLUENCED MICHIGAN INDUSTRIAL ARTS TEACHERS' SELECTION OF INSTRUCTIONAL UNITS

By

Henry W. Kuehl

A THESIS

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

DOCTOR OF EDUCATION

Department of Secondary Education and Curriculum

1972

A STUDY OF THE FACTORS WHICH INFLUENCED MICHIGAN INDUSTRIAL ARTS TEACHERS' SELECTION OF INSTRUCTIONAL UNITS

By

Henry W. Kuehl

Statement of the Problem

The problem investigated in this study was to determine what factors are related to Michigan industrial arts teachers' selection of instructional units.

It was hypothesized that those methods of exposure which demonstrated the units in situations most nearly like the teachers' own teaching situations would be most frequently associated with the teachers' use of the units. It was therefore hypothesized that the methods of exposure ranked from most to least associated with teachers' use of the units would follow the order: observation of fellow teachers teaching the units; observation of student teaching supervisors teaching the units; participation in the units while enrolled in college classes; observation of teachers in other schools teaching the units; observation of video tape, movie, or slide presentations of secondary or college students performing the units; hearing the units described at meetings; discussing the units in college classes; and reading about the units.

Methodology

Six industrial arts units and ten methods of exposure to new instructional practices were identified from the literature and common usage in the field. An Industrial Arts Unit Inventory was developed to ascertain whether Michigan secondary industrial arts teachers had been exposed to the six units in any of the ten identified ways. The inventory also requested respondents to indicate reasons why they had taught or had not taught the units.

The inventory was mailed to a random sample of 500 secondary industrial arts teachers in the state of Michigan. Returns were received from 301 members of the sample.

The Spearman rank-difference correlation and the analysis of variance were utilized to test the hypothesized difference in methods of exposure between those teachers who had taught units and those who had not.

Findings and Conclusions

A correlation of .90 was found between the predicted rank of the methods of exposure and the rank of methods of exposure across all units, which was based on the proportions of teachers who reported they used the units. However, correlations computed between predicted and observed ranks of individual units revealed that only one out of six units was significantly correlated with the predicted rank.

An exposure score was computed for each teacher by assigning him a certain number of points for each exposure.

An analysis of variance was computed to determine whether there was a significant difference between the means of the exposure scores for teachers who taught units and those who did not. The variance was significant beyond the .001 level of confidence.

More teachers appeared to value product design and project units than the other units. Teachers frequently reported lack of funds and inappropriateness of the units as reasons for not using the units. Rejection of units to satisfy the wishes of building principals was not reported very often as a reason for not teaching the units.

Major conclusions were:

1. The number of teachers who indicated they use instructional units increases as the methods by which they have been exposed to the units follow the order: read about; discussed in college class; meeting; junior and/or senior high school experience; movie, video tape, or slides; other schools; college laboratory; student teaching; and fellow teacher.

2. Teachers frequently indicated they do not select instructional units because they are inappropriate for the technical areas they teach, their students are not capable of carrying out the units, they have insufficient operating budgets, and they lack the knowledge to carry out instructional tasks. The teachers did not indicate a high frequency of rejection of instructional units because of their principals' requests.

Implications and Recommendations

It appears that demonstration of units in settings which are very similar to those of the observing teachers should be utilized as a pre-service and in-service model.

Demonstration of units could be accomplished by: (1) having teachers perform them in college classes, (2) demonstrating them in summer workshops which utilize the teachers' peers as demonstrating teachers, (3) showing teachers video tapes or movies of their peers teaching the units in the normal course of their teaching, and (4) selecting student teaching supervisors who teach the units.

It is recommended that a study be conducted to test experimentally the conclusions of the study.

ACKNOWLEDGMENTS

The writer wishes to express his gratitude to the chairman of his guidance committee, Dr. George Myers, for his help and encouragement during this study; to Dr. George Ferns and Dr. C. B. MacLean for their particular assistance in matters pertaining to the industrial arts field; and to the secondary industrial arts teachers who participated in the study.

The writer is also indebted to his wife, Lois, for her encouragement to carry out the study.

TABLE OF CONTENTS

LIST OF TABLES

Page

CHAPTER I

THE NATURE OF THE STUDY

Statement of the Problem

Leaders in the field of industrial arts indicate they would like to have industrial arts teachers teach such units as experimentation and research, quantity production, and product design. However, the number of teachers who are teaching such units appears to be increasing too slowly, as viewed by leaders in the field.

Miller and Smalley began their chapter "The Future Role of the Project in Industrial Arts" by saying:

> Has the perpetuation of mediocre projects in the average shop become a major pitfall of the development of good industrial arts programs for the space-age curriculum of our high schools? Many industrial arts educators believe so and are considering what should be done to the project to improve its status.[1]

In the material which follows, Glazener, Hostetler, Mitchell, Reed, and Wright all voiced the need to shift the emphasis from projects as ends to projects as means to teach problem solving and knowledge of technology. Glazener called for projects which utilize "experimental and research

---

[1]Rex Miller and Lee H. Smalley, Selected Readings for Industrial Arts (Bloomington: McKnight and McKnight Publishing Company, 1963), p. 220.

techniques," for "improvement in design and/or instruction in design principles" and a "decreasing supply of tie racks, bird houses, and milking stools."[1]

Hostetler said:

> . . . When they [projects] are used as goals or ends in themselves, their worthiness becomes thin and their value questionable. . . . The real test of a good project is when it involves investigation and solution of problems on the part of the student.
> . . . The group project may be carried to completion by the line production method. In fact, it is hard to see how industrial arts can achieve its basic function today without the use of line production methods.[2]

Maley pointed out the value of research and experimentation units, wherein ". . . the making is now carried on towards the end of developing experimental apparatus and the pursuit of product, tool, material, or process analysis, testing, or development."[3]

Industrial arts leaders have used a variety of techniques to influence teachers' selection of units of instruction. However, little evidence is available which indicates what factors in the teaching environment or what strategies are most effective in influencing teachers' selections. Therefore, this study focused on the problem of determining what factors are related to the selection of instructional units by Michigan secondary industrial arts teachers.

---

[1] Ibid., p. 222.

[2] Ibid., pp. 222-223.

[3] Roy O. Billett, Donald Maley, and James J. Hammond, The Unit Method (Washington, D. C.: American Industrial Arts Association, 1960), p. 6.

Purposes of the Study

The purpose of the study was to determine whether teachers' choice of instructional units was related to the ways the teachers had been exposed to the units.

For the purpose of this study, a unit was defined as a group of related instructional goals about which a teacher and his pupils develop and implement learning activities.

Teachers usually vary considerably in selecting goals for units bearing similar titles. Many teachers stress technical insights about production as their goals for teaching quantity production units. Other teachers incorporate the technical insights, but they also include knowledge and attitudes regarding unions, employer-employee relationships, economic aspects of production, and the social significance of production. Some teachers structure units themselves, while others allow the students to generate phases of the units.

In a similar manner, individually constructed student artifacts can be used as vehicles to teach a certain body of knowledge and to develop skill. The projects can also be constructed to teach students how to solve problems, as well as to develop skill and technical knowledge.

The purpose of the study was to determine whether teachers used the units identified in the inventory in their own teaching situations. The intent was to find out if they had selected the topics for study, rather than to determine what instructional goals the teachers had hoped to achieve.

The units selected for the study were those which have been used by teachers. They have also been frequently referred to in industrial arts literature, such as Miller and Smalley's Selected Readings for Industrial Arts[1] and The Unit Method,[2] published by the American Industrial Arts Association.

The units selected for the study were:

Quantity production--The class is organized to function as a group to produce multiple copies of objects. The objects are considered to function interchangeably, and are composed of interchangeable parts.

Experimentation and research--Students conduct experiments with industrial products and equipment, or student-produced equipment, which result in data collection and analysis. Major emphasis is on student recognition of experimentation and research as an industrial process, and on the development of students' abilities to solve problems.

Model industry--Students construct a scale model of an industrial plant while they also study the plant's sources of materials, processing methods, human and physical organization of the plant, and products produced.

Practice pieces or modules--Students produce practice pieces or modules which are designed to assist students in developing insights regarding technical relationships, proper technical procedures, tools, equipment and materials, and manual skills. The pieces are not meant to be useful articles beyond the class setting.

Product design--Students plan articles to fulfill functions specified by the instructor or themselves. Major instructional emphasis is placed on student problem solving and application of elements of design.

Projects--Students individually, or as a group, construct articles which are intended to be useful beyond the class setting. Interchangeability of parts is not required.

---

[1] Miller and Smalley, op. cit.

[2] Billett, Maley, and Hammond, op. cit.

The methods by which teachers had been exposed to units were identified by reviewing the processes by which teachers frequently learn about units. The methods of exposure used for the study were:

College laboratory--The teacher performed the activities of the unit in a college laboratory class.

Discussion in college class--The teacher discussed the unit in a college class.

Student teaching--The teacher observed his student teaching supervisor teaching the unit.

Fellow teacher--The teacher observed a fellow teacher in his school teaching the unit.

Other school--The teacher observed a teacher in another school teaching the unit.

Junior and/or senior high school--The teacher experienced the unit while enrolled in a junior and/or senior high school class.

Movie, video tape, or slides--The teacher observed movies, video tapes, or slides of the unit being taught to secondary or college students.

Meeting--The teacher heard a speaker at a meeting discuss the unit.

Read about--The teacher read about how to teach the unit.

The adoption of units of instruction may also be affected by lack of resources, student ability, the instructor's knowledge of how to provide the leadership, and/or that the instructor does not value the unit. It was assumed that industrial arts teachers exhibit considerable freedom to adopt instructional units. However, the teachers' reasons for having taught or for not having taught the units were solicited to examine whether their choices of units were affected by their teaching environments. The teachers were asked to respond to the following selected reasons for teaching or for not teaching the units identified above.

For Teaching:

You value it--The teacher considered the unit to be a valuable experience for his students.

Other teachers wanted it--Other industrial arts teachers in the teacher's school system asked him to teach the unit.

Students wanted it--The teacher's students wanted him to teach the unit.

For Not Teaching:

Other industrial arts class--The teacher's students had or would have experienced the unit in other industrial arts classes.

Inappropriate--The teacher considered the unit to be inappropriate for the technical area that he taught.

Principal didn't want it--The teacher's principal didn't want the teacher to teach the unit.

Students not capable--The teacher did not think his students were socially, physically, or mentally capable of profiting from the unit.

Knowledge to proceed--The teacher lacked the knowledge to organize the unit.

Facilities--The teacher thought that his laboratory facilities were inadequate for teaching the unit.

Funds--The teacher thought that his instructional budget was inadequate for teaching the unit.

Need for the Study

Industrial arts leaders utilize a variety of strategies to influence the instructional decisions of industrial arts teachers. They attempt to reach them through undergraduate and graduate level courses, in-service programs, and dissemination by printed matter. However, evidence is generally lacking regarding the effectiveness of the various means used by the leaders; i.e., does observation of a student teaching supervisor teaching a unit significantly influence the student teacher's use of the unit later on? Does that observation influence the later selection of the unit to a greater extent than discussion of the unit in an industrial arts curriculum class? Does viewing a video tape of the unit being taught influence a teacher's decision to use the unit more than his performance of the activities of the unit as a student in a college laboratory?

Rogers identified four key elements which should be kept in mind in attempts to bring about any change. They are: (1) the nature of the innovation itself, (2) the means of communicating the change to the people who are expected to change, (3) the social systems interacting in the change process, and (4) the time required for the target person or persons to become aware of and assimilate the change.[1]

Industrial arts teachers appear to exhibit a great deal of personal autonomy in selecting units. Therefore, the primary focus of the work was on the relative strengths of ten methods of communicating to industrial arts teachers about instructional units.

Some consideration was given to time and social systems, as they became integral parts of the methods of

---

[1]McClelland, William A. "The Process of Effecting Change" (Presidential Address, Division of Military Psychology of the American Psychological Association, San Francisco, California, September, 1968), p. 6.

communication. The nature of the innovations was not considered as a variable for this study; rather, the study attempted to identify communication processes which would be closely associated with the use of any of the units studied.

A secondary purpose of the study was to determine the frequency with which industrial arts teachers reported that various people or groups in their local social systems affected their selection of instructional units. Those data were gathered so industrial arts leaders could determine whether or not they need to exert any influence to alter the effects of the community social systems on selection of industrial arts units.

One often hears the statement, "Teachers teach the way they are taught." That assumption is generally used to support the contention that if it is desired that teachers use certain methods or content, the methods or content must be demonstrated to the teachers in the same manner in which the teachers are to utilize them. Lindbeck and Feirer revealed that industrial arts leaders frequently operate on the basis of that assumption.[1]

After completing a survey of teacher-training programs in several universities, John Jamrich wrote:

> To further provide opportunity for the prospective teacher to become acquainted with a variety of teaching methods, the instructional procedures and materials employed in the education sequence must be such as to

---

[1]John L. Feirer and John R. Lindbeck, Industrial Arts Education (New York: The Center for Applied Research in Education, Inc., 1964), p. 70.

> to demonstrate the application of those methods in actual learning situations. This means that use must be made of a variety of teaching procedures such as the lecture methods, the discussion method, field trips, audio-visual materials, and committee work in a manner which will allow the prospective teacher to evaluate the effectiveness of these methods. Again, the application of these methods must permeate the entire education sequence, with full support and understanding by the entire education staff. In other words, the prospective teachers should be taught as the institution and instructors wish them to teach.[1]

Othanel Smith, Saul Cohen, and Arthur Pearl also believed that teachers need demonstrations to implement abstract ideas about teaching, for they said:

> Acceptance and respect for a child as a human being, belief in his potential, and understanding of his social and emotional situation are all very good when they are expressed in appropriate teaching performances. In the abstract, they are little more than pious expressions. The experienced teacher in search of help in his efforts to work effectively with children might in justice lament, "Show me not the end without the means!"[2]

In a discussion of the need to individualize instruction in public schools, the organizers of the "New School" of the University of North Dakota stated, "To prepare teachers for this task, it is essential that they too experience an individualized program of instruction in their own college studies."[3]

---

[1]John X. Jamrich, "A Study of Current Practices in Conducting General Methods and Related Courses in the Preparation of Secondary School Teachers," Journal of Educational Research, XLVIII (1954), 64.

[2]Othanel Smith, Saul B. Cohen, and Arthur Pearl, Teachers for the Real World (Washington, D. C.: The American Association of Colleges for Teacher Education, 1969), 155.

[3]University of North Dakota, "A Description of the New School: University of North Dakota" (Paper distributed at the Annual Meeting of the American Association of Colleges for Teacher Education, Chicago, March 1, 1969), p. 8. (Mimeographed.

Jamrich, Smith and his associates, and the organizers of the "New School" of the University of North Dakota all assumed that teachers should be taught as they are expected to teach. However, Brickell conducted research to support that assumption. After interviewing elementary and secondary teachers in the state of New York, he concluded:

> The most effective way to convince a school staff that it should adopt a new program is to let it observe the successful new program in action. Nothing persuades like a visit. Written descriptions of the new program, speeches about it and research reports concerning it should all be regarded as preliminary or supplementary to a visit. The innovation must be demonstrated under conditions which are not abnormal, artificial or unrealistic --that is, not too different from the everyday circumstances in the observer's own school and community. The most persuasive demonstration consists of the continuing use of the new approach as a basic part of regular instruction in a normal school setting.[1]

Brickell stressed two elements of a strategy for communicating an innovation: (1) The innovation should be demonstrated and (2) The demonstration should occur in a setting which is very similar to that of the observing teachers. These conclusions offer possible strategies which could be utilized by industrial arts leaders to affect the secondary industrial arts teachers' selection of units. The present study was conducted to determine whether the same conclusions could be drawn for the field of industrial arts.

---

[1]Henry M. Brickell, Organizing New York State for Educational Change (Albany: New York State Education Department, 1961), p. 67.

Basic Assumptions of the Study

The following assumptions were made in the process of conducting the study:

1. Michigan secondary industrial arts teachers are allowed some freedom to choose the units they teach.
2. The goal of identifying those factors in industrial arts teaching situations which frequently affect the selection of instructional units would be deemed important by industrial arts leaders.
3. The goal of identifying the variable relationships between methods of exposure of industrial arts teachers to instructional units and their selection of those units would be deemed important by industrial arts leaders.

Delimitation of the Study

The study was delimited in the following ways:

1. The units of instruction selected for the study were limited to quantity production, experimentation and research, model industry, practice pieces or modules, project design, and projects. The units were further limited to the definitions provided for each unit (see page 4).
2. The methods of exposure were limited to college laboratory; discussion in a college class; student teaching; fellow teacher; other school; junior and/or senior high school experience; movie, video tape,

or slides; discussion by a speaker at a meeting; and reading.

3. Data for the study were limited to those collected via a mailed questionnaire returned by a random sample of 500 Michigan secondary industrial arts teachers. No empirical data regarding the industrial arts teachers' selection of units or means of being exposed to the units were utilized.
4. The conclusions of the study may be significant for other curriculum fields; however, this study was designed specifically for the industrial arts field.

Theory and Formulation of Hypothesis

Brickell stressed that teachers are most influenced to accept a new program which they have seen demonstrated in a situation very much like their own.[1] It was therefore hypothesized that industrial arts teachers would be most inclined to use units they had seen demonstrated. It was further hypothesized that teachers' use of the units would increase as the method of exposing the teachers to the units more closely approximated their teaching situations. The order of exposure, ranked from most closely associated with their teaching situations to least associated, was hypothesized as follows: fellow teacher; student teaching; college laboratory; other schools; movie, video tape, or slides; junior or

---

[1]Ibid., p. 67.

senior high school; meeting; discussed in college class; and read about. The order was hypothesized for the following reasons:

1. The situation in which a teacher watches a fellow teacher in the same building should more frequently parallel his own situation than that which he observed during his student teaching. Teaching in the same building should provide essentially the same level of physical resources and students with similar abilities.

2. Observation of a student teaching supervisor should more nearly approximate a teacher's situation than his participation in the unit in a college class, because the students taught were secondary rather than college students. Teachers might think that instructional goals and methods used for college classes could not generally be transferred to high school teaching situations.

3. Participation in the unit as college students should be more closely related to the teachers' use of the units than observation of teachers in other schools, because the latter situation does not allow as much time for the assimilation of instructional goals and organization. Teachers' observations of other teachers is usually for less than one instructional day. If teachers' observations of other teachers generally occur for periods sufficiently long to span the time required to teach the units, it would seem that observation of other teachers would be more closely associated with teaching the unit than participation in the unit as a college student.

4. Observation of teachers in other buildings should be more closely related to teachers' use of the units than viewing movies, video tapes, or slides of high school or college students participating in the units. The visual aids could be suspected of having been edited to show primarily the successful events, whereas live observation would provide a more nearly true situation. Both would provide approximately the same viewing time.

5. Viewing video tapes, movies, or slides of high school students should be more closely associated with teaching the units than viewing college students, by the same media, participating in the same units. Media showing the high school students draw from the same age range of students.

6. Movies, video tapes, and slides of high school or college students should be more closely related to teachers' use of the units than their own experience in junior or senior high school, because the teachers watch the media for the purpose of evaluating the unit as a possible teaching resource. Therefore, they more carefully consider the goals and instructional organization than they did in junior or senior high school.

7. Teachers' performance of the units while enrolled in junior and/or senior high school classes should be more closely related to the teachers' use of the units than hearing a description of students' performance of the units. The teachers would have opportunities actually to see the physical arrangement of the facilities and the activities of the

students. Experiencing the units should therefore give the teachers more familiarity with the units. Consequently, they would be less fearful of being able to teach the units. Having experienced the units as students would also give the teachers greater opportunities to determine the attitudes of the students toward the units.

8. Hearing units discussed at meetings should be more closely associated with teaching the units than discussions of the units in college classes, because the discussions at the meetings would have focused on students' performing the units as opposed to the potential of performance which would have been related in college classes. The teachers would therefore gain from the meetings the feeling that the units could actually be taught successfully.

9. Discussions of the units in college classes should be more closely associated with teaching the units than reading about them, because there would be greater opportunities in the college classes to ask questions and gain a variety of viewpoints regarding the merits of the units. The classes would also afford greater opportunities to discuss how to teach the units. There is also a possibility that the teachers may have identified with the instructor and other students in the class who endorsed the units.

Determination of the relationships between methods of exposing teachers to units and their use of the units was based on teachers' responses on the inventory, which indicated whether they had taught the units and the methods by which they had been exposed to the units. The incidence of reported use was then tabulated by methods of exposure to determine the ranking of methods of exposure by incidence of use of the units. The following relationships were hypothesized:

<u>Major Hypothesis</u>:

> When ranking methods by which Michigan secondary industrial arts teachers had been exposed to selected industrial arts instructional units from greatest to least on the basis of reported incidence of use of the instructional units by those teachers, the following rank order will occur: fellow teacher; student teaching; college laboratory; other schools; movie, video tape, or slides; junior and/or senior high school; meeting; discussed in college class; and read about.

Summary and Overview

The major problem of the study was to determine factors related to the selection of instructional units by Michigan secondary industrial arts teachers. Specific purposes were to determine: (1) the relationships between teachers' selection of certain instructional units and the methods by which the teachers had been exposed to those units and (2) the frequency with which industrial arts teachers responded to selected reasons for having taught or for not having taught the units.

The need for the study was supported by concern among industrial arts leaders that industrial arts teachers have not appeared to select particular instructional units; however, no systematic data were available to reflect what factors were related to the teachers' selection of the units. Furthermore, data were lacking regarding the relative strengths of various means of affecting teachers' choices of instructional units.

Basic assumptions of the study were that: (1) Michigan secondary industrial arts teachers are allowed some freedom to choose the units they teach and (2) The goal of identifying those factors in industrial arts teaching situations which frequently are associated with teachers' selection of instructional units should be of value to industrial arts leaders.

The study was delimited to Michigan secondary industrial arts teachers. Units of instruction were limited to quantity production, experimentation and research, model industry, practice pieces or modules, product design, and projects. Methods of exposure of the teachers to the units were limited to experiencing the unit in college laboratories; discussing in college classes; observation during student teaching; observation of teachers within the same building; observation of teachers in other schools; experiencing the units while enrolled as a junior and/or senior high school student; observation of video tapes, slides, or movie presentations; verbal descriptions at meetings; and reading.

It was hypothesized that the probability that industrial arts teachers would indicate they had taught certain instructional units would increase as the methods by which the teachers had been exposed to the units more nearly matched their own teaching situations and as the methods of exposure approached a live performance of the unit.

The remainder of the study is organized in the following manner. A review of related literature is presented in Chapter II. The design of the instrumentation and survey phase of the study is given in Chapter III. The sample is described, the statistical hypothesis is stated, analysis procedures are discussed, and the testing and administration of the inventory are described. In Chapter IV, data are presented, analyzed, and interpreted. A summary of the study, conclusions, and recommendations are presented in Chapter V.

CHAPTER II

REVIEW OF LITERATURE RELATED TO CHANGING TEACHERS' SELECTION OF INSTRUCTIONAL UNITS

Introduction

A discussion of the process of affecting industrial arts teachers' selection of instructional units is actually a discussion of the process of change. This chapter relates the purposes and hypothesis of the study to the general framework of research on change. Also discussed in the chapter is research concerned with change strategies, which tend to support the hypothesis that teachers are prone to accept those changes which they see demonstrated in settings which are very much like their own.

Identification of the Elements of Change

Various systems have been developed to account for all of the elements of change. The systems appear to be quite similar, as is evidenced by the following schemes.

Katz, Levin, and Hamilton defined the process of diffusion of innovations as the (1) acceptance, (2) over time, (3) of some specific item--an idea or practice--by (4) individuals, groups, or other adapting units, linked to

(5) specific channels of communication, (6) to a social structure, and (7) to a given system of values, or culture.[1]

Miles included in his discussion of the change process the elements of: characteristics of educational systems, the innovation itself, innovating persons or groups, status of the planning and execution of the change process, and the eventual fate of innovations advocated.[2]

Rogers identified the following as key elements of change related to diffusion of innovations: the nature of the innovation itself, communication, the social system, and time.[3]

Rogers' elements appear to embody those suggested in the other two schemes, except that Miles' category of characteristics of educational systems may be viewed as being somewhat outside the social system referred to by all three schemes. That element is more completely explored, along with all of the other elements of change, in the following section.

Elements of Change Related to Teachers' Selection of Instructional Units

Miles cited the research of Sloan, Wayland, Colvard, Flesche, Masters, and Eliot to support the contention that

---

[1]Matthew B. Miles, Innovation in Education (New York: Teachers College, Columbia University, 1964), pp. 237-252.

[2]Ibid., p. 632.

[3]Everett M. Rogers, Diffusion of Innovations (New York: The Free Press, 1965), p. 12.

the United States has a national educational system which might serve to brake or increase the potential for innovations in local schools. The researchers referred to the national recruitment of teachers, successful and relatively easy change from one school to another by students and teachers, the national market for instructional materials, and national examination systems as all providing evidence that the curricula of the nation's schools are very similar.[1]

The heavy reliance in industrial arts curricula on projects which have been preplanned for students may very well be attributed, to a marked extent, to professional periodicals and textbooks which have incorporated such plans.

The use of practice modules was given a similar impetus about 100 years ago. The use of that particular approach was accelerated as a result of the Russian display at the Centennial Exposition at Philadelphia in 1876. Dr. John R. Runkle, President of the Massachusetts Institute of Technology at that time, was greatly impressed by the Russian display. He wrote:

> At Philadelphia, in 1876 almost the first thing I saw was a small case containing three series of models--one of chipping and filing, one of forging, and one of machine tool work. I saw at once that they were not parts of machines, but simply graded models for teaching manipulations in those arts.[2]

---

[1]Miles, _op. cit._, pp. 632, 642.

[2]Charles A. Bennett, _History of Manual and Industrial Education 1870 to 1917_ (Peoria: Charles Bennett Co., Inc., 1937), p. 320.

Runkle proceeded to set up shop courses at the university level, in which students were taught in a similar manner. Secondary teachers were also trained through that process.

At the same time, C. M. Woodard was traveling around the country organizing high school shop programs to be taught in the same way. His work and Runkle's training of teachers thus helped the "practice pieces" method of shop training to spread across the nation.[1]

The trend for the establishment of a national curriculum through the processes cited above tends to work against the diffusion of new units of instruction such as quantity production, because facilities, textbooks, students, administration, and other teachers' expectations tend to be oriented toward the old units. Diffusion processes may also work to establish a new practice. For example, the fact that suppliers for industrial arts programs have sold materials testing equipment nationwide may tend to augment widespread acceptance of units in research and experimentation.

Assessment of Results

Miles cited the lack of a visible payoff such as an economic return as a deterrent to change in schools. That is, if industrial arts teachers are unable to detect the development of any different student abilities by teaching a different unit, they are unlikely to teach it.[2]

---

[1] Ibid., p. 310.

[2] Miles, op. cit., p. 634.

Brickell reported that teachers would be more likely to put into practice new ideas to which they had seen students react.[1]

Miles' and Brickells' conclusions support the hypothesis that teachers are more likely to teach those units which they have seen demonstrated, because they have been able to evaluate the outcomes.

The Nature of the Innovation Itself

Rogers identified the following characteristics of innovations which may affect their diffusion: relative advantage, that is, whether they are perceived to be better than what they replace; compatibility with the values and experiences of the client; divisibility of the innovations into parts which might be adopted a piece at a time; complexity or degree of difficulty encountered in understanding the innovations.[2]

Variation between the six units included in the present study in regard to the above characteristics would have helped to explain different rates of utilization by secondary teachers. However, those characteristics have not been discussed in this study because the purpose of the study was to identify methods of exposure which would be associated with the use of all of the units.

---

[1]Brickell, op. cit., p. 33.

[2]McClelland, op. cit., p. 7.

Social Systems

Rogers defined a social system as:

> . . . a population of individuals who are functionally differentiated and engaged in collective problem-solving behavior. . . . All of the members cooperate at least to the extent of having some common problem which they are seeking to solve.[1]

Industrial arts teachers work within several types of social systems which might influence their selection of instructional units. Some of these systems are: their classes of students, industrial arts departments, building faculties, school administrators, school systems, and communities. However, research regarding the influence of these social systems on adoption of changes by individual industrial arts teachers has generally been lacking because individual teachers have not usually been chosen as the unit of analysis in research. In contrasting diffusion research in rural sociology and education, Eichholz and Rogers noted:

> In rural sociology the unit of analysis is usually the individual farmer. In some 150 educational studies completed to date on the diffusion of innovations the unit of analysis has been the school or the school system.[2]

The Community.--After reviewing several research projects regarding the effect of a social system's norms on innovation by its members, Rogers concluded, "An individual's

---

[1]Rogers, op. cit., p. 14.

[2]Miles, op. cit., p. 314.

innovativeness varies directly with the norms of his social system on innovativeness."[1]

Rogers and Burdge found that 20 per cent of the variation in Ohio farmers' innovation scores could be accounted for by community norms.[2]

Brickell found that parents, citizen groups, and boards of education did not exert strong influence for the adoption of innovative practices in schools, but they would exert strong opposition to programs if they did not favor them.[3]

School administrators.--There has been considerable discussion concerning the role of administrators in instructional leadership. That is particularly true of secondary principals. The research cited below is related to that issue.

Brickell determined that most changes in instructional programs which affected more than one classroom had been introduced or actively supported by administrators.[4]

Demeter stated:

> Building principals are key figures in the process. Where they are aware of and sympathetic to an innovation, it tends to prosper. Where they are ignorant

---

[1]Rogers, op. cit., p. 71.

[2]Ibid.

[3]Brickell, op. cit., pp. 20-21.

[4]Ibid., p. 22.

> of its existence, or apathetic if not hostile, it tends to remain outside the bloodstream of the school.[1]

While Brickell's and Demeter's studies tended to support the retarding or neutral roles of the principal with regard to classroom innovation, Chesler, Schmuck, and Lippitt found evidence to support the conclusion that principals play significant roles in stimulating classroom innovations. They said:

> There is high and significant correlation between the amount of staff inventiveness, as measured by the mean number of new practices developed by each teacher, and the principal's support for innovative teaching. There is an even higher correlation between the teacher's perception of his principal's support and his perception of his colleagues' support of innovation.[2]

The Research Division of the Institute for Development of Educational Activities, Inc., concluded that the individual school is the crucial unit for educational change. They found the principal to be the key agent of change, but also found that principals generally lacked the necessary skills of managing decision making, implementing scientific problem-solving procedures, becoming aware of a great variety of resources which can be brought to bear on such problem solving, becoming more discriminating in selecting such resources,

---

[1]Lee H. Demeter, "Accelerating the Local Use of Improved Educational Practices in School Systems" (unpublished Doctoral dissertation, Teachers College, Columbia University, 1951), p.23

[2]Mark Chesler, Richard Schmuck, and Ronald Lippitt, "The Principal's Role in Facilitating Innovation," Theory Into Practice, II (December, 1963), 274.

and developing the skills to deal with the conflict built in the middle management role.[1]

Other teachers.--Industrial arts teachers may receive support or rejection from other industrial arts teachers or other teachers in the building or system.

Brickell found that as long as a teacher did not attempt an innovation that would affect other teachers, the teacher had almost total control of his instructional decisions; but when the teacher's choices affected other teachers, the teacher lacked the authority to proceed against the wishes of the other staff members.[2]

Rogers and Eichholz found that elementary teachers rejected new instructional media partially because of the experiences other teachers had had with them and because of the attitudes their colleagues displayed toward them.[3]

Rogers' statement that "An individual's innovativeness varies directly with the norms of his social system" also could be applied to department or building faculty as communities in which industrial arts teachers function. It would therefore appear that social norms in operation within departments or building faculties could either inhibit or enhance

---

[1]Institute for Development of Educational Activities, Inc., /I/D/E/A/ Reporter. A newsletter prepared by the Institute for Development of Educational Activities, Inc. (Melbourne, Florida, Fall Edition, 1969), p. 9.

[2]Brickell, op. cit., p. 23.

[3]Miles, op. cit., p. 307.

the prospects of the adoption of new units of instruction by industrial arts teachers.

Students.--Brickell revealed that teachers are concerned about adopting changes which may not be appropriate for their students. In discussing that point, he said:

> An essential purpose of the visit is to enable the observer to compare conditions in the two schools. He is especially wary of variations in mental ability of pupils, financial support of the program, physical facilities, make-up of the community and characteristics of the teachers.[1]

Brickell also found that:

> Instructional innovations are almost always evaluated by observing the reactions of the students while they are receiving the new instruction. In the eyes of the practitioner, no other evidence outweighs student reaction as a measure of success.[2]

In view of Brickell's statements, it appears quite likely that industrial arts teachers may reject new instructional ideas because they think their students will react negatively to them. However, the teachers may adopt new programs which their students desire.

Individual teachers.-- Brickell found in his study of New York State teachers that classroom teachers may make the following types of changes themselves: (1) change in classroom practice, (2) relocation of existing curriculum content, (3) introduction of single special courses at the high school level. Brickell stated, "The teacher exerts almost complete

---

[1]Brickell, op. cit., p. 29.

[2]Ibid., p. 33.

control over his own classroom work. In fact the administrator often does not know what the teacher is doing from day to day."[1] Brickell's research tends to support an underlying assumption of this study--that teachers exercise some autonomy in the selection of instructional units.

Time

Rogers indicated that time available for the client to assimilate the innovation can greatly affect its adoption.[2] He and several other rural sociologists developed an adoption model with the five stages of (1) awareness, (2) interest, (3) evaluation, (4) trial, and (5) adoption.[3] Rogers said, "There is not complete agreement as to the number of stages in the adoption process, although there is general consensus on the existence of stages, and that adoption is seldom an 'impulse' decision."[4]

If Brickell's conclusion can be accepted, that "In the eyes of the practitioner, no other evidence outweighs student reaction as a measure of success,"[5] it would appear that the evaluation stage of Rogers' adoption model cannot be reached until teachers have actually seen units taught. It would therefore appear that the time required for teachers to

---

[1]Ibid., p. 25.

[2]Rogers, op. cit., p. 17.

[3]Ibid., p. 81.

[4]Ibid., p. 80.

[5]Brickell, op. cit., p. 33.

adopt units could be shortened by exposing them through demonstrations rather than by discussion or reading about the units. The teachers could thereby reach the evaluation stage sooner.

In the present study, exposure of teachers to units through observing teachers in other schools was not ranked as high as exposure by observing teachers in the same building. That relationship was hypothesized primarily because the exposure through visitation to other schools is often for only a portion of a day. The time requirement theorized by Rogers is thus related to that hypothesized relationship.

Communication

Havighurst and Neugarten identified methods of communication in three broad socialization categories of reward and punishment, didactic teaching, and imitation.[1] The methods of exposure of industrial arts teachers to instructional units used for the present study may all be identified with either didactic or imitation methods of communication. Discussion of units in college classes, presentations by speakers at meetings, and reading about units are all didactic methods. Being exposed to units by performing the activities in college laboratories or in junior or senior high school classes or by observations of other teachers are all means by which teachers could learn through imitation of instructors.

---

[1]Robert J. Havighurst and Bernice L. Neugarten, Society and Education (Boston: Allyn and Bacon, Inc., 1962), p. 77.

It has been hypothesized in this study that teachers who have been exposed to instructional units by imitative methods are more likely to teach the units than those who have been exposed to the units by didactic methods.

Exposure by reading, class discussion, and lecture.--In reviewing methods of teaching, Wingo indicated that the lecture method, reading, and class discussions have frequently been examined and compared as methods of instruction, with no conclusive evidence indicating the efficiency of one method over another.[1]

Wingo also revealed that the lecture method, reading, and class discussions have been compared to the project and laboratory methods of teaching. He expressed some reservations about making generalized statements regarding the efficiency of certain methods because of the lack of clear definitions of each one. However, he did say research generally indicated the project and laboratory methods were superior to lecture and discussion methods of instruction.[2] Exposure of teachers to instructional units by having them participate in such units as junior or senior high school students or as college students appears to fall in the category of the laboratory method of instruction. In light of Wingo's conclusions, it would appear that teachers would be more likely to

---

[1]Chester W. Harris and Marie R. Liba, eds., Encyclopedia of Educational Research (New York: The Macmillan Company, 1960), p. 853.

[2]Ibid., pp. 851-852.

teach units if they had been exposed to them by participation in them, rather than by presentations by speakers at meetings, discussions in college classes, or reading about them. That relationship was hypothesized for this study.

Exposure through imitation.--Havighurst and Neugarten wrote:

> A large part of what the child learns occurs through unconscious imitation and identification. Yet parents, teachers, and other adults, in planning socialization experiences for children and adolescents, are probably making less than full use of these processes. In many learning situations where adults rely upon the methods of reward and punishment or upon didactic teaching, learning might well be left to the child's tendency to imitate and identify with admired people around him. In the classroom situation, for example, the processes of unconscious imitation and identification occur as frequently as elsewhere, they might occur even more frequently if teachers focused their attention upon them. The teacher who is first admired as a person will be more effective as a teacher.[1]

Bandura and Walters also reflected on the lack of the use of imitative learning, for they said:

> The importance of social agents as a source of patterns of behavior continues to be largely ignored, despite evidence from informal observation and laboratory experimentation that the provision of models in actual or symbolic form is an exceedingly effective procedure for transmitting and controlling behavior.[2]

Bandura and Ross demonstrated that models are effective in shaping children's aggressive and problem-solving behavior, even though the aggressive techniques exhibited

---

[1] Havighurst and Neugarten, op. cit., p. 77.

[2] Albert Bandura and Richard H. Walters, Social Learning and Personality Development (New York: Holt, Rinehart and Winston, Inc., 1964), p. 51.

were contrary to more socially acceptable behavior exhibited by the children's parents.[1]

In discussing the findings in his study of change in schools in the state of New York, Brickell stated:

> The consultant asked hundreds of teachers and administrators, "What does it take to persuade you to adopt a program being used in another school? What would make you feel the program might be worth a try?" Their answers were remarkably uniform. The most persuasive experience a school person can have is to visit a successful new program and to observe it in action. Speeches, literature, research reports and conversations with participants outside the actual instructional setting are interesting but relatively unconvincing. Implication: Recommended new programs must be demonstrated so they can be observed in action.[2]

It would appear to be a reasonable assumption that teachers might adopt instructional goals and methods through a modeling process very much as children do. Observation of other teachers and their student teaching experiences are two planned phases of their education by which teachers in training may develop modeling tendencies. However, it should not be forgotten that the teachers have been exposed to teacher models all through their educational programs, from elementary grades through the college level; and that those less formally designed modeling experiences may greatly influence prospective teachers. For example, an industrial arts teacher educator who espoused the virtues of teaching units of quantity production and experimentation and research, but who provided his preservice teachers only the activity of individual

---

[1] Ibid., p. 61.

[2] Brickell, op. cit., p. 27.

projects, may well have indicated to his students that providing units of instruction by individual projects was much more important than teaching units of quantity production and experimentation. The preservice teachers would be especially prone to model the teacher educators with whom they identified.

Brickell discovered that while educators in New York State indicated the most convincing method of communicating the essence of a new program was through observing it, the observed situation must be demonstrated in situations very similar to those of the observers. If the observed situations tended to differ from those of the observers, the observers were apt to conclude that the programs could not be duplicated in their schools because the differences in teaching situations would cause them to fail.[1] Likewise, New York educators rejected the idea of a centrally located demonstration center because they believed it would provide an artificial situation. They rejected campus schools as demonstration centers for the same reason.[2]

Films as special devices for imitative learning.--Bandura and his associates found that film mediated models were as effective as real-life models in transmitting deviant patterns of behavior.[3]

---

[1] Brickell, op. cit., p. 29.

[2] Ibid., pp. 29-30.

[3] Bandura and Walters, op. cit., p. 61.

Orme set up an experiment in which he tested the relative effects of symbolic and perceptual modeling in teaching selected instructional skills to student teachers. The symbolic modeling was provided by written and verbal instructions, whereas the perceptual modeling was provided by means of a filmed model who portrayed the desired behavior. Orme found the perceptual modeling method to be significantly more effective than the symbolic method in helping teachers to acquire the desired behavior; but he also found that a combination of symbolic and perceptual modeling was more effective than either of the methods used alone.[1]

Freedman randomly assigned Hunter College elementary education students to three methods of observing elementary classrooms. He concluded that observation by kinescope presentation was superior to observation by live television or direct observation.[2]

Fulton and Rupiper found that preservice teachers who observed motion pictures of classrooms scored higher on a test of observed behavior than those who observed classrooms directly.[3]

---

[1]Michael E. Orme, "The Effects of Modeling and Feedback Variables on the Acquisition of a Complex Teaching Strategy" (unpublished Doctoral dissertation, Stanford University, 1966), pp. 81-82.

[2]Frederick R. Cyphert and Ernest Spaights, An Analysis and Projection of Research in Teacher Education, Cooperative Research Project No. F-015 (Columbus, Ohio: The Ohio State University Research Foundation, 1964), p. 44.

[3]*Ibid.*, pp. 44-45.

Communications through professional meetings.--Brickell found that educators tended to believe that speakers at professional meetings were not truthful about the successes and limitations of the innovations they described. The educators indicated that speakers tended to make their schools and programs sound like they were highly successful.[1]

Communications through writing.--Brickell found that educators tended to suspect that articles in professional journals and research reports tended to maximize the successes of innovative programs.[2]

Communications through peers.--New York educators indicated to Brickell that they tended to believe reports about new programs if the persons giving the reports were outside the agency which provided the new program. That was especially true if the conversations were with personal friends. However, those convictions fell short of being as adequate as observation of the new programs, because there were too many elements in the new programs which could not be communicated by any sort of verbal description.[3]

In discussing the communication of innovations from innovative to adopter groups, Miles said:

> . . . it seems essential to create explicit communication channels between persons in and out of the innovating groups, particularly at the peer level. Such channels

---

[1]Brickell, op. cit., pp. 27-28.

[2]Ibid., p. 28.

[3]Ibid.

> not only supply feedback on the progress of the innovation's acceptance and development, but serve to increase the credibility of innovators and add support from the environment.[1]

After reviewing the conclusions of Katz and Menzel and Coleman and Rahim, as well as his own research with Beal, Rogers concluded that personal influence from peers was more important: (1) at the evaluative stage and less important at other stages, (2) for relatively later adopters than for earlier adopters, (3) in uncertain situations than in clear-cut situations.[2]

Brickell also concluded that educators tended to be influenced by friends to accept new programs.[3]

Communication of knowledge to proceed.--Brickell concluded that innovative programs were more apt to fail because of the inabilities of the teachers to carry them out than by teachers' reluctance to attempt them. He suggested that the key to successful implementation of new programs was to give teachers the assistance they needed to learn to do new tasks. He recommended that assistance be given in the forms of guided practice with an expert at hand, lots of instructional materials, encouragement, and a chance to get ideas from other teachers who were learning the new program.[4]

---

[1] Miles, op. cit., p. 655.

[2] Rogers, op. cit., pp. 219-222.

[3] Brickell, op. cit., p. 28.

[4] Ibid., pp. 31-32.

Summary

The elements in the process of change, as identified and considered by several researchers, were discussed in this chapter. The relationship of each of the elements to the present study was also examined.

The characteristics of educational systems, assessment of results, and the nature of the innovations undoubtedly have some differing effects on the adoption of the units studied. However, the present study is concerned with identifying methods of communication which are strongly related to teachers' use of all the units. The purpose of the study does not involve looking for communication methods which would be more effective with some units than others.

The research supports the conclusion that principals, other teachers, and students might influence teachers' selection of units. Thus, those elements of the teachers' social systems were included in the selected reasons to which teachers could respond for having taught or for not having taught the units. However, the research also supports the conclusion that teachers are free to make independent changes within their classroom programs if the changes do not affect other teachers. Industrial arts teachers' choices of instructional units appear to fall in that category. Therefore, the major thrust of the study focuses on methods by which individual teachers were influenced to select units of instruction.

Brickell indicated that teachers fail to continue new programs because they lack the knowledge to proceed.

Therefore, lack of knowledge was included as a response teachers could make for not having taught the units.

The research on modeling and Brickell's research support the hypothesis that teachers are more likely to accept and use programs which they have seen demonstrated in situations very much like their own. The research also especially indicated that the demonstration and discussion of the new programs should be done by the teachers' peers.

The research cited has not been applied to the field of industrial arts. Therefore, the present study represents an attempt to carry out the research in that field.

Chapter III contains a discussion of the design and instrumentation of the study.

CHAPTER III

DESIGN AND INSTRUMENTATION OF THE STUDY

The primary purpose of the study was to determine whether certain relationships exist between selected methods of exposing Michigan industrial arts teachers to certain instructional units and teachers' indicated use of those units. The differences hypothesized are presented in the null (H_o) and alternate (H_1) form in this chapter.

The Spearman rank-difference correlation coefficient and the analysis of variance were computed as two separate analyses of the data. Therefore, the (H_o) and (H_1) statements of the hypothesis are stated for each method of analysis.

The secondary purpose of the study was to determine the frequency with which teachers indicated certain reasons why they had or had not taught the units identified for the study.

Null and Alternate Hypotheses

H_o: Methods of exposure ranked by proportion of teachers who taught the units to which they had been exposed will not be significantly correlated to the predicted rank of methods of exposure.

H_1: Methods of exposure ranked by proportion of teachers who taught the units to which they had been exposed will be significantly correlated to the predicted rank of methods of exposure.

H_o: There will not be a significant difference between the means of exposure scores for teachers who taught units and those teachers who did not.

H_1: There will be a significant difference between the means of exposure scores for teachers who taught units and those teachers who did not.

Initial Instrument Development

The first part of the instrument used in the study was developed to determine the extent to which teachers reported use of instructional units was related to the methods by which they had been exposed to the units.

The second part of the instrument was designed to determine the frequency with which teachers indicated certain reasons why they had or had not taught the units.

Development of the instrument involved: (a) identification of the instructional units to be included, (b) identification of methods by which teachers might have been exposed to the units, and (c) reasons given for teaching or not teaching the units of instruction.

Identification of Units of Instruction

Units of instruction were identified through a review of literature in the industrial arts field. There was no attempt to exhaust all possible units; rather, only those which appeared frequently in the literature were included.

Quantity production.--"Quantity production" is a term which is frequently used in industrial arts literature as a name for a unit of instruction in which students are organized to simulate a manufacturing company. The students frequently design, produce, and sell an article. The primary purpose of the unit is generally to help students to understand how companies organize human and material resources to "mass produce" products which incorporate parts which can be interchanged. The economic and social significance of "mass production" are emphasized. Leaders such as Wilber and Hostetler have advocated teaching units in quantity production.[1] The following definition was derived for the inventory:

> The class is organized to function as a group to produce multiple copies of objects. The objects are considered to function interchangeably and are composed of interchangeable parts.

Experimentation and research.--Maley expounded the virtues of "experimentation and research" as a unit of instruction.[2] The instructional emphasis in the unit is generally focused on attitudes and problem-solving abilities, which are reflected in scientific data collection and analysis. The recognition of research and experimentation as an aspect of industry is also frequently stressed. The appearance of materials testing equipment which has been designed for industrial arts laboratories is evidence that the unit has become somewhat accepted by teachers. The following definition was developed for the inventory:

> Students conduct experiments with industrial products and equipment, or student-produced equipment, which result in data collection and analysis. Major

---

[1]Miller and Smalley, op. cit., pp. 205 and 223.

[2]Billett, Maley, and Hammond, op. cit., pp. 5-13.

> emphasis is on student recognition of experimentation and research as an industrial process and the development of students' abilities to solve problems.

<u>Model industry</u>.--The study of a "model industry" seems to have been given considerable impetus by John Dewey's emphasis on having students learn about something by having them at least simulate the situation and the thing about which they were to learn. In more recent years, various members of the staff of the University of Maryland have advocated building models as a part of the study of the selected industry. The instructional emphasis generally appears to be on how a company procures a raw product and follows a series of steps to produce an article such as brick or paper. The study generally puts less emphasis on the human organization than is required in the unit on "quantity production." The following definition was developed for use with the inventory:

> Students construct a scale model of an industrial plant while they also study the plant's sources of materials, processing methods, human and physical organization of the plant, and products produced.

<u>Practice pieces</u>.--Units of instruction oriented toward "practice pieces or modules" appear to be a holdover from the impact of the Russian exhibit at the Centennial Exposition in Philadelphia in 1876. Writers such as Fryklund have tended to encourage the continuation of the unit through their promotion of the analyses of trades as a basis for industrial arts instruction.[1] The practice pieces or modules frequently

---

[1]Miller and Smalley, <u>op. cit</u>., pp. 164 and 242-253.

are not designed to be a useful part of any article, but are completed as a means to help students develop technical insights and manual skills as ends in themselves. The definition which follows was developed for the inventory:

> Students produce practice pieces or modules which are designed to assist students to develop manual skills and insights regarding proper procedures, tools, equipment, and materials. The practice pieces are not meant to be useful articles beyond the class setting.

Product design.--"Product design" has been encouraged by Lindbeck, Lahti, and others as a basis for teaching problem solving and the application of elements of design.[1] The unit is also offered to help students become more aware of the engineering functions of industry. The following definition was developed for the inventory:

> Students plan articles to fulfill functions which have been specified by the instructor or themselves. Major instructional emphasis is placed on student problem solving and application of elements of design.

Projects.--Individually or group-constructed "projects" which are useful articles have been utilized as instructional units for many decades. This particular unit appears to have been offered primarily to attain two instructional goals. Teachers may provide the unit as a vehicle to teach knowledge of tools and materials and to help students develop manual skills. Other teachers put more instructional emphasis on the development of students' abilities to solve problems. Industrial arts leaders have frequently expressed concern over the

---

[1]Miller and Smalley, op. cit., pp. 267-271.

emphasis they have seen teachers place on the first rather than the last of these two goals.[1] However, that distinction of purpose was not crucial for this study. Therefore, the following definition was utilized:

> Students individually, or as a group, construct articles which are intended to be useful beyond the class setting. Interchangeability of parts is not required. The selection of which articles a student may construct may be made either by the instructor or the student.

Identification of Methods of Exposure

Those methods by which industrial arts teachers commonly learn about new instructional programs were identified as the methods of exposure.

The statements of exposure incorporated specified duration of the exposures so that it might be possible to replicate the research.

The methods of exposure, as stated in the inventory, are listed below:

College lab--You were enrolled in a college class where you devoted at least one week of class time to the performance of activities designed to achieve the objectives of the unit as opposed to merely discussing or writing about what activities should be performed.

Discussed in college class--You were enrolled in a college class where at least 30 minutes of class time was devoted to the discussion of possible activities associated with the unit, but you did not perform such activities in that class.

Student teaching--You observed your student teaching supervisor provide his class instructional activities designed to achieve the goals of the unit for a period of at least 30

---

[1] *Ibid.*, pp. 220-233.

minutes. (Your student teaching supervisor was the person who had immediate responsibility for providing the instructional activities for the class for which you did your student teaching.)

Fellow teacher--You observed a teacher, who taught in the same building, provide his class instructional activities designed to achieve the goals of the unit for a period of at least 30 minutes.

Other school--You observed a teacher, in a school building other than your own, provide his class instructional activities designed to achieve the goals of the unit for a period of at least 30 minutes.

Jr.-Sr. high experience--You were enrolled in a junior or senior high school class where you devoted at least one week of class time to the performance of activities designed to achieve the objectives of the unit as opposed to merely discussing or writing about what activities should be performed.

Read about--You have read an account of how to teach the unit. The length of the text of the account was the equivalent of one double-spaced 8-1/2" x 11" typewritten page.

Identification of Reasons for Teaching or for Not Teaching the Units

The reasons indicated in the inventory for teaching or for not teaching the units were those commonly given by teachers for making choices of instructional units. They are listed below:

For Teaching:

Required curriculum--The unit is a required part of the curriculum.

Requested by administration--Your administration requested that you teach the unit.

Other IA teachers wanted it--Other industrial arts teachers in your system asked you to teach the unit.

For Not Teaching:

Other IA class--Your students have/or will experience the unit in other industrial arts classes.

Inappropriate for technical area--The unit is inappropriate for the technical area you teach.

Administration didn't want it--Your administration asked you not to teach the unit.

Students not capable--Your students are socially, physically, or mentally incapable of profiting from the unit.

Knowledge to proceed--You do not know how to organize the unit.

Facilities--Your industrial arts facilities are inadequate to teach the unit.

Funds--You do not have sufficient funds in your budget to provide the unit.

Pretesting and Refinement of the Instrument

A pilot study was conducted to obtain reactions to the questionnaire and the cover letter.[1] Reactions were also obtained from the members of an industrial arts doctoral seminar group at Michigan State University.

Pilot Study Procedures

Twenty-five industrial arts teachers were randomly selected from the Michigan Department of Education Register of Certified Personnel--Alphabetical List of Industrial Education Personnel as of February 1971.

Copies of the proposed cover letter, inventory, and reaction and suggestion sheet were mailed on March 22, 1971, to each of the 25 teachers in the pilot group (Appendix A). The teachers were asked to:

---

[1]Copies of the proposed pilot study cover letter, inventory, and reaction and suggestion sheet, and letter to the pilot group are included in Appendix A.

1. Read the proposed cover letter.
2. Read, complete, and write on the inventory any comments they might wish to make.
3. Complete the reaction and suggestion sheet.

The teachers who had not returned the pilot study material by April 6th were sent a follow-up letter.

Results of the Pilot Study

Just seven of the group of 25 teachers in the pilot study returned the material requested. The results of those returns are indicated below.

Five of the seven respondents indicated that the introductory letter would have motivated them to respond to the inventory. One responded by checking "No"; but he did not offer any comments. The seventh teacher commented "so-so" to the question.

Five teachers indicated that the introductory letter adequately explained the purpose of the study. They did not offer any comments. The other two respondents indicated that the letter did not adequately explain the purpose of the study, but they did not offer any comments.

All seven respondents indicated that the directions for responding to the inventory were clear and sufficient. None offered additional comments. All seven teachers responded that the directions of the six instructional units were clear and sufficient. One teacher indicated that the blank columns should be eliminated from the inventory. None of the teachers appeared to have any difficulty completing the inventory.

Feedback From the Seminar Group

A seminar group of industrial arts doctoral students from Michigan State University was selected to provide feedback because they all had had recent teaching experience or were presently teaching at the secondary level. The students were also chosen because they were attempting to organize their own research projects and could therefore bring to bear those insights gained from their own activities.

As a result of the meeting with the seminar group, the amount of exposure time was dropped from each description of methods of exposure because members of the group expressed the belief that people varied too much in the amount of time they required to make an adequate observation.

The reference to construction of a scale model of an industrial plant was dropped from the description of the "Model Industry" unit because several members of the seminar group indicated that the study of selected industries frequently did not entail the construction of models. The title of the unit was also changed from "Model Industry" to "Selected Industry."

The group also suggested that exposure through professional meetings and by means of movies, slides, or video tape should be incorporated in the methods of exposure. They also suggested the addition of a category of "You Value It--You consider the unit to be a valuable experience for your students." should be added to the reasons for having taught the units.

The seminar group also offered several comments which were incorporated in the cover letter.

The Final Instrument

The final instrument incorporated the directions for completion of the inventory and explanation of methods of exposure on the same page as the inventory, rather than as a cover page. The reasons for having taught or not having taught the units were incorporated in a second page of the inventory.

The final instrument also included a request for the respondents to indicate the grade level and length of time for which a unit had been taught. These data were requested to provide some insight regarding any differences between junior and senior high school classes in the selection of units. The data were also gathered to determine whether the teachers tended to carry out the units or drop them after a brief trial.[1]

Administration of the Instrument

The Sample

The sample used in the study was randomly selected from the entire population of industrial arts teachers in Michigan.

---

[1]Copies of the final inventory, cover letter, and follow-up letter are found in Appendix B.

The sample of 500 teachers was drawn from a computer printout of the Michigan Department of Public Instruction Register of Certified Personnel--Alphabetical List of Industrial Education Personnel as of February 1971.

Mailing and Follow-Up Procedures

The cover letter, inventory, and a self-addressed return envelope were mailed during the period of May 7-11, 1971. A follow-up letter and additional copy of the inventory were mailed on May 26-27, 1971.

Returns

A total of 308 of the 500 selected teachers returned completed inventories. Seven of the returns were incomplete and were therefore not used in the analysis of the data.

Although the teachers who did not respond to the inventory could seriously have biased the data, there was no additional attempt to secure their responses because all mailing had been done to the teachers' school addresses. Due to the closing of the academic year, and the lack of home addresses, it became impractical to attempt to obtain further responses.

Data Preparation

The data from each inventory were entered on two data processing cards. A card was used for each page of the inventory. All of the possible methods of exposure for each unit were assigned a zero or one. The one indicated that the teacher had been exposed to the unit in that particular way. A one was also key punched on the card if the teacher had taught the unit. A zero was utilized if the teacher had not taught the unit.

Statistical Analysis

The Spearman rank-difference correlation coefficient was used to test the null hypothesis in the first method of analysis. The Spearman rank-difference correlation was chosen as a method of analysis because the hypothesis had been stated as a rank order, and it was possible to convert the incidence of reported exposure to units to a similar rank for statistical analysis.

The .05 level of significance was used for the Spearman rank-difference correlation coefficient to determine whether the null hypothesis would be accepted or rejected. The correlations were all inspected to determine their magnitude and direction.

The analysis of variance was utilized as a second method of analysis of the data. The method allowed crediting each method of exposure for each unit to each teacher, rather than assigning him his highest level and ignoring all others, as was necessary in the first method of analysis.

The .01 level of significance was utilized as a basis for accepting or rejecting the null hypothesis.

The data from the second page of the inventory indicated the frequencies with which the teachers reported reasons for teaching or not teaching the units. Those data were presented as frequencies of responses and as percentages of total frequencies.

Summary

This chapter contained a statement of the null and alternate hypotheses, and a discussion of the development, testing, and administration of the inventory and statistical design. The major hypotheses were that: (1) Methods of exposure ranked by proportion of teachers who taught the units to which they had been exposed would be significantly correlated to the predicted rank of the methods of exposure, and (2) There would be a significant difference between the means of exposure scores for those teachers who taught units and those teachers who did not.

The final instrument contained two major parts. The first part solicited responses from each teacher to determine their exposure to the units and whether they had taught them. The second part requested teachers to indicate why they had taught or had not taught the units.

The inventory was sent to Michigan industrial arts teachers. Usable returns were received from 301 teachers.

The Spearman rank-difference correlation and the analysis of variance were utilized to analyze the data. The .05 level of significance was employed with the first method of analysis, and the .01 level was used with the latter.

The analysis of the data obtained from the inventory is presented in Chapter IV.

CHAPTER IV

ANALYSIS OF THE DATA

Introduction

The "Industrial Arts Unit Inventory" was sent to 500 Michigan industrial arts teachers in May of 1971. The statistical analyses of the hypothesized relationships were conducted on 301 usable responses. The frequencies of reasons given for teaching or not teaching units were also calculated on the 301 usable responses.

The data were analyzed in three ways to maximize the depth of analysis and to check the conclusions drawn from each method of analysis.

The first two analyses presented offered the advantage of analyzing the apparent strength of each type of exposure, but ignored situations in which teachers had been exposed to units in more than one way.

The third analysis of the data accounted for multiple methods of exposure of teachers to units, but it did not allow for an analysis of the apparent strengths of different types of exposures.

Hypothesized Relationships Between Methods of Exposure of Teachers to Units and Their Indicated Use of the Units

The major hypothesis is restated below for convenient reference for the following discussion:

> When ranking methods by which Michigan secondary industrial arts teachers had been exposed to selected industrial arts instructional units from greatest to least on the basis of reported incidence of use of the instructional units by those teachers, the following rank order will occur: fellow teacher; student teaching; college laboratory; other schools; movie, video tape, or slides; junior and/or senior high school; meeting; discussed in college class; and read about.

Analysis Number One: Assignment to One Method of Exposure

Each teacher was categorized according to his highest level of exposure for each unit. The levels of the methods of exposure were determined by the ranking stated in the hypothesis. For example, exposure by fellow teacher was hypothesized to be more closely associated with teaching the units than exposure by reading. Therefore, if a teacher had been exposed in both ways, the teacher was categorized only as having been exposed by a fellow teacher. Table 1 presents a hypothetical example of the assignment process.

The assignment process yielded a group of teachers for each of the ten sources of exposure for each unit. It also yielded a group who had not been exposed to each of the units. Those data are represented by the bottom figure of each cell in Table 2.

TABLE 1.--An example of assignment to methods of exposure.

Methods of Exposure	Hypothetical Pattern of Exposures for an Individual: Quantity Production	Exper. & Research	Selected Industry	Practice Pieces	Product Design	Projects	Predicted Rank of Methods of Exposure	Resulting Assignment to Highest Order of Exposure: Quantity Production	Exper. & Research	Selected Industry	Practice Pieces	Product Design	Projects
Fellow teacher			x			x	1			x			x
Student teaching		x				x	2		x				
College laboratory		x	x		x		3					x	
Other school	x					x	4	x					
Movie, etc. jr-sr high	x				x		5						
Movie, etc. college							6						
Jr-sr high experience				x		x	7				x		
Meeting	x					x	8						
Discussion--class	x	x	x		x	x	9						
Read about	x	x			x	x	10						
None of above													

TABLE 2.--Calculation of the rank across all methods of exposure.

	Number of Teachers Assigned to Each Unit and Number Who Taught the Units[a]								
Methods of Exposure	Quantity Production	Exper. & Research	Selected Industry	Practice Pieces	Product Design	Projects	Totals Across All Units	Proportion Who Taught	Rank Across All Units
Fellow teacher	26 67	14 29	20 25	48 57	59 67	142 150	309 395	.7823	1
Student teaching	8 16	5 12	8 16	24 28	37 42	40 44	122 158	.7721	2
Movie, etc. college	2 4	2 3	0 0	0 0	1 1	0 0	5 8	.6250	3
College lab.	43 69	31 87	24 54	58 92	77 118	47 57	280 477	.6195	4
Other school	5 15	4 12	2 9	4 10	2 6	8 8	26 60	.4166	5
Jr-sr high	0 3	1 2	0 0	1 8	2 3	4 10	8 26	.3077	6
Movie, etc. jr-sr	10 20	1 13	2 23	4 6	2 2	0 0	19 64	.2969	7
Meeting	4 4	0 7	2 9	0 3	2 4	0 0	8 27	.2962	8
Read about	9 15	7 28	4 28	1 12	7 15	1 3	29 101	.2871	9
Discussion--class	10 54	7 45	19 51	6 16	3 13	3 3	48 182	.2637	10
None of above	8 34	1 63	10 86	21 69	12 30	18 26	70 308	.2272	11

[a]The bottom number in each cell is the number exposed to the unit. The top number is the number who taught the unit.

Procedure to test the major hypothesis.--The number of teachers in each cell was summed across all units for each method of exposure. Those sums appear in Table 2 as the bottom numbers in the "Totals Across All Units" column. The top number in each cell of the same column represents the number of teachers who indicated they taught units to which they had been exposed. The ratios thus obtained were reduced to decimal equivalents to produce the figures in the column, "Proportion Who Taught." Each method of exposure was then ranked on the basis of the proportions which had been calculated. Those ranks appear under the column, "Rank Across All Units" in Table 2.

The reported rank across all units was compared to the predicted rank of methods of exposure in Table 3. The Spearman rank-difference correlation coefficient was computed and found to be .90. The null hypothesis was rejected and the alternate hypothesis was accepted, since p exceeded the table value necessary to meet the .05 level of significance.

H_o: Methods of exposure ranked by proportion of teachers who taught the units to which they had been exposed will not be significantly correlated to the predicted rank of methods of exposure.

H_1: Methods of exposure ranked by proportion of teachers who taught the units to which they had been exposed will be significantly correlated to the predicted rank of methods of exposure.

It was concluded that the reported rank computed from teachers' reported exposure and incidence of use was highly correlated to the predicted rank of the methods of exposure.

TABLE 3.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure across all units.

Methods of Exposure	Reported Rank Across All Units	Predicted Rank
Fellow teacher	1	1
Student teaching	2	2
College laboratory	4	3
Other school	5	4
Movie, etc. jr-sr high	7	5
Movie, etc. college	3	6
Jr-sr high school	6	7
Meeting	8	8
Discussion in college class	10	9
Read about	9	10
None of above	11	11

p = .90; significant at .05 level

Visual analysis of the computed rank of methods of exposure reveals that all demonstration methods ranked higher than exposure through discussion in a college class or by reading. That finding supports an underlying premise of the hypothesis, which indicated that teachers would be more likely to teach units which they had seen demonstrated.

It appears that exposure by an audio-visual presentation of a college class carrying out the unit was much more closely related to teaching the unit than had been expected. The same situation appears to be true for exposure through junior or senior high school experience. However, the cells across all six units for each of those methods of exposure contained zeros and small numbers of teachers. They could have been very susceptible to error by chance. Therefore, a second analysis of the data was completed by contrasting the rank order of exposures for each unit with the rank order predicted across all units.

Rank order of exposures for each unit correlated with rank order predicted across all units.--The rank of methods of exposure for each unit was obtained by determining the proportion of teachers in each cell who had taught units to which they had been exposed. The proportions obtained were ranked for each unit.

The Spearman rank-difference correlation coefficients between the rank of each unit and the predicted rank were computed. Tables 4 through 10 present the calculations of the ranks of the units and the correlations.

The Spearman rank-difference correlation coefficients were found to be .2637 for quantity production, .5454 for experimentation and research, .5910 for selected industry, .6978 for practice pieces or modules, .5069 for product design, and .2978 for projects. The null hypothesis was accepted for all units except practice pieces because that value of "p" was the only one which exceeded the table value necessary to meet the .05 level of significance.

TABLE 4.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure for quantity production.

Methods of Exposure	Proportions of Teachers[a]	Proportions Rank	Predicted Rank
Fellow teacher	$\frac{26}{67}$ = .3881	7	1
Student Teaching	$\frac{8}{16}$ = .5000	5	2
College laboratory	$\frac{43}{69}$ = .6232	2	3
Other school	$\frac{5}{15}$ = .3333	8	4
Movie, etc. jr-sr	$\frac{10}{20}$ = .5000	5	5
Movie, etc. college	$\frac{2}{4}$ = .5000	5	6
Jr-sr high experience	$\frac{0}{3}$ = .0000	11	7
Meeting	$\frac{4}{4}$ =1.0000	1	8
Discussion	$\frac{10}{54}$ = .1852	10	9
Read about	$\frac{9}{15}$ = .6000	3	10
None of above	$\frac{8}{34}$ = .2105	9	11

p = .2637; not significant at .05 level

[a]The proportion of those who taught the unit out of the total exposed. Calculated for each cell. The ratios were taken from Table 2.

TABLE 5.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure for experimentation and research.

Methods of Exposure	Proportions of Teachers[a]	Proportions Rank	Predicted Rank
Fellow teacher	$\frac{14}{29}$ = .4827	3	1
Student teaching	$\frac{5}{12}$ = .4166	4	2
College laboratory	$\frac{31}{87}$ = .3565	5	3
Other school	$\frac{4}{12}$ = .3333	6	4
Movie, etc. jr-sr	$\frac{1}{13}$ = .0769	9	5
Movie, etc. college	$\frac{2}{3}$ = .6666	1	6
jr-sr high experience	$\frac{1}{2}$ = .5000	2	7
Meeting	$\frac{0}{7}$ = .0000	11	8
Discussed in class	$\frac{7}{45}$ = .1555	8	9
Read about	$\frac{7}{28}$ = .2500	7	10
None of above	$\frac{1}{63}$ = .0160	10	11
	p = .5454; not significant at .05 level		

[a]The proportion of those who taught the unit out of the total exposed. Calculated for each cell. The ratios were taken from Table 2.

TABLE 6.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure for selected industry.

Methods of Exposure	Proportions of Teachers[a]	Proportions Rank	Predicted Rank
Fellow teacher	$\frac{20}{25}$ = .8000	1	1
Student teaching	$\frac{8}{16}$ = .5000	2	2
College laboratory	$\frac{24}{54}$ = .4444	3	3
Other school	$\frac{2}{9}$ = .2222	5.5	4
Movie, etc. jr-sr	$\frac{2}{23}$ = .0869	9	5
Movie, etc. college	$\frac{0}{0}$ = .0000	10.5	6
jr-sr high experience	$\frac{0}{0}$ = .0000	10.5	7
Meeting	$\frac{2}{9}$ = .2222	5.5	8
Discussion in class	$\frac{19}{51}$ = .3725	4	9
Read about	$\frac{4}{28}$ = .1428	7	10
None of above	$\frac{10}{86}$ = .1149	8	11

p = .5910; not significant at .05 level

[a]The proportion of those who taught the unit out of the total exposed. Calculated for each cell. The ratios were taken from Table 2.

TABLE 7.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure for practice pieces.

Methods of Exposure	Proportions of Teachers[a]	Proportions Rank	Predicted Rank
Fellow teacher	$\frac{48}{57}$ = .8421	2	1
Student teaching	$\frac{24}{28}$ = .8571	1	2
College laboratory	$\frac{58}{92}$ = .6304	4	3
Other school	$\frac{4}{10}$ = .4000	5	4
Movie, etc. jr-sr	$\frac{4}{6}$ = .6666	3	5
Movie, etc. college	$\frac{0}{0}$ = .0000	10.5	6
Jr-sr high experience	$\frac{1}{8}$ = .1250	8	7
Meeting	$\frac{0}{3}$ = .0000	10.5	8
Discussion	$\frac{6}{16}$ = .3750	6	9
Read about	$\frac{1}{12}$ = .0833	9	10
None of above	$\frac{21}{69}$ = .2957	7	11

p = .6978; significant at .05 level

[a]The proportion of those who taught the unit out of the total exposed. Calculated for each cell. The ratios were taken from Table 2.

TABLE 8.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure for product design.

Methods of Exposure	Proportions of Teachers[a]	Proportions Rank	Predicted Rank
Fellow teacher	$\frac{59}{67}$ = .8805	4	1
Student teaching	$\frac{37}{42}$ = .8809	3	2
College laboratory	$\frac{77}{118}$ = .6525	6	3
Other school	$\frac{2}{6}$ = .3333	10	4
Movie, etc. jr-sr	$\frac{2}{2}$ =1.0000	1.5	5
Movie, etc. college	$\frac{1}{1}$ =1.0000	1.5	6
Jr-sr high experience	$\frac{2}{3}$ = .6666	8	7
Meeting	$\frac{2}{4}$ = .5000	7	8
Discussion	$\frac{3}{13}$ = .2307	11	9
Read about	$\frac{7}{15}$ = .4666	8	10
None of above	$\frac{12}{30}$ = .4137	9	11

p = .5069; not significant at .05 level

[a]The proportion of those who taught the unit out of the total exposed. Calculated for each cell. The ratios were taken from Table 2.

TABLE 9.--The Spearman rank-difference correlation between the predicted and reported ranks of methods of exposure for projects.

Methods of Exposure	Proportions of Teachers[a]	Proportions Rank	Predicted Rank
Fellow teacher	$\frac{142}{150}$ = .9466	3	1
Student teaching	$\frac{40}{44}$ = .9090	4	2
College laboratory	$\frac{47}{57}$ = .8245	5	3
Other school	$\frac{8}{8}$ =1.0000	1.5	4
Movie, etc. jr-sr	$\frac{0}{0}$ = .0000	10	5
Movie, etc. college	$\frac{0}{0}$ = .0000	10	6
Jr-sr high experience	$\frac{4}{10}$ = .4000	7	7
Meeting	$\frac{0}{0}$ = .0000	10	8
Discussion	$\frac{3}{3}$ =1.0000	1.5	9
Read about	$\frac{1}{3}$ = .3333	8	10
None of above	$\frac{18}{26}$ = .7200	6	11

p = .2978; not significant at .05 level

[a]The proportion of those who taught the unit out of the total exposed. Calculated for each cell. The ratios were taken from Table 2.

TABLE 10.--The Spearman rank-difference correlations between the predicted and reported ranks of methods of exposure for all units.

Methods of Exposure	Quantity Production	Experimentation and Research	Model Industry	Practice Pieces or Modules	Product Design	Projects	Predicted Rank
Fellow teacher	7	3	1	2	4	3	1
Student teaching	5	4	2	1	3	4	2
College laboratory	2	5	3	4	6	5	3
Other school	8	6	5.5	5	10	1.5	4
Movie, etc. jr-sr	5	9	9	3	1.5	10	5
Movie, etc. college	5	1	10.5	10.5	1.5	10	6
Jr-sr high experience	11	2	10.5	8	5	7	7
Meeting	1	11	5.5	10.5	7	10	8
Discussion-class	10	8	4	6	1	1.5	9
Read about	3	7	7	9	8	8	10
None of above	8	10	8	7	9	6	11
Correlation (p) with predicted rank	.2637	.5454	.5910	.6978*	.5069	.2978	

*Significant at .05 level

It was concluded that the predicted rank was not significantly correlated with the computed rank for any of the units except practice pieces.

The conclusion obtained by the correlation of the rank of each unit with the predicted overall rank appears to be very much different from that which was drawn upon examination of the correlation between the rank computed over all units and the predicted rank. While it could be assumed that the goal of the study has been achieved because exposure methods which seem to hold over all units have been identified, the lack of significant correlations achieved in analyzing one unit at a time cast serious doubt upon the validity of the first analysis. However, the analysis of individual units resulted in the use of cells with low numbers and zeros, which might have subjected the ranking of exposures within individual units to a great deal of error. On the other hand, the analysis across all units combined to form 11 cells which contained larger numbers of teachers and were therefore less subject to error by chance.

While the explanation provided above appears to be plausible, it could have been subject to error. A third method of analysis therefore served to check the results obtained in the first and second methods of analysis.

Analysis Number Two: The Calculation of Exposure Scores for All Respondents

Each method of exposure was assigned a value from one through ten which reflected its position in the ranking predicted by the major hypothesis. The scores ranged from ten for exposure by a fellow teacher to one for reading about a unit. Table 11 presents the values for each of the methods of exposure.

TABLE 11.--Values assigned to methods of exposure for calculation of exposure scores.

Method of Exposure	Value Assigned
Fellow teacher	10
Student teaching	9
College laboratory	8
Other school	7
Movie, etc. jr-sr high	6
Movie, etc. college	5
Jr-sr high experience	4
Meeting	3
Discussion in college class	2
Read about	1

An exposure score was determined for each teacher for each unit by assigning him the appropriate number of points for each exposure he indicated. Table 12 presents an example of the determination of an individual's exposure score for each unit.

An analysis of variance was computed to determine if there were significant differences between the means of exposure scores for those teachers who taught units and those who did not teach them. Table 13 presents that analysis.

The null hypothesis, H_o, was rejected and the alternate hypothesis, H_1, was accepted.

H_o: There will not be significant differences between the means of exposure scores for teachers who taught units and those teachers who did not.

H_1: There will be significant differences between the means of exposure scores for teachers who taught units and those teachers who did not.

Significant differences beyond the .001 level of significance were found for all six units between the means of exposure scores of those teachers who taught the units and those who did not.

The second method of analysis strongly supported the high correlation found in the first analysis. Therefore, there appears to be strong support for the major hypothesis.

Possible Alternatives to the Hypothesized Relationships

In light of the fact that the .9 correlation found in the first analysis above reflects a very powerful theory, further analyses were conducted to determine whether there might be some alternative explanations for the perceived relationships.

TABLE 12.--An example of the determination of a teacher's exposure scores.

Methods of Exposure	Hypothetical Pattern of Exposures for An Individual: Quantity Production	Exper. & Research	Selected Industry	Practice Pieces	Product Design	Projects	Predicted Rank of Methods of Exposure	Resulting Assignment of Exposure Value: Quantity Production	Exper. & Research	Selected Industry	Practice Pieces	Product Design	Projects
Fellow teacher			x			x	1			10			10
Student teaching		x				x	2		9				9
College laboratory		x	x		x		3		8	8		8	
Other school	x					x	4	7					7
Movie, etc. jr-sr high	x				x		5	6				6	
Movie, etc. college							6						
Jr-sr high experience				x			7				4		
Meeting	x					x	8	3					3
Discussion--class	x	x	x		x	x	9	2	2	2		2	2
Read about	x	x			x	x	10	1	1			1	1
							Exposures Scores for Each Unit	19	20	20	4	17	32

TABLE 13.--The analysis of variance between exposure score means of teachers who taught units and those who didn't.

Unit	Exposure Scores Mean: Taught	Exposure Scores Mean: Did Not Teach	Std Dev.	Cell Size: Taught	Cell Size: Did Not Teach	Between MS	Within MS	F	Signif. p<*
Quantity Production	14.369	10.100	10.662	160	141	1365.78	113.72	12.01	.0007
Experiment. & Research	16.603	6.950	9.823	73	228	5150.32	96.50	53.37	.0001
Selected Industry	13.990	4.758	9.298	90	211	5375.48	86.46	62.17	.0001
Practice Pieces or Modules	17.300	6.700	11.914	163	138	8393.14	141.97	59.12	.0001
Product Design	19.58	9.290	12.754	205	96	6921.33	162.66	42.55	.0001
Projects	27.57	13.000	15.86	264	37	6894.48	251.62	27.40	.0001

*Significant beyond .001 level.

Exposure of teachers to units by observation of fellow teachers would be most likely to occur in larger schools. The larger school districts employ more industrial arts teachers; thus a teacher would have more colleagues who might expose him to new units. The small schools frequently employ one industrial arts teacher. Consequently, the teacher in the one-teacher situation could not possibly be exposed to units by a teacher in the same building. Therefore, an analysis of response and nonresponse to the Industrial Arts Unit Inventory was completed to determine whether either group tended to represent large or small schools. The chi-square test of goodness of fit was used to determine whether respondents and nonrespondents differed on the basis of their school enrollments. The data for that analysis are presented in Table 14.

Since the chi-square value of 22.36 exceeded the table value at the .05 level of significance, it was concluded that the respondents and nonrespondents differed significantly on the basis of the enrollment of their school districts.

The percentage of respondents for the total sample by school district category is presented in Table 14. A visual analysis of the percentages of respondents does not reflect a consistent pattern favoring either large or small school districts. It was therefore concluded that teachers' use of the selected units did not appear to be related to the enrollments of their school districts.

TABLE 14.--Comparison of respondents and nonrespondents on the basis of school enrollments.

Classification of Schools by Enrollment	Number of Respondents by School District	Number of Nonrespondents by School District	Total	Per Cent of Respondents
50,000 and over	24	14	38	63
20,000 to 49,999	56	38	94	60
10,000 to 19,999	34	42	76	45
5,000 to 9,999	58	34	92	63
4,500 to 4,999	12	4	16	75
4,000 to 4,449	16	7	23	70
3,500 to 3,999	4	14	18	22
3,000 to 3,499	10	7	17	59
2,500 to 2,999	17	9	26	65
2,000 to 2,499	18	10	28	64
1,500 to 1,999	18	8	26	69
1,000 to 1,499	18	2	20	90
500 to 999	15	7	22	68
below 500	1	3	4	25
Totals for All Districts	301	199	500	

Since teachers frequently reported they had not taught units because they lacked sufficient funds, the average dollars expended per student in schools represented by respondents to the Industrial Arts Unit Inventory was compared to the average amount expended in schools represented by nonrespondents. The average for schools represented by respondents was $477.52 for the 1970-71 school year. The average for schools represented by nonrespondents was $648.19. Since the respondents taught in schools which spent considerably less per student, it was concluded that teachers' tendency to teach the selected units was not significantly related to the dollars expended per student in their school districts.

Teachers' selection of units might not necessarily be due to demonstrations by their fellow teachers. That perceived relationship might rather reflect the desires of the other industrial arts teachers to have the teachers use the units. The research on change cited in Chapter II supports the contention that teachers might be influenced by other industrial arts teachers in their building. Teachers may be required to teach units which are portions of fixed curricula of their school systems. The teachers may also be discouraged from attempting new instructional units. This explanation seems to suggest the need for further research to isolate the effects on teachers' selection of units of demonstration or encouragement or discouragement from their colleagues.

Reasons Given for Teaching or Not Teaching the Units

The industrial arts teachers sampled were asked to indicate why they had taught or had not taught the units. Complete statements of the reasons listed in the inventory were given on pages 46-47. The reasons for having taught the units were referred to as: (1) you value it, (2) other teachers wanted it, and (3) students wanted it. The reasons for not having taught the units were referred to as: (1) other IA class, (2) inappropriate, (3) principal didn't want it, (4) students not capable, (5) knowledge to proceed, (6) facilities, and (7) funds.

The frequencies of all the reasons given for having taught and for not having taught each of the units are presented in Table 15.

Teachers reported they had taught quantity production, practice pieces or modules, product design, and projects because they valued them approximately twice as often as they reported teaching experimentation and research and selected industry for the same reason.

Teachers reported they valued product design and projects much more frequently than they reported the other units.

Inadequate facilities for teaching the units, lack of funds, and the inappropriateness of the units for the technical area taught generally appeared to outweigh other reasons for not teaching units, although those reasons were

TABLE 15.--Frequencies of reasons indicated by teachers for teaching or for not teaching units.

Reasons Indicated	Quantity Production	Experimentation & Research	Selected Industry	Practice Pieces--Modules	Product Design	Projects	Total Freq.	%
For Teaching								
You Value It	133	70	86	153	223	241	906	67.3
Other Teachers	10	5	10	15	19	43	102	7.5
Students Wanted	43	18	16	34	61	167	339	25.2
Total Frequency	276	93	112	202	303	451		
%	19.2	7.5	8.8	15.0	21.1	31.4		
For Not Teaching								
Other IA Class	25	21	27	8	9	6	96	8.5
Inappropriate	53	66	54	41	19	10	243	21.8
Principal	4	5	4	4	2	0	19	1.5
Students Not Capable	24	72	34	17	19	2	168	15.2
Knowledge	16	43	31	11	8	2	111	10.0
Facilities	68	95	47	31	12	1	254	23.5
Funds	67	64	45	26	13	1	216	19.4
Total Frequency	257	366	242	138	82	22		
%	23.3	32.0	21.9	12.6	7.5	1.9		

seldom used as a reason for rejecting the teaching of projects.

Rejection of the units by the building principal was infrequently given as a reason for rejection of the units.

Summary

The statistical analysis was conducted on 301 usable responses from the original sample of 500 Michigan industrial arts teachers.

Two methods of analysis were used to test the major hypothesis. The first method assigned teachers to their highest order of exposure for each unit. It therefore ignored multiple exposures to individual units. It did, however, allow an analysis for individual units. The second method of analysis assigned exposure scores to each exposure so multiple exposures could be included. However, that method did not allow for an analysis of each unit.

The Spearman rank-difference correlation coefficient was computed to test the hypothesis that methods of exposure ranked by proportion of teachers who taught the units to which they had been exposed would be significantly correlated to the predicted rank of methods of exposure. The computed value of the coefficient was .90 for the correlation of rank across all units with the predicted rank. The correlation was significant beyond the .05 level. It was concluded that the predicted rank and the rank of exposures across all units were highly correlated.

Spearman rank-difference correlation coefficients were also computed for the rank of exposures for each unit and the predicted rank. The correlations were .2637 for quantity production, .5454 for experimentation and research, .5910 for selected industry, .6978 for practice pieces or modules, .5069 for product design, and .2978 for projects. The null hypothesis of no significant correlation was accepted for all units except practice pieces. The correlation was significant at the .05 level.

An analysis of variance was computed to test the hypothesis that there would be significant differences between the mean exposure scores of teachers who taught units and those who did not. Significant differences beyond the .001 level were found for all six units.

The reasons which teachers indicated for teaching or not teaching the units were presented in a frequency table. Teachers reported that they taught the other units because they valued them much more frequently than they reported teaching experimentation and research and model industry for the same reason. More teachers appeared to value product design and projects than the other units. Teachers reported lack of funds and inappropriateness of the unit for their technical instructional area much more frequently than other reasons for not teaching the units. Rejection of units by building principals was infrequently given as a reason for not teaching units.

Chapter V presents a summary of the entire study. Appropriate conclusions and recommendations for further study are also made.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The problem investigated in this study was to determine what factors are related to Michigan industrial arts teachers' selection of instructional units.

The following assumptions were made for the study: (1) Michigan secondary industrial arts teachers are allowed some freedom to choose the units they teach and (2) industrial arts leaders would consider it important to know what factors in their teaching situations and what methods of exposure to instructional units appeared to influence the teachers' selection of units.

It was hypothesized that the methods by which industrial arts teachers had been exposed to units would be associated with their use of the units in their own teaching situations. Specifically, it was hypothesized that those methods of exposure which demonstrated the units in situations most nearly like the teachers' situations would be most frequently associated with the teachers' use of the units.

A review of the literature concerned with diffusion of innovations revealed that researchers in the field generally agreed that a study of diffusion of an innovation should account for the following elements in the process: the nature of the innovation itself, communication, the social systems involved, and the time required for the innovation to be diffused.[1] The present study was concerned primarily with the element of communication by the exposure of teachers to instructional units. However, the elements of time and social systems were given consideration. No effort was made to study the effects of the characteristics of the units themselves because the study attempted to ascertain whether certain relationships held up over all the units included in the study.

The research on change supported the conclusion that teachers were affected by other teachers, principals, students, and the community. However, Brickell's research supported the assumption that industrial arts teachers have considerable freedom in selecting instructional units.

The research concerned with communication of innovations revealed that modeling behavior which was exhibited either in person or by film was an effective means of altering the behavior of observers. Brickell found that educators supported the conclusion, for they indicated that seeing a new program being taught in a situation similar to their own was an effective means of influencing them to attempt the program.[2]

---

[1]Rogers, op. cit., p. 6.

[2]Brickell, op. cit., p. 27.

The research about change indicated that communication of an innovation by peers was more effective than communication by other groups.

In the present study it was hypothesized that:

> When ranking methods by which Michigan secondary industrial arts teachers had been exposed to selected industrial arts instructional units from greatest to least on the basis of reported incidence of use of the instructional units by those teachers, the following rank order will occur: fellow teacher; student teaching; college laboratory; other schools; movie, video tape, or slides; junior and/or senior high school; meeting; discussed in college class; and read about.

The Industrial Arts Unit Inventory was mailed to a random sample of 500 secondary school industrial arts teachers in the state of Michigan. Usable returns were received from 301 respondents.

A Spearman rank-difference correlation of .90 was found between the predicted rank of the methods of exposure and the rank of methods of exposure for all units, which was based on the proportions of teachers who reported they used the units. The correlation was significant beyond the .05 level of confidence. Spearman rank-difference correlations computed between the predicted rank of the methods of exposure and the ranks for each unit were reported to be .2637 for quantity production, .5454 for experimentation and research, .5910 for selected industry, .6978 for practice pieces or modules, .5069 for product design, and .2978 for projects. The null hypothesis was accepted for all units except practice pieces, which was significant at the .05 level.

An exposure score was computed for each teacher by assigning him a certain number of points for each exposure. An analysis of variance was computed to determine whether there was a significant difference between the means of the exposure scores for teachers who taught the units and those who did not. The variance was significant beyond the .001 level of confidence.

Teachers most often indicated that they chose units because they valued them. They appeared to value quantity production, practice pieces, product design, and projects more frequently than experimentation and research and selected industry units. More teachers appeared to value product design and projects more than they did the other units. Teachers reported lack of funds and inappropriateness of the units for their technical instructional areas more frequently than other reasons for not teaching the units. Rejection of units by building principals was not reported very often as a reason for not teaching the units.

Conclusions

The analysis of the data supported the following conclusions about the selection by Michigan secondary industrial arts teachers of the six instructional units studied. No attempt should be made to generalize beyond that population or those six units.

1. The number of teachers who indicate that they use instructional units increases as the methods by which

they have been exposed to the units follow the following order: read about; discussed in college class; meeting; junior and/or senior high school experience; movie, video tape, or slides; other schools; college laboratory; student teaching; and fellow teacher.

2. Teachers frequently indicate that they do not select instructional units because they are inappropriate for the technical areas they teach, their students are not capable of carrying out the units, they have insufficient operating budgets, and they lack the knowledge to carry out instructional tasks. The teachers do not indicate a high frequency of rejection of instructional units because of their principals' requests.

Implications

If teachers observe units being taught, they will be more inclined to teach them than if they are exposed to the units by reading about them or by hearing them discussed in college classes or at meetings.

Teachers are most likely to teach units which they have seen demonstrated by fellow teachers or by student teaching supervisors.

Teaching instructional units to teachers by having them perform the units in college laboratories appears to be a highly promising means of influencing the teachers to use the units.

Secondary school principals do not appear to influence greatly industrial arts teachers' choices of instructional units.

Industrial arts teachers appear to repeat those industrial arts experiences they had in junior and/or senior high school.

Lack of funds required to teach units of instruction does not appear to affect greatly industrial arts teachers' selection of units.

Recommendations

Industrial arts leaders should emphasize demonstration of units as a means of teaching units to industrial arts teachers.

University instructors should demonstrate units by having industrial arts teachers carry out the units. The university instructors should not espouse one thing and do something which is contrary to it.

Supervisors of student teaching should be selected partially because of their ability to be demonstration teachers. They should be encouraged to demonstrate a wide range of units for the benefit of their student teachers.

University courses should be organized to allow for teachers to see their peers teach students within their normal classroom and time schedule. Observation by undergraduates could be scheduled during the school day. Summer demonstration classes or movies or video tapes of regularly scheduled classes could facilitate observation by teachers in the field. The observers could view the presentations at times when they would not be expected to be teaching. Observation in such a way would also make the demonstrating teacher available to discuss the demonstration. The demonstration could be viewed many times to obtain added information.

Since industrial arts teachers appear to be greatly influenced by other industrial arts teachers in the same building, efforts to change the curriculum in that building should involve all of the industrial arts teachers. Otherwise, any change implemented by one teacher may be met with opposition.

The industrial arts background of undergraduate industrial arts candidates should be screened for good and poor experiences which they might tend to carry over to their teaching situations.

Movies, video tapes, and slide presentations ranked higher than discussion methods in influencing teachers' choices of units. Therefore, those media could be used to produce programs which would show teachers teaching in their normal situations. Those productions could be used at meetings, for in-service programs, and in university courses.

It appears that industrial arts leaders do not have to be especially concerned about convincing secondary principals about the worth of the units, because the teachers indicated their principals did not frequently object to their choices of units. However, several studies which were cited did indicate that the principals can be important positive forces in the introduction of innovations. Therefore, industrial arts leaders should continue to inform secondary principals of innovations to gain their support.

Many industrial arts teachers continue to reject quantity production, experimentation and research, and model industry units on the grounds that their students are not capable or their facilities or budgets are inadequate. Industrial arts leaders should examine those issues to determine whether they are presenting the units with realistic goals and facilities in mind.

While this study tends to support the conclusion that teachers are inclined to teach that content and by those methods by which they have been taught, it is recommended that the apparent strengths of demonstration teaching should be tested through experimental research which would control the methods of exposure available to treatment groups. It is also recommended that interviews be held with teachers and building principals to determine whether the teachers have taught in the manner in which they were taught. It is particularly recommended that demonstrations by teachers from other schools be presented by means of summer programs, movies, or video tapes to determine whether those methods could serve as effective and convenient means of communicating change.

Future studies should determine whether teachers in rural, inner city, and suburban schools differ in their selection of units.

It is recommended that several case studies of industrial arts teachers should be conducted to determine whether their choices of units are more affected by observations of teachers in the same buildings than by the social relationships between the industrial arts teachers.

It is recommended that future studies be more specific in delineating the beliefs and behaviors which are to be communicated by teaching the units.

Many questions and problems remain to be answered to determine the possible effects of demonstrating units of instruction to teachers. Hopefully, continued effort can be directed toward extending knowledge in this important area.

BIBLIOGRAPHY

BIBLIOGRAPHY

Bandura, Albert, and Walters, Richard H. _Social Learning and Personality Development_. New York: Holt, Rinehart and Winston, Inc., 1964.

Bennett, Charles A. _History of Manual and Industrial Education 1870 to 1917_. Peoria: Charles Bennett Co., Inc., 1937.

Billett, Roy O.; Maley, Donald; and Hammond, James J. _The Unit Method_. Washington, D. C.: American Industrial Arts Association, 1960.

Brickell, Henry M. _Organizing New York State for Educational Change_. Albany: New York State Education Department, 1961.

Chesler, Mark; Schmuck, Richard; and Lippitt, Ronald. "The Principal's Role in Facilitating Innovation." _Theory Into Practice_, II (December, 1963), 269-277.

Cyphert, Frederick R., and Spaights, Ernest. _An Analysis and Projection of Research in Teacher Education_. Cooperative Research Project No. F-015. Columbus, Ohio: The Ohio State University Research Foundation, 1964.

Demeter, Lee H. "Accelerating the Local Use of Improved Educational Practices in School Systems." Unpublished Doctoral dissertation, Teachers College, Columbia University, 1951.

Feirer, John L., and Lindbeck, John R. _Industrial Arts Education_. New York: The Center for Applied Research in Education, Inc., 1964.

Harris, Chester W., and Liba, Marie R., eds. _Encyclopedia of Educational Research_. New York: The Macmillan Company, 1960.

Havighurst, Robert J., and Neugarten, Bernice L. _Society and Education_. Boston: Allyn and Bacon, Inc., 1962.

Institute for Development of Educational Activities, Inc. _/I/D/E/A/ Reporter_. A newsletter prepared by the Institute for Development of Educational Activities, Inc., Melbourne, Florida, Fall edition, 1969.

Jamrich, John X. "A Study of Current Practices in Conducting General Methods and Related Courses in the Preparation of Secondary School Teachers." Journal of Educational Research, XLVIII (1954), 57-65.

McClelland, William A. "The Process of Effecting Change." Presidential Address, Division of Military Psychology of the American Psychological Association, San Francisco, California, September, 1968.

Michigan Department of Education Register of Certified Personnel--An Alphabetical List of Industrial Education Personnel as of February, 1971.

Miles, Matthew B. Innovation in Education. New York: Teachers College, Columbia University, 1964.

Miller, Rex, and Smalley, Lee H. Selected Readings for Industrial Arts. Bloomington: McKnight and McKnight Publishing Company, 1963.

Orme, Michael E. "The Effects of Modeling and Feedback Variables on the Acquisition of a Complex Teaching Strategy." Unpublished Doctoral dissertation, Stanford University, 1966.

Rogers, Everett M. Diffusion of Innovations. New York: The Free Press, 1965.

Smith, Othanel; Cohen, Saul B.; and Pearl, Arthur. Teachers for the Real World. Washington, D. C.: The American Association of Colleges for Teacher Education, 1969.

University of North Dakota. "A Description of the New School: University of North Dakota." Paper distributed at the Annual Meeting of the American Association of Colleges for Teacher Education, Chicago, March 1, 1969. (Mimeographed.)

APPENDICES

APPENDIX A

PILOT STUDY FORMS

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON, MICHIGAN 49202
TELEPHONE (517) 787-0350

INTRODUCTORY LETTER

Although there are numerous demands on your time, will you please take a few minutes of your time to serve as a member of a pilot group to test the adequacy of some materials which may help improve educational programs for industrial arts teachers?

Specifically, I would like your candid reactions to these materials so your suggestions may be incorporated into the final research materials. May I suggest the following procedure:

1. Read the proposed cover letter.
2. Read the directions for the inventory and complete the inventory.
3. Complete the reaction and suggestion sheet.

While the reactions and suggestion sheet that has been enclosed requests some specific information, I encourage you to write directly on the letter, inventory directions or inventory, any questions or points you would like to bring to my attention concerning the letter, directions, format, clarity of unit descriptions or areas that are confusing. Since the improvement of this instrument is my major concern at this time, your specific responses to the inventory items will not be analyzed but will be held in strict professional confidence.

I would appreciate receiving your reply at your earliest convenience.

Thank you for your assistance and cooperation.

Sincerely,

Henry Kuehl
Deputy Superintendent

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON, MICHIGAN 49202
TELEPHONE (517) 787-0350

PROPOSED COVER LETTER

As one who helps plan local and regional inservice programs and university extension courses, I need to receive feedback from teachers to determine what aspects of their professional training have had the greatest impact on their teaching practices. I am therefore combining my doctoral dissertation requirement with this on-the-job need in an attempt to find out whether the ways in which you have been exposed to six selected units are related in a particular way to whether or not you teach the units.

I realize that your own professional values and factors in your teaching situation need to be considered in addition to your professional training as you select instructional units. Therefore, I am asking that you indicate which of those factors have affected your selection of units of instruction.

Your response will not only assist me to provide inservice education more effectively in Jackson County, but the knowledge gained will be disseminated to Michigan school districts and Michigan industrial arts teacher educators so that alterations may be made in inservice workshops and undergraduate and graduate programs if the data from this study so warrants. It is hoped that you would therefore have an opportunity to benefit from such changes.

I would appreciate it if you would complete the enclosed inventory at your earliest convenience and return it to me in the self-addressed envelope provided.

You need not sign your name to the inventory, for only group data will appear in the report.

If you wish to receive a summary of this report, please so indicate in the bottom margin of the second page.

I appreciate your assistance in this attempt to upgrade service to Michigan industrial arts teachers.

Sincerely,

Henry Kuehl

Enclosure

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

Jackson, Michigan

INDUSTRIAL ARTS UNIT

Inventory

INTRODUCTION: As a teacher in the field of industrial arts, you are asked to indicate the following:

1. The methods by which you have become aware of each of the units indicated below.

2. Whether or not you provide your students such units of instruction.

SPECIFIC DIRECTIONS:

1. Please check all methods by which you have become aware of each unit.

2. Indicate whether or not you have provided your students with such units by marking either yes or no for each unit.

EXPLANATIONS OF METHODS OF BECOMING AWARE OF UNITS:

College lab - You were enrolled in a college class where you devoted at least one week of class time to the performance of activities designed to achieve the objectives of the unit as opposed to merely discussing or writing about what activities should be performed.

Discussed in college class - You were enrolled in a college class where at least 30 minutes of class time was devoted to the discussion of possible activities associated with the unit, but you did not perform such activities in that class.

Student teaching - You observed your student teaching supervisor provide his class instructional activities designed to achieve the goals of the unit for a period of at least 30 minutes. (Your student teaching supervisor was the person who had immediate responsibility for providing the instructional activities for the class for which you did your student teaching.)

Fellow teacher - You observed a teacher, who taught in the same building as you, provide his class instructional activities designed to achieve the goals of the unit for a period of at least 30 minutes.

Other school - You observed a teacher, in a school building other than your own, provide his class instructional activities designed to achieve the goals of the unit for a period of at least 30 minutes.

Jr-Sr. high experience - You were enrolled in a junior or senior high school class where you devoted at least one week of class time to the performance of activities designed to achieve the objectives of the unit as opposed to merely discussing or writing about what activities should be performed.

Read about - You have read an account of how to teach the unit. The length of the text of the account was the equivalent of one double spaced 8 1/2" x 11" typewritten page.

EXPLANATIONS OF REASONS FOR OR FOR NOT TEACHING THE UNITS

For Teaching

Required curriculum - The unit is a required part of the curriculum in your school.

Requested by administration - Your administration has requested that you teach the unit.

Other Industrial Arts teachers want it - Other industrial arts teachers in your system asked you to teach the unit.

For Not Teaching

Other Industrial Arts class - Your students have/or will experience the unit in other industrial arts classes.

Inappropriate technical area - The unit is inappropriate for the technical area you teach.

Administration didn't what - Your administration asked you to not teach the unit.

Student not capable - Your students are socially, physically or mentally incapable of profiting from the unit.

Knowledge to proceed - You do not know how to organize the unit.

Facilities - Your industrial arts facilities are inadequate to teach the unit.

Funds - You do not have sufficient funds in your budget to provide the unit.

INDUSTRIAL ARTS UNIT

Inventory

INDUSTRIAL ARTS UNIT	Methods by which you became aware of the unit							Have you taught the unit?		Reasons for teaching the unit				Reasons for not teaching the unit							
	College Lab	Discussed in Class	Read About	Student Teaching	Fellow Teacher	Other School	Jr/Sr High Experience	Yes	No	Required Curriculum	Requested by Admin.	Other IA Teachers Want It	Other --	Other IA Class	Inappropriate Tech. Areas	Admin. Didn't Want	Students Not Capable	Knowledge to Proceed	Facilities	Funds	Other --
1. <u>Quantity Production</u> - The class is organized to function as a group to produce multiple copies of objects. The objects are considered to function interchangeably and are composed of interchangeable parts.																					
2. <u>Experimentation and Research</u> - Students conduct experiments with industrial products and equipment, or student produced equipment, which result in data collection and analysis. Major emphasis is on student recognition of experimentation and research as an industrial process and the development of students' abilities to solve problems.																					
3. <u>Model Industry</u> - Students construct a scale model of an industrial plant while they also study the plant's sources of materials, processing methods, human and physical organization of the plant, and products produced.																					
4. <u>Practice Pieces</u> - Students produce practice pieces or modules which are designed to assist students to develop manual skills and insights regarding proper procedures, tools, equipment and materials. The practice pieces are not meant to be useful articles beyond the class setting.																					
5. <u>Product Design</u> - Students plan articles to fulfill functions specified by the instructor or themselves. Major instructional emphasis is placed on student problem solving and application of elements of design.																					
6. <u>Projects</u> - Students individually, or as a group, construct articles which are intended to be useful beyond the class setting. Interchangeability of parts is not required. The selection of which articles a student may construct may be made either by the instructor or the student.																					

REACTION AND SUGGESTION SHEET

1. Would the introductory letter motivate you to respond to the inventory?

_____ YES _____ NO Comments:

2. Did the introductory letter adequately explain the purpose of the study?

_____ YES _____ NO Comments:

3. Were the directions for responding clear and sufficient?

_____ YES _____ NO Comments:

4. Were the directions of the six instructional units clear and sufficient?

_____ YES _____ NO Comments:

APPENDIX B

FINAL INVENTORY, COVER AND FOLLOW-UP LETTERS

INDUSTRIAL ARTS UNIT
Inventory

DIRECTIONS:

1. Check the box for each way you have been exposed to each unit.

2. If you have taught the unit, write in approximately the greatest number of weeks you have ever taught it and follow that with the grade level. If less than a week, write in the number of hours followed by the grade level. Examples: You taught Quantity Production for five weeks at the 8th grade level - 5wk-8 ..or 10 hours at 9th grade level - 10hrs-9.

3. Check the box for each reason why you have taught the unit . . or . . have not taught the unit. Write in any additional reasons you may wish to add.

DESCRIPTIONS OF UNITS

1. Quantity Production - The class is organized to function as a group to produce multiple copies of objects. The objects are considered to function interchangeably and are composed of interchangeable parts.
2. Experimentation and Research - Students conduct experiments with industrial products and equipment, or student produced equipment, which result in data collection and analysis. Major emphasis is on student recognition of experimentation and research as an industrial process and the development of students' abilities to solve problems.
3. Selected Industry - Students study a selected industry's sources of materials, processing methods, human and physical organization of production, and products produced.
4. Practice Pieces or Modules - Students produce practice pieces or modules which are designed to assist students to develop insights regarding technical relationships, proper technical procedures, tools, equipment and materials and manual skills. The pieces are not meant to be useful articles beyond the class setting.
5. Product Design - Students plan articles to fulfill functions specified by the instructor or themselves. Major instructional emphasis is placed on student problem solving and application of elements of design.
6. Projects - Students individually, or as a group construct articles which are intended to be useful beyond the class setting. Interchangeability of parts is not required.

WAYS BY WHICH YOU HAVE BEEN EXPOSED TO THE UNITS:	Quantity Production	Experimentation and Research	Selected Industry	Practice Pieces or Modules	Product Design	Projects
College Lab - You performed activities of the unit in a college laboratory.						
Discussed in College Class - You were enrolled in a college class where you discussed activities of the unit; but you did not perform such activities.						
Student Teaching - You observed your student teaching supervisor teach the unit to his secondary school students.						
Fellow Teacher - You observed a teacher in your school teach the unit.						
Other School - You observed a teacher in another school teach the unit.						
Jr-Sr High Experience - You were enrolled in a junior or senior high school class where you performed activities of the unit.						
Movie, Video Tape or Slides - You have seen a movie, video tape or slide presentation of students performing activities of the unit. The students were secondary students						
The students were college students						
Meeting - You attended a meeting where a speaker described students' performance of the unit.						
Read About - You have read an account of how to teach the unit.						
Have you taught the unit? Write in no ...or the number of weeks ... or the number of hours if less than a week. Also write in grade level.						

DESCRIPTION OF UNITS

Reasons Why You "HAVE" Taught the Unit:	Quanity Production - The class is organized to function as a group to produce multiple copies of objects. The objects are considered to function interchangeably and are composed of interchangeable parts.	Experimentation and Research - Students conduct experiments with industrial products and equipment, or student produced equipment, which result in data collection and analysis. Major emphasis is on student recognition of experimentation and research as an industrial process and the development of students' abilities to solve problems.	Selected Industry - Students study a selected industry's sources of materials, processing methods, human and physical organization of production, and products produced.	Practice Pieces or Modules - Students produce practice pieces or modules which are designed to assist students to develop insights regarding technical relationships, proper technical procedures, tools, equipment and materials and manual skills. The pieces are not meant to be useful articles beyond the class setting.	Product Design - Students plan articles to fulfill functions specified by the instructor or themselves. Major instructional emphasis is placed on student problem solving and application of elements of design.	Projects - Students individually, or as a group construct articles which are intended to be useful beyond the class setting. Interchangeability of parts is not required.
You Value It - You consider the unit to be a valuable experience for your students						
Other Teachers Wanted It - Other industrial arts teachers in your system asked you to teach the unit.						
Students Wanted It - Your students wanted you to provide the unit						
Write In Others						
Reasons Why You "HAVE NOT" Taught the Unit:						
Other IA Class - Your students have/or will experienced the unit in other industrial arts classes.						
Inappropriate - The unit is inappropriate for the technical area you teach.						
Principal Didn't Want It - Your principal asked you not to teach the unit.						
Students Not Capable - Your students are socially, physically or mentally incapable of profiting from the unit.						
Knowledge to Proceed - You do not know how to organize the unit.						
Facilities - Your industrial arts facilities are inadequate to teach the unit.						
Funds - You do not have sufficient funds in your budget to provide the unit.						
Write In Others						

JACKSON COUNTY INTERMEDIATE SCHOOL DISTRICT

COMMERCIAL EXCHANGE BUILDING
2301 EAST MICHIGAN AVENUE
JACKSON, MICHIGAN 49202
TELEPHONE (517) 787-0350

COVER LETTER

As one who helps plan local and regional inservice programs and university extension courses, I need to receive feedback from teachers to determine what aspects of their professional training have had the greatest impact on their teaching practices. I am therefore combining my doctoral dissertation requirement with this on-the-job need in an attempt to find out whether the ways in which you have been exposed to six selected units are related in a particular way to whether or not you teach the units.

I realize that your own professional values and factors in your teaching situation need to be considered in addition to your professional training as you select instructional units. Therefore, I am asking that you indicate which of those factors have affected your selection of units of instruction.

Your response will not only assist me to provide inservice education more effectively in Jackson County, but the knowledge gained will be disseminated to Michigan school districts and Michigan industrial arts teacher educators so that alterations may be made in inservice workshops and undergraduate and graduate programs if the data from this study so warrants. It is hoped that you would therefore have an opportunity to benefit from such changes.

I would appreciate it if you would complete the enclosed inventory at your earliest convenience and return it to me in the self-addressed envelope provided.

You need not sign your name to the inventory, for only group data will appear in the report.

If you wish to receive a summary of this report, please so indicate in the bottom margin of the second page.

I appreciate your assistance in this attempt to upgrade service to Michigan industrial arts teachers.

Sincerely,

Henry Kuehl

Enclosure

May 26, 1971

Please help a fellow industrial arts man!

I cannot complete my dissertation (nor my degree requirements) if I don't receive more responses from individuals like yourself.

A short time ago, I sent you a survey like the one enclosed. If you have not already completed and returned that survey, I would appreciate having you take a few minutes to complete it and return it to me.

You may or may not realize any immediate benefit from this study, but I appeal to you to help a fellow educator.

Sincerely,

Henry Kuehl
Jackson County Intermediate
School District
2301 East Michigan Avenue
Jackson, Michigan 49202

Enclosure