THE UNIVERSITY OF ALBERTA

THE ATTITUDES OF ALBERTA INDUSTRIAL ARTS TEACHERS TOWARD THEIR PREPARATION

BY

RUSSEL K. ROSKEWICH

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NAME OF AUTHOR: RUSSEL K. ROSKEWICH

TITLE OF THESIS: THE ATTITUDES OF ALBERTA INDUSTRIAL ARTS TEACHERS TOWARD THEIR PREPARATION

DEGREE: Master of Education

YEAR THIS DEGREE GRANTED: 1990

(Signed) Russ Roskewich

Permanent Address:

R R 1, Site 4, Box 16

Stony Plain, Alberta

T0E 2G0

Date: APRIL 25, 1990

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled THE ATTITUDES OF ALBERTA INDUSTRIAL ARTS TEACHERS TOWARD THEIR PREPARATION, submitted by Russel K. Roskewich, in partial fulfillment of the requirements for the degree of Master of Education.

....
Supervisor

....

....

Date ...APRIL 19,.......1990

ABSTRACT

The purpose of this research was to replicate part of a study by Cameron Ross (1976) in order to determine the attitudes of industrial arts teachers toward their preparation for teaching industrial arts in Alberta during the 1988-89 school year. The same three classifications of Alberta industrial arts teachers (those prepared at the University of Alberta, those prepared at other Canadian institutions, and those prepared at non-Canadian institutions) were created and their preparation ratings for teaching Alberta industrial education (non-vocational) analyzed for differences.

The population for this research was the industrial education (non-vocational) teachers of all 137 school jurisdictions in Alberta. A random sample of 75 junior high school teachers and 75 senior high school teachers were selected for the study.

Two questionnaires were designed and pilot tested for use in the study; one for junior high school industrial arts teachers and one for senior high school industrial arts teachers.

An analysis of demographic data indicated the majority of the participants were males that possessed Bachelor of Education degrees, acquired 11 or more years teaching experience, and had teaching assignments that contained both junior and senior high school industrial education (non-vocational) students.

Part of the findings of this study revealed that teachers prepared at the University of Alberta and outside Canada viewed themselves to be adequately prepared to teach more than one-half of the Alberta industrial arts curriculum content areas to both junior and senior high school students; teachers prepared

at other Canadian institutions rated themselves to be adequately prepared to teach less than one-half these content areas to the same students.

Part of the findings of the Ross study in 1976 revealed that industrial arts teachers educated in Canada felt they were prepared to teach less than one-half the content areas comprising Alberta industrial arts to junior high school but not senior high school students; teachers educated outside Canada perceived they were prepared to teach one-half or more of these content areas to both levels of students.

Recommendations as a result of this study were made to the Department of Adult, Career and Technology Education to periodically replicate this study with modifications to the instrument in order to monitor the match between the educational product and the changing requirements of Alberta Education.

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The writer expresses indebtedness to the personnel at the Department of Educational Research Services for their part in processing the research data, and to Phil McKenzie for her invaluable assistance in interpreting the results.

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CHAPTER I

THE PROBLEM

Introduction

In 1963 the newly founded Division of Industrial and Vocational Education at the University of Alberta, Faculty of Education, was charged with the responsibility of preparing industrial arts and vocational education teachers for the province of Alberta. This study will concentrate on one aspect of the dual function of the department: the preservice preparation of teachers for industrial arts. The second function, which is the preparation of journeymen from selected trades and individuals from selected non-apprenticeable trades for teaching vocational education in the secondary schools of the province, is recognized but will not be discussd.

The multiple activity program advocated by Henry R. Ziel, then Chairman of the Division, was the basis used to prepare preservice industrial arts teachers who would offer industrial arts to students from grades seven through twelve in the schools of the province.

The industrial arts curriculum guides issued by the Curriculum Branch of the Department of Education prior to 1963 supported skill development in unit shop programs that contained woodwork, drafting and metalwork. (Smith, 1973, p. 82) Industrial arts as a course was offered mainly to boys in junior and senior high schools in the province. In 1963, when J. D. Harder was appointed Supervisor of Industrial Arts, a new provincial curriculum for this subject area was established because of Harder's advocacy and support for the multiple activity organizational pattern of industrial arts. (Smith, 1973, pp. 88 - 89)

The industrial arts teacher preparation program at the University of

Alberta that was put in place in 1964 remained relatively stable for nearly a decade until 1973, when the Ministers of Education and Advanced Education recommended that by 1977 all teachers in the province were to have a baccalaureate for initial certification. A further condition of this approval, included in the annual report of the Associate Minister of Education, Dr. J.S. Hrabi, was that the four year teacher preparation program include an extended practicum which equalled one semester of study. (Alberta Education, 1973, p. 6) Following the release of that edict, academic staff of the Department of Industrial and Vocational Education began to convert departmental full courses into half - courses. This was the first revision of the program since its establishment in 1964. Theoretically junior level industrial arts teacher preparation courses at the university equipped preservice teachers to teach at the junior high school level. Senior level teacher preparation courses prepared preservice teachers to teach this subject at the senior high school level.

In 1976, Ross reported the findings of his research in which he attempted to determine the attitudes of industrial arts teachers in Alberta toward their teacher education program which prepared them to teach industrial arts in the secondary schools of the province. The relationship of the Ross study and its implication for the current study will be discussed in a subsequent section of this study.

Since the completion of the Ross study in 1976, a number of changes have taken place in the industrial arts teacher education program at the University of Alberta. According to Preitz, DeLeeuw and Yanitski (1983), changes also appeared in the structure for industrial arts which in 1969 was placed under the generic term of "Industrial Education". (p. 16) In addition, the organization of the curriculum guides promulgated by the Curriculum Branch of Alberta Education began to take on a different configuration.

Purpose of the Study

The purpose of this study was to replicate as near as possible the Ross study to determine the attitudes that teachers currently teaching Industrial Education Grades 7, 8 and 9, and Industrial Education 10, 20, 30 in Alberta had toward their teacher preparation. The researcher found that replication was next to impossible because the time differential between the two studies produced changes in curriculum at Alberta Education and changes in the experiential background of those who may be selected to participate in the study. These teachers were placed in three groupings and then their attitudes were compared. The three groupings were: those teachers who graduated from the University of Alberta, those who graduated from other Canadian institutions, and those who graduated from non-Canadian institutions. The attitudes compared were how well prepared industrial education teachers felt they were for teaching the courses mentioned above in the schools of the province.

Sub-Problems

The purpose of this study was accommodated with the use of three sub-problems. The first sub-problem identified if differences in attitudes existed between University of Alberta graduates and graduates from other Canadian institutions toward the preparation they received to teach industrial education in Alberta.

The second sub-problem determined if differences in attitudes existed between University of Alberta graduates and graduates from non-Canadian institutions toward the preparation they received to teach industrial education in Alberta.

The third sub-problem ascertained if differences in attitudes existed between graduates of other Canadian institutions and graduates from non-Canadian institutions toward the preparation they received to teach industrial education in Alberta.

Null Hypotheses

The use of statistical research to determine relationships between variables in the problem statement required that these relationships be stated in the form of null hypotheses. The sub-problems stated as null hypotheses read as follows:

There is no significant difference between the attitudes of graduates from the University of Alberta and graduates from other Canadian institutions toward the preparation they received to teach industrial education in Alberta.

There is no significant difference between the attitudes of graduates from the University of Alberta and graduates from non-Canadian institutions toward the preparation they received to teach industrial education in Alberta.

There is no significant difference between the attitudes of graduates from other Canadian institutions and graduates from non-Canadian institutions toward the preparation they received to teach industrial education in Alberta.

Significance of the Study

A major significance of this study was the comparison of the results from the study with the results of the Ross study to determine attitudinal change of industrial education teachers toward their preservice preparation. This comparison had significance because it revealed if there were any changes in attitude which took place over the last decade. Changes in attitude may have resulted from experience and maturation.

The results of this study may have significance for researchers in other provinces or states who may wish to research the attitudes that industrial arts teachers in other jurisdictions have toward their teacher preparation.

Related significance of the results from this study is that these results may add to the research findings that are available for those interested in conducting research for industrial arts or industrial education.

Limitations

The limitations imposed by Ross on his study are also applicable to the current study. These limitations included definition of the population sample to a specific school year, accuracy and nature of instrument design, and interpretation of statements on the questionnaire by respondents.

This study was limited to a random sample of active industrial arts teachers in Alberta secondary schools who were teaching during the 1988-89 school year. Another limiting factor was the design of the two research instruments used in the study.

A limitation was placed on the research when the researcher omitted topics from the Leather and Textiles, and Synthesizing modules. The former included craft -orientation in a limited number of schools in the province, and the latter created difficulties in the preparation of 11 statements to represent terminal behaviors.

The inclusion of the same participants in both studies by their being randomly selected twice and remaining undetected created a further limitation.

Definition of Terms

In order for the reader to completely understand the purpose of this study, the key terms that may have more than one meaning, that have meanings which have been revised, or that have meanings which are open to interpretation have to be clearly defined. The following definitions were developed or adopted for the study. The definitions are study specific and apply to this study only.

Industrial Education. The term "industrial education" has caused considerable problems among teachers, teacher educators and administrators when it was first introduced into the lexicon of education in Alberta in1968. Attempts were made by personnel of the Curriculum Branch of the Department of Education to provide a suitable definition for this term.

Prior to the release of a "Rationale for Industrial Education" in 1970 there were two discrete subject areas in the curriculum which complemented one another. These were "industrial arts" and "vocational education". With the publication of the 1972 Handbook in Industrial Education for Guidance to Teachers, Counsellors and Administrators these two terms were amalgamated under the rubric "Industrial Education". In subsequent manuals released by the Curriculum Branch in 1974, 1976, 1979, and 1983 the definition for the term "industrial education" continually evolved. The most recent definition that appears in the 1983 manual states:

> Industrial Education is a program consisting of courses that provide a continuum of experiences, starting with exploratory experiences and activities in the elementary and junior high school, expanding in the high school to the development of skills in career fields and culminating in on-the-job experience. (p. 2)

From an analysis of this definition one would assume that industrial education begins in the elementary grades and culminates in the world of work. This is not the case because curriculum designers at the Department of Education consider industrial education in the elementary grades to be a strategy and not a course.

How "industrial arts" and "vocational education" were amalgamated under the rubric of "industrial education" is described in detail in a subsequent chapter of this report.

For the purpose of this study the terms Grades 7, 8, 9 Industrial Education; and Industrial Education 10, 20, 30 are used as synonyms for the term industrial arts.

The following definitions are modifications from the Ross study and have been reformulated for the present study:

Content area. The principles, concepts, processes and experiences which comprise the learning material for one of the sub-sets specified by the Curriculum Branch of Alberta Education in the Curriculum Guide for either Grades 7, 8 and 9 Industrial Education or Industrial Education 10, 20, 30.

Industrial Education teacher. An educator identified by the Alberta Department of Education as being an instructor with responsibility for teaching either junior high school Industrial Education 7, 8, 9 or Industrial Education 10, 20, 30 courses in an Alberta school during the 1988/89 school year.

Preparation course. A course (from a program terminating in a bachelor of education degree) which provides a sequence of instructional units that equip the undergraduate student with skills in the three domains of learning. (Ross, 1976, p. 59)

The following definition was developed by the researcher in order to complete the list of required definitions:

Industrial Arts teacher education program. A series of practical and theoretical courses taught at the University that include non-education, education, option, practicum, and curriuculum and instruction courses totalling a minimum of 120 credits and terminating in a bachelor of education degree. Upon successful completion of these courses the individual can teach industrial education at either the junior high school or senior high school levels and is certificated to teach this subject area by the Department of Education.

Instrumentation

Data gathering instruments for the survey technique include personal interviews, questionnaires and telephone interviews. Each method has its advantages and disadvantages. According to Jaeger (1984), the mail survey (questionnaire) is the only feasible choice if budget limitations prevail or if the restricted availability of trained or trainable interviewers are key factors in the criteria for applicable instrument selection. (pp. 5 - 6) It was for the reason of financial constraints that the researcher elected to use a mailed questionnaire to collect data for the study.

According to authorities who have written on the advantages of the mailed questionnaire, Mouly (1963) is one author who believes that it is a preferred survey technique since the questionnaire has the advantages of covering a wider geographic area, reaching aloof people, producing objective replies, permitting contemplated responses, and allowing an extended coverage for a reduced cost and effort. (p. 240) Another advantage of a mailed questionnaire is that it includes the implementation of uniform instructions to all respondents, and without the biases of the investigator affecting the results. Disadvantages of the questionnaire take in miscalculations of questions by respondents and low questionnaire return. (Ary, Jacobs & Razavieh, 1979, p. 175)

A search was made of related studies to locate research instruments that might provide the researcher with a base to prepare the questionnaire for the current study. It was evident to the researcher that the Ross instrument would have to be revised before it could be used in this study for three reasons. The first reason was the datedness of Ross' study which had been completed ten years prior to the current study. The second reason was that modifications had been made to the teacher preparation program in the past decade. The third reason was that during the time between the completion of Ross' study and the current study, curriculum guides for junior and senior high school industrial arts had been revised a number of times and renamed Junior High School Grades 7, 8, 9 Industrial Education and Industrial Education 10, 20, 30, respectively.

The six point Likert scale used in the Ross instrument was retained in the redesigned instrument because the six categories allowed a participant to express his or her value for each questionnaire item along a continuum from definite favorableness to definite unfavorableness with a position of near-neutrality at the centre. According to Likert (1967), the labelling of the attitude extremes are unimportant; the ability to achieve quantitative differences in attitudes in one direction or another produces the desired results. (p. 191) The categories that were used were: "no value", "most inadequate", "inadequate", "adequate", "most adequate" and "excellent".

For this research two instruments were developed, one for junior high school industrial education teachers and the second for senior high school industrial education teachers. This procedure was followed because of the advanced nature of the materials and technologies taught in grades 10, 11, and 12. There were listed on the two instruments, some common behaviors because the terminal behaviors developed at the junior high school become the entry behaviors at the senior high school level. Other areas of commonality between the two instruments were labelled 'Background information', 'General Content' and 'General Methodology'. The latter two made reference to the competencies a teacher needed to organize and present instructional content to the learner.

The format for each research instrument was in two parts. The first part asked participants to provide information on both their professional preparation and on their teaching background.

The second part of the questionnaire included a listing of terminal behaviors, called items, taken from the curriculum guides for either Grades 7, 8, 9 Industrial Education, or Industrial Education 10, 20, 30. Participants were asked to rate each of these behaviors using the six point Likert scale.

The new research instrument was developed by cross-referencing the 1983 curriculum guides for junior and senior high school industrial education courses with Ross' questionnaire. From this process content areas and statements that were applicable, those that were no longer applicable, and those that needed to be written to represent new curriculum content were identified.

The instrument, for junior high school industrial education teachers, contains 11 statements for each of the fourteen junior high school industrial education content areas found in that particular curriculum guide.

The questionnaire, designed for senior high school teachers who teach the Industrial Education 10, 20, 30 series of courses, was constructed using the curriculum guides for Visual Communications, Materials, Power Technology and Electricity-Electronics.

Prior to being used in the major portion of the research, the research instruments were pilot tested. A sample of these instruments can be found in Appendix D, p. 301 (junior high school) and Appendix E, p. 312 (senior high school).

Pilot Study

Two individuals from the Curriculum Branch of Alberta Education were asked to become involved in the pilot study. Their role in this part of the investigation was to review the instrument to determine: the accuracy of its statements, the sequencing of questions on the instrument, and the wording of statements so they were clearly understood.

These individuals were selected to be part of the study because they provide leadership and direction to curriculum committees that design curricula for industrial education courses. In addition, both of these participants are knowledgeable and have a thorough understanding of the Alberta Multiple Activity Program because they are former industrial arts teachers who have taught this program at either junior high school or senior high school levels.

The results of the pilot study determined the revisions that needed to be made to the questionnaire.

Analyzing Data

A meeting was held with a member of the Department of Educational Research Services, Faculty of Education, to review the design and construction of the junior high school and senior high school instruments and to determine how the data should be processed. Both instruments were designed so that the data could be grouped according to institution responsible for teacher preparation and that all information in part B of both questionnaires could be placed on 80 column key punch cards.

The researcher was advised that junior high school instruments be processed separately from senior high school instruments. The researcher was cautioned to select a suitable statistical measure for the data that would prevent an overwhelming output from the computer which could lead to difficulty in interpretation.

Population and Sample

Two groups of people were classified as being vital to the input for this study. These included all Alberta junior high school teachers of Grades 7, 8, 9 Industrial Education, and all Alberta senior high school teachers of Industrial Education 10, 20, 30 series of courses.

Junior High School Grades 7, 8, 9 Industrial Education teachers in the province were identified as a population for the study because the random sample taken from this population completed the junior high school instrument.

Senior high school teachers of the Industrial Education 10, 20, 30 series of courses comprised the second population from which a random sample was taken to provide input to the senior high school instrument.

The random sample for the two populations had to be representative of both rural and urban teachers. This randomness was determined by drawing one hundred and fifty teachers in the following groupings:

fifty rural junior high school Grades 7, 8, 9 Industrial Education teachers;

twenty-five urban junior high school Grades 7, 8, 9 Industrial Education teachers;

fifty rural senior high school Industrial Education 10, 20, 30 teachers; and

twenty-five urban senior high school Industrial Education 10, 20, 30 teachers.

This stratification provided for an equal number of junior high school and senior high school teachers, and for a ratio of two rural teachers to one urban teacher. This procedure was followed because Alberta has more rural school jurisdictions than urban school jurisdictions.

The sample of teachers was randomly selected from school jurisdictions that were stratified according to rural and urban, randomly identifying three junior high schools and three senior high schools in each jurisdiction. One non-vocational industrial education teacher was randomly selected from each school if more than one teacher was listed.

Identifying which of the 1,731 (Alberta Education, 1986-87 Annual Report, p. 45) operating schools in the province offered industrial education programs at the junior high school and senior high school levels involved the use of two lists produced by the Department of Education. The first government record utilized was a listing of industrial education teachers for the 1988/89 school year entitled "Teachers Teaching Industrial Education". This tally provided the researcher with a list of industrial education teachers who taught this subject area in secondary schools of the province, along with the names of their schools and employing jurisdictions. The second government inventory, a 1987/88 "List of Operating Schools in Alberta", provided the researcher with the names of the schools in each jurisdiction, the name of the principal for each school, and the grades taught in each school. The researcher stratified all the Alberta school jurisdictions according to the classifications of "rural" and "urban". School boards that were located entirely in cities were considered to be urban jurisdictions, and all other school boards (school districts containing towns, county school boards, and school divisions) were treated as rural jurisdictions. A list of cities, towns and villages supplied by Alberta Municipal Affairs in a publication entitled Alberta's Local Governments was used as a reference for classifying jurisdictions. (Walchuk,1987, pp. 121 - 129)

The procedure known as random sampling allows all members of a target populaton to have an unbiased and independent opportunity of being chosen for the sample. According to Ary, Jacobs and Razavieh (1985), this procedure involves the following steps: "1. Define the population 2. List all members of the population 3. Select the sample by employing a procedure where sheer chance determines which members on the list are drawn for the sample." (p.141)

The researcher used the simple random procedure for selecting rural and urban school jurisdictions to the ratio of 2:1, for selecting three junior high schools and three senior high schools from each jurisdiction, and for selecting one non-vocational industrial education teacher (if more than one existed) from each school. The technique used for this sheer chance choosing procedure consisted of placing all the names of a target population on small pieces of paper and drawing them from a hat until the required number for the sample was reached. As a name was drawn and recorded, it was returned to the hat. Then another selection was made.

In cases where vocational and non-vocational industrial education teachers taught in the same school, the selection was made after the researcher obtained more information about the personnel involved. More information was received by contacting the superintendent or his designate via telephone, or by contacting the principal of the school in question by telephone. In some cases, the researcher selected a teacher from a school because he knew the teacher to be non-vocational. In other cases, the approval letter received from the superintendent or his designate stipulated the teachers to be used for the study.

Four sheets of paper were used to list teachers according to previously identified groupings. The random selection process of identifying school jurisdictions, schools and teachers was repeated until all four groupings of rural and urban junior and senior high school teachers reached the required numbers. In completing this process, 62 school jurisdictions were identified of which 45 were rural and 17 were urban.

Since it was important for the researcher to communicate with these 62 superintendents (or their designates), each jurisdiction was matched with the name of the appropriate superintendent listed in "Alberta School Jurisdictions and Superintendents" found in The Alberta Teachers' Association Members' Handbook, 1988. (pp. 8 - 9) Appendix A contains a copy of this list.

Methodology

The methodology listed includes the processes that the researcher followed in order to bring this study to a successful conclusion.

An analysis and review of the Ross study was made to determine if it could be replicated using the instrument that was designed for that investigation. From this analysis the decision was made that the replication of the study was viable but that the research instrument would have to undergo extensive revision for a number of reasons. The major reason was change. Since Ross completed his study in 1976, both industrial arts and vocational education have been placed under the umbrella term of industrial education. Another reason was that Ross referred to Department of Education curriculum guides that were developed in 1968 and 1972 which were no longer in use. These curriculum guides were revised in 1982. The process that was used to prepare the questionnaire for this study is fully described in a previous section of this chapter entitled "Instrumentation".

The research instrument was pilot tested before it was used with research participants. The individuals selected for this phase of the study were not involved in the data collection phase or in any other phase of the research. The purposes for conducting a pilot study and the results of the pilot study are listed in the section labelled "Pilot Study".

Sixty-two Alberta school superintendents were involved in the investigation because they had to grant permission to the researcher to allow non-vocational industrial education teachers in their jurisdiction to participate in the research. From the census of superintendents who have schools in their jurisdictions offering industrial education courses, a random sample of 27 was selected from both rural and urban areas using a ratio of two rural superintendents to one urban superintendent. The number 27 was chosen because each jurisdiction was expected to contain 3 junior high and 3 senior high school non-vocational industrial education teachers to ensure a sample of 150 instructors. In actuality, the number of non-vocational industrial education teachers available from each jurisdiction was not always the required six so therefore additional superintendents had to be selected to supplement the random sample. This process was repeated until a research population of superintendents capable of providing 150 teacher participants according to prescribed requirements was achieved. Consequently, the list of superintendents grew from 27 to 62 (45 rural and 17 urban).

The selection procedure made use of simple stratified random sampling described by Clark and Schade (1974), Leabo (1976), Jaeger (1984), Ary et al., (1985) and Joliffe (1986). The textbook by Ary et al., (1985) entitled Introduction to Research in Education served as the source for the sampling procedure.

After a list of the random sample of superintendents and their school jurisdictions was compiled, a random sample of junior and senior high schools (maximum of three of each type of school for each school jurisdiction) was assembled using the same sampling procedure. The non-vocational industrial education teachers for each school were derived from a current list called "Teachers Teaching Industrial Education" supplied by personnel from the

Department of Education. Three junior high school teachers and three senior high school teachers from each school jurisdiction (if available) were selected to produce a total of 150 teachers who would receive copies of the instrument and who would be asked to particpate in the survey.

A letter was prepared and sent to each superintendent identified in the sampling procedure. The reasons for the letter were to: request permission for the researcher to involve the industrial education teachers in the research, permit the researcher to correspond with these teachers, and allow the superintendents to sanction the study. A copy of this letter can be found in Appendix B. This letter was mailed to 62 superintendents. There were 41 superintendents who responded to the initial letter for a rate of response of 66%. To increase this rate of response a follow-up letter was mailed to 24 delinquent superintendents. This follow-up procedure resulted in an additional 7 superintendents responding for a total rate of response of 77%. As soon as permission was received from the superintendent or his designate, a letter was sent to the principal of the school identified or selected. The purpose of the letter was to inform the principal that an industrial education teacher in his school would receive a questionnaire in the immediate future. The questionnaire was mailed to the teacher one day following the mailing of the letter to the principal.

Because of unforseen circumstances, the research population had to be reduced to 120 for four reasons. Firstly, a few superintendents gave the two questionnaires sent to them for perusal to teachers in their jurisdiction for completion. These questionnaires were then returned to the researcher and thus made up the population for that jurisdiction. Secondly, a few superintendents did not give permission for their teachers to participate in the survey. Consequently, these teachers who were slated to receive questionnaires had to be removed from the research population. In the third instance, the superintendents identified the schools and/or the teachers to be used for the study. The number identified was less than the number anticipated. Finally, a few superintendents informed the researcher that no industrial education (non-vocational) existed in their jurisdiction for the present term. The teachers randomly selected from the provincial listings for those jurisdictions had to be removed from the research population.

A covering letter accompanied the research instrument that was mailed to those identified as the research population. The purpose of that letter was to explain to the participant the goal of the research; to ask the industrial education teacher to cooperate in the study by completing the questionnaire; and to give a deadline date for submission of completed instruments. Of the 120 teachers who comprised the research population, 97 responded to this letter for an 81% rate of response. No follow-up letters were prepared primarily because of the cost of mailing them to all participants (since they were anonymous) in order to address a delinquent 19% of the population. Another reason was the limited number of days remaining in the school term. Teachers at year-end are normally busier than usual and have less time for voluntary participation. See Appendix C for a copy of this letter.

The collected data were placed on 80 column data processing cards for electronic processing. These cards were placed into three groupings according to the institution that prepared the teacher. These groupings were "the University of Alberta", "other Canadian universities" and "non-Canadian institutions".

The statistical procedure employed consisted of using two measures of central tendency (mean and median) to provide an index from a frequency distribution for each item of each subset (content area) for each grouping. The individual indices were used to produce a mean, a median and a standard deviation for each content area. Medians expressing group ratings of preparation for each content area were the statistical measures used for comparison with some of the findings in the Ross (1976) study. The junior high school data was processed separately from the high school data.

From the analyzed data, in the form of computer readouts, tables were constructed for ease of analyzing data and in preparing the results of the study.

Summary, conclusions, recommendations and observations were made from these results. These conclusions and oservations were compared to those of the Ross study.

The following organizational pattern will be used for the remainder of this report:

Chapter Two - Related Literature and Research

Chapter Three - Analysis of Data: Part A

Chapter Four - Analysis of Data: Part B Junior High

Chapter Five - Analysis of Data: Part B Senior High

Chapter Six - Research Findings

Chapter Seven - Summary, Conclusions, Recommendations, and Observations

CHAPTER II

RELATED LITERATURE AND RESEARCH

Overview

The first chapter of this report presented a detailed description of the research design that was used to collect data for analysis.

This chapter will report the literature and research that is related to the topic under investigation. To report the findings of the literature search, the chapter will have the following organization: an historical overview of the evolution of industrial arts in Alberta; an analysis of industrial arts teacher education in Alberta; and research completed that is related to this investigation.

An Historical Overview of the Evolution of Industrial Arts in Alberta

The history of "industrial arts" predates that of the province in the form of manual training when it was brought into the Northwest Territories in 1900 as the Macdonald Manual Training Program. Three years later the program ceased to exist, and in 1905 Alberta and Saskatchewan were the provinces carved out of the Northwest Territories. In An Historical Overview of Industrial Arts in Alberta, Preitz, DeLeeuw and Yanitski (1983) identify three overlapping periods in the evolution for industrial arts in the province. These periods are: Manual Training/Manual Arts (1930 - 1936), Technical Electives (1936 - 1944), and Industrial Arts (1944 - 1983). (p. 2) To these changes can be added Industrial Education (1968 - 1983) when industrial arts, vocational education and work experience were placed under this generic title. (Handbook in

Industrial Education for Guidance to Teachers, Counsellors and Administrators 1972). Although the term industrial education has been used in the lexicon of educational terms in the province for nearly two decades, in the fall of 1977 another term was introduced by personnel of the Curriculum Branch of Alberta Education. That term was Practical Arts (1977 - 1989). Harder (1977) in Alberta Education and Diploma Requirements lists under courses in chart 4, page 21, the fields of study of Practical Arts which are categorized as Industrial Education, Home Economics and Business Education.

Manual Training - The Macdonald Experiment

The first major thrust in the development of industrial arts at a nationwide level came at the turn of the twentieth century when Sir William Macdonald was persuaded by Professor James Robertson of the need for manual training in Canada. Consequently Macdonald, a wealthy tobacco manufacturer and educational philanthropist, contributed one and one-half million dollars over a period of three years (1900, 1901, 1902) for the establishment of twenty-one centres across Canada to promote manual training in the public school systems throughout the nation. The experiment was planned and implemented by Dr. Robertson, and the centres were chosen so that they could serve as nucleii for regional development of manual training. (Haywood, 1975, p. 11) This program became known as the Macdonald Manual Training Plan. Funds from the Plan were used to provide proper facilities for the program, equipment and salaries for teachers who were brought in from Great Britain, the United States and Sweden as well as to promote local teacher training. Buildings were the responsibility of contracting school boards. According to Preitz et al., (1983):

> At the end of the three year period the school districts were the recipients of all materials and equipment. It was understood by those who participated in the Plan that funding after the Plan was terminated would be the responsibility of the cooperating school district. (p. 3)

The Alberta location for one of the twenty-one centres was Nose Creek outside of Calgary. Summer school programs were developed for the training of Canadian teachers at these centres which resulted in forty-five instructors becoming qualified to teach this subject area. (Chalmers, 1967, p. 204)

Manual training was based on the theory of formal discipline and handwork. Its purposes were to educate the mind through the hands, develop skill of hand and eye, develop appreciation for the dignity of labor, and develop the powers of observation through the senses. (Silvius & Curry, 1956, p. 461) Typical subjects in manual training according to Butts (1955) were Woodworking, Clay Modeling, Iron Forging, Foundry and Sheetmetal Work, Machine Shop Work and Mechanical Drawing. (p. 501) Learning activities for manual training were restricted to exercises with strong emphasis placed on the development of manual skills practiced in the correct sequence and safe use of common hand tools.

The results of the introduction of a manual training program into the Calgary Public School System in 1900 were so successful the school board passed a resolution in 1902 recommending that provision be made in the program of studies for this subject as well as time in the curriculum for teaching it. This acceptance of the manual training program paved the way for its introduction into the secondary schools in Alberta. The end of the three year pilot project of the Macdonald experiment resulted in the equipment from the project being turned over to local school boards. (Smith, 1973, pp. 45 - 46)

In 1908 which was five years after the termination of the Plan, the Edmonton

Public School Board introduced manual training into its schools and used both Woodworking and Blacksmithing as learning activities. In 1913, the Edmonton Board opened its first technical school and in 1916 the Calgary Board established a secondary school manual training centre. (Preitz et al., 1983, p. 3) The Calgary Board of Education in 1908 had special instructors in charge of manual training and music. In the extreme southern part of the province, Lethbridge opened its manual training building in 1913. Early in 1915, because of poor economic conditions resulting from crop failures, the school board made the decision to close this school. Consequently the equipment was placed in storage and the high school was transferred to the manual training school building. (11th Annual Report, 1915, p. 37) Economic conditions forced Medicine Hat to close both its Departments of Manual Arts and Household Arts and release the teachers in charge of these Departments. (Mathew, 1984, p. 66)

Preservice teachers attending both the Calgary and the Camrose Normal Schools were given a course of instruction in Manual Training and Domestic Science. As a result of that instruction, manual training continued to improve and the introduction of this type of program into the schools was the first step toward a more practical form of education for the older boys. (Mathew, 1984, p. 67)

It was evident by the increase in the number of centres in Edmonton (11) and in Calgary (10) that manual training continued to make satisfactory progress immediately after World War I. Campbell (1970) wrote "at the beginning of the school year, September 1920, the Department of Education announced that Manual Training would be an optional subject in Grade IX". (p. 134) Enrollments in this subject increased drastically in Edmonton when approximately 75 per cent of the boys selected Manual Training as their option.

In describing the evolution of manual training in the early 1920's, Mathew

(1984) stated:

> The following year [1921] there were 23 individual schools in the province equipped to teach Manual Training and there were 45 teachers who taught this course. Manual Training was introduced in Grade VI and VII, and continued through Grade XI where metal, forging and machine shop were used as teaching media instead of wood. Practical work in electricity and an introduction to sheetmetal were introduced as learning activities in the intermediate grades. (p. 68)

By 1926, manual training continued to evolve and became part of the subjects available in the secondary school curriculum. During this evolutionary process the learning experiences were expanded to include Drafting, Cabinetwork, Woodturning, Carpentry, Forging, Sheetmetal and Machine Shop.

The transition from Manual Training to Manual Arts was very subtle when the design aspect in the latter was substituted for the exercise block. In Manual Arts, design of the object made became a part of educational handiwork. Ross (1976) considered the project method of learning to be one of the most important contributions of Manual Arts. (p. 4) Manual Arts was introduced into secondary grades as a course of study by the Department of Education in 1926 and remained a dominant force in the educational structure of the province until 1936. Secondary school Manual Arts I consisted of Drafting, Cabinetwork, Woodcarving and Carpentry. Manual Arts II concentrated on Drafting, Forging, Sheetmetal and Machine Shop. Prior to 1926 Manual Arts was limited to Grades VII and VIII.

In addition to Manual Arts I and II, courses categorized as being technical were offered in special technical schools in the two large population centres, Calgary and Edmonton. These schools placed heavy emphasis on vocational work, and the course of study was designed so that the student would spend half the school day in shop experiences and the remaining half day in academic subjects. The technical courses offered in the technical schools included Drafting, Woods, Metals, Electricity and Motor Mechanics. (Smith, 1973, pp. 46 - 49)

Personnel at the Department of Education in 1935 began to study the existing structure of education, which had been in effect since 1912, with the thought of reorganizing it. The structure from 1912 to 1935 consisted of classifying Grades I to VIII as elementary school, and Grades IX to XII as high school. With the reorganization, Grade IX was removed from the high school grades and placed with Grades VII and VIII to form the intermediate school. With the new arrangement, the province had a 6 - 3 - 3 system of education according to the following structure: Grades I to VI, elementary school; Grades VII to IX, intermediate school; and Grades X to XII, high school. The term "intermediate school" continued to be used until 1945 when the term "junior high school" was introduced.

Another innovation that the Department of Education introduced during the 1936-37 school year was the "credit system" for coursework. Under this system, credits and instructional time became congruent with a measure of one credit being assigned to each thirty-five minutes of instructional time per week. (Smith, 1973, p. 57) A total of 100 credits were required for a student to graduate from a high school with a diploma. These innovations, particularly the new structure for education and the credit system, had an impact on technical education by aligning it more closely with commercial and academic education.

When the credit system was introduced it became mandatory for students to attend school because of the correlation between credits and instructional time per week. (Mathew, 1984, p. 72)

In describing the development of the practical subject industrial arts during this time period in the educational history of Alberta, Preitz et al., (1983) wrote:

> Interwoven with these educational innovations was the fact that a number of manual training teachers became extremely critical of what they were teaching. These teachers were of the opinion that the scope of manual training was too narrow because of its heavy emphasis on woodwork. (p. 4)

A major innovation that effected the educational structure of Alberta during the mid 1930's was Calgary Public School Board's decision to amalgamate technical, commercial and academic education at the high school level into a single entity. The first composite high school in the province was established at Western Canada High School in Calgary. This concept gained favour among educators in the cities of Medicine Hat, Lethbridge and Edmonton. School boards in these centres united their commercial and practical subjects with academic courses to form composite high schools. (Harder, 1964, p. 14)

In 1938 the high school program of manual arts became general shop with a change in emphasis that highlighted individuality in student content selection. The general shop concept reflected a new philosophy and broadened those learning activities that were an integral part of the manual arts. In 1934 the learning activities for General Shop I that were available at the intermediate school level (Grades VII, VIII and IX) included Drafting, Woodwork, Metalwork, Automotives and Farm Mechanics. During the 1938-39 school year manual arts became General Shop II in the high school curriculum. The units Small Engines and Plastics were added to those that were already available in General Shop I, to embellish the curriculum for students in Grades X, XI and XII. (Smith, 1973, pp. 50 - 52)

The shift to general shop, according to Haywood (1975), was due mainly to the efforts of Dr. Carpenter who was Principal of the Provincial Institute of Technology and Art, Inspector of Schools, and Director of Technical Education. The shift was brought about to include more practicality, and efforts were being made to incorporate shop subjects in all courses. New subjects were introduced on an experimental basis. Department of Education school statistics from 1935 to 1937 carried the following courses which became exclusive by 1939: Woodwork, Metalwork, Technical Drawing, Mechanical Drawing, Drawing Design and Woodwork, and Electricity. (pp. 14 - 16)

A parallel track to General Shop II for high school students was called Technical Electives. These courses included Woodwork, Metalwork, Automotives, Electricity, and Arts and Crafts. (Department of Education, 40th Annual Report 1944, pp. 10 - 12) Technical Electives in the Senior High School Program of Studies were classified as Group C courses. General Shop was categorized as a Group D subject.

It was evident that both professionals and laymen were confused by the titles used for the practical subjects - technical electives, industrial arts and vocational education. Dr. Carpenter attempted to clarify this confusion when he wrote:

> one must not confuse technical education (technical electives) with vocational education. The Industrial Arts courses are not carried primarily as vocational training: they are essentially exploratory, and educative in the full sense of providing diversified experience that will develop understandings, appreciatons and desirable attitudes. (Department of Education, 40th Annual Report 1944, p. 16)

Industrial arts has been an approved subject in the province of Alberta since 1945. (Department of Education, 41st Annual Report 1945, p. 53) Between 1945 and 1965 the majority of the industrial arts shops at the high school level could be classified as unit shops, and those at the junior high school level were organized as general shops. Unit shops were designed and equipped with one subject orientation, for instance Woodwork, Metalwork, etc.

In describing the decade of the 40's, Preitz et al., (1983) wrote:

> The provincial supervisor for technical education, in 1944, indicated that "Manual Training Days" were over and that a new direction was needed for this form of education. The term "Industrial Arts" began to gain greater use by educators in the province because as a subject area it provided for vocational as well as explorational experiences on the part of the learner. Promoting this type of broadened curriculum was not without opposition. A positive result of philosophical shift was the fact that an increased awareness began to develop concerning the role that industrial arts could have as part of general education. (p. 4)

In January 1949, Dr. W. G. Carpenter retired as Director od Technical Education, and also as Principal of the Provincial Institute of Technology and Art. Mr. A. P. Tingley, who assumed the position of Supervisor of General Shop from Dr. Carpenter, identified several objectives for industrial arts. According to Smith (1973). these objectives concentrated on providing exploratory experiences for students through exposure to a wide range of tools, materials and occupations. In addition, student use of the experimental process in an industrial arts setting would lead to the discovery and development of desirable personal-social traits. As Supervisor of General Shop, Tingley also advocated that the development of consumer knowledge and appreciation, aesthetic appreciation and a reasonable spread of technical knowledge were suitable objectives for industrial arts. As to the future of industrial arts, Tingley believed that a break from tradition was needed so that there would be more group participation and education centering on the child and society rather than preparation for a trade. (pp. 53 - 55)

Although educators in the province gave their support to the term "Industrial Arts" as a substitute for the term "General Shop", it was not until 1946 that the former became the dominant term in use. Mathew (1984) wrote "this name change was instituted to designate the technical subjects taught in the intermediate school program". (p. 80)

In 1945 personnel of the Department of Education changed the name "intermediate school" for Grades VII, VIII and IX to "junior high school" because of the confusion caused by the word "intermediate" among both professionals and laymen. (Department of Education, 42nd Annual Report 1946, p. 60)

Robert Byron, who replaced Tingley as Supervisor of Industrial Arts in 1950, pointed out the importance of incorporating subjects other than woodwork into industrial arts so that students wouild be able to familiarize themselves with materials, processes and products of industry. (Smith, 1973, p. 58) This philosophical shift began to develop when Tingley saw that industrial arts had exploratory value and that there was a need for the student to experience materials and processes other than those associated with Woodwork. Tingley identified and reinforced this position in the 46th Annual Report 1950 of the Department of Education when he wrote:

> There is an increasing realization of the exploratory value of Industrial Arts courses and of the need for experiences in phases other than Woodwork, which has been the traditional and popular medium. Electricity, Metalwork, Concrete Work, and crafts including Leatherwork, Plastics, and Bookbinding are being treated with increasing success. A major purpose of such courses is to familiarize pupils with raw materials, products and processes of industry, and it would be unfortunate to limit such experience to Woodwork. (p. 66)

Although Byron made a significant contribution to industrial arts as a leader, his tenure with the Department of Education was relatively short. He was granted a leave of absence on January1, 1952 to serve as a technical education consultant in Greece with the International Labor Office. His replacement was Mr. J. P. Mitchell. Mitchell remained with the Department of Education for nine years. When he left the Department in 1961, he assumed the position of Principal of the Northern Alberta Institute of Technology.

During the tenure of J. P. Mitchell, considerable curriculum revision took place in industrial arts. Following the recommendation made by the Advisory

Committee on Industrial Arts and Technical Education, courses at the Grade X level were revised to conform with the philosophy of general education promulgated for that grade. (Mitchell, 1952, p. 54) Industrial arts and technical education courses with 8 credits at the Grade X level were revised to become 4 or 5 credit courses. The courses effected included: Woodwork, Metalwork, Electricity and Automotives. It was evident that these changes were made for two purposes: to facilitate the achievement of the objectives and to facilitate programming. (Mathew, 1989, p. 65)

By 1956 Alberta's philosophy and structure of general education included industrial arts. Junior high school industrial arts was mandatory for boys and junior high school home economics was mandatory for girls. Efforts to revise industrial arts at the high school level were being made by Department of Education personnel since the early fifties. (Preitz et al., 1983, pp. 6 - 7) Industrial Arts at the junior high school level was taught in a general shop. This was a learning environment "that was equipped and organized so students may participate in various activities and have experiences with a variety or tools, equipment and materials". (Silvius & Curry, 1956, p. 31) The programs that were offered in this environment was exploratory. Exploratory courses in the 1953 edition of the Junior High School Program were Art, Dramatics, Community Economics, Home Economics, Industrial Arts, Music, Oral French and Typewriting.

Industrial arts at the senior high school level was taught in a unit shop. In this organizational plan, students concentrated on one type of shopwork such as Woodworking, Metalworking or Electricity. The vocational orientation of this plan caused considerable confusion among the general public and a number of influential leaders in education in the province.

The confusion created by the vocational orientation of industrial arts in a unit shop was compounded by the fact that technical electives were available to high school students. Students in a technical elective would spend the first half of a school day in the academic subjects and the remaining half day in a shop. Teachers who taught these subjects were fully qualified journeymen who also had trade experience. According to Preitz et al., (1983), "these electives at the high school level, although part of general education, had a definite vocational bias". (p. 8)

It was evident from publications that emanated from the Curriculum Branch between 1950 and 1960 that industrial arts in the province was divided into four levels. Preitz et al., (1983) described these levels in the following manner:

> Level I was for Grade VII, VIII and IX and was conducted in a General Shop. The program consisted of six constant units and six elective units from Drafting, Woodwork, Metalwork, Plastics, Art Metal, or Leather. Level II was for Grade X students and was conducted in a Unit Shop. The program at this level consisted of seven courses each having a number of units. The Unit Shop courses at this level included: Woodwork, Metalwork, Electricity, Automotives, Printing Arts and Crafts, Agriculture and Drafting. Level III industrial arts was for Grades X, XI, and XII students who attended shop classes in a town or rural area. The general mechanics course at this level consisted of eight courses each having a number of units and included Woodwork, Metakwork, Electricity, Automotives, Drafting, and in some instances Agriculture. Level IV was purely vocational education and was recommended for Grades XI and XII and was taught in Unit Shops where fourteen vocational education courses each having a number of units were taught. Some of the courses at this level included: Woodwork, Metalwork, Electricity, Automotives, Drafting, Arts and Crafts, and Agriculture. (p. 8)

Technical electives came under severe criticism by educational leaders and students alike. The former claimed that these courses were not industrial arts but rather pseudo-vocational education, and the latter expressed that they found only general education value in them with little appraisal as vocational education because these courses were not articulated with the apprenticeship program in the province. Dissatisfaction grew among industrial arts teachers when they found it difficult to make a clear distinction between manual training, manual arts and industrial arts. In describing this period of turmoil, Mathew (1984) wrote:

> The most vociferous critic of the high school technical elective program was the Chairman of the Calgary Public School Board, Harvey Bliss. In his criticism of this program, Bliss took the position that the program should be revised or dropped by the Department of Education. . . . There were some members of the Edmonton Public School Board who considered these courses to be a waste of money. (p. 91)

An advantage that resulted from this dissension was that it helped to focus attention to the need for a philosophical shift in the purpose of industrial arts and its learning environment.

With the passage of the Technical and Vocational Training Assistance Act in 1960 to cost share secondary school vocational education between the federal and provincial governments, the death knell for technical electives as a subject in the province was sounded. This Act provided financial assistance to the provinces for the development of vocational education programs and facilities for producing skilled manpower. The Agreement signed between the Federal Government and the Province of Alberta was called the Technical and Vocational Training Assistance Agreement (TVTA) and included, as one of its ten cost-shared programs, vocational training at the high school level. In this training program, at least one-half of the total school time would be spent on courses that prepared students for entry into an occupation, with the remaining half day being spent in academic subjects. Funding for the legislation would continue until 1967. (Harder, 1964, pp. 15 - 17)

Because vocational education as a subject area has no relevance to the current study, it will not be discussed. Program 7 - a program for the training of technical and vocational teachers - has significance for this study and is reported in a subsequent section of this chapter. A significant feature of this Act, as well as other federal legislation that provided financial support to vocational education, was that no monies could be used to support any form of manual training or industrial arts.

Administrative changes and appointments were made at the Department of Education that would influence the direction of industrial arts during its contemporary period. Among these changes that took place in 1961 was the replacement of J. P. Mitchell by R. C. Cunningham who was later replaced by M. R. McDougall in October, 1962. A year later in September 1963, McDougall was replaced by J. D. Harder as Provincial Supervisor of Industrial Arts. Harder remained as supervisor until 1969 when he became Inspector of High Schools, Industrial Education. In March 1967, A. A. Day was appointed Assistant Supervisor of Industrial Arts. (Mathew, 1984, pp. 93 - 102)

As a result of Program 7 of the Technical and Vocational Training Assistance Agreement, administrators of the Department of Education and the University of Alberta made two significant decisions that would influence the leadership and the direction taken by industrial arts. The first of these, announced in 1962 by the Deputy Minister of Education Dr. W. H. Swift, was the declaration to establish a Division of Industrial and Vocational Education within the Faculty of Education, Edmonton Campus. The second decision, which was part of the first and was made by university administrators, was the transfer of the industrial arts teacher education program from the Calgary campus to the Edmonton campus. (How this transfer was initiated and implemented is fully discussed in the following section of this chapter.) Administrators of The University (Edmonton campus) selected Dr. H. R. Ziel to chair the newly formed Division. A year later this Division was given Departmental status.

In 1962, The Division of Industrial and Vocational Education received its mandate to prepare vocational education teachers and technical education instructors using funds allocated to the University of Alberta by the Federal Government under Program 7 of the TVTA. This mandate was expanded to include the preparation of industrial arts teachers upon the transfer of the industrial arts teacher education program to the Edmonton campus. When Ziel arrived on campus he brought with him a four phase program for the preparation of industrial arts teachers using the common materials and technologies found in a productive society as content organizers. This program was to be taught in a multiple-activity laboratory with the product (project) being used as a teaching vehicle. A distinguishing feature of the program advocated by Ziel was that it could be applied to a secondary school setting.

The four phase program proposed by H. R. Ziel could be offered to both boys and girls in junior and senior high schools in order to achieve these objectives:

1. reinforce academic disciplines;
2. provide a synthesizing educational environment;
3. interpret productive society; and
4. provide exploratory experiences for guidance in career pursuits.

Phase I of the multiple-activity program was to introduce junior high school students at the Grade VII level to tools, machines, materials and processes. The content areas of a typical laboratory would be Woods, Plastics, Metals, Ceramics, Graphic Arts and Materials Testing. (Ziel, 1971, pp. 25 - 26) This phase would make use of the product which would not be of the student's choice, but rather preselected by the instructor in order to optimize learning experiences according to the stated objectives. Products were to be relatively simple and provide the learner with an appreciation of the action of the tool or machine on the material rather than an aquisition of skills. (Ziel, 1963, pp. 18 - 19)

Phase II of the program would provide Grade VIII and IX students with the opportunity to explore technologies found in a productive society using an experimental rather than a product approach. The technologies found in this phase included: Electricity, Graphic Communications, Electronics, Computer, Power, Power Transmision and Mechanical Transmission. Systems in these technologies were to be analyzed for their units, components and principles, or from the general to the specific. (Ziel, 1971, pp. 28 - 31) The intent of this phase was to introduce the students to technologies that were prevalent in the world of work and also to show the student the interdependence of these technologies. In addition, an identification of the most prominent industries that used these technologies was to be included, along with a list of career opportunities and preparation that was required for an individual to enter them. A student's exposure to each of these technologies would allow him/her to determine his/her abilities and interests, which would enable him/her to make a practical career choice in later years. (Ziel, 1963, pp. 19 - 20)

In Phase III, senior high school students at the Grade X level were to receive laboratory experiences which focused on the human element in any establishment which strived to meet established goals. The simulation of circumstances displaying human interaction in an organizational setting would be used as a technique for learning. For instance, a class would form a company to produce a product or provide a service. Deriving the structure of the company to meet its objectives took precedence over its purpose. Conference type sessions would be used to expound on the variables that created an effect on the quality or cost of a product. (Ziel, 1963, p. 20)
These student experiences were to be centered around the processes of authority, communication, decision making and organization that are found at various levels of institutions engaging a particular technology. (Ziel, 1971, p. 29)

FIGURE ONE HAS BEEN REMOVED DUE TO COPYRIGHT RESTRICTIONS

Figure 1

The four phase multiple-activity industrial arts program proposed by H. R. Ziel (Taken from Ziel, H. R., Man Science Technology: An Educational Program, 1971, p. 23)

The intent of this phase was to cover a study of the social structure of the work plant, in the form of informal and formal organizations. These closely related divisions in reality displayed a worker's efficiency, productivity and social adjustment which should be of importance to students who are future employees. (Ziel, 1971, p. 104)

The final phase (Phase IV) of this program, geared for Grades XI and XII, anticipated an in-depth study of a cluster of technologies of the student's choosing. It may be beneficial at this stage to incorporate consultants of outside sources or other disciplines. The technique for learning was to be the completion of a prototype product. (Ziel, 1963, p. 20) The ideal intent of Phase IV was to have each student draw on his previous experience of six materials areas, seven technologies and four institutional processes in order to select advanced experiences of between two and three areas in Grade XI with greater depth in Grade XII, or to cover advanced experiences of two-three areas in Grade XI and two-three different areas in Grade XII. Not all students would participate in this phase; those that were academic or vocational bound would be excluded. (Ziel, 1971, p. 30) The three clusters of materials, processes and technologies control that were to be facilitated were Industrial Arts Phase IVA: Electricity, Electronics and Computers; Phase IVB: Power Technology, Power Transmission and Mechanical Technology; and Phase IVC: Materials, Graphic Communications and Testing Technology. (Ziel, 1971, p. 120) Figure 1 includes graphs which illustrate the relationship of each phase of this program.

The program when originally proposed by Ziel was referred to as the "Ziel Plan" and was later renamed the "Alberta Plan". (Preitz et al., 1983, p. 9) Ziel and his associates travelled throughout the province talking to interested groups about the advantages of the new industrial arts program which was a radical departure from the program that was in place. Two of the most influential officials that supported Ziel were Dr. Coutts, Dean of the Faculty of Education and Dr. Byrne, Chief Superintendent of Schools for the Department of Education. (Smith, 1973, p. 153)

When the industrial arts program was transferred to the Edmonton campus, The University was without laboratory space for teaching industrial arts curriculum and instruction courses. To alleviate this problem, Ziel (in 1963) made arrangements with the Edmonton Public School Board to conduct a two year pilot project at Hillcrest Junior High School. As a partner in this research project, the School Board agreed to provide the facilities and equipment that were necessary to evaluate the effectiveness of the Plan. These facilities at Hillcrest served a dual purpose. They were used by the student population of the school for their industrial arts courses, and they were used as instructional laboratories by academic staff of the Department of Industrial and Vocational Education for the preparation of preservice industrial arts teachers.

In writing about this period in the evolution of industrial arts in the province, Mathew (1984) wrote: "immediately after being appointed [that appointment took place September 3, 1963] Supervisor of Industrial Arts, Harder elected to examine, first hand, the industrial arts program in various centres in the province" (p. 94). Smith (1973), in reporting the findings of his research, provided a rationale for Harder's visits by claiming that they were done partly to determine if the charges made by Ziel that the Alberta program failed to meet the needs of Alberta students was correct. (p. 87)

One of the schools that Harder visited was Hillcrest Junior High School which he closely monitored by keeping in regular contact with the two teachers of the pilot project initially called "The World of Work".

By Christmas of 1963 and resulting from observations made during these school visits, Harder recommended that the junior high school industrial arts curriculum be revised so that a multiple-activity program would be developed in the province. To "sell" the multiple-activity concept and its accompanying program to school boards and school administrators throughout the province, Harder used a slide-tape presentation. His efforts gained him province-wide acceptance, and the multiple-activity organizational pattern became the learning environment for industrial arts at the junior high school level.

In order to follow through on Harder's recommendation, a curriculum committee was endorsed by the Secondary School Curriculum Committee and approved by the Director of Curriculum, M. Watts. Within a year the revised 1965 edition of the Junior High School Curriculum for Industrial Arts was ready. This particular curriculum guide was further revised and refined in 1969, 1976 and 1982. It is significant to note that although personnel of the Department of Education accepted the concept of multiple-activity, they never accepted the term "Alberta Plan" as a descriptor for the new industrial arts program. Instead these educators preferred to use the term "Alberta's Multiple Activity Program".

With the acceptance of the multiple-activity concept and the curriculum guide for junior high school in place, educational leaders at the Department of Education recognized the need to revise the senior high school program for industrial arts. The existing programs were General Shop I, General Shop II and Technical Electives, and the curriculum guides were written for unit shops.

To revise these curriculum guides, a meeting of the Senior High Industrial Arts Advisory Sub-Committee of the Department of Education was called for September 28, 1964. At that meeting the members of the Committee discussed problems that were encountered in senior high school industrial arts throughout the province. (Mathew, 1984, p. 96) Approximately two months later, the Committee agreed to retain unit shop courses in the larger population centres by clustering the General Mechanics course. The clusters for this course were to have the following titles: "Woodwork, Metalwork, Electricity-Electronics, Plastics, Power Mechanics, Production Science, Research and Development, and Computers" (Smith, 1973, p.102). The completion of any four of these nine units would be considered a year's work and produce 4 - 5 credits in the major area.

The clustering concept was changed at the February meeting of the Committee to produce two high school industrial arts programs. In describing these programs, Mathew (1984) stated that "one program was the cluster program, the clustering of common materials or technologies into one course, and the other was Industrial Arts General". (p. 96) Cluster courses were given the numeric designations 10 for Grade X, 20 for Grade XI, and 30 for Grade XII, and were organized in the following manner: Industrial Arts Electronics 10, 20, 30; Industrial Arts Graphic Communications 10, 20, 30; Industrial Arts Materials 10, 20, 30; and Industrial Arts Power Mechanics 10, 20, 30. The other course was classified as Industrial Arts General 10, 20, 30. The major difference was that cluster courses provided the student with greater depth than did a general course. A student who elected to enroll in Industrial Education Electronics 10, 20, 30 would receive 5 credits for each level (for a total of 15 credits) and would concentrate on Electronics for the three years. A student who enrolled in Industrial Arts General 10, 20, 30 would study units in Electricity, Graphics, Materials, and Power. The latter student would not have the opportunity to acquire the depth of knowledge or experience of the former student.

A year later in September1965, the complete industrial arts program for the senior high school had been revised with each course having 4 - 5 credits. The titles of the interim curriculum guides made available by the Curriculum Branch of Alberta Education were Industrial Arts Electronics 10, 20, 30; Industrial Arts Graphic Communications 10, 20, 30; Industrial Arts Materials 10, 20, 30; Industrial Arts Power 10, 20, 30; and Industrial Arts General 10, 20, 30. (Harder, 1965, p. 44) These guides were pilot tested in the schools of the province. Following revision based on information collected from the pilot study, they were released by the Curriculum Branch in 1966 as bona fide Curriculum Guides. They were later revised in 1969, 1976, and 1982.

In the March 1967 issue of the Industrial Arts Newsletter written by J. D. Harder, it was announced that A. A. Day had been appointed Assistant Supervisor of Industrial Arts for the Province. Prior to this appointment, Day was an industrial arts teacher with the Calgary Public School Board.

The next major revision made by the curriculum committees to an industrial arts curriculum guide ocurred in 1975 when the Curriculum Branch released the curriculum guide for Production Science 30. In 1976, a year later, the Curriculum Branch released curriculum guides for Industrial Education Visual Communications 10, 20, 30; Industrial Education Electricity - Electronics 10, 20, 30; Industrial Education Materials 10, 20, 30; and Industrial Education Power Technology 10, 20, 30.

Drastic change took place in the practical subjects when the "industrial education" concept was introduced, developed and implemented. This concept was first introduced in 1969 by Harder when he released the Rationale for Industrial Education which amalgamated "Industrial Arts" and "Vocational Education" under the generic title "Industrial Education".

A subsequent revision of the rationale and its accompanying Industrial Education Matrix was presented to those who attended the Red Deer Conference of the Specialist Council on April 24 - 26, 1976. On the Matrix all secondary school vocational education courses were clustered into seven career fields; and industrial arts, business education and work experience were labelled as being related. As a consequence, curricula revised by curriculum committees for either junior high school or senior high school industrial arts contained the phrase "Industrial Education" in the title of the revised curriculum guide. Examples of the inclusion of this phrase are: "Junior High School Grades 7 - 8 - 9 Industrial Education Curriculum Guide" and "Industrial Education Power Technology 10, 20, 30".

On February 9 1989, the Minister of Education commissioned a review of secondary education in Alberta. "The goal of the review was to assess the secondary school program available to Alberta students and to provide direction for future changes" (Report of the Minister's Advisory Committee: Foundation for the Future, undated, p. 1). The review was perceived by the Minister and personnel of the Department of Education to be necessary for these reasons: "as the world becomes more complex and more competitive, quality education is becoming increasingly important;there is a need to provide firm direction to the education system; and education systems have come under criticism provincially and nationally" (Alberta's Secondary Education Program: the Public View, undated, p. 1).

An important aspect of the review process was the input, in the form of comments and recommendations, from a broad cross-section of Albertans including the public, parents, students and educators. These Albertans presented their views and concerns by responding to a questionnaire, replying to a Gallup poll on secondary education, corresponding through 200 briefs that were sent to Alberta Education and by having students complete an opinionaire. As a result of the Secondary Education Review on June 12 1985, the Government of Alberta released a new directional policy statement for curriculum and programs titled Secondary Education in Alberta. The policy statement provides the framework for structuring and upgrading the instructional programs of the secondary schools which includes compulsory core courses and optional complementary courses. Several changes were made to the senior high school program and diploma requirements. Among these were: increase in the passing standard from 40% to 50%; increase in the number of specified courses for the General High School Diploma and the Advanced High School Diploma; inclusion of a mandatory course for all students - Career and Life Management (CALM); and the introduction of the Certificate of Achievement as an alternative to the other two diplomas. The Certificate of Achievement would be awarded to students who successfully completed the Integrated Occupations Program of Study.

When the high school programs were implemented during the 1988-89 school year, it was found that the increase in the number of specified credits required for graduation (75 out of 100) reduced the amount of time remaining for complementary courses. Consequently, student enrollments in the fine arts, the second language program and the practical arts began to decline. This decline caused concern among school administrators throughout the province. The superintendents of schools for the two major school systems in Calgary and Edmonton established committees to review the practical arts in their systems.

In the spring of 1988 Dr. Reno Bossetti, Deputy Minister of the Department of Education, appointed Sharon Prather as Program Manager for the Review and Revision of Practical Arts Programs in Alberta Secondary Schools. The purpose of this review was "to establish and implement a plan which will ensure the best possible practical arts program for Alberta's junior and senior high school students" (Project Overview, 1988, p. 2).

According to the Project Overview (1988) the decision to review these programs was based on these factors:

> the need to match curricula with future trends and economic and employment needs.
> the trend toward integration and consolidated (cross-crafting) of trade-career specific and general programs that would be intended to

ensure development of generic skills that are portable over time despite changes in technology and shifting requirements of the worksite.
the need to review apprenticeship articulation, community partnership (cooperative education, off-campus, work experience) and technical modernization in a systematic and deliberate manner for the full range of practical arts.
the need to address the principles outlined in the Secondary Education Policy Statement, June 1985.
the need and opportunity to deliver components of the practical arts program through distance education and off-campus systems.
the need to review the content and program structure of the practical arts programs. (p. 2)

The review was being conducted in two phases. Phase I was the drafting of a vision paper called "Directions for Change - A Vision for Practical Arts Programs in Secondary Schools in Alberta". (Prather, 1988, p. 8) The paper outlines the expected outcomes of the vision, proposes a new name [Career and Technology Studies] for the practical arts and identifies initiatives that will help to achieve the goals of the review. At the time of the writing of this report the vision statement had to be validated by the stakeholder groups who are concerned with the proposed changes.

Phase II will be the effective implementation of the "vision" in a cost-effective manner that minimizes the pressure on the education system. To implement this phase, programs of study will be developed and appropriate resources identified.

Alberta Industrial Arts Teacher Preparation

Preparation For Manual Training

Immediately after Alberta became a province in 1905, the provincial government acted quickly and established a normal school in Calgary which offered a four month teacher training program. When the normal school building was completed in 1907, manual training became a part of the curriculum. An increased need for teachers in the province led to the expansion of normal schools. One was established in Camrose in 1913, and a third normal school was opened in Edmonton in 1921. In 1913, teachers of manual training in the province were able to supplement their normal school education with Department of Education summer school sessions that were offered at the University of Alberta. Both the Camrose and Edmonton Normal Schools had discontinuous operation. These two schools were in operation when a teacher shortage existed and were closed when that need was fulfilled. The normal schools and the Department of Education Summer Schools at the University of Alberta continued to provide the training required for the teachers of practical subjects until 1943. The three normal schools until then were controlled and operated by the Department of Education when they were transferred to the University of Alberta which had accepted responsibility for teacher education. (Mathew, 1984, pp. 63 - 64)

One provincial institution that was involved in the preparation of teachers of practical subjects from manual training to industrial arts was the Provincial Institute of Technology and Art which opened in the autumn of 1916 in its temporary facilities at the Colonel Walker School in East Calgary. (Simon, 1962, p. 69) This school was made available to the provincial government by the Calgary Public School Board on a rent free basis for a period of four years. Simon (1962) described a conference that was held on September 14, 1916 where arrangements were made for the Institute to offer courses for teachers "that would lead to special certificate in art, manual arts, woodwork, household arts and physical training" (p. 75). It was anticipated that these courses would correspond to those given at the summer session for teachers of the Department of Education at the University of Alberta and that full credit would be granted by the Department to those that successfully completed these courses.

In 1908, facilities and staff of the Calgary Normal School were moved to the McDougall School because of overcrowded conditions. By 1914, Connaught and Sunnyside Schools were used to alleviate overcrowding and to provide classrooms for practice teaching. It soon became evident to provincial authorities that a larger normal school was needed. This need was coupled with renewed demands in 1918 for the construction of a building to house the Institute of Technology. (Simon, 1962, p. 113) The concept evolved for the construction of a combined normal-technical school. The normal school, to be in close proximity to the technical institute, would accommodate ten grades of the public school. The combined Normal School and Institute of Technology was ready for occupancy in the summer of 1920. According to Simon (1962), "Special courses for teachers in manual training, household economics, art and commercial art were offered, but due to a lack of demand for them . . . were not given" (p. 129). The course in manual training for teachers was an eight - month course when sufficient enrollment warranted it. The course for teachers of manual training was to be covered in two summers. The first summer school at the Institute of Technology was offered in 1921 and was for teachers of vocational subjects. In 1921 the Department of Education began to issue certificates to teachers of special subjects. Summer school for these teachers continued until 1928 when it was discontinued because of a lack of enrollment.

The program was re-established in 1935 with twenty-nine teachers enrolled. The following summer a total of eight courses were offered: Woodwork, Metalwork, Electricity, Motor Mechanics, Drafting, Art Metal, Sewing, Foods and Nutrition. (Simon, 1962, p. 202) Individuals who successfully completed the shop courses at the Institute's five week summer session were permitted to begin teaching practical subjects in the schools of the province. Those teachers who completed a second summer school program were given authority to continue teaching these subjects. (Simon, 1962, p. 203)

Those teachers who wanted to teach general shop were required to complete a full term of shop subjects at the Institute. A prerequisite for admission to this program, however, was the completion of Normal School training.

This arrangement continued until 1939 when shop subjects were discontinued. The Annual Report of the Department of Education for that year explained these subjects were discontinued "because of the stress and demands upon the accommodation of the Institute of Technology and Art, and because of there being an adequate supply of teachers with primary qualifications available to meet current demands" (p. 45).

As a result of the war in 1940, the Institute buildings were taken over by the Federal Government for use by the R. C. A. F. as a wireless training school, and technical classes were transferred to the Grandstand Building at the fair grounds of the Calgary Exhibition Association. (The Calgary Herald, July 30, 1940) Normal School classes were moved to King Edward School. Courses in general shop and home economics continued but were taught in other schools of the Calgary Public School Board.

In 1945 the Institute of Technology, in cooperation with the Faculty of Education at the University of Alberta, resumed the training program for industrial arts teachers. The Faculty of Education was created out of the Provincial Normal Schools. Under an agreement with the university, the Institute of Technology accepted the responsibility for providing both theoretical and technical courses to industrial arts students in the first three years of the four program. That program led to the Bachelor of Education Degree in Industrial Arts.

Summer session institute courses for teachers of industrial arts students were again discontinued in 1949 and not resumed until 1960. (Simon, 1962, p. 292) The major reason for taking this action was that industrial arts students had to take summer session university courses at the Edmonton campus. It was not until 1961 that a summer school was established at the Calgary campus of the University of Alberta. Once again the Institute resumed its summer classes for industrial arts teachers and students.

Interest in industrial arts continued to grow at the secondary school level, but the supply of suitably qualified teachers did not keep up with the demand. In 1961, the signing of the Technical and Vocational Training Assistance Agreement between Alberta and the Government of Canada greatly affected industrial arts and vocational education in the province. This Act provided matching grants to promote the development of vocational education throughout Canada. Program 7, which was the program providing for the training of technical and vocational teachers, is of particular interest to this study because it led to the establishment of the Division of Industrial and Vocational Education in the Faculty of Education, Edmonton campus. The establishment of this new division led to the phasing out of the industrial arts teacher education program at the Calgary campus. (Haywood, 1975, p. 19) The new division of the Faculty of Education was given the responsibility of preparing both industrial arts and vocational education teachers. (Mathew, 1984, p. 93) This Division was elevated to Department status by senior administration of the University in 1963.

Industrial Arts Teacher Education Since 1963

While the multiple-activity organizational structure for the teaching of industrial arts was being advocated by H. R. Ziel at the Edmonton campus, the basic teacher education program for industrial arts students offered at the Calgary campus was taught in unit shops. Those students who successfully completed this program taught industrial arts in general shops throughout the province. The core academic courses were taught by professors at the Calgary campus and shop courses were taught by instructors at the Institute of Technology. (Interview Mr. J. Pallas, August 26, 1988) The course majors for each year of the Calgary program during 1963-64 included these subjects:

<u>First Year</u>
1. EDIA 241: Mechanical Drawing
2. EDIA 242: Woodwork
3. EDIA 246: Metalwork

<u>Second Year</u>
1. EDIA 341: Mechanical Drawing
2. EDIA 244: Electricity
3. EDIA 342: Woodwork

<u>Third Year</u>
1. EDIA 248: Auto Mechanics
2. EDIA 441: Woodwork
3. EDIA 346: Metalwork

<u>Fourth Year</u>
1. EDIA 347: Autobody
2. EDIA 344: Electricity
3. EDIA 349: Handicraft
4. EDIA 345: Welding (University of Alberta, <u>1963-64 Calendar</u>, pp. 266 - 267)

The fourth year of the program was offered at both Calgary and Edmonton.

The Calgary campus also offered a teacher education program for teachers who taught technical education in unit shops throughout the province. The first and second years of this program were similar to the pedagogical portion of the industrial arts plan. The difference came in the third year when the student would elect to participate in a unit shop specialization in either Wood, Auto Mechanics, Electricity or Metal. Students enrolled in this program would qualify for a certificate of apprenticeship. To be eligible for this certificate, the students had to be prepared to undertake fifteen months of approved industrial internship. (University of Alberta, 1963-64 Calendar, p. 267) This internship was in addition to the four year bachelor of education program.

When Ziel assumed the chairmanship of the Division of Industrial and Vocational Education in 1963, he brought with him a four phase program for industrial arts that would be taught in a multiple activity laboratory. His position was that the unit shop could no longer be justified for these reasons: (1) the emerging technologies should be used as content organizers for industrial arts and (2) students should be exposed to a variety of materials and technologies if they were to make a wise career choice. Because the university lacked laboratory space, Ziel made arrangements with the Edmonton Public School Board to use the industrial arts portion of Hillcrest Junior High School as a teaching facility.

The four phase program offered by the Division at the Edmonton campus provided preservice teachers with industrial arts content that used the same methods these teachers were expected to use when educating their pupils. In 1963 this program was offered as an alternate to the one that was offered at the Calgary campus. The four year Edmonton-based Bachelor of Education program for industrial arts students consisted mainly of full courses and had the following configuration:

First Year

1. EDIA 203 and EDADM 261
2. EDPSY 276
3. English 210
4. Approved Mathematics Course
5. EDIA 260 - General Industrial Arts, Full Laboratory Course
6. Physical Education (University of Alberta, 1963-64 Calendar, p. 269)

The University of Alberta 1963-64 Calendar described EDIA 203 as a half course, from September to December, that provided the student with the past and present theory and practice of this subject area. (p. 292) The General Industrial Arts course was "hands-on" instruction that was designed to prepare industrial arts majors with the psychomotor skill base required to teach grades seven and eight in the areas of Ceramics, Electricity, Graphic Arts, Metals, Plastics and Wood; and illustrated the organization of an ideal multiple-activity laboratory.

Second Year

1. Approved Chemistry Course
2. ED CI 250 - 100 Hours of Student Teaching
3. Approved Physics Course
4. Approved Social Science Course
5. EDIA 270 - Full Laboratory Course

Certification: Interim Standard S Certificate (University of Alberta, 1963-64 Calendar, p. 269)

EDIA 270 developed basic knowledge and skills in seven technological areas for teaching Grades VIII and IX. (University of Alberta, 1963-64 Calendar, p. 293) At this point, an undergraduate had a broad general education background and was qualified to teach junior high school industrial arts. The student was eligible to apply to the Registrar of the Department of Education for an Interim Standard S Teaching Certificate.

Students who elected to complete years three and four took additional laboratory courses in both of these years to build on the skill base they developed in the first two years of the program.

Third Year

1. EDPSY 476
2. Philosophy 240 or 242
3. Approved Arts or Science Option
4. EDIA 360 - Full Laboratory Course, Laboratory of Technology
5. EDIA 370 - Full Laboratory Course, Technology I

Certification: Interim Professional Certificate (University of Alberta, 1963-64 Calendar, p. 269)

EDIA 360 was production oriented and equipped undergraduates for teaching Grade X students the factors that affect designing, manufacturing, marketing, quality and cost of a product.

EDIA 370 developed competence in computer and electricity - electronics technologies, which was one of the Grades XI and XII clusters. The aspiring teacher was now qualified to teach Grades I to XII. (University of Alberta, 1963-64 Calendar, p.294) Students who completed year three were eligible to apply to the Department of Education for an Interim Professional Teaching Certificate.

Fourth Year

1. EDFDN 492
2. Approved Social Science Course
3. EDIA 350 - Educational Programs in Industry, Full Classroom Course
4. EDIA 460 - Technology II, Full Laboratory Course
5. EDIA 470 - Technology III, Full Laboratory Course (University of Alberta, 1963-64 Calendar, p. 269)

EDIA 350 displayed the nature of educational programs practiced by management and labor.

EDIA 460 provided greater depth in the cluster of materials and processes, and power technologies.

EDIA 470 developed competence in graphic communications and mechanical technologies. (University of Alberta, 1963-64 Calendar, p. 294)

The graduate was now prepared to teach all phases of industrial arts to either junior or senior high school students.

A unique part of the program was that it strongly advocated the integration of teaching methods and student evaluation techniques. Potential industrial arts teachers were discouraged from placing emphasis on the lecture and the demonstration as methods to present instructional content. These students were encouraged to keep lecture and demonstration time to a minimum so that print and non-print media could be used to support instruction. Recommendations for instructional processes included the conference method of leading discussion meetings; job instructional training for directing student learning of machine operations on the job; and various forms of individualized instruction in the form of taped lessons, audio-visual software, charts, computer-aided instruction and pictorial programmed instruction booklets which would allow student access (and repetition if necessary) during his prime need.

Aspiring teachers were discouraged from relying heavily on any form of written tests or the completed product as a means of evaluating student achievement. As a substitute for these conventional evaluation procedures it was recommended that the campus class member use the PERT (Performance Evaluation Review Technique) method of charting a student's performance as well as the use of critical incidence performance appraisal for taking a 'snap-shot' of a student's progress on a prescribed task. (Ziel, 1971, p. 141)

By September of 1964 the laboratories had been moved from Hillcrest Junior High School to the basement of the "J" wing of the Northern Alberta Institute of Technology (N.A.I.T.). The facilities at N.A.I.T. were organized as multiple-activity laboratories and the courses were taught by either professors or sessional appointees from the Department of Industrial and Vocational Education. The academic courses were taught at the University of Alberta. (Interview, C. Preitz, August 29, 1988)

As the special program for teachers of general shop in Edmonton gained foothold in its first year, the process of phasing out the program at Calgary had begun with the start of the Fall term of the 1964-65 academic year when first year registrations for that program were no longer accepted. (University of Alberta, 1964-65 Calendar, p. 214) The phase out of the Calgary program was completed in 1967-68.

The industrial arts teaching laboratories remained at N.A.I.T. until the fall term of 1968 when they were moved to temporary facilities on the campus of the University of Alberta. These facilities were housed in specially built "Butler Huts" which became the home of the industrial arts laboratories until 1985.

With the exception of a few minor content changes initiated by individual professors, the proposed teacher education curriculum remained unchanged for nearly a decade, but had during this time significantly affected the industrial arts philosophy in Alberta. By the 1970-71 term, 86.9% of the Alberta schools offering industrial arts were doing so in multiple-activity laboratories. (Smith, 1973, p. iv)

The first signs of change to the university program was the introduction of an additional 100 hours of student teaching (Ed. IA 451 and Ed. IA 453) in the fourth year in 1970-71 to the 100 hours that were required in the second year of the program. (University of Alberta, 1970-71 Calendar. Section 74.8) The next year saw the student teaching component reduced to 100 hours when this component was placed in the third year of the program. At this time, also, science courses were re-scheduled to allow a selection from at least two fields to permit a junior-senior sequence in either Mathematics, Chemistry, or Physics. (University of Alberta, 1971-72 Calendar, Section 73.4.3) This mandate allowed for the first development of a minor.

In 1973 the Minister of Education, The Honourable Julian Koziak, announced that the minimum acceptable qualification for teaching in Alberta schools by 1977 would be a Bachelor of Education degree. (Haywood, 1975, p. 20) When that edict was issued, it was also mandated that one full term of student teaching become part of the requirements for the degree. As a result, the Faculty of Education received approval from the university to increase the student teaching component of its programs to between two and three course equivalents. (University of Alberta, 1974-75 Calendar, Sections 72.5 - 73.1.1) All departments in the Faculty of Education redesigned their programs, converted their full courses into half year courses, and adopted the component model that was approved by the Faculty of Education Council. The component model had the same number of course equivalents, namely 20, and included the following components:

Component	Number of Course Equivalents 1974-75	1975-76
a. non-education courses	6 1/2	7
b. teaching specialization	3 1/2	5
c. student teaching	1	2
d. curriculum instruction	4	1
e. basic education courses	3	3
f. free options	2	2
	20	20

(taken from the University of Alberta, 1974-75 Calendar, Section 73.4.2 and the University of Alberta, 1975-76 Calendar, Section 73.4.2)

Departmental courses that appeared in the University of Alberta comprehensive calendars from 1963-64 to 1975-76 contained alpha course descriptors that were either EDIA or EDVOC The "ED" prefix meant that the course was offered by the Faculty of Education and was used by all departments or divisions of the faculty. The abbreviation IA denoted an industrial arts course while VOC was for a vocational education course.

During the 1974-75 calendar year, the academic staff of the Department of Industrial and Vocational Education began program revision in order to integrate the courses offered into the component model. When the program was revised, the alpha descriptors for both industrial arts and vocational education courses were changed to EDIND which meant only that the course was offered by the Department and was a common descriptor for both industrial arts and vocational education routes.

The revised program contained a series of three credit half courses for each route. The University of Alberta 1975-76 Calendar indicated the new program for industrial arts had this structure (* denotes a half course, ** represents a full course equivalent, and **** signifies two full course equivalents):

First Year
1. Approved Non-Education **
2. Approved Social Science **
3. Technical Drawing - Design **
4. EDADM *
   EDIND 200 series *
5. EDIND 200 series ** (Section 73.4.2)

Industrial arts students could select the EDIND 200 level courses from the following half-year course offerings:

EDIND 211 - Materials I	Metals and Materials Testing
EDIND 213 - Materials II	Wood, Plastics and Earths
EDIND 233 - Technology I	Power Technology
EDIND 235 - Technology II	Graphics Technologies
EDIND 237 - Technology III	Electronic and Computer Technologies (Section 73.4.2)

Second Year
1. Approved Science **
2. Approved Science *
   Approved Arts *
3. EDPSY **
4. EDIND 457/495 **
5. EDIND 497 *
   Free Option * (Section 73.4.2)

In the second year industrial arts students were required to take two additional industrial content courses that would help build their skill base to cut, shape, form and finish a material or to learn the concepts associated with a technology.

A free option was a course that the student could select from any faculty, department or division in the university. An industrial arts student could choose another industrial arts content course. EDIND 391 Multiple Activity Laboratory I was a laboratory course where the skills, knowledge, understanding and attitudes acquired by the student in Materials I and II, and Technology I, II,and III were synthesized. An alternative to a free option was the selection of an additional course in Mathematics or Science so the student could develop a second teaching subject.

Third Year
1. Approved Science **
2. Approved Arts *
   Basic Education *
3. Senior EDFDN **
4. EDIND 457/495**
5. EDIND 497 *
   Free Option * (Section 73.4.2)

Industrial arts students were considered to have a minor after completing one and one-half (3 half courses) courses in Mathematics, Chemistry or Physics in the second and third year of the program. One of these half courses had to be taken at the senior undergraduate level.

Fourth Year
1. Education Practicum ****
2. EDIND 477 *
   Approved Business Administration *
3. Non-Education Option **
4. Free Option ** (Section 73.4.2)

Course descriptions of other half year courses that were available to industrial arts students in the third and fourth year were:

EDIND 392 - Industrial Arts Activities for Elementary Teachers
EDIND 395 - Man and Technology I - Study of the interrelationship of man and technology utilizing simulated industrial environment.
EDIND 412 - Materials I A - Further study of Metals and Materials Testing. Prerequisite: Ed. Ind. 211
EDIND 416 - Materials II A - Further study of Woods, Plastics and

Earths. Prerequisite: Ed. Ind. 213

EDIND 434 - Technology I A - Further study of Power Technology. Prerequisite: Ed. Ind. 233

EDIND 436 - Technology II A - Further study of Graphics Technologies. Prerequisite: Ed. Ind. 235

EDIND 438 - Technology III A - Further study of Electronic and Computer Technologies. Prerequisite: Ed. Ind. 237

EDIND 457 - Multiple Activity Laboratory I - Synthesizing activities with content from the material and technology components of productive society.

EDIND 477 - Man and Technology II - Study of the teaching of the interrelationship of man and technology.

EDIND 492 - Technical Communications - Instruction and practise in communication skills.

EDIND 496 - Individual Directed Study. Prerequisite: consent of the department

EDIND 497 - Curriculum Development.

EDIND 498 - Individual Directed Laboratory Study. Prerequisite: consent of the Department. (University of Alberta, 1975-76 Calendar, Section 74.8)

The component model which guided the industrial arts program of study remained in place until the 1977-78 academic year. Change was influenced by a statement made to the Legislature by the Honourable Julian Koziak, Minister of Education. On May 4 1977, after extensive deliberations with representatives from the Alberta Teachers' Association, the Alberta School Trustees' Association and Dr. R. Anderson (Dean of the Faculty of Education, University of Lethbridge and representing Alberta universities), the Minister announced to the House that:

> BEGINNING THIS FALL THE UNIVERSITIES WILL INTRODUCE A VALUABLE PROGRAM OF PRACTICAL CLASSROOM EXPERIENCE EQUIVALENT TO THIRTEEN FULL WEEKS FIELD TRAINING FOR BACHELOR OF EDUCATION DEGREE STUDENTS. THIS WILL MORE THAN DOUBLE THE FIELD EXPERIENCE PRESENTLY INVOLVED. BY 1981 SUCCESSFUL COMPLETION OF AN EXTENDED PRACTICUM WILL BE A REQUIREMENT FOR PROFESSIONAL CERTIFICATION. (Alberta Education, Communications 1977, New Release #24)

Upon making this announcement, the Minister of Education indicated that in addition to the regular funding of the province to the universities, an implementation grant of six million dollars would be made available through the Department of Advanced Education and Manpower. This money was to be distributed among the Universities of Alberta, Calgary and Lethbridge in four annual installments of $1.5 million.

Prior to this announcement, education students at the universities received the majority of their student teaching experience in urban schools. It was felt that a significant consequence of this ruling would be expanded opportunities for the placement of student teachers in schools located in rural areas.

Efforts to implement the Minister's ruling created considerable discussion among academic staff at both Department and Faculty levels concerning the structure of the practicum. The final decision defined education practicum as being a three phase structure that was distributed throughout the four years of the program.

Students enrolled in the industrial arts route would receive Phase I of the education practicum in the second term of the first year. Phase II of the practicum would be taken in the first term of the third year. During the second year of the program, industrial arts registrants would be teaching junior high school pupils on a one-to-one basis in EDIND 457 - Multiple Activity Laboratory II facilities located on campus. These students were bussed to the University from one of the junior high schools of the Edmonton Catholic School District. Phase III of the practicum would be classified as the professional term consisting of two university courses and three practicum courses. This phase of the practicum was designed as a "sandwich" program where students would spend three weeks of the term in two university classes and four weeks of the term in a cooperating school practicum. At the end of the four weeks practicum the cycle would be repeated.

The basic framework of the industrial arts student program at the University saw little change for eleven years since its revision in 1977-78. The first year of the new program was designed to accommodate the transfer of students (either external or internal to the University) into the Department with a minimum loss of credit.

Early in the 1986-87 academic year exploratory discussions were held between designated personnel from the university and The Northern Alberta Institute of Technology (NAIT) to determine if both institutions could collaborate to offer skill development courses to university industrial arts students. The results of these discussions culminated in the winter term (Term II) of the 1987-88 academic year when EDIND 233 - Technology I: Power Technology and EDIND 237 - Technology III: Electronic and Computer Technologies were transferred to the institute of technology to be offered on a pilot basis. This was the first step of an expanded cooperative arrangement between the two institutions that was to follow.

At the end of the term an assessment was made of the pilot study by personnel from Program Development Services at NAIT. The purpose of that assessment was to determine the strengths and weaknesses of the pilot study, and to facilitate more effective and efficient delivery of future courses. The findings of this study included seven recommendations. Four of these recommendations were directed at content and three at instruction. As a result of these findings, University of Alberta and NAIT personnel formed the opinion that the effort to transfer courses should become more "collaborative" instead of "cooperative".

Additional discussions were held which resulted in the transfer of two more courses to the institute in Term I of the 1988-89 academic year. The junior courses that were transferred included EDIND 211 - Materials I: Metals and Materials Testing, and EDIND 213 - Materials II: Woods, Plastics and Earths. In the winter term of 1988-89 the companion senior level Materials courses, EDIND 412 - Materials I-A and EDIND 416 - Materials II-A were transferred to NAIT Students who were involved with Term II courses took the prerequisite junior courses at the university. This was the last class of students to complete EDIND 211 and EDIND 213 in university laboratories. Students who entered the program in September, 1988 became the first group of students to spend a complete year at NAIT to develop their psychomotor skill base.

It was anticipated that the transfer of courses to the Northern Institute of Technology would be on a gradual phase-in basis that would be accomplished over a three year period 1987-90. The phasing-in of these courses is being evaluated by both institutions. During the 1988-89 academic year a formative evaluation was conducted by Occupational Education Systems Ltd. who had been contracted by the Department to complete the evaluation. The two major purposes of this study were to provide direction and modification in the collaboration, and to improve the quality of the courses offered. The final report "Teacher Education in Industrial Arts" included 38 recommendations of which a number were referred to the Career Education Task Force in the Department. Other recommendations were to be discussed with NAIT personnel to initiate a smooth collaborative program. Table 1 contains data which shows the gradual transfer of courses to NAIT and the year when the transfer for each course occured or will occur.

During the administration of Dean W.W.Worth, Faculty of Education, there was concern expresssed by him to members of the Department about the number of sessionals who were teaching industrial arts content courses. From 1980 until 1989, EDIND 235 was taught by staff who held a sessional appointment. Those selected as sessionals to teach both the junior and senior Graphics courses were practising industrial arts teachers with expertise in

Graphics. A major disadvantage of this arrangement was that these courses had to be offered after regular secondary school operating hours. As a result,

Table 1

<u>Industrial Arts Course Transfer to NAIT: Year and Term</u>

Year and Term of Transfer						
87/88-2	88/89-1	88/89-2	89/90-1	89/90-2	90/91-1	90/91-2
Course Transferred						
233A		233B	233C		233D	
237A		237B	237C		237D	
	211B	412A	211C	412B	211D	412C
	213B	416A	213C	416B	213D	416C
			235C	434B	235D	434C
				436B		436C
				438B		438C

<u>NOTES</u>

A Class entering U of A 8609 as first year students
B Class entering U of A 8709 as first year students
C Class entering U of A 8809 as first year students
D Class entering U of A 8909 as first year students

some university students who were enrolled in one of these courses were attending classes from eight o'clock in the morning to nine o'clock at night.

Westerra Institute of Technology became, in the autumn of 1983, Alberta's third and newest institute of technology. Two of the courses offered at this institute were of interest to the Department: Printing and Graphic Arts - Basic Typesetting and Printing, and Graphic Arts - Art and Copy Preparation. Informal exploratory discussions were held between Dr. R. Bigsby, Special Consultant to the President (of the institute), and Dr. F.D. Ilott who was asked by the Department Chairman to represent the Department. These discussions were held to determine if the Graphics courses at the institute could be offered to university students. Little became of these discussions for the following reasons: the costs were considered to be too high; the students would have to travel too great a distance; timetabling these courses at times other than late afternoon or early evening would be difficult; and a radical change would have to be made to the curriculum of the institute in order to include content found in university courses.

The laboratory courses that remained at the University of Alberta, along with all non-laboratory (education practicum) courses, were EDIND 391 (Multiple Activity Laboratory I), EDIND 395 (Man and Technology I) and EDIND 457 (Multiple Activity Laboratory II). These laboratories at the University of Alberta are being used to teach the methods courses to industrial arts students. (Personal Interview with F.D. Ilott, Coordinator of the Transfer Program; August 29, 1989)

The main reason for the transfer of laboratory courses to NAIT was budget cuts at the University of Alberta which led to cuts in the funding for sessional lecturers. Alternatives were sought for offering laboratory curriculum content to preservice industrial arts teachers. In the spring of 1986 Dr. H.D. Tichenor, Chairman of the Department of Industrial and Vocational Education, met with S. Such, President of NAIT, and F. Williamson, Vice-President of NAIT to explore the development of a new cooperative education program. This new program could be utilized by preservice industrial arts teachers and NAIT students alike, and multiple exits could be offered to graduates. The program would employ university personnel to offer the professional component and NAIT personnel to accommodate the technical component, and possible funding could be obtained from Advanced Education. Extenuating circumstances, however, led to changes in program implementation which resulted in NAIT providing the service of educating students for the Department at the University of Alberta. (Personal Interview with H.D. Tichenor, Department Chairman at the time of initiation of the Transfer Program; March 28, 1990)

The President's Advisory Committee on Campus Reviews (PACCR)

From the time of the formation of the Department of Industrial and Vocational Education in 1962, the most influential change agent has been the President's Advisory Committee on Campus Reviews (PACCR). The review concept for the University began to evolve in 1977 but was not fully developed and accepted until 1980. Initially the review process began with the formation of an Advisory Committee to the President. This Committee eventually evolved into PACCR which was given the "mandate to conduct reviews of all campus units, academic and administrative/support units". (Campus Reviews, 1988, p. 2) The ultimate goal of PACCR is program improvement through constructive change and adaptation to continually changing circumstances. (Campus Reviews, 1988, p. 6)

The review process consists of three distinct yet interrelated phases. Phase One of the procedure begins with the unit under review conducting a self study.

From this procedure a self study report is produced which serves as the primary document for the Unit Review Committee (URC) which normally consists of four members: two persons who are external to the University but from the same discipline, one internal person who is from a related discipline, and a second internal person who is from the University-at-large. (Campus Reviews, 1988, p. 10)

Members of the department under review are requested to provide a maximum of six nominees for external members of the team, as well as nominees for the internal-related member. (Campus Reviews, 1988, p. 10)

"PACCR suggests nominees for the University-at-large position and may consult with others to obtain comments on the appropriateness of nominations". (Campus Reviews, 1988, p. 10) The URC conducts an on-site review of the unit which normally takes place over a four day period. Prior to conducting the review, each member of the Committee receives (among other items) a copy of the Unit Self Study Report and a copy of Campus Reviews.

Arrangements are made by PACCR for members of the URC to have a direct interchange of information "with the head of the department, members of the department, students if appropriate, chairmen or directors of related departments, Dean and President". (Campus Reviews, 1988, p. 11) PACCR makes the necessary arrangements for other interviews. The URC prepares a report which is sent to the Chairman/Director, and the appropriate Dean or Associate Vice-President. (Campus Reviews, 1988, p. 14) The URC report is then circulated among the members of the unit for close scrutiny and study. "The unit is asked to prepare a response in which they can agree, differ from, or add to the findings, and to undertake implementation of recommendations so appropriate". (Campus Reviews, 1988, p. 14) This is the third phase of the procedure.

The response of the department and summaries of the reports are sent are sent to PACCR which meets with the head of the unit. Following this meeting, PACCR "submits its summary together with the three reports to the President". (Campus Reviews, 1988, p. 14) After the President has received all of the information and has met with PACCR, he converges with the Department Chairman, the Dean of Education, the Dean of the Faculty of Graduate Studies and Research, and the appropriate vice-president. "This group considers actions that are appropriate for joint consideration and later meets with the members of the Planning and Priorities Committee." (Campus Reviews, 1988, p. 14)

The Vice-President (Academic) has responsibility for long-term monitoring of the Reviews. Approximately a year and a half after the President, and the Planning and Priorities Committee have processed the Review, the Vice-President reconsiders some of the main items whose disposition may still need to be reviewed.

The PACCR procedure for the Department of Industrial and Vocational Education began in the fall of 1985 when members of the Department were informed by the Chairman that it had been selected for review. To initiate the self study process, study papers were developed and specific review tasks were assigned to academic staff who shared their findings in Departmental meetings. The screening process for a department chairman resulted in the curtailment of review activities which were not resumed until the fall of 1987. Early in the spring of 1986 the Dean of Education appointed an acting chairman for the Department who later became Chairman of the Department.

During the interim period, department members engaged in a number of developmental activities that examined the role of the Department and its future. Although these activities were not official PACCR activities, they did add to the review process because they contributed to the foundation for future review discussions. The eight topical areas that were identified were examined according to "what is" and "what should be", and were thoroughly reviewed at a Departmental retreat in Red Deer. Dr. Robert Taylor, Chairman of the Center for the Study of Vocational Education at Ohio State University, served as resource person at that retreat.

When the PACCR self study process was re-activitated in the fall of 1987, it was pursued as a major goal for the Department. Early in 1988, a series of one day retreats were held to identify developmental issues related to each chapter of the self study report. The most significant chapter of the report highlighted the "Departmental Development for the Future". Part of that chapter contained a conceptual model which incorporated the traditional role of teacher preparation for industrial arts and vocational education, as well as select programs in post secondary education. This portion contained programs in adult, continuing and professional education; and educational technology: media, communications, computers in education, instructional design and distance learning.

The URC readily accepted the conceptual model as did the high level administrators of the university who were involved in the PACCR process. Numerous council meetings were held in the Department where a number of new titles for the Department were presented. Academic staff, with input from both undergraduate and graduate students, chose Adult, Career and Technology Education as the new name for the Department. This new name, along with a rationale for the change was presented on May 15, 1989 by the Department Chairman to the Executive Committee of the Faculty of Education. On May 16, 1989 the minutes of the Faculty Council of the Faculty of Education indicated that the name change had been approved. On August 3, 1989, the Chairman received a memorandum from the Academic Development

Committee stating that the Committee had approved the change in name and that it would be effective on September 1, 1989.

Related Research

A review of the indices and data bases that are used to report the findings of educational research show that only the study completed by Ross (1976) was closely related to the current study. This review did assist the researcher in identifying a number of completed studies that could be used as background material for the research and writing the thesis. Among these were the research completed by Smith (1973) The Development of the Industrial Arts Multiple Activity in Alberta; the study prepared by Ible (1974) Problems in Beginning Industrial Arts Teaching; the research findings reported by Haywood (1975) Goals, Competencies, and Content Areas for the Education of Industrial Arts Teachers in Alberta; and the investigation completed by Mathew (1984) Industrial Education in Alberta: Its Evolution and Development: 1968-1982. All of these studies were conducted to fulfill the requirements by the investigator for a master's degree. The doctoral dissertation that served as a guide for the current study was the one completed by Ross (1976) An Assessment of the Alberta Industrial Arts Teacher Education Program.

Smith (1973)

Smith completed a descriptive study which traced the evolution of industrial arts from the Macdonald Manual Training Plan (1900-1903) to the establishment of the Alberta Multiple Activity Program (1963). This researcher was concerned with the changes that occured in industrial arts (philosophy, objectives, teacher preparation and facilities) and what these changes held for the future of this subject area. His research was used as background and support material for the current study.

Smith's work on teacher preparation provided by the University of Alberta for industrial arts was particularly important to this study. In 1945, the University of Alberta accepted the mandate to prepare industrial arts teachers for general and unit shops of the province. A portion of the teacher education was conducted at the Calgary campus. University of Alberta facilities were used for pedagogical courses and facilities at the Institute of Technology were utilized for practical courses.

One of the biggest change agents for industrial arts was the multiple activity program advocated by Ziel and taught at the University of Alberta, Edmonton campus. This program received wide acceptance by school administrators, parents and industrial arts teachers, and led to the conversion of many unit shops to multiple activity facilities.

The Smith study identified several complicating factors that were related to teacher preparation and the implementation of the multiple activity concept on a province wide basis. The factors relating to teachers and their preparation involved the difficulty in keeping current with rapidly changing technology; fulfilling the expectation of developing considerable skills because of the breadth of the program; the lack of university accreditation for upgrading skills and knowledge; and the need for preparation in remedial reading. Obstacles to implementing the program provincially included the teacher's lack of experience and training in setting up multiple-activity laboratories, the high cost of program operation, and the need for program prevalency and efficiency in order to justify the cost. Of prime concern to Smith was the fact that the program advocated by Ziel at the University (referred to as the Ziel Plan) was not completely congruent with the program developed by the provincial Department of Education (referred to as the Alberta Multiple Activity Program).

Ible (1974)

David Ible conducted an investigation to identify the most difficult problems perceived by industrial arts teachers in their first three years of teaching. To collect data from the 72 teachers, a questionnaire of 100 items with a 5 point Likert scale was used. Of these 72 teachers, 61 (85%) returned completed instruments.

The 100 teaching problems on the research instrument were categorized according to administrative routine; teaching aids, materials and resources; laboratory management; student evaluation; curriculum; professional development and teaching methodology. The results showed that research participants found student evaluation; and teaching aids, materials and resources to be the most difficult problem areas in the initial years of teaching. As the participants acquired greater experience, disparities began to occur between third year teachers (who perceived more difficult teaching problems), and first and second year teachers. The results also showed that teachers with a Bachelor of Education in Industrial Arts identified more difficult problems than did teachers who did not possess this qualification.

Haywood (1975)

In fulfilling the requirements for a Master of Education degree, Phillip Haywood involved a stratified random sample of 90 (20%) of the industrial arts teachers in Alberta. These teachers were asked to respond to a questionnaire that used matched pairs of statements concerned with the goals, the competencies, and the content areas for industrial arts education.

Haywood found that the most important goals of industrial arts teacher education were those that had a direct relationship to the work function of the teacher in an industrial arts laboratory. This researcher found that the 67 participants who returned completed questionnaires regarded as essential competencies the skills, knowledges, and understandings of relevant tools, equipment, materials, and technologies found in industrial arts laboratories. These same respondents perceived the most important content area to be Woodwork although the other traditional content areas of Graphic Arts, Power Technology, Electronics and Metalwork were considered to be almost as important.

Mathew (1984)

The research completed by Norman Mathew was a descriptive study which traced the evolution of the industrial education concept in Alberta from its introduction in 1968 to its complete implementation in 1982.

It is evident from what Mathew wrote that the amalgamation of industrial arts and vocational education under the rubric of industrial education required major curriculum revisions of both programs. In reporting his findings Mathew makes mention of teacher education that was offered cooperatively between the Calgary campus of the university and the Provincial Institute of Technology and Art. Mathew's historical research took the form of describing the identifiable eras of vocational education and industrial arts as frames of reference before proceeding to their union and subsequent influence on Alberta Education.

The information presented on industrial arts provided insight into the development of the university Program of Study that was used to prepare industrial arts teachers when unit shops were used to teach instructional content.

Ross (1976)

In conducting his research Ross used a questionnaire with 331 participants who taught industrial arts in the secondary schools of the province in 1975/76. The purpose of his research was to determine the value placed by Alberta industrial arts teachers on their teacher education programs for developing the specialized competencies they needed to teach industrial arts. Ross found that the majority of the respondents prepared at the University of Alberta perceived themselves to be adequately prepared to teach industrial arts to junior high school students but inadequately prepared to teach this subject area to senior high school students.

Teachers prepared at the University of Alberta felt that they were adequately prepared to teach less than one-half the seventeen industrial arts content areas found in published curriculum guides from the Curriculum Branch of the Department of Education. Ross found that the greater the number of content courses acquired by industrial arts teachers, the greater was the value they placed on their preparation.

Teachers who were prepared by universities other than the University of Alberta perceived themselves adequately prepared to teach industrial arts to both junior high school and senior high school pupils. These teachers were of the opinion that their preparation was adequate for them to teach one-half or more of the seventeen industrial arts content areas.

When the research design and instrumentation was being conceptualized for the current study, serious consideration was given to replicating the research design used by Ross and using the Ross questionnaire of 206 competency statements. However, a comparison of the content areas and performance items listed in the Ross questionnaire with the current curriculum guides revealed that much of the Ross survey instrument was outdated. The questionnaire used by

Ross was the same for both junior high school and senior high school industrial arts teachers. The format of the Ross instrument, however, was followed when the researcher developed the questionnaire used for this study. This research used two separate questionnaires, one for junior high school teachers and one for senior high school teachers, that were constructed by listing all of the specialized competencies for each level found in the curriculum guides used in 1989 and assembling them under content area titles. The Ross questionnaire was referenced for the wording of phrases that could be reused in the assembly of the two questionnaires.

It was found that only portions of the data collecting procedure used by Ross could be replicated in the present study for these reasons:

Firstly, those school districts in the metropolitan Edmonton area and the Northern Institute of Technology who collaborated on establishing "Procedures for Conducting University Initiated Projects in the Schools" adhere more stringently to the guidelines that they established in the late 1960's. Consequently, this added to the number of steps in the methodology for conducting this survey. A number of school districts and industrial arts teachers from these districts would be involved in the research which made it imperative that this procedure be written into the research methodology and followed. This requirement added to the number of components in the research design of the present study.

Secondly, in January 1985, the General Faculties Council approved a policy on ethics in human research that requires all proposed research involving human participants be subject to an ethics review. Early in 1988 guidelines for conducting human research were promulgated by General Faculties Council to simplify the review procedure. The Dean of Education designated this responsibility to departments who established an ad hoc Department Ethics

Review Committee. This committee reviews all research proposals, funded as well as non-funded, before the research is begun.

When this study was conceptualized, it was determined that a random sample of 150 rural and urban industrial arts teachers from junior and senior high schools would be drawn. Consequently, the use of these teachers in the research precluded that the Department Ethics Review Committee had to review and approve both the research design and the research questionnaire. This additional procedure had to be written into the research methodology.

Summary

Industrial Arts was first taught in Alberta at the turn of the century when this province was still part of the Northwest Territories. As this practical subject area evolved, it was first called 'Manual Training' when it was part of the Macdonald Experiment and later became known as 'Manual Arts' (1926 - 1936). Various terms for practical subjects occupied different eras that in many cases were overlapping. The time period for 'General Shop' ran concurrently with 'Technical Electives' (1936 - 1944). The difference between the two existed in their classification; Technical Electives were labelled Group C courses and General Shop was called a Group D subject. Industrial Arts (1944 - 1983) became the next dominant term, and was combined with vocational education and work experience to form Industrial Education (1968 - 1983). The term 'Practical Arts' (1977 - 1989) was introduced by personnel of the Curriculum Branch of Alberta Education to include Industrial Education, Home Economics, and Business Education.

Teacher education programs for industrial arts began at the Calgary Normal

School with the creation of this province in 1905. Other normal schools were established in Camrose and Edmonton. Eventually preparation for teaching this subject area was offered intermittently and alternately during summer sessions at Calgary and Edmonton institutions. Full preparation during winter sessions began at the University of Alberta, Calgary campus and the Provincial Institute of Technology and Art until the formation of the Division of Industrial and Vocational Education at the University of Alberta, Edmonton campus in 1963. After this date, the Calgary program was phased out. Teacher education for industrial arts has remained exclusively at the University of Alberta since that date to the current time.

Studies addressing topics that fit into the framework of this research provided information on the historical development of the subject area, identified subject material that was relevant to a teacher preparation program, and outlined the problems that concerned beginning industrial arts teachers. One research document that measured attitudes of teachers toward their preparation for teaching industrial arts in Alberta was of special interest to this study and influenced the development of this research. The 1976 doctoral dissertation by Ross revealed that teachers prepared at the University of Alberta felt they were adequately prepared to teach all content areas in junior high school industrial arts but less than one-half of the seventeen content areas for senior high school industrial arts. This report also pointed out that the value industrial arts teachers placed on their preparation increased with the number of preparation courses acquired by them.

CHAPTER III

ANALYSIS OF DATA: PART A

Introduction

The previous chapter contained a description of the evolution of industrial arts in Alberta since 1905. Also included as content of that chapter was a description of the industrial arts teacher preparation program since its beginning. Research that was related to the current study was identified and reported.

This content of this chapter presents an analysis of the data that were collected from 92 of the 98 Alberta industrial arts teachers who returned either a completed junior high school or a senior high school research instrument. Two questionnaires, one for junior high school teachers and one for senior high school teachers, were used in this study. Of the 98 returned questionnaires, six were not usable.

It will be recalled from the research design described in Chapter I that the population selected for the purpose of this study included industrial arts teachers in the following categories: 50 rural junior high school teachers, 25 urban junior high school teachers, 50 rural senior high school teachers and 25 urban senior high school teachers. These categories were created in order to obtain representation from all areas of the province.

Research instruments received by the May 30, 1989 deadline were placed into one of the following six categories: junior high school teachers prepared at the University of Alberta (30), junior high school teachers prepared at other Canadian institutions (6), junior high school teachers prepared at non-Canadian institutions (12) for a total of 48 teachers; senior high school teachers prepared at the University of Alberta (30), senior high school teachers prepared at other Canadian institutions (7) and senior high school teachers prepared at non-Canadian institutions (7) for a total of 44 teachers. The group placement of each participant was determined by his/her response to question 7 of the background information portion of the questionnaire.

The response to each question or item on the returned questionnaires was coded and an unanswered item was left blank. All of the returned questionnaires were then taken to the Department of Educational Research Services, University of Alberta, where personnel keypunched the research information onto 80 column computer cards.

Both questionnaires were designed in two parts. Part A which was common to both instruments contained eight questions to secure background information from participants.

Part B of the junior high school instrument consisted of two sections. The first section contained 2 categories that referred to the competencies a teacher needed for organizing and presenting content to a learner, and the second section encompassed 14 categories that were content areas listing student terminal behaviors a student should acquire after successfully completing Junior High School Grades 7, 8, 9 Industrial Education. These behaviors are found in the curriculum guide for junior high school industrial education. Each of the 16 categories included 11 items that were individually measured by participants on a 6-point Likert scale.

Part B of the senior high school instrument also contained two sections. The first section listed the same teacher related competencies that were part of the first section taken from the junior high school questionnaire. The second section, however, included 14 categories that were content areas listing student terminal behaviors for senior high school students who successfully completed all Industrial Education courses at the 10, 20, 30 level. These performances were taken from the Curriculum Guides for Industrial Education 10, 20, 30 series of courses. For each of the 14 categories, participants were provided with 11 items to rank on a 6-point Likert scale. The choices available on the Likert scale were: 1-"no value", 2-"most inadequate", 3-"inadequate", 4-"adequate", 5-"most adequate", and 6-"excellent".

Statistical Procedures

Frequencies generated from the 8 questions in Part A of both instruments were tabulated to embellish numbers and percents for each teacher group. Comparisons were then made between both the junior and senior high school teachers, and contrast statements were also made among these two cohorts. Responses to Part B of the junior high school instrument were tabulated according to content area, where each of the three groups were represented by the mean (indicator of combined performance), the median (indicator of typical performance) and the standard deviation (indicator of diversification of responses). Standard deviations were placed in each table for observation by the reader. The comparative analysis of each content area was followed by an item analysis in which the behaviors viewed by each group to be the "most adequately prepared" were listed, accompanied by the items perceived to be the "least adequately prepared".

An assembly of all sixteen content areas for each of the six groups was made in order to provide a composite perspective of each group's attitude toward its entire teacher preparation program. The findings of this analysis for program adequacy were also compared to those of the Ross study in 1976.

In order to compare the findings of this study to that of Ross (1976), interpretation of the median (statistical measure representing the midpoint of the responses) for each content area was used to determine ratings of 'inadequate' or 'adequate'. A median value of greater than 3.500 would represent 'adequate' since this value is the midpoint in the six-point Likert scale; and a median value below 3.500 would record 'inadequate'. A rating of one-half or more of the sixteen content areas at either 'inadequate' or 'adequate' could be used to indicate the value of the total preparation program for each group of teachers. In the Ross study, responses to the same Likert scale were converted to a dichotomous scale of 'inadequate' or 'adequate' for each content area.

Due to the small numbers in the sample population for two of the three groups of junior high school teachers, an analysis of data using a oneway ANOVA (Analysis of Variance) with a Scheffé statistical procedure could not be used. Instead, comparisons of group ratings were made by converting frequencies for each content area into measurements of 'inadequate' and 'adequate' by analyzing medians. A median of 3.500 or higher indicated that 50% or more of the frequencies were in the upper 'adequate' limit.

Responses to Part B of the senior high school instrument were processed the same as were the responses to Part B of the junior high school instrument.

Data generated from Part A questions were tabulated and analyzed under the category 'Background Information Questions' (Chapter III) and Part B information was processed beneath the headings 'Attitudes of Junior High School Teachers Toward Their Preparation' (Chapter IV) and 'Attitudes of Senior High School Teachers Toward Their Preparation' (Chapter V).

Background Information Questions

Part A of both instruments asked 8 questions in order to secure demographic data from participants for the purpose of developing a composite profile of those involved in the study. This comparison is presented in the form of tables for ease of interpretation by the reader. The 8 questions sought participant information on variables such as current teaching assignment, teaching experience, professional qualifications, preparation program for teaching Industrial Arts, number of years of teacher preparation, institution(s) responsible for teacher preparation, and other sources of teacher preparation.

Teaching Assignment

The intent of the first question that was asked of the participant was to discover the nature of the industrial arts teaching assignment at the time of the study.

The question:

1. YOU ARE CURRENTLY TEACHING: a. GRADES 7, 8, 9 INDUSTRIAL EDUCATION
   b. INDUSTRIAL EDUCATION 10, 20, 30 SERIES OF COURSES

The data collected from both instruments by this question are presented in Table 2. Of the 90 participants who responded to this question, 41 (45.6%) indicated that they had a teaching assignment that included teaching both junior and senior high school students. The teacher cluster that had this dual teaching assignment consisted of 20% (18) junior high school teachers and 25.6% (23) senior high school teachers.

Table 2

<u>Current Teaching Assignment</u>

(N = 90)

Industrial Arts Teacher Group	Teaching Assignment: Junior High I. A.		Senior High I. A.		Junior-Senior High I. A.		Total	
	No.	%	No.	%	No.	%	No.	%
Group 1	18	20.0	2	2.2	10	11.1	30	33.3
Group 2	4	4.4	0	0.0	2	2.2	6	6.7
Group 3	6	6.7	0	0.0	6	6.7	12	13.3
Total	28	31.1	2	2.2	18	20.0	48	53.3
Group 4	1	1.1	13	14.5	15	16.7	29	32.2
Group 5	0	0.0	3	3.3	3	3.3	6	6.7
Group 6	0	0.0	2	2.2	5	5.6	7	7.8
Total	1	1.1	18	20.0	23	25.6	42	46.7
Grand Total	29	32.2	20	22.2	41	45.6	90	100.0

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions
Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Each individual junior high school teacher group had at least one-half its members (18 out of 30, 4 out of 6, and 6 out of 12) teaching only junior high school industrial arts. The senior high school teacher groups, however, had one-half or fewer of its members (13 out of 29, 3 out of 6, and 2 out of 7) teaching industrial arts at the Grade 10, 11 or 12 level.

The reasons for the dual teaching assignments could be that a good number of the industrial arts laboratories where participants taught were located in junior-senior high schools, or that industrial arts was taught in senior high schools that received students from feeder junior high schools.

Teaching Experience

The second question asked participants to indicate the number of years of teaching experience they had at the time of the study.

The question:

2. PLEASE CIRCLE THE NUMBER OF YEARS YOU HAVE TAUGHT INDUSTRIAL ARTS (INDUSTRIAL EDUCATION) IN ALBERTA:

1 2 3 4 5 6 7 8 9 10 12 14 16 18 20 or more

The responses were clustered into three categories: 1-5 years, 6-10 years, and 11 or more years. These data are displayed in Table 3.

Of the 91 respondents who answered question 2, 46 (51.5%) had 11 or more years experience teaching industrial arts. A more detailed analysis of this category reveals that an aggregate of 24 (26.4%) members were junior high school teachers and 22 (24.2%) were senior high school teachers. The second highest experience cluster, 6 - 11 years, contained 14 (15.4%) junior high school teachers and 15 (16.5%) senior high school teachers for a total of 29 or 31.9% of those involved in the study. The smallest experience cluster (1 - 5

Table 3

Years Teaching in Alberta Schools

(N = 91)

Industrial Arts Teacher Group	Years Teaching Experience							
	1 - 5		6 - 10		11 or more		Total	
	No.	%	No.	%	No.	%	No.	%
Group 1	9	9.9	8	8.8	13	14.3	30	33.0
Group 2	0	0.0	3	3.3	3	3.3	6	6.6
Group 3	1	1.1	3	3.3	8	8.8	12	13.2
Total	10	11.0	14	15.4	24	26.4	48	52.8
Group 4	6	6.6	9	9.9	15	16.5	30	33.0
Group 5	0	0.0	5	5.5	1	1.1	6	6.6
Group 6	0	0.0	1	1.1	6	6.6	7	7.7
Total	6	6.6	15	16.5	22	24.2	43	47.3
Grand Total	16	17.6	29	31.9	46	50.5	91	100.0

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions
Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

years) represented 16 (17.6%) teachers who returned completed instruments. Ten or 11.0% of these teachers taught junior high school industrial arts and 6

(6.6%) taught senior high school industrial arts. When considering the three groups of junior high school teachers, the greatest numbers fell into the category '11 or more' years of teacher experience (13 out of 30, 3 out of 6, and 8 out of 12). Of the three groups of senior high school teachers, the University of Alberta prepared 15 out of 30 who had 11 plus years of teaching experience. Teachers that were prepared outside Canada had 6 out of 7 that fell into the 11 plus years of experience teaching category. Teachers prepared in other Canadian institutions had only 1 participant with 11 or more years teaching experience.

Professional Qualifications

Questions 3 and 4 were designed to elicit information on the professional qualifications of participants. The intent of question 3 was to establish the highest university degree participants attained.

The question:

3. THE HIGHEST DEGREE FOR WHICH YOU HAVE ATTAINED CREDIT IS:

a. BACHELOR OF EDUCATION DEGREE

b. BACHELOR OF EDUCATION/AFTER DEGREE

c. MASTER OF EDUCATION DEGREE

d. OTHER ______________

The data for this question can be found in Table 4 and indicate that 66 of the 90 respondents, or 73.3%, had as their highest educational qualification a Bachelor of Education degree. From these 66 participants, 35 (38.9%) were junior high school teachers and 31 (34.4%) were senior high school teachers.

Of the three groups of teachers who made up the junior high school cohort, there were 27 out of 30, 3 out of 5, and 5 out of 12 teachers who had earned a

Table 4

Highest University Degree Attained

(N = 90)

Industrial Arts Teacher Group	University Degree									
	B. Ed.		B. Ed./A.D.		M. Ed.		Other		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Group 1	27	30.0	0	0.0	3	3.3	0	0.0	30	33.3
Group 2	3	3.3	1	1.1	1	1.1	0	0.0	5	5.6
Group 3	5	5.6	1	1.1	2	2.2	4	4.4	12	13.3
Total	35	38.9	2	2.2	6	6.7	4	4.4	47	52.2
Group 4	25	27.8	2	2.2	0	0.0	3	3.3	30	33.3
Group 5	2	2.2	2	2.2	2	2.2	0	0.0	6	6.7
Group 6	4	4.4	1	1.1	0	0.0	2	2.2	7	7.8
Total	31	34.4	5	5.6	2	2.2	5	5.6	43	47.8
Grand Total	66	73.3	7	7.8	8	8.9	9	10.0	90	100.0

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions
Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

'B. Ed.' degree. The 'Other' classification allowed Group 1 teachers to identify programs they had partially completed such as: a graduate studies program in

Industrial Education and a Graduate Diploma in Educational Administration. Group 2 teachers identified 'diploma' as another educational qualification. Group 3 teachers listed 'Bachelor of Science Degree' (3) and 'Graduate Diploma in Educational Administration' and "teacher college in the United Kingdom'.

Two of the three groups of senior high school teachers [those prepared at the University of Alberta (25) and those prepared at non-Canadian institutions (4)] possessed a Bachelor of Education degree. Group 5, those that were prepared at other Canadian institutions, had 2 who had a 'B. Ed.' degree. Other data in this table show that 7 of those involved in the study had completed an after-degree in education after they received their initial degree. Of the 90 participants who provided information to this question, 8 or 8.9% had a masters degree. One member of group 6 identified a 'Doctorate in Philosophy" as an 'Other' educational qualification.

Question 4 of the 'Professional Qualifications' category was to determine the teaching specialization designated on the Bachelor of Education degree.

The question:

4. YOUR BACHELOR DEGREE IS IN:

a. INDUSTRIAL ARTS c. OTHER ________________

b. VOCATIONAL EDUCATION

In Table 5 are data which show that 65 of the 88 junior high school and senior high school teachers or 73.9% had a Bachelor of Education degree with a specialization in Industrial Arts. The majorities of all three groups of junior high school industrial arts teachers had this qualification (23 out of 29, 5 out of 6, and 7 out of 10).

Table 5

Nature of Bachelor of Education Degree

(N = 88)

Industrial Arts Teacher Group	Bachelor of Education Degree: Industrial Arts		Vocational Education		Other		Total	
	No.	%	No.	%	No.	%	No.	%
Group 1	23	26.1	3	3.4	3	3.4	29	33.0
Group 2	5	5.7	0	0.0	1	1.1	6	6.8
Group 3	7	8.0	0	0.0	3	3.4	10	11.3
Total	35	39.8	3	3.4	7	7.9	45	51.1
Group 4	23	26.1	2	2.3	5	5.7	30	34.1
Group 5	2	2.3	2	2.3	2	2.3	6	6.8
Group 6	5	5.7	0	0.0	2	2.3	7	8.0
Total	30	34.1	4	4.6	9	10.2	43	48.9
Grand Total	65	73.9	7	7.9	16	18.2	88	100.0

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions
Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

The majority of senior high school industrial arts teachers prepared at the University of Alberta (23 out of 30) and the majority of senior high school industrial arts teachers prepared at non-Canadian institutions (5 out of 7) also had a Bachelor of Education degree in Industrial Arts.

The group of senior high school industrial arts teachers prepared at other Canadian institutions, 6, had an equal number of teachers (2) who had a Bachelor of Education degree in Industrial Arts, Vocational Education and other specialties. Group 1 teachers (3) have identified 'Other' subject area specialization as being Biology, Mathematics, and History. Group 2 teachers (1) listed their subject area specializations as Biology, Science, and Library. Members of the third group of junior high school industrial arts teachers (3) indicated that they received teacher preparation in Drafting, Social Studies, and training in guilds in the United Kingdom.

Group 4, the first senior high school industrial arts teacher group, (5) identified Mathematics, Chemistry, Psychology, and Home Economics as other subjects listed on the Bachelor of Education degree. Group 5 (2) listed Biology and Science as other subject specialties. Group 6 teachers (2) labelled Science as their other specialization.

Preparation Program for Teaching Industrial Arts

The purpose of question 5 was to determine the teacher preparation program which prepared teachers to teach Industrial Arts in the secondary schools of Alberta.

The question:

5. THE TEACHER EDUCATION PROGRAM WHICH PREPARED YOU TO TEACH IN THIS SUBJECT AREA WAS:

a. INDUSTRIAL ARTS b. VOCATIONAL EDUCATION c. OTHER ________

Data in Table 6 show that 81 of the 91 participants or 89.0% of both

Table 6

Preparation Program to Teach Industrial Arts

(N = 91)

Industrial Arts Teacher Group	Preparation Program: Industrial Arts		Vocational Education		Other		Total	
	No.	%	No.	%	No.	%	No.	%
Group 1	27	29.7	3	3.3	0	0.0	30	33.0
Group 2	6	6.6	0	0.0	0	0.0	6	6.6
Group 3	11	12.1	0	0.0	1	1.1	12	13.2
Total	44	48.4	3	3.3	1	1.1	48	52.7
Group 4	29	31.9	1	1.1	0	0.0	30	33.0
Group 5	3	3.3	3	3.3	0	0.0	6	6.6
Group 6	5	5.5	0	0.0	2	2.2	7	7.7
Total	37	40.7	4	4.4	2	2.2	43	47.3
Grand Total	81	89.0	7	7.7	3	3.3	91	100.0

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -jumior high school teachers prepared at non-Canadian institutions
Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

teacher cohorts indicated that Industrial Arts was their major teacher education program. An analysis of each group of junior high school teachers revealed that 27 out of 30, 6 out of 6, and 11 out of 12 listed Industrial Arts as the program or study that prepared them to teach industrial arts.

An investigation of the three groups of senior high school teachers show those prepared at the University of Alberta (29 out of 30) and those prepared at non-Canadian institutions (5 out of 7) indicated their teacher preparation to be Industrial Arts. The group of senior high school teachers prepared at other Canadian institutions classified Industrial Arts (3 out of 6) and Vocational Education (3 out of 6) as the program that prepared them to teach Industrial Arts in the province.

A teacher from Group 3 listed a teacher's college in the United Kingdom in the 'Other' category as a teacher preparation program. In the senior high school set of groups, only 2 participants in Group 6 identified a teacher preparation for technology in the United Kingdom and Vocational Education as 'Other' sources of preparing to teach Industrial Arts.

Number of Years Preparing to Teach Industrial Arts

Question 6 was directed at identifying the number of years of teacher preparation participants had prior to becoming an Industrial Arts teacher.

The question:

6. PLEASE INDICATE THE NUMBER OF YEARS OF TEACHER EDUCATION THAT PREPARED YOU TO TEACH INDUSTRIAL ARTS (INDUSTRIAL EDUCATION):

   1 2 3 4 5 6 7 8 9

The display of figures in Table 7 show that the majority of respondents (56

Table 7

Years Preparing to Teach Industrial Arts

(N = 90)

Industrial Arts Teacher Group	Years Teacher Education													
	1		2		3		4		5		6-		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Group 1	2	2.2	1	1.1	5	5.6	21	23.3	0	0.0	1	1.1	30	33.3
Group 2	2	2.2	1	1.1	0	0.0	2	2.2	1	1.1	0	0.0	6	6.7
Group 3	0	0.0	1	1.1	0	0.0	8	8.9	1	1.1	2	2.2	12	13.3
Total	4	4.4	3	3.3	5	5.6	31	34.4	2	2.2	3	3.3	48	53.3
Group 4	3	3.3	2	2.2	4	4.4	17	18.9	2	2.2	2	2.2	30	33.3
Group 5	2	2.2	0	0.0	0	0.0	3	3.3	0	0.0	1	1.1	6	6.7
Group 6	0	0.0	0	0.0	1	1.1	5	5.6	0	0.0	0	0.0	6	6.7
Total	5	5.6	2	2.2	5	5.6	25	27.8	2	2.2	3	3.3	42	46.7
Grand Total	9	10.0	5	5.6	10	11.1	56	62.2	4	4.4	6	6.7	90	100.0

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions
Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

out of 90 or 62.2%) had four years of teacher preparation. A greater proportion of junior high school teachers (31 out of 48) had four years teacher education than did their high school counterparts (25 out of 42). Perhaps the majority of participants had 'Four Years' of teacher preparation because a Bachelor of Education Degree with a major in Industrial Arts is a four year program in most universities in North America that offer this program of study.

Junior high school teachers in Group 1 and Group 3 had high frequencies 21 out of 30, and 8 out of 12, in the '4 Years' teacher education category. The second highest teacher preparation category for Group 1 teachers was '3 Years' (5 out of 30). For Group 3 teachers it was 'Six or More Years' (2 out of 12). In Group 2 there were an equal number (2 out of 6) who indicated either 'Four Years' or 'One Year' of teacher education.

At least one-half of the respondents in all three groups of senior high school teachers (17 out of 30, 3 out of 6, and 5 out of 6) had four years of teacher preparation. The second highest category of teacher preparation for teachers in Group 4 and Group 5 was 'One Year'. This was followed by Group 6 teachers with 'Three Years' teacher preparation.

Source of Industrial Arts Teacher Preparation

This study was concerned with a comparative analysis of where both junior high school and senior high school industrial arts teachers received their preparation. The possibilities were the University of Alberta, other Canadian institutions and non-Canadian institutions. The technique used in forming the six groups (three junior high school and three senior high school) was to use the responses to Question 7 as the criterion for placing teachers into an appropriate group.

The question:

7. PLEASE IDENTIFY AND RANK THE INSTITUTION(S) MAINLY RESPONSIBLE FOR YOUR PREPARATION :

a. UNIVERSITY OF ALBERTA ( ) 1, 2, 3

b. OTHER CANADIAN INSTITUTIONS ( ) 1, 2, 3

c. NON-CANADIAN INSTITUTIONS ( ) 1, 2, 3

IF A GRADUATE OF THE PROGRAM AT THE UNIVERSITY OF ALBERTA, PLEASE GIVE THE YEAR OF GRADUATION: 19____

Junior high school participants were placed in one of three groups according to their response to Question 7. The same procedure was used with the senior high school industrial arts teachers to form a second set of three groups. Those teachers who received their preparation in more than one institution were asked to rank these institutions. These teachers were placed in the group for the institution that was ranked first. The second part of the question asked participants to give the year of their graduation. The information collected with this question was not used because of the responses to Question 2.

In Table 8 are data which show that of 48 junior high school industrial arts teachers 30 received their teacher education in Industrial Arts at the University of Alberta. These data also show that of 44 senior high school teachers 30 secured their preparation to teach industrial arts at the University of Alberta. Aggregating these two groups, 30/48 and 30/44, show that 68/92 or 65.2% of the participants graduated from the Industrial Arts Program of Study offered at the University of Alberta. Of the 92 participants, 13 received their preparation at other Canadian institutions and there were 19 teachers who received their industrial arts teacher education at a non-Canadian institution.

Table 8

Source of Preparation to Teach Industrial Arts

(N = 92)

Industrial Arts Teacher Group		Categories of Responses No.	%
Group 1 -	junior high school teachers prepared at the University of Alberta	30	32.6
Group 2 -	junior high school teachers prepared at other Canadian institutions	6	6.5
Group 3 -	junior high school teachers prepared at non-Canadian institutions	12	13.0
Total		48	52.2
Group 4 -	senior high school teachers prepared at the University of Alberta	30	32.6
Group 5 -	senior high school teachers prepared at other Canadian institutions	7	7.6
Group 6 -	senior high school teachers prepared at non-Canadian institutions	7	7.6
Total		44	47.8
Grand Total		92	100.0

The numbers of participants from each group that responded to each question in Part A and each item in Part B represent the number (N) of useful responses for each table. In not all cases did the 92 participants respond to all questions on the research instrument.

Other Sources of Preparation to Teach Industrial Arts

Question 8, the final question of Part A, asked participants to list other sources of preparation.

The question:

8. PLEASE LIST OTHER SOURCES OF YOUR PREPARATION:_______________

An analysis of the responses to this question revealed that those involved in the research identified the following as sources of preparation for teaching Industrial Arts in Alberta:

Group 1 -junior high school teachers prepared at the University of Alberta

Practical training in jobs (outside teaching)

Hobbies

Trade apprenticeship at NAIT, SAIT

Selkirk College (British Columbia, no transfer)

Work experience in trades (automotives, welding, building construction)

Night courses in welding, sheetmetal, and photography

INDEC conferences *

'Buddy' system of development

Industrial Teaching diploma (France)

* INDEC is an acronym for the Industrial Education Specialist Council of the Alberta Teachers' Association

Group 2

No responses

Group 3

Journeyman Certificate in Cabinetmaking

Other family members who are industrial education teachers in Alberta

Industrial Arts conventions

Group 4

Practical experience

Experience in work world

Being raised on a farm

Architectural technology

Journeyman certificate from NAIT or SAIT (Heavy Duty Mechanics, Carpentry, Offset Printing, Automechanics, Electricity, Welding)

Computer courses

Canadian Airforce training

Group 5

Training at NAIT, SAIT

Training at Toronto Welding School

Group 6

Vocational agriculture

Training in the Royal Navy

Working as a teacher's aid in Industrial Education

CHAPTER IV

ANALYSIS OF DATA: PART B JUNIOR HIGH SCHOOL

Attitudes of Junior High School Industrial Arts Teachers Toward Their Preparation

Part B of the junior high school questionnaire contained two content areas 'General Content' and 'General Methodology' that listed 11 competencies each a teacher would need to organize and present instructional content to a learner. Participants were asked to rate each statement using a six point Likert scale which ranged from "no value - 1" to "excellent - 6".

The second section of Part B was divided into fourteen content areas representing or combining curriculum concepts taken from the curriculum guide for Junior High School Grades 7-8-9 Industrial Education, 1982 which is an official publication of Curriculum Design, Alberta Education. The content areas formulated for this study were labelled 'Small Engines', 'Power Transmission', 'Reaction Propulsion', 'Electricity & Magnetism', 'Utilization', 'Electronics-Computers', 'Woods', 'Metals', 'Plastics', 'Earths', 'Printing', 'Photography', 'Technical Drawing', and 'Industrial Simulation'. Participants were asked to rate their preparation for teaching each statement using a six-point Likert scale. The intervals of the Likert scale contained the following labels: 1, "no value"; 2, "most inadequate"; 3, "inadequate"; 4, "adequate"; 5, "most adequate"; 6, "excellent".

The data generated by Part B of the junior high school questionnaire was processed in four different ways. Firstly, responses of all three groups were analyzed by content area. These group responses were measured by using the mean (indicator of combined performance), along with the median (indicator of typical performance) and the standard deviation (indicator of the diversification of responses) for each content area. Standard deviations are placed in appropriate tables for the observation of the reader.

Secondly, an item analysis of each content area was made for each group in order to contrast the tasks that group members felt they were "most adequately prepared" and "least adequately prepared" to teach. These tasks represented terminal behaviors that a student should possess upon completion of a content area and teacher behaviors for teaching industrial arts. If a group felt strongly towards a content area, many items would appear at one extreme of the scale. Up to five items could be listed to be "most adequately prepared" or "least adequately prepared"; more items represented a majority of the preparation for the content area. The preparedness to teach each item was contributed to the teacher education program that the participant completed. Variables such as 'Other' were not considered to be preparation. The mean for each statement was the criterion used to select the item(s) located at the extremes of the Likert scale used by participants for responses. The total mean of all three groups for each content area was the reference used for comparison. In the content that follows the two tables generated by this item analysis immediately followed the table produced for group comparisons for the entire content area.

The third form of analysis involved the creation of tables for the total group and for each group that contained an assembly of statistical measures (mean, median and mode) for all sixteen areas, arranged in descending order of the mean. These tables were created to provide a measure of preparation adequacy of each group toward their preparation. A mean at midpoint or higher in the Likert scale for each content area indicated that the rating group considered themselves adequately prepared to teach this area. A simple count of adequately prepared areas determined the adequacy of preparation for the total program.

Another set of tables was constructed that arranged the rated content areas in descending order of the median. This measure recorded the midpoint of the number of responses, placing the 'adequate' frequencies in the upper limit. Some of the data from this study could then be compared to some of the data from the study by Ross (1976) which used percents to measure perceived adequacy of each group after converting responses from the six-point Likert scale to a dichotomous scale of 'adequate' and 'inadequate'.

The final form of analysis was to make group comparisons of content area preparation. Since the sample population in two of the three groups was too small to use a oneway Analysis of Variance and a Scheffé procedure for tests of significant difference between groups, median measures were used as indicators of preparation.

General Content

Combined responses to the content area labelled 'General Content' measure the degree of preparedness viewed by each group toward teaching industrial arts at the Grade 7, 8 and 9 level. From an analysis of data presented in Table 9, it is evident that Group 3 teachers (mean = 4.240) perceived themselves to be the best prepared, followed by Group 1 participants (mean = 3.576). Group 2 teachers (mean = 2.712) considered themselves to be the least prepared and the mean for this group was considerably below the total group mean (3.621).

An item analysis for the content area labelled 'General Content' are displayed in Table 9A. These data reveal that Groups 1 and 3 viewed

Table 9

Group Attitudes of Junior High School Industrial Arts Teachers Toward Preparation to Teach 'General Content'

Industrial Arts Teacher Group	Group Attitude Toward 'General Content' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	30	3.576	3.773	0.913
Group 2 -	6	2.712	2.500	1.034
Group 3 -	11	4.240	3.909	0.646
Total	47	3.621		0.966

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

themselves to be best prepared (Group 1 mean = 4.567, Group 3 mean = 5.727) to be able to "maintain a safe working laboratory environment". Group members considered to "be able to interpret graphic drawings" (mean = 4.000) as their strongest item, followed by their ability (mean = 3.667) to "be able to maintain a safe working laboratory environment". Both Groups 1 and 2 pinpointed their preparation to "identify safety practices" (Group 1 mean = 4.400, Group 3 mean = 5.364) as the second highest for the General Content area.

Different paired combinations of three items were perceived by the three groups of junior high school industrial arts teachers as being the least prepared by the teacher education program they completed. According to data in Table 9B, Group 1 teachers identified they were least ready to "describe elements of

Table 9A

Items Rated "Most Adequately Prepared" by Participants to Teach General Content'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 1 -	9	be able to maintain a safe working laboratory environment	4.567
	10	identify safety practices	4.400
Group 2 -	3	be able to interpret graphic drawings	4.000
	9	be able to maintain a safe working laboratory environment	3.667
Group 3 -	9	be able to maintain a safe working laboratory environment	5.727
	10	identify safety practices	5.364
Total Mean = 3.621			

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

consumer awareness" (mean = 2.700) to their students, followed by their ability to "identify environmental implications of laboratory curriculum content" (mean = 2.800). Group 2 respondents indicated their capability to "identify safety practices" (mean = 1.833) as being their weakest, with a slight increase in their proficiency to "describe elements of consumer awareness" (mean = 2.000).

Group 3 participants pinpointed their greatest inadequacy to be their ability to "identify safety practices" (mean = 3.273).

Table 9B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'General Content'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	1	describe elements of consumer awareness	2.700
	2	identify environmental implications of laboratory curriculum content	2.800
Group 2 -	11	identify safety practices	1.833
	1	describe elements of consumer awareness	2.000
Group 3 -	2	identify environmental implications of laboratory curriculum content	3.000
	11	identify safety practices	3.273

Total Mean = 3.621

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

General Methodology

The content area labelled 'General Methodology' listed 11 items that could measure a teacher's ability to create and maintain a learning environment organized as a multiple-activity laboratory. Data in Table 10 indicate that Group

Table 10

Group Attitudes of Junior High School Industrial Arts Teachers Toward Preparation for 'General Methodology'

Industrial Arts Teacher Group	Group Attitude Toward 'General Methodology' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	30	3.603	3.636	0.793
Group 2 -	6	2.697	2.727	1.095
Group 3 -	12	4.727	4.909	0.815
Total	48	3.771	3.818	1.034

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

3 members took the position that they were the best prepared for this content area (mean = 4.727) which was well above the total mean of 3.771. They were followed by Group 1 teachers with a mean of 3.603 and Group 2 participants were lowest with a mean of 2.697. Following an item analysis of the 'General Methodology' section of the instrument, these data were placed in Table 10A

Table 10A

Item(s) Rated "Most Adequately Prepared" by Participants for 'General Methodology'

(N = 48)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 1 -	3	use audio-visual teaching aids	4.467
	2	develop a daily lesson plan	4.267
Group 2 -	1	develop a yearly program plan	3.000
	2	develop a daily lesson plan	3.000
	3	use audio-visual teaching aids	3.000
	9	maintain a smooth operating laboratory equipment inventory	3.000
Group 3 -	2	develop a daily lesson plan	5.583
	3	use audio-visual teaching aids	5.333

Total Mean = 3.771

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

to show that Group 1 teachers considered the "use of audio-visual teaching aids" as one of their greatest strengths (mean = 4.467), followed by their ability to "develop a daily lesson plan" with a mean of 4.267. Group 2 teachers hallmarked their ability to: "develop a yearly program plan", "develop a daily lesson plan", "use audio-visual aids", and "maintain a smooth operating laboratory equipment inventory" as their strong points with a mean of 3.000 for each item. Group 3 teachers also selected two items that were identified by Group 1 and Group 2 teachers, but in a different order. These items were to "develop a daily lesson plan" (mean = 5.583) and to "use audio-visual teaching aids" (mean = 5.333).

In Table 10B are data which list the items from the 'General Methodology' section of the research instrument that the three groups identified as having the greatest inadequacies when practising their profession. All three groups indicated they were least adequately prepared to "satisfactorily deal with student injury" (Group 1 mean = 2.733, Group 2 mean = 1.833, and Group 3 mean = 3.917). Industrial Arts teachers in Group 1 indicated they were least adequately prepared to "maintain an adequate supplies inventory" (mean = 2.967). Group 2 participants considered their knowledge of being able to "construct evaluative tests to include measurements of psychomotor, cognitive and affective development" (mean = 2.333) as being a second weakness. Members of Group 3 held the attitude that they were least adequately prepared to "follow ordering procedures according to budget" (mean = 4.000) as their second greatest concern.

Small Engines

The content area labelled 'Small Engines' listed 11 items that could be categorized under these three major headings: examining internal combustion engines, identifying design components and the environmental impact of small engines, and performing repair procedures on small engines. Group 3 teachers were of the attitude that they were best prepared (mean = 3.871) to teach this content area. Next in rank order were Group 1 participants with a mean of

Table 10B

Item(s) Rated "Least Adequately Prepared" by Participants for 'General Methodology'

(N = 48)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	8	satisfactorily deal with student injury	2.733
	10	maintain an adequate supplies supplies inventory	2.967
Group 2 -	8	satisfactory deal with student injury	1.833
	4	construct evaluative tests to include measurements of psychomotor, cognitive and affective development	2.333
Group 3 -	8	satisfactorily deal with student injury	3.917
	11	follow ordering procedures according to budget	4.000

Total Mean = 3.771

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

3.072. Group 2 members rated themselves least qualified (mean = 2.379) to teach this content area. The total mean of 3.188 indicates Group 3 educators were well above the mean to teach small engines with Group 1 teachers just below the mean and Group 2 instructors well below the mean in their preparation to teach small engines. See Table 11 for these data.

Table 11

Group Attitudes Toward Preparation to Teach 'Small Engines'

Industrial Arts Teacher Group	Group Attitude Toward 'Small Engines' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	29	3.072	3.273	1.19
Group 2 -	6	2.379	2.455	1.133
Group 3 -	12	3.871	4.682	1.723
Total	47	3.188	3.273	1.392

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

When considering other items from this content area (see Table 11A) Group 1 respondents selected their ability to "examine an internal combustion engine" (mean = 3.448) as being their best. This was followed by their ability to "examine various internal combustion engines" with a mean of 3.379. Group 2 members have rated their capability to "analyze the power output of a small engine" (mean = 3.000) as their single most highlight. Group 3 participants classified these three items as their distinguished qualities: "safely operate a small engine", "examine an internal combustion engine" and "examine major

Table 11A

<u>Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Small Engines'</u>

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	2	examine an internal combustion engine	3.448
	1	examine various internal combustion engines	3.379
Group 2 -	7	analyze the power output of a small engine	3.000
Group 3 -	6	safely operate a small engine	4.167
	2	examine an internal combustion engine	4.000
	4	examine major sub-systems of a small engine	4.000

Total Mean = 3.188

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

sub-systems of a small engine" with a mean of 4.167, 4.000 and 4.000 respectively.

Of the 11 content area items Group 1 teachers listed in Table 11B their ability to "tune-up a small engine" (mean = 2.517) as a weak area in their preparation. Another weak area was the ability of these teachers to "properly

Table 11B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Small Engines'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	10	tune-up a small engine	2.517
	9	properly troubleshoot a small engine	2.655
Group 2 -	11	properly store a small engine	2.000
Group 3 -	8	analyze the hazards of a small engine	3.667
	9	properly troubleshoot a small engine	3.667

Total Mean = 3.188

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian Universities
Group 3 -junior high schoool teachers prepared at non-Canadian institutions

troubleshoot a small engine" (mean = 2.655). Teachers who formed Group 2 singled out the adeptness to "properly store a small engine" (mean = 2.000) as a weakness in their preparation. Group 3 educators categorized as their weakness the ability to "analyze the hazards of a small engine" (mean = 3.667) and to "properly troubleshoot a small engine" (mean = 3.667).

Power Transmission

The 11 Items listed under 'Power Transmisssion' could be aggregated under these three headings: illustrate various forms of energy and energy transformation, identify power transmission systems, and identify power transmission system components. Group 3 educators produced the highest aggregate responses (mean = 3.311) toward this content area, followed by Group 1 instructors with a mean of 3.218. For this content area, Group 2 teachers had a mean of 2.400. The means of both Group 3 and 1 respectively were above the total mean (3.153) while the mean of Group 2 was considerably below this measure of central tendency. See Table 12.

Table 12

Group Attitudes Toward Preparation to Teach 'Power Transmission'

Industrial Arts	Group Attitude Toward 'Power Transmission' Preparation			
Teacher Group	Number	Mean	Median	Standard Deviation
Group 1 -	29	3.218	3.455	1.044
Group 2 -	5	2.400	3.000	1.342
Group 3 -	12	3.311	3.182	1.129
Total	46	3.153	3.273	1.129

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

An analysis of the 'Power Transmission' portion of the research instrument for items the three groups selected as being their strengths revealed that Group 1 perceived they were well prepared to "identify various fluid power control devices" (mean = 3.414) and to "illustrate various forms of energy" (mean = 3.379). Group 2 identified their three strongest items to be: "identify various fluid power control devices", "identify mechanical output", and "identify fluid power output". Each item had a mean of 2.600. Group 3 also categorized three items that they viewed to be their best. These were to "identify various mechanical transmission devices" (mean = 3.667), "illustrate various forms of energy" (mean = 3.583), and "identify energy input in mechanical systems" (mean = 3.583).

Of the content area item(s) in 'Power Transmission' pinpointed by research participants to be the least adequately prepared by their industrial arts teacher education program for each of the three groups, Group 1 members selected these two items: to "identify fluid power output" (mean = 3.000) and to "identify fluid power energy transformation" (mean = 3.034). Group 2 participants listed to "illustrate various forms of energy" (mean = 2.000) and to "identify various mechanical transmission devices" (mean = 2.200) while Group 3 respondents rated "to identify fluid power energy transformation" (mean = 2.917) as the weakest areas in their preparation.

Reaction Propulsion

The content area 'Reaction Propulsion' listed 11 items that asked participants to rate their preparation to design products which used the principles of reaction propulsion for preparing, assembling and testing reaction propulsion products; and using various forms of energy for product performance and start-up. Group 3 teachers viewed themselves to have the greatest preparation (mean = 2.835) for this content area. Group 1 teachers followed

Table 12A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Power Transmission'

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	5	identify various fluid power control devices	3.414
	1	illustrate various forms of energy	3.379
Group 2 -	5	identify various fluid power control devices	2.600
	8	identify mechanical output	2.600
	9	identify fluid power output	2.600
Group 3 -	6	identify various mechanical transmission devices	3.667
	1	illustrate various forms of energy	3.583
	2	identify energy input in mechanical systems	3.583

Total Mean = 3.153

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Table 12B

Items Rated "Least Adequately Prepared" by Participants to Teach 'Power Transmission"

(N = 46)

Industrial Arts Teacher Group	Items Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	9	identify fluid power output	3.000
	11	identify fluid power energy transformation	3.034
Group 2 -	1	illustrate various forms of energy	2.000
	6	identify various mechanical transmission devices	2.200
Group 3 -	11	identify fluid power energy transformation	2.917
Mean = 3.153			

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

those in Group 3 with a mean of 2.024. Instructors in Group 2 considered their capabilities for this content area to be the lowest (mean = 1.709). The aggregate responses for Group 3 were above the total mean (2.195) and the average ratings for Group 1 were slightly below this combined group measure. The mean for Group 2 was noticeably below the total group mean. These data can be found in Table 13.

An analysis for the item(s) in this content area perceived to be the best prepared by the teacher education program for each group of teachers revealed that Group 1 members described their skills to "use the SI system of measurement in product development (model rocket, CO_2 car)" (mean = 3.034) and to "use mechanical energy for starting engines" (mean = 2.481) as strengths. Group 2 teachers catalogued three items to be their strongest qualities in this content area: to "use separation tools in product material preparation" (mean = 2.200), their skill to "use suitable combining processes in product assembly" (mean = 2.200) and their knowledge to "discuss the use of chemical energy in the production of power" (mean = 2.200). Industrial Arts teachers who comprised Group 3 identified their abilities to "design a model

Table 13

Group Attitudes Toward Preparation to Teach 'Reaction Propulsion'

Industrial Arts	Group Attitude Toward 'Reaction Propulsion' Preparation			
Teacher Group	Number	Mean	Median	Standard Deviation
Group 1 -	27	2.024	2.000	0.971
Group 2 -	5	1.709	1.000	0.984
Group 3 -	11	2.835	3.000	1.177
Total	43	2.195	2.455	1.077

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers pepared at other Canadian universities
Group 3 -junior high school teachers prepared at non-Canadian universities

rocket from supplied information" (mean = 3.455) and to "use separation tools in product material preparation (model rocket, CO_2 car)"(mean = 3.273) as their greatest adequacies. These data can be found in Table 13A.

The content area items where participants were least adequately prepared in their teacher preparation programs for the three groups of junior high school Industrial Arts teachers are presented in Table 13B. Group 1 educators chose to "design a CO_2 car from supplied information" (mean = 1.556) and to "design a model rocket from supplied information" (mean = 1.667) as the tasks which they were least adequately prepared to teach. Group 2 instructors categorized six items as making up their weakest qualifications. These included their ability to: "discuss design principles relating to reaction propulsion devices", "design a

Table 13A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Reaction Propulsion'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	4	use the SI system of measurement in product development (model rocket, CO_2 car)	3.034
	11	use mechanical energy for starting engines	2.481
Group 2 -	5	use preparation tools in product material preparation (model rocket, CO_2 car)	2.200

Table 13A (continued) Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Reaction Propulsion'

(N = 43)

Industrial Arts Teacher Group	Items Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
	6	use suitable combining processes in product assembly (model rocket, CO_2 car)	2.200
	9	discuss the use of chemical energy in the production of power	2.200
Group 3 -	2	design a model rocket from supplied information	3.455
	5	use separation tools in product material preparation (model rocket, CO_2 car)	3.273

Total Mean = 2.195)

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

model rocket from supplied information", "design a model CO_2 car from supplied information", "perform comparative tests on assembled student products (model rocket, CO_2 car)", "use electrical energy for ignition of fuel", and "use mechanical energy for starting engines" (mean = 1.400 for all items). Group 3 members identified three of the 11 items that they were least able to perform, which were to: "use the SI system of measurement in product development (model rocket, CO_2 car)" (mean = 1.636), "discuss the use of chemical energy in the production of power "(mean = 2.545), and "use mechanical energy for starting engines "(mean = 2.545).

Electricity & Magnetism

The content area of 'Electricity & Magnetism' contained items that prepared teachers to discuss electrical and magnetic theories, show the relationship between electricity and magnetism, draw schematic diagrams for various types of electrical circuits, and demonstrate electrical measurements and components. Members of all three groups indicated an attitude that they were reasonably prepared for teaching this area, and in the following order: Group 3

Table 13B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Reaction Propulsion'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	3	design a CO_2 car from supplied information	1.556
	2	design a model rocket from supplied information	1.667
Group 2 -	1	discuss design principles relating to reaction propulsion devices	1.400
	2	design a model rocket from supplied information	1.400
	3	design a model CO_2 car from supplied information	1.400

Table 13B (continued) Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Reaction Propulsion'

(N = 43)

Industrial Arts	Item(s) Rated "Least Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
	8	perform comparative tests on assembled student products (model rocket, CO_2 car)	1.400
	10	use electrical energy for starting ignition of fuel	1.400
	11	use mechanical energy for starting engines	1.400
Group 3	4	use the SI system of measurement in product development (model rocket, CO_2 car)	1.636
	9	discuss the use of chemical energy in the production of power	2.545
	11	use mechanical energy for starting engines	2.545
Total Mean = 2.195			

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

(mean = 4.205), Group 1 (mean = 3.938) and Group 2 (mean = 3.545). These data are shown in Table 14. Although all three group means were within 0.66 of each other, the total group mean of 3.957 indicates that Group 3 participants were above the mean, Group 1 respondents were almost equal to the mean, and Group 2 constituents were below the mean.

Content area items outlined by the three groups to be those for which they were the best prepared produced a total of ten of the 11 performance behaviors: two of these behaviors for Group 1, six for Group 2 and two for Group 3. In Table 14A there are data which show that Group 1 members indicated they were best prepared to "differentiate between series and parallel circuits" (mean = 4.393) and "draw schematic diagrams of basic

Table 14

Group Attitudes Toward Preparation to Teach 'Electricity & Magnetism'

Industrial Arts Teacher Group	Group Attitude toward 'Electricity & Magnetism' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	28	3.938	4.227	1.401
Group 2 -	6	3.545	3.773	0.803
Group 3 -	12	4.205	4.727	1.237
Total	46	3.957	4.182	1.290

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

electrical circuits" (mean = 4.321). Group 2 felt they were the best prepared to teach the following six performances each with a mean of 3.833: "know the theory of electron movement", "identify sources of electricity", "describe the nature of magnetism", "explain the relationship between electricity and magnetism", "differentiate between series and parallel circuits", and "demonstrate electrical measurements" Group 3 respondents rated most adequately prepared to teach "differentiate between series and parallel circuits" (mean = 4.750) and "describe the nature of magnetism" (mean = 4.667).

Table 14B lists the content area items that group members claimed to be the least adequately prepared by their teacher education programs and reveals that participants of all three groups chose "identify overload protection devices" (Group 1 mean = 3.679, Group 2 Mean = 3.000 and Group 3 mean = 3.583) as a teaching handicap. The item of least value identified by respondents of Group 1 was their adeptness to "operate electro-magnetic devices" (mean = 3.429). Group 3 affiliates brought forth their aptitude to "use directional control devices" (mean = 3.417) as their weakest performance.

Table 14A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Electricity and Magnetism'

(N = 46)

Industrial Arts	Item(s) Rated "Most Adequately" Prepared		
Teacher Group	Item No.	Description	Mean
Group 1 -	6	differentiate between series and parallel circuits	4.393
	5	draw schematic diagrams of basic electrical circuits	4.321

Table 14A (continued) <u>Items "Most Adequately Prepared" by Participants to Teach 'Electricity and Magnetism'</u>

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 2 -	1	know the theory of electron movement	3.833
	2	identify sources of electricity	3.833
	3	describe the nature of magnetism	3.833
	4	explain the relationship between electricity and magnetism	3.833
	6	differentiate between series and parallel circuits	3.833
	7	demonstrate electrical measurements	3.833
Group 3 -	6	differentiate between series and parallel circuits	4.750
	3	describe the nature of magnetism	4.667

Total Mean = 3.957

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3- junior high school teachers prepared at non-Canadian institutions

Utilization

Statements listed under 'Utilization' dealt with the conversion and utilization of electrical energy, and procedures in safely troubleshooting and repairing electrical appliances. Group 3 teachers viewed themselves to be the best prepared to teach this portion of the curriculum with a mean of 3.455, followed by Group 1 which had a mean = 2.893. Industrial Arts teachers in Group 2 had a

Table 14B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Electricity and Magnetism'

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	11	operate electro-magnetic devices	3.429
	9	identify overload protection devices	3.679
Group 2 -	9	identify overload protection devices	3.000
Group 3 -	10	use directional control devices	3.417
	9	identify overload protection devices	3.583
Total Mean = 3.957			

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

mean of 2.818 which was the lowest for all three groups. When compared to the total mean of 3.036, Group 3 members were above the mean, and teachers in

Groups 1 and 2 were below this measure of central tendency. These data can be located in Table 15.

Table 15

Group Attitudes Toward Preparation to Teach 'Utilization'

Industrial Arts Teacher Group	Group Attitude Toward 'Utilization' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	28	3.938	4.227	1.401
Group 2 -	6	3.545	3.773	0.803
Group 3 -	12	4.205	4.727	1.237
Total	46	3.957	4.182	1.290

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Of the content area items selected by all three groups to be the best prepared by their respective teacher education programs, Group 1 claimed two, Group 2 listed four and Group 3 also identified two. The two items rated by Group 1 participants were their abilities "to convert electrical energy to light energy" (mean = 3.308) and "convert electrical energy to mechanical energy" (mean = 3.192). Group 2 teachers selected these 4 of the 11 items: to "convert electrical energy to mechanical energy", "convert electrical energy to heat energy", "convert electrical energy to light energy" and "convert electrical energy to chemical energy" as their strengths. Group 3 surveyors pinpointed as their strengths "use converted electrical energy" (mean = 3.909) and "identify unsafe electrical conditions" (3.583) as their main features. Data in Table 15A present this information.

Information in Table 15B lists the items that participants rated as being least adequately prepared to teach by the training programs. Teachers from Group 1 rated "identify repairs to correct malfunctioning electrical appliances" (mean = 2.200) and "troubleshoot electrical appliances for defects" (mean = 2.280) as two items they were least adequately prepared to teach. Group 2 instructors indicated as a weakness in their preparation to "troubleshoot electrical

Table 15A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Utilization' (N = 44)

Industrial Arts	Item(s) Rated "Most Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
Group 1 -	4	convert electrical energy to light energy	3.308
	2	convert electrical energy to mechanical energy	3.192
Group 2 -	2	convert electrical energy to mechanical energy	3.167
	3	convert electrical energy to heat energy	3.167
	4	convert electrical energy to light energy	3.167

Table 15A (continued) Items Rated "Most Adequately Prepared" by Participants to Teach 'Utilization'

(N = 44)

Industrial Arts Teacher Group	Item(s) Rated "most Adequately Prepared"		
	Item No.	Descripton	Mean
	5	convert electrical energy to to chemical energy	3.167
Group 3 -	7	use converted electrical energy	3.909
	9	identify unsafe electrical conditions	3.583

Total Mean = 3.036

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

appliances for defects" (mean = 2.000). Those industrial arts teachers who formed Group 3 mentors rated three items to "identify repairs to correct malfunctioning electrical appliances" (mean = 3.083), "convert electrical energy to chemical energy" (mean = 3.167), and "troubleshoot electrical appliances for defects" (mean = 3.167) as content areas they were least adequately prepared to teach.

Electronics - Computers

The 11 items in the 'Electronics - Computers' content area of the instrument could be placed in these broad categories: identify electronic components;

assemble and test communications systems; use computer input, central processing, and output devices; and describe elements of computer programming. A collection of the data scheduled in Table 16 to the 11 performance items indicated that Group 1 instructors considered themselves to be the best prepared (mean = 3.414) to teach this content, followed by Group 3

Table 15B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Utilization'

(N = 44)

Industrial Arts	Item(s) Rated "Least Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
Group 1 -	11	identify repairs to correct malfunctioning electric appliances	2.200
	10	troubleshoot electrical appliances for defects	2.280
Group 2 -	10	troubleshoot electrical appliances for defects	2.000
Group 3 -	11	identify repairs to correct malfunctioning electric appliances	3.083
	5	convert electrical energy to chemical energy	3.167
	10	troubleshoot electrical appliances for defects	3.167
Total Mean = 3.036			

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

with a mean of 2.157 and trailed by teachers in Group 2 with a mean of 1.970. When compared to the total mean of 2.903, Group 1 members placed above this mean and Groups 2 and 3 participants were below this measurement.

Content area items for Electronics-Computers viewed by teachers in the three groups of junior high school instructors as best prepared to teach are shown in Table 16A. University of Alberta graduates selected two of the 11 items to "identify electronic components" (mean = 4.179) and "describe computer development" as items they were most adequately prepared to teach.

Table 16

Group Atitudes Toward Preparation to Teach 'Electronics - Computers'

Industrial Arts Teacher Group	Group Attitude Toward Electronics - Computers Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	27	3.414	3.364	1.275
Group 2 -	6	1.970	1.818	1.010
Group 3 -	11	2.157	2.091	0.965
Total	44	2.903	2.955	1.321

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian universities
Group 3 -junior high school teachers prepared at non-Canadian institutions

Participants who formed Group 2 felt they were most adequately prepared to teach to "discuss phonograph systems (mean = 2.903). Participants from Group 3 chose two of the eleven items to "identify electronic components" (mean = 2.636) and "assemble communications devices" (mean = 2.273) as their strengths.

Content area items identified by members of each of the three groups to be the least prepared to teach are presented in Table 16B. Group 1 teachers chose

Table 16A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Electronics - Computers'

(N = 44)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 1 -	1	identify electronic components	4.179
	7	describe computer development	3.750
Group 2 -	6	discuss phonograph systems	2.500
Group 3 -	1	identify electronic components	2.636
	4	assemble communications devices	2.273

Total Mean = 2.903

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Table 16B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Electronics - Computers'

(N = 44)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	3	review regulations on signal transmission devices	2.815
	6	discuss phonograph systems	2.815
Group 2 -	8	use various computer input devices	1.500
	9	use various computer output devices	1.500
	10	describe components of a computer central processing unit	1.500
	11	describe elements of computer programming	1.500
Group 3 -	3	review regulations on signal transmission devices	1.818
	2	assemble oscillator circuits	2.000
	10	describe components of a computer central processing unit	2.000

Total Mean = 2.903

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

their aptitudes to "review regulations on signal transmission devices" (mean = 2.815) and "discuss phonograph systems" (mean = 2.815) as items for which their preparation was weakest. Group 2 instructors catalogued four of the eleven items as those they were least prepared to teach. All four items had a mean of 1.500 and were "use various computer input devices", "use various computer output devices", "describe components of a computer central processing unit", and "describe elements of computer programming". Those that comprised Group 3 rated the "review regulations on signal transmission devices" (mean = 1.818), "assemble oscillator circuits" (mean = 2.000), and "describe components of a computer central processing unit" (mean = 2.000) as their weakest proficiencies.

Woods

The 11 items in the content area 'Woods' traced the development of wood as a material from its source, called for the identification of the features of wood, and enumerated the steps required to process wood from its raw state to the finished product. Those teachers who were prepared at non-Canadian institutions viewed themselves to be the best prepared to teach this material to junior high school students. The mean for this group was 5.265 which was above the total mean of 4.337. Group 1 teachers had a mean of 4.038 while teachers in Group 2 displayed a mean of 3.924). The data that display this information are in Table 17.

The items labelled by each group of junior high school Industrial Arts teachers to be the best prepared by the teacher education program for each group is indexed in Table 17A. Group 1 participants recognized "identify characteristics of woods" (mean = 4.310) and "demonstrate wood combining using adhesives" (mean = 4.310) as being their greatest assets.

Table 17

Group Attitudes Toward Preparation to Teach 'Woods'

Industrial Arts Teacher Group	Group Attitude Toward 'Woods' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	29	4.038	4.364	1.552
Group 2 -	6	3.924	3.455	1.688
Group 3 -	12	5.265	5.409	0.612
Total	47	4.337	4.636	1.473

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Group 2 respondents labelled "identify sources of wood" (mean = 4.667) and "use wood coating processes" (mean = 4.667) as the items they were most adequately prepared to teach. Group 3 rated "identify characteristics of woods" (mean = 5.667) and "use mechanical fastening devices" (mean = 5.667) as two items they were best prepared to teach. An item common to both Group 1 and Group 3 was their abilities "to identify characteristics of woods".

The items recognized by the three groups of teachers to be the least adequately prepared for the laboratory are presented in Table 17B. Group I participants perceived "describe wood extraction processes" (mean = 3.379) and "use wood combining processes" (mean = 3.724) as being items they were least prepared to teach. Group 2 individuals verified "use the metric system"

Table 17A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Woods'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	3	identify characteristics of woods	4.310
	9	demonstrate wood combining using adhesives	4.310
Group 2 -	1	identify sources of wood	4.667
	10	use wood coating processes	4.667
Group 3 -	3	identify characteristics of woods	5.667
	11	use mechanical fastening devices	5.667

Total Mean = 4.337

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

(mean = 3.000), "use wood forming processes" (mean = 3.500) and "use wood conditioning processes" (mean = 3.500) to be their weakest prepared performances. Group 3 instructors pinpointed "use the metric system in product development" (mean = 3.417) as an item they were least prepared to teach.

Metals

The items listed under the content area labelled 'Metals' trace the procedures involved in extracting metal from its source, identify features

Table 17B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Woods'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	2	describe wood extraction processes	3.379
	8	use wood conditioning processes	3.724
Group 2 -	5	use the metric system in product development	3.000
	7	use wood forming processes	3.500
	8	use wood conditioning processes	3.500
Group 3 -	5	use the metric system in product development	3.417

Total Mean = 4.337

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

and compositions of metals, and record the steps involved in processing refined metal to its finished product. Table 18 shows a rank order of perceived preparation by group. Teachers in Group 3 had the highest mean of 4.593, Group 2 had a mean of 3.635, and Group 1 had the lowest mean of 3.539. The total mean was 3.820.

The items in the Metals content area for which the three groups were most

Table 18

Group Attitudes Toward Preparation to Teach 'Metals'

Industrial Arts Teacher Group	Group Attitude Toward 'Metals' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	29	3.539	4.000	1.290
Group 2 -	6	3.635	3.313	1.588
Group 3 -	12	4.593	5.000	1.235
Total	47	3.820	4.000	1.364

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

adequately prepared are displayed in Table 18A. Teachers of all three groups identified to "use metal forming processes" (Group 1 mean = 4.172, Group 2 mean = 4.500, and Group 3 mean = 5.083) as the item they were most adequately prepared to teach. The second highest mean for Group 1 instructors was their aptitude to "identify metal conditioning using heat" (mean = 3.828), and by Group 2 educators it was to "describe sources of metals" (mean = 3.828). Group 3 chose to "describe sources of metals" (mean = 4.909) and "describe metals extraction processes" (mean = 4.909) as the second greatest asset.

Of the items described to be the least adequately prepared (see Table 18B) by all three teacher groups, Group 1 members selected to "use metal coating

Table 18A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Metals'

(N = 47)

Industrial Arts Teacher Group	Content Area Item(s) Most Adequately Prepared		
	Item No.	Description	Mean
Group 1 -	8	use metal forming processes	4.172
	9	identify metal conditioning using heat	3.828
Group 2 -	8	use metal forming processes	5.083
	1	describe sources of metals	4.000
Group 3 -	8	use metal forming processes	5.083
	1	describe sources of metals	4.909
	2	describe metals extraction processes	4.909

Total Mean = 3.820

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

materials" (mean = 3.000) and "describe metals refining processes (mean = 3.207) as the items they were least prepared to teach. Group 2 participants identified to "describe alloying processes" (mean = 3.000), "use the metric system in product development" (mean = 3.000) and "use metal coating materials" (mean = 3.000) as items they were least adequately prepared to teach. Group 3 respondents also selected "use the metric system in product development" (mean = 3.583) and "use metal coating materials" (mean = 4.250) as items in Metals they were least prepared to teach.

Plastics

The 11 items in the content area labelled 'Plastics' on the research

Table 18B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach Metals'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	11	use metal coating materials	3.000
	3	describe metals refining processes	3.207
Group 2 -	4	describe alloying processes	3.000
	6	use the metric system in product development	3.000
	11	use metal coating materials	3.000
Group 3 -	6	use the metric system in product development	3.583
	11	use metal coating materials	4.250
Total Mean = 3.820			

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

instrument included items that involved the procedures in extracting plastics from its sources, identify properties of plastics, and register the methods involved in processing plastic material into a final product.

Table 19 includes data which indicate Group 3 teachers perceived themselves to be the best prepared to teach Plastics (mean = 3.902), followed by Group 1 with a mean of 3.618 and Group 2 who had a mean of 3.155. When compared to the total mean 3.631, members of Group 3 were slightly above this measurement while Group 1 participants were slightly below, and Group 2 respondents nearly five - tenths of a point below the total mean.

Table 19

Group Attitudes Toward Preparation to Teach 'Plastics'

Industrial Arts	Group Attitude toward 'Plastics' Preparation			
Teacher Group	Number	Mean	Median	Standard Deviation
Group 1 -	29	3.618	3.727	1.287
Group 2 -	6	3.155	3.192	1.353
Group 3 -	12	3.902	4.136	1.416
Total	47	3.631	3.909	1.317

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Table 19A lists the items that the teacher education programs of all three groups of teachers best prepared them to teach. Members of all three groups indicated "use plastics forming processes" (Group 1 mean = 4.448, Group 2 mean = 3.667, and Group 3 mean = 4.500) as an item they had proper preparation to teach. Group 1 also rated to "identify properties of plastics" (mean = 4.000) while Group 2 rated to "explain plastics conditioning using heat" (mean = 3.500) and "identify plastics adhesive/cohesive combining processes" (mean = 3.500) as the second item they were most adequately prepared to teach.

Items in the Plastics content area for which the three group of teachers felt least adequately prepared are categorized in Table 19B. Those teachers in Group 1 indicated to "describe plastics refining processes" (mean = 3.103) and "describe plastics extraction processes" (mean = 3.241) as items in which their preparation was weakest. Group 2 identified their qualities to "use the metric system in product development" (mean = 2.667) and "describe plastics refining processes" (mean = 2.800) while those instructors in Group 3 chose to "use the metric system in product development" (mean = 3.333) and "use plastics separation processes" (mean = 3.500) as their weakest areas of preparation.

Earths

The content area labelled 'Earths' categorized items that involved operations in removing earths from their sources and preparing them to be useable materials, and listing the procedures involved in processing earths materials into finished products.

Data in Table 20 show that Group 1 members rated themselves to be the best prepared (mean = 3.323) to teach items related to earths as a material, well above the total group mean of 2.875. Group 2 participants had a mean of 2.197; Group 3 a mean of 2.062. These latter two groups of teachers placed their preparation to teach Earths below the total mean.

Table 19A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Plastics'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 1 -	7	use plastics forming processes	4.448
	4	identify properties of plastics	4.000
Group 2 -	7	use plastics forming processes	3.667
	8	explain plastics conditioning using heat	3.500
	9	identify plastics adhesive/ cohesive combining processes	3.500
Group 3 -	7	use plastics forming processes	4.500
	1	describe plastics sources	4.500

Total Mean = 3.631

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian instituions
Group 3 -junior high school teachers prepared at non-Canadian institutions

A list of the items for Earths that were identified by those involved in the research to be the best prepared by their respective teacher preparation programs is presented in Table 20A. It is evident from these data that Group 1 teachers felt they were most adequately prepared to teach "use earths forming procedures" (mean = 3.966) and "use earths finishing procedures" (mean =

Table 19B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Plastics'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	3	describe plastics refining processes	3.103
	2	describe plastics extraction processes	3.241
Group 2 -	5	use the metric system in product development	2.667
	3	describe plastics refining	2.800
Group 3 -	5	use the metric system in product development	3.333
	6	use plastics separation processes	3.500

Total Mean = 3.631

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian instituions
Group 3 -junior high school teachers prepared at non-Canadian institutions

3.931). Group 2 felt the same two toward these two items (both with means of 2.500), as well as "use earths separation procedures" and "use earths conditioning processes" (both also with means of 2.500). Teachers in Group 3 felt they were best prepared to teach the "use mechanical fastening devices" (mean = 2.273) and "prepare earths materials for molding" (mean = 2.182) items.

Table 20

Group Attitudes Toward Preparation to Teach Earths'

Industrial Arts	Group Attitude Toward 'Earths' Preparation			
Teacher Group	Number	Mean	Median	Standard Deviation
Group 1 -	29	3.323	3.545	1.204
Group 2 -	6	2.197	2.091	1.170
Group 3 -	11	2.062	1.909	1.233
Total	46	2.875	3.000	1.321

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian instituions
Group 3 -junior high school teachers prepared at non-Canadian institutions

The items that all three groups of teachers identified as being "least prepared to teach" are found in Table 20B. Teachers in Group 1 identified the items "use mechanical fastening devices" (mean = 2.448) and "identify refining processes" (mean = 2.828) as items for which they received inadequate preparation. Group 2 and 3 participants both identified "use the metric system in product development" (Group 2 mean = 1.833, Group 3 mean = 2.000) as an item where their preparation was weakest. Group 3 participants also indicated these inadequecies in their preparation: "explain earths extraction processes", "use earths separation processes", "use earths forming procedures", "use earths conditioning processes" and "identify adhesion/cohesion combining procedures".

Table 20A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Earths'

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 1 -	7	use earths forming procrdures	3.966
	10	use earths finishing procedures	3.931
Group 2 -	10	use earths finishing procedures	2.500
	7	use earths forming procedures	2.500
	8	use earths conditioning processes	2.500
	10	use earths finishing procedures	2.500
Group 3 -	11	use mechanical fastening devices	2.273
	5	prepare earths materials for molding	2.182

Total Mean = 2.875)

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Printing

'Printing' contained items that tested the perceived readiness of group participants toward identifying principles of product design, preparing various types of printing masters, demonstrating various processes of printing, and using common finishing procedures. Group 1 teachers deemed themselves to

Table20B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Earths'

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	11	use mechanical fastening devices	2.448
	3	identify refining processes of	2.828
Group 2 -	4	use the metric system in product development	1.833
Group 3 -	4	use the metric system in product development	2.000
	2	explain earths extraction processes	2.000
	6	use earths separation processes	2.000
	7	use earths forming procedures	2.000
	8	use earths conditioning processes	2.000
	9	identify adhesion/cohesion combining procedures	2.000

Total Mean = 2.875

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

be the best prepared for this content area (mean = 4.269) which was above the total mean (3.874). Teachers in both Group 3 (mean = 3.705) and Group 2 (mean = 2.303) placed below the total mean. Data for this analysis are displayed in Table 21.

The content area items recognized by all three group members to be the best prepared are catalogued in Table 21A. Members in Group 1 were best prepared to teach "prepare a photographic master" (mean = 4.690) and "demonstrate the offset process of printing" (mean = 4.552). Group 2 rated as best their preparation to teach "use the printer's point system of measurement" (mean = 2.667) and "prepare a silkscreening stencil" (mean = 2.667). Group 3 respondents rated "identify principles of product design" (mean = 4.000) and added the two items identified by Group 2 (Group 3 means = 3.917) as their items of best preparation.

The items for 'Printing' that participants of all three groups felt they were least adequately prepared to teach are shown in Table 21B. Those teachers who were prepared at the University of Alberta felt that "identify principles of design" (mean = 3.966) and "use common finishing procedures" (mean = 4.000) as their weakest abilities. Group 2 identified their aptitudes to "prepare a relief printing master" (mean = 1.833) and "use common finishing procedures" (mean = 2.000) as items they were least adequately prepared to teach. Group 3 members indicated "use common finishing procedures" (mean = 3.417) and "demonstrate the relief process of printing" (mean = 3.500) as skills they least developed at university.

Photography

The content area labelled 'Photography' encompassed items that requested scaled responses to the procedures involved in creating images in light sensitive materials, producing and finishing prints, and displaying expertise in audio-visual processes and equipment. Table 22 contains the data for group

Table 21

Group Attitudes Toward Preparation to Teach 'Printing'

Industrial Arts Teacher Group	Group Attitude Toward 'Printing' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	29	4.269	4.3364	1.419
Group 2 -	6	2.303	2.727	1.050
Group 3 -	12	3.705	4.591	1.744
Total	47	3.874	4.000	1.582

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers preapred at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

comparisons of preparation for this subject category.

Teachers who formed Group 1 indicated that they were the best prepared to teach Photography, mean = 4.241, and placed well above the total mean of 3.917. The mean for Group 3 educators was 3.500. Those teachers in Group 2 had a mean of 3.036. The means of the latter two groups were below the total mean.

The content area items that were rated by group members to be the best prepared are presented in Table 22A. Members of all three groups rated to "demonstrate light control on a camera" (Group 1 mean = 4.862, Group 2 mean = 3.400, and Group 3 mean = 3.750) as one of their strengths. Group 1 indicated they were well prepared to teach "assemble various photographic

Table 21A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Printing'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	5	prepare a photographic master	4.690
	8	demonstrate the offset process of printing	4.552
Group 2 -	2	use the printer's point system of measurement	2.667
	7	prepare a silkscreening stencil	2.667
Group 3 -	1	identify principles of product design	4.000
	2	use the printer's point system of measurement	3.917
	7	prepare a silkscreening stencil	3.917

Total Mean = 3.874

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers preapred at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

images" (mean = 4.724). Group 2 teachers selected "explain the composition of light sensitive materials" (mean = 3.400) as an item of strength. To Group 3 educators it was their ability to "explain the principles of audio-visual presentation equipment" (mean = 3.917) as a learning activity they were best prepared to teach.

Table 21B

Items Rated "Least Adequately Prepared" by Participants to Teach Printing'

(N = 47)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	1	identify principles of product design	3.966
	11	use common finishing procedures	4.000
Group 2 -	6	prepare a relief printing master	1.833
	11	use common finishing procedures	4.000
Group 3 -	11	use common finishing procedures	3.417
	9	demonstrate the relief process of printing	3.500

Total Mean = 3.874

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers preapred at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Table 22B portrays the 'Photography' items that members of all three groups rated as being least prepared to teach after completing their teacher preparation program. Group 1 participants indicated they least developed their expertise to "explain the principles of audio-visual presentation equipment" (mean = 3.655) and "produce prints using advanced altering techniques" (mean = 3.759). Group 2 respondents selected "identify multi-media production processes" (mean = 2.600) and "explain the principles of audio-visual

Table 22

Group Attitudes Toward Preparation by Participants to Teach 'Photography'

Industrial Arts Teacher Group	Group Attitude Toward 'Photography' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	29	4.241	4.182	1.087
Group 2 -	5	3.036	2.909	1.544
Group 3 -	12	3.500	4.045	1.626
Total	46	3.917	4.091	1.339

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

presentation equipment" (mean = 2.600) as non-expertise items. Group 3 recipients acknowledged the following items as weaknesses: "produce prints using advanced altering techniques" (mean = 3.000) and "use print finishing procedures" (mean = 3.250).

Technical Drawing

'Technical Drawing' contained items that respondents were to rate on the six point Likert scale. These items were to recognize drafting requirements for different applications, interpret and produce various types of drawings, and display expertise in the use of drafting and reproduction equipment. It was evident from data in Table 23 that Group 3 respondents rated their preparation

Table 22A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Photography'

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 1 -	1	demonstrate light control on a camera	4.862
	4	assemble various photographic images	4.724
Group 2 -	1	demonstrate light control on a camera	3.400
	2	explain the composition of light sensitive materials	3.400
Group 3 -	11	explain the principles of audio-visual presentation equipment	3.917
	1	demonstrate light control on a camera	3.750

Total Mean = 3.917

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

in Technical Drafting to be the highest, with a mean of 5.705. Group 2 participants had a mean of 4.364. Both groups were above the total mean which was 4.351. The mean for Group 1 was 3.769. This mean was below the total mean of 4.351.

Table 22B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Photography'

(N = 46)

Industrial Arts Teacher Group	Items Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	11	explain the principles of audio-visual presentation equipment	3.655
	1	produce prints using advanced altering techniques	3.759
Group 2 -	10	identify multi-media production processes	2.600
	11	explain the principles of audio-visual presentation equipment	2.600
Group 3 -	7	produce prints using advanced	3.000
	8	use print finishing procedures	3.250

Total Mean = 3.917

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

In Table 23A are data which show the items for Technical Drafting that junior high school Industrial Arts participants rated as most adequately prepared to teach. Group 1 constituents rated "to produce a complete drawing (mean = 4.107) and "interpret orthographic pictorial drawings" (mean = 4.071) as items they were most prepared to teach. Group 2 and 3 participants rated "to interpret

Table 23

Group Attitudes Toward Preparation to Teach 'Technical Drawing'

Preparation Industrial Arts Teacher Group	Group Attitude Toward 'Technical Drawing'			
	Number	Mean	Median	Standard Deviation
Group 1 -	28	3.769	4.000	1.338
Group 2 -	6	4.364	3.864	1.327
Group 3 -	12	5.705	5.955	0.403

Total Mean = 4.351

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

orthographic pictorial drawings" (means = 5.167, 5.833 respectively) as an item of strength. Those respondents who comprised Group 2 indicated "to interpret isometric pictorial drawings" (mean = 5.000) and "produce a complete drawing" (mean = 5.000) as items they were adequately prepared to teach. Those participants in Group 3 rated these three items to "interpret technical drawings", "demonstrate basic drafting skills using drafting instruments", "produce a complete drawing" and "use a drafting machine to produce a drawing" with a mean of 5.833 showing adequate preparation.

Table 23B includes those content area items for Technical Drafting that were rated by members of each group to be the least adequately prepared by their teacher preparation program.

Table 23A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Technical Drawing'

(N = 46)

Industrial Arts	Item(s) Rated "Most Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
Group 1 -	8	produce a complete drawing	4.107
	4	interpret orthographic pictorial drawings	4.071
Group 2 -	4	interpret orthographic pictorial drawings	5.167
	3	interpret isometric pictorial drawings	5.000
	8	produce a complete drawing	5.000
Group 3 -	4	interpret orthographic pictorial drawings	5.833
	5	interpret technical drawings	5.833
	6	demonstrate basic drafting skills using different instruments	5.833
	8	produce a complete drawing	5.833
	9	use a drafting machine to produce a drawing	5.833

Total Mean = 4.351

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Table 23B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Technical Drawing'

(N = 46)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	11	reproduce a drawing	3.214
	10	identify methods of duplicating drawings	3.393
Group 2 -	10	identify methods of duplicating drawings	3.167
	11	reproduce a drawing	3.333
Group 3 -	1	explain differences in drafting in different applications	5.417
	10	identify methods of duplicating drawings	5.417

Total Mean = 4.351

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Teachers of all three groups rated "identify methods of duplicating drawings" (Group 1 mean = 3.393, Group 2 mean = 3.167, Group 3 mean = 5.417) as an item that was either their least or second least developed performance. The lowest rated behavior by Group 1 teachers (mean = 3.214) and second lowest rated behavior by Group 2 educators (mean = 3.333) was to "reproduce a drawing". The other lowest rated behavior by Group 3 instructors was to "explain differences in drafting in different applications" (mean = 5.417).

Industrial Simulation

The final content area in Part B of the junior high school Industrial Arts (Education) questionnaire had items that asked respondents to distinguish manufacturing eras, identify various production systems and systems of ownership, and discuss the functions of various company departments. Table 24 displays data that was provided by the three groups of teachers. Teachers from Group 3 received the highest rating with a mean of 3.765, followed by Group 1 educators (mean = 3.495) and then Group 2 instructors (mean = 2.109). The total mean of 3.411 is below the former two groups and above the latter cluster.

Items rated as those that participants were most adequately prepared to teach are scheduled in Table 24A. Group 1 teachers selected "discuss the organization of company personnel and production methods" (mean = 4.185), and "discuss the function of a marketing department" (mean = 4.074) as items they were most adequately prepared to teach. Group 2 educators rated the item "identify mass production systems (mean = 2.400) as the item of highest strength. Group 3 instructors also rated this item as the highest (mean = 4.000), followed closely by the item "identify custom or personalized production systems" (mean = 3.917).

Performance items which group participants rated the least adequately prepared to teach can be found in Table 24B. Group 1 instructors chose "discuss the nationalization system of ownership" (mean = 2.889) and "discuss the partnership system of ownership" (mean = 2.963) as their least developed items. Group 2 teachers catalogued six performance items, all with a mean of 2.000, to be their weakest items of preparation. These items were: "identify

Table 24

Group Attitudes Toward Preparation to Teach 'Industrial Simulation'

(N = 44)

Industrial Arts Teacher Group	Group Attitude Toward 'Industrial Simulation' Preparation			
	Number	Mean	Median	Standard Deviation
Group 1 -	27	3.495	3.636	1.048
Group 2 -	5	2.109	2.000	1.249
Group 3 -	12	3.765	3.773	1.576

Total Mean = 3.411

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

custom or personalized production items", "discuss the nationalization system of ownership", "discuss the function of a research and development department", "discuss the organization of company personnel and production methods", "discuss the function of a marketing department", and "discuss the function of a company finance department". Group 3 educators indicated that only one item of the 11 listed was their most frail, and that was to "discuss the nationalization system of ownership (mean = 3.500).

Table 24A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Industrial Simulation'

(N = 44)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 1 -	9	discuss the organization of company personnel and production methods	4.185
	10	discuss the function of a marketing department	4.074
Group 2 -	3	identify mass production systems	2.400
Group 3 -	3	identify mass production systems	4.000
	2	identify custom or personalized production systems	3.917

Total Mean = 3.411

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 2 -junior high school teachers prepared at non-Canadian institutions

Content Area Ratings by Program

Attitude measurements of the three groups of junior high school industrial arts teachers toward their preparation for the sixteen content areas are presented for the total group followed by each teacher preparation program in Tables 25, 25A, 25B and 25C.

Table 24B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Industrial Simulation'

(N = 44)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 1 -	7	discuss the nationalization system of ownership	2.889
	5	discuss the partnership system of ownership	2.963
Group 2 -	2	identify custom or personalized production systems	2.000
	7	discuss the nationalization system of ownership	2.000
	8	discuss the function of a research and development department	2.000
	9	discuss the organization of company personnel and production methods	2.000
	10	discuss the function of a marketing Department	2.000
	11	discuss the function of a company finance department	2.000
Group 3 -	7	discuss the nationalization system of ownership	3.500

Total Mean = 3.411

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

These content areas were catalogued in the order created by arranging the content areas in descending values of the mean. Each of the three tables lists the mean, median, and standard deviation for each content area. As content area classifications were made during the analysis of data, the mean in parenthesis was placed immediately following the name of this subject section.

Table 25 displays the ratings from highest to lowest (according to the mean) of the perceived preparation of all participants for the sixteen content areas listed in Part B of the junior high school questionnaire.

Members of this total group recognized their preparation for 'Technical Drawing' (4.351), 'Woods' (4.337), 'Electricity & Magnetism' (3.957), and 'Photography' (3.917) to be the best, followed by their training for 'Printing' (3.874), 'Metals' (3.820), 'General Methodology' (3.771), and 'Plastics' (3.631). The third highest rated cluster of content areas was 'General Content' (3.621), 'Industrial Simulation' (3.411), 'Small Engines' (3.188), and 'Power Transmission' (3.153); the lowest rated was 'Utilization' (3.036), 'Electronics - Computers' (2.903), 'Earths' (2.875) and 'Reaction Propulsion' (2.915).

Table 25A lists the values of the 30 junior high school teachers who were prepared at the University of Alberta toward their training to teach each of the sixteen content areas listed on the research questionnaire for this cohort.

Teachers in Group 1 rated their preparation for 'Printing' (4.269), 'Photography' (4.241), 'Woods' (4.038), and 'Electricity & Magnetism' (3.938) to be the four areas they were most adequately prepared to teach. Members in this group scaled their preparation for the areas 'Technical Drawing' (3.769), 'Plastics' (3.618), 'General Methodology' (3.603) and 'General Content' (3.576) to be second highest. The third highest prepared areas for Group 1 teachers were 'Metals' (3.539), 'Industrial Simulation' (3.495), 'Electronics - Computers' (3.414) and 'Earths' (3.323). The units 'Power Transmission' (3.218), Small

Table 25

Ratings: 3 Groups of Junior High School Industrial Arts Teachers Toward Preparation to Teach 16 Content Areas

(N = 48)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Technical Drawing	46	4.351	4.695	1.418
Woods	47	4.337	4.636	1.473
Electricity & Magnetism	46	3.957	4.182	1.290
Photography	46	3.917	4.091	1.329
Printing	47	3.874	4.000	1.582
Metals	47	3.820	4.000	1.364
General Methodology	48	3.771	3.818	1.034
Plastics	47	3.631	3.909	1.317
General Content	47	3.621	3.818	0.966
Industrial Simulation	44	3.411	3.500	1.297
Small Engines	47	3.188	3.273	1.392
Power Transmission	46	3.153	3.273	1.129
Utilization	44	3.036	3.091	1.068
Electronics - Computers	44	2.903	2.955	1.321
Earths	46	2.875	3.000	1.321
Reaction Propulsion	43	2.915	2.455	1.077

Table 25A

Group 1* Industrial Arts Teacher Ratings Toward Preparation to Teach 16 Content Areas

(N = 30)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Printing	29	4.269	4.364	1.419
Photography	29	4.241	4.182	1.087
Woods	29	4.038	4.364	1.552
Electricity & Magnetism	28	3.938	4.227	1.401
Technical Drawing	28	3.769	4.000	1.338
Plastics	29	3.618	3.727	1.287
General Methodology	30	3.603	3.636	0.793
General Content	30	3.576	3.773	0.913
Metals	29	3.539	4.000	1.290
Industrial Simulation	27	3.495	3.636	1.048
Electronics - Computers	27	3.414	3.364	1.275
Earths	29	3.323	3.545	1.204
Power Transmission	29	3.218	3.455	1.044
Small Engines	29	3.072	3.273	1.197
Utilization	26	2.893	2.955	1.005
Reaction Propulsion	27	2.024	2.000	0.971

*Group 1 -junior high school industrial arts teachers prepared at the University of Alberta

Engines' (3.072), 'Utilization' (2.893) and 'Reaction Propulsion' (2.024) were recognized by Group 1 members to be their weakest areas of preparation.

The attitudes of Alberta junior high school industrial arts teachers prepared at other Canadian institutions toward their industrial arts teacher education for each content area are part of Table 25 B.

The six members of Group 2 declared they were best prepared to teach 'Technical Drawing' (4.364), 'Woods' (3.924), 'Metals' (3.635) and 'Electricity & Magnetism' (3.545). The teachers in this group scaled the content areas and indicated that 'Plastics' (3.155), 'Photography' (3.036), 'Utilization' (2.818) and 'General Content' (2.712) were the second highest areas where their preparation was higher than least adequate. The subject classifications viewed by Group 2 teachers to be the third highest prepared by their teacher education program were 'General Methodology' (2.697), 'Power Transmission' (2.400), 'Small Engines' (2.379) and 'Printing' (2.303). The four subject area categories rated by members of Group 2 to be the least adequatelly presented were 'Earths' (2.197), 'Industrial Simulation' (2.109), 'Electronics - Computers' (1.970) and 'Reaction Propulsion' (1.709).

Table 25C categorizes the statistical measures of junior high school Industrial Arts teachers (12) who were prepared at non-Canadian institutions toward the kind of preparation they received in each of the sixteen content areas found on the research questionnaire.

These participants comprised Group 3 and identified 'Technical Drawing' (5.705), 'Woods' (5.265), 'General Methodology' (4.727) and 'Metals' (4.593) to be areas where they were the most adequately prepared to teach. Instructors in Group 3 rated 'General Content' (4.240), 'Electricity & Magnetism' (4.205), 'Plastics' (3.902) and 'Small Engines' (3.871) as the second highest in their preparation. The area categories viewed by members of this group to be next

Table 25B

Group 2* Industrial Arts Teacher Ratings Toward Preparation to Teach 16 Content Areas

(N = 6)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Technical Drawing	6	4.364	3.864	1.327
Woods	6	3.924	3.455	1.688
Metals	6	3.635	3.313	1.588
Electricity & Magnetism	6	3.545	3.773	0.803
Plastics	6	3.155	3.192	1.353
Photography	5	3.036	2.909	1.544
Utilization	6	2.818	3.045	0.947
General Content	6	2.712	2.500	1.034
General Methodology	6	2.697	2.727	1.095
Power Transmission	5	2.400	3.000	1.342
Small Engines	6	2.379	2.455	1.133
Printing	6	2.303	2.727	1.050
Earths	6	2.197	2.091	1.170
Industrial Simulation	5	2.109	2.000	1.249
Electronics - Computers	6	1.970	1.818	1.010
Reaction Propulsion	5	1.709	1.000	0.984

*Group 2 -junior high school industrial arts teachers prepared at other Canadian institutions

Table 25C

Group 3* Industrial Arts Teacher Ratings Toward Preparation to Teach 16 Content Areas

(N = 12)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Technical Drawing	12	5.705	5.955	0.403
Woods	12	5.265	5.409	0.612
General Methodology	12	4.727	4.909	0.815
Metals	12	4.593	5.000	1.235
General Content	11	4.240	3.909	0.646
Electricity & Magnetism	12	4.205	4.727	1.237
Plastics	12	3.902	4.136	1.416
Small Engines	12	3.871	4.682	1.723
Industrial Simulation	12	3.765	3.773	1.576
Printing	12	3.705	4.591	1.744
Photography	12	3.500	4.045	1.626
Utilization	12	3.455	3.455	1.221
Power transmission	12	3.311	3.182	1.222
Reaction Propulsion	11	2.835	3.000	1.177
Electronics - Computers	11	2.157	2.091	0.965
Earths	11	2.062	1.909	1.233

*Group 3 -junior high school industrial arts teachers prepared at non-Canadian institutions highest prepared were 'Industrial Simulation' (3.765), 'Printing' (3.705), 'Photography (3.500) and 'Utilization' (3.455). The four content areas rated by this group of teachers to be the weakest in terms of preparation were 'Power Transmission' (3.311), 'Reaction Propulsion' (2.835), 'Electronics - Computers' (2.175) and 'Earths' (2.062).

A comparison of the responses of preparedness (by each group of teachers toward the content areas that made up their program) for this study to the findings of the Ross study in 1976 was done by creating Tables 26, 26A, 26B and 26C to arrange the content areas of each group in the order created by descending values of the median. Responses in the Ross study were converted from the six-point Likert scale to a dichotomous scale, recording either 'inadequate' or 'adequate' the preparation of each group of teachers for each content area. In order to compare the findings of this study to that of Ross (1976), interpretation of the median (statistical measure representing the midpoint of the responses) for each content area was used to determine ratings of 'inadequate' or 'adequate'. A median value of 3.500 or higher would represent 'adequate', since this value is the midpoint in the six-point Likert scale; and a median value below 3.500 would record 'inadequate'. A rating of one-half or more of the sixteen content areas at either 'inadequate' or 'adequate' could be used to indicate the value of preparation for the total program for each group of teachers.

The medians in Table 26 indicated that the total group of participants rated themselves to be adequately prepared to teach 'Technical Drawing' (4.697), 'Woods' (4.636), 'Electricity & Magnetism' (4.182), 'Photography' (4.091), 'Printing' (4.000), 'Metals' (4.000), 'Plastics' 3.909), 'General Methodology' (3.818), 'General Content' (3.818) and 'Industrial Simulation' (3.500). This group of teachers considered their preparation for 'Small Engines' (3.273), 'Power Transmission' (3.273), 'Utilization' (3.091), 'Earths' (3.000), 'Electronics - Computers' (2.955), and 'Reaction Propulsion' (2.455) to be inadequate.

Table 26

Junior High School Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 48)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Technical Drawing	46	4.697	General Content	49	3.818
Woods	47	4.636	Industrial Simulation	44	3.500
Electricity & Magnetism	46	4.182	Power Transmission	46	3.273
Photography	46	4.091	Small Engines	47	3.273
Printing	47	4.000	Utilization	44	3.091
Metals	47	4.000	Earths	46	3.000
Plastics	47	3.909	Electronics - Computers	44	2.955
General Methodology	48	3.818	Reaction Propulsion	43	2.455

Table 26A presents data that include medians rating content areas for Group 1 participants. These University of Alberta prepared teachers considered themselves to be adequately prepared to teach 'Printing' (4.364), 'Woods'

(4.364), 'Electricity & Magnetism' (4.227), 'Photography' (4.182), 'Technical Drawing' (4.000), 'Metals' (4.000), 'General Content' (3.773), 'Plastics' (3.727), 'General Methodology' (3.636), 'Industrial Simulation' (3.636) and 'Earths' (3.545). Inadequacies Group 1 respondents identified in their preparation was to teach items in 'Power Transmission' (3.455), 'Electronics - Computers' (3.364), 'Small Engines' (3.273), 'Utilization' (2.955) and 'Reaction Propulsion' (2.000).

Table 26A

Group 1* Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 30)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Printing	29	4.364	General Methodology	30	3.636
Woods	29	4.364	Industrial Simulation	27	3.636
Electricity & Magnetism	28	4.227	Earths	29	3.545
Photography	29	4.182	Power Transmisson	29	3.455
Technical Drawing	28	4.000	Electronics - Computers	27	3.364
Metals	29	4.000	Small Engines	29	3.273
General Content	30	3.773	Utilization	26	2.955
Plastics	29	3.727	Reaction Propulsion	27	2.000

*Group 1 -junior high school industrial arts teachers prepared at the University of Alberta

The rated preparations of Group 2 to teach the content areas that make up the Alberta Junior High School Industrial Education Curriculum are listed in Table 26B. These teachers prepared at other Canadian institutions perceived themselves to be adequately prepared to teach 'Technical Drawing' (3.864),

Table 26B

Group 2* Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 6)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Technical Drawing	6	3.864	General Methodology	6	2.727
Electricity & Magnetism	6	3.773	Printing	6	2.727
Woods	6	3.455	General Content	6	2.500
Metals	6	3.313	Small Engines	6	2.455
Plastics	6	3.192	Earths	6	2.091
Utilization	6	3.045	Industrial Simulation	5	2.000
Power Transmission	5	3.000	Electronics - Computers	6	1.818
Photography	5	2.909	Reaction Propulsion	5	1.000

*Group 2 -junior high school industrial arts teachers prepared at other Canadian institutions and 'Electricity & Magnetism' (3.773). Group 2 participants considered their preparation to be inadequate to teach these other content areas: 'Woods' (3.455), 'Metals' (3.313), 'Plastics' (3.192), 'Utilization (3.045), 'Power Transmission' (3.000), 'Photography' (2.909), 'General Methodology' (2.727), 'Printing' (2.727), 'General Content' (2.500), 'Small Engines' (2.455), 'Earths' (2.091), 'Industrial Simulation' (2.000), 'Electronics - Computers' (1.818) and 'Reaction Propulsion' (1.000) to be inadequate.

Table 26C contains data which displays the ratings teachers prepared in non-Canadian institutions had toward teaching the content areas found in Part B of the junior high school questionnaire. The medians of these subject categories indicated that Group 3 members considered themselves to be adequately prepared to teach 'Technical Drawing' (5.955), 'Woods' (5.409), 'Metals' (5.000), 'General Methodology' (4.909), 'Electricity & Magnetism' (4.727), 'Small Engines' (4.682), 'Printing' (4.591), 'Plastics' (4.136), 'Photography' (4.045), 'General Content' (3.909) and 'Industrial Simulation' (3.773). Group 3 teachers rated their preparation to teach 'Utilization' (3.455), 'Power Transmission' (3.182), 'Reaction Propulsion' (3.000), 'Electronics - Computers' (2.091) and 'Earths' (1.909) to be inadequate.

Group Comparisons by Content Area

A comparison of preparatory ratings of the three groups for each content area are scheduled in Table 27. Because of small numbers in the sample population, statistical measures such as MANOVA (Multifactor Analysis of Variance), oneway ANOVA's (Analyses of Variance) and Scheffé tests for significant differences between pairs of groups could not be used. In their place medians were used as indicators of the preparations rated by the sample population because the numbers that comprised these three groups were not

Table 26C

Group 3* Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 12)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Technical Drawing	12	5.955	Photography	12	4.045
Woods	12	5.409	General Content	11	3.909
Metals	12	5.000	Industrial Simulation	12	3.773
General Methodology	12	4.909	Utilization	12	3.455
Electricity & Magnetism	12	4.727	Power Transmission	12	3.182
Small Engines	12	4.682	Reaction Propulsion	11	3.000
Printing	12	4.591	Electronics - Computers	11	2.091
Plastics	12	3.902	Earths	11	1.909

*Group 3 -junior high school industrial arts teachers prepared at non-Canadian institutions

large enough to be representative of all industrial arts teachers in the province.

An analysis of these data show that Group 1 participants rated their preparation higher than did Group 2 members for a majority of the content areas, namely 'Woods' (4.364, 3.455), 'Photography' (4.182, 2.909), 'Printing' (4.364, 2.727), 'Metals (4.000, 3.313), 'General Methodology' (3.636, 2.727), 'General Content' (3.773, 2.500), 'Industrial Simulation' (3.636, 2.000), 'Small

Table 27

Comparisons of Junior High School Industrial Arts Teacher Group Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 48)

Content Area	Number	Median	Content Area	Number	Median
Technical Drawing			General Content		
Group 1 -	28	4.000	Group 1 -	30	3.773
Group 2 -	6	3.864	Group 2 -	6	2.500
Group 3 -	12	5.955	Group 3 -	11	3.909
Woods			Industrial Simulation		
Group 1 -	29	4.364	Group 1 -	27	3.636
Group 2 -	6	3.455	Group 2 -	5	2.000
Group 3 -	12	5.409	Group 3 -	12	3.773
Electricity & Magnetism			Small Engines		
Group 1 -	28	4.227	Group 1 -	29	3.273
Group 2 -	6	3.773	Group 2 -	6	2.455
Group 3 -	12	4.727	Group 3 -	12	4.682
Photography			Power Transmission		
Group 1 -	29	4.182	Group 1 -	29	3.455
Group 2 -	5	2.909	Group 2 -	5	3.000
Group 3 -	12	4.045	Group 3 -	12	3.182

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Table 27 (continued)

Comparisons of Junior High School Industrial Arts Teacher Group Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 48)

Content Area	Number	Median	Content Area	Number	Median
Printing			Utilization		
Group 1 -	29	4.364	Group 1 -	26	2.955
Group 2 -	6	2.727	Group 2 -	6	3.045
Group 3 -	12	4.591	Group 3 -	12	3.455
Metals			Earths		
Group 1 -	29	4.000	Group 1 -	29	3.545
Group 2 -	6	3.313	Group 2 -	6	2.091
Group 3 -	12	5.000	Group 3 -	11	1.909
Plastics			Electronics - Computers		
Group 1 -	29	3.727	Group 1 -	27	3.364
Group 2 -	6	3.192	Group 2 -	6	1.818
Group 3 -	12	4.909	Group 3 -	11	3.000
General Methodology			Reaction Propulsion		
Group 1 -	30	3.636	Group 1 -	27	2.000
Group 2 -	6	2.727	Group 2 -	5	1.000
Group 3 -	12	4.909	Group 3 -	11	3.000

Group 1 -junior high school teachers prepared at the University of Alberta
Group 2 -junior high school teachers prepared at other Canadian institutions
Group 3 -junior high school teachers prepared at non-Canadian institutions

Engines' (3.273, 2.455), 'Earths' (3.545, 2.091) and 'Electronics - Computers' (3.364, 1.818). Preparation ratings for the remaining six content areas were not markedly different.

Group 3 members rated their preparation higher than did Group 1 participants for the content areas 'Technical Drawing' (5.955, 4.000), 'Woods' (5.409, 4.364), 'Metals' (5.000. 4.000), 'General Methodology' (4.909, 3.636) and 'Small Engines' (4.682, 3.273). Group 1 considered their preparation more adequate than Group 3 for the content areas 'Earths' (3.564, 1.909), and 'Electronics - Computers' (3.364, 2.091). Differences between preparation ratings for the remaining nine content areas appeared negligible.

Differences in media measurements appear to be the greatest between content areas for Group 2 and Group 3. Group 3 teachers perceived themselves to be more adequately prepared than Group 2 instructors for twelve of the sixteen content areas: 'Technical Drawing' (5.955, 3.864), 'Woods' (5.409, 3.455), 'Electricity & Magnetism' (4.727, 3.773), 'Photography' (4.045, 2.909), 'Printing' (4.591, 2.727), 'Metals' (5.000, 3.313), 'Plastics' (4.136, 3.192), 'General Methodology' (4.909, 2.727), 'General Content' (3.909, 3.773), 'Industrial Simulation' (3.773, 2.000), 'Small Engines' (4.682, 2.455) and 'Reaction Propulsion' (3.000, 1.000). Preparation ratings for the remaining four content areas did not show a noticeable difference.

CHAPTER V

ANALYSIS OF DATA: PART B SENIOR HIGH SCHOOL

Attitudes of Senior High School Industrial Arts Teachers Toward Their Preparation

The format used to present information for Part B of the senior high school Industrial Arts questionnaire will be identical to that used to report the results for Part B of the junior high school Industrial Arts instrument.

For the purpose of data analysis three groups of high school teachers were formed. Group 4, 30 respondents, consisted of those teachers who received their industrial arts preparation at the University of Alberta. Teachers in Group 5, consisting of 7 members, received their preparation to teach industrial arts at other Canadian institutions. Teachers who formed Group 6, containing 7 participants, received their preparation to teach industrial arts at non-Canadian institutions. All of those who returned a completed questionnaire did not respond to all of the statements listed on the research instrument.

Part B of the senior high school questionnaire included the following two content areas 'General Content' and 'General Methodology'. Each content area consisted of eleven competencies that an industrial arts teacher needed in order to organize and present instructional content to a learner.

In addition to these two categories, Part B of the instrument also included a listing of terminal behaviors for each content area that were taken from curriculum guides for the Industrial Education 10, 20, 30 series of courses. These were assembled under fourteen content areas - each area with eleven terminal behaviors (items). For the purpose of the research the fourteen content areas had this classification: 'Electricity/Electronics Basics', 'Communications', 'Computers', 'Power Sources', 'Fluid Power', 'Mechanical Systems', 'Woods', 'Plastics', 'Metals', 'Hot Metals', 'Drafting', 'Printing', 'Photography', and 'Process Photography'. Participants were asked to rate each item by circling one of six numbers on a Likert scale. The intervals of the Likert scale were: 1. "no value"; 2. "most inadequate"; 3. "inadequate"; 4. "adequate"; 5. "most adequate"; 6. "excellent".

The data produced by Part B of the senior high school questionnaire was processed in four different ways. Initially, responses of all three groups were compared for each of the sixteen content areas that made up the requirements to teach Industrial Arts in the province. These group ratings were measured by recording the mean, median, and standard deviation for each group for each content area; although only the mean was used for deriving comparative statements. Group means were also compared to the total mean for each of these subject classifications.

Secondly, an item analysis of each content area was made for each group to contrast the nature of the content that group members felt they were "most adequately" and "least adequately" prepared to teach. The mean for each item was the criteria used to select the terminal behavior(s) located at the extremes of the Likert scale used by participants for responses. The total mean of all three groups for each content area was the reference used for comparison. The two tables created by this item analysis (one table for items perceived to be the "most adequately prepared" and one table for items perceived to be the "least adequately prepared") immediately followed the table produced for group comparisons of the entire content area.

The third form of analysis involved the creation of two tables for each group. These tables contained an assembly of the statistical measures (mean, median and standard deviation) for each of the sixteen content classifications that needed to be present in a program to prepare an industrial arts teacher for the Alberta multiple-activity curriculum. One set of tables arranged content areas according to descending values of the mean; the other set of tables arranged content areas according to descending values of the median. The median information was used to make comparisons with part of the findings of the Ross (1976) study.

For the fourth form of analysis, group comparisons of their perceived preparation for the sixteen content areas were made with median measurements. Since the sample population for the three groups was so small, statistical tests called MANOVA (Multifactor Analysis of Variance), ANOVA's (Analyses of Variance) and Scheffé statistical measures for significant differences between pairs of groups at a probability level equal to or less than 0.050 could not be used. Median scales provided indications of preparation adequacy by displaying a midpoint value for scaled responses. Without measuring the magnitude of responses, the median provided a point on the scale at which 50% of the responses were above and 50% below.

General Content

The performance items listed under the heading 'General Content' measured the respondent's ability to teach Industrial Arts in a learning environment organized as a multiple-activity laboratory. These items called for responses to behaviors that involved consumer and career education, implications of curriculum content, and identification of safety practices. Table 28 has data which show that Group 6 teachers (mean = 4.248) rated themselves to be the best prepared for this content area. This mean was above the total mean of 3.639. Group 4 teachers had a slightly lower mean of 3.520

and those in Group 5 had a still lower mean of 3.473. Both Groups 4 and 5 ranked their training for teaching the items in this content area below the total mean.

The items for which teachers perceived to be the "most adequately prepared" to teach are listed in Table 28A. Both Group 4 and Group 6 teachers identified "to be able to maintain a safe working laboratory environment" (Group 4 mean = 4.655; Group 6 mean = 5.143) and "identify safety practices" (Group 4 mean = 4.552; Group 6 mean = 5.000) as their strongest items of preparation. Group 5 instructors selected "interpret graphic drawings" (mean = 4.667) and

Table 28

Group Attitudes of Senior High School Industrial Arts Teachers Toward Preparation to Teach 'General Content'

Industrial Arts	Group Attitude Toward 'General Content' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	29	3.520	3.818	1.065
Group 5 -	5	3.473	3.545	1.351
Group 6 -	7	4.248	4.091	0.432
Total	41	3.639	3.909	1.040

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

"identify measuring systems" (mean = 4.167) to be their strong items.

The items these groups of teachers perceived "least adequately prepared" to teach for the content area categorized as 'General Content' are displayed in Table 28B. Group 4 participants categorized "explain function of Worker's Compensation Act" (mean = 2.633) and "describe elements of consumer awareness" (mean = 2.714) as items they were least adequately prepared to

Table 28A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'General Content'

(N = 41)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 4 -	9	be able to maintain a safe working laboratory environment	4.655
	10	identify safety practices	4.552
Group 5 -	3	be able to interpret graphic drawings	4.667
	4	identify measuring systems	4.167
Group 6 -	9	be able to maintain a safe working laboratory environment	5.143
	10	identify safety practices	5.000

Total Mean = 3.639

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

teach. Group 5 teachers rated "identify environmental implications of laboratory curriculum content" (mean = 2.600), "describe elements of consumer

Table 28B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'General Content'

(N = 41)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	11	explain function of Worker's Compensation Act	2.633
	1	describe elements of consumer awareness	2.714
Group 5 -	2	identify environmental implications of laboratory curriculum content	2.600
	1	describe elements of consumer awareness	2.800
	6	describe societal implications of laboratory curriculum content	2.800
Group 6 -	11	explain function of Worker's Compensation Act	3.000
	2	identify environmental implications of laboratory curriculum content	3.286

Total Mean = 3.639

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

awareness" (mean = 2.800) and "describe societal implications of laboratory curriculum content" (mean = 2.800) as being weakest in their preparation. Group 6 respondents indicated from their rating "explain the function of the Worker's Compensation Act" (mean = 3.000) and "identify environmental implications of laboratory curriculum content" (mean = 3.286) to be items in which they had least preparation.

General Methodology

The content area for 'General Methodology' listed items that would determine a teacher's ability to create and maintain an organized learning environment in a laboratory. Content area items under this heading included: performances involving the structuring, delivery and evaluation of information to students; the motivation and organization of student personnel; the satisfactory dealing of student injury; and the maintenance of laboratory equipment and supplies. Information catalogued in Table 29 reveal Group 6 teachers rated themselves best prepared to implement 'General Methodology' with a mean of 4.182 which was above the total mean of 3.624. Both Group 4 (mean = 3.546) and Group 5 (mean = 3.473) were below the mean for Group 6 and slightly below the total mean.

'General Methodology' items rated to be "most adequately prepared" by each of the three groups are detailed in Table 29B. All three groups selected "use audio-visual teaching aids" (Group 4 mean = 4.300; Group 5 mean = 4.167; Group 6 mean = 4.714) as an item in which their teacher preparation was most adequate. Group 4 members rated "develop a system for organizing student personnel" (mean = 3.933) as another "most adequate" item. Teachers in Group 5 indicated by their rating that "relate information to students" (mean = 4.167) was a strong item in their preparation. Members of Group 6 were the only group to rate "develop a yearly program plan" (mean = 4.857) as an item for which their preparation was most adequate.

Items proclaimed to be the "least adequately prepared" by the three research groups involved in the research were used to organize Table 29B.

Table 29

Group Attitudes of Senior High School Industrial Arts Teachers Toward Preparation for 'General Methodology'

Industrial Arts	Group Attitude Toward 'General Methodology' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	30	3.546	3.682	0.938
Group 5 -	6	3.473	3.545	1.351
Group 6 -	7	4.182	4.364	0.658
Total	43	3.624	3.727	0.896

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

All three groups rated "follow ordering procedures according to budget" (Group 4 mean = 2.800; Group 5 mean = 2.167; Group 6 mean = 3.429) as the item for which they were least adequately prepared at university. Both Group 4 and Group 6 participants identified "satisfactorily deal with student injury" (Group 4 mean = 2.833; Group 6 mean = 3.714) to be an item where their preparation was less than adequate. For Group 6 members "maintain a smooth operating laboratory equipment inventory" (mean = 3.714) as an item they considered least adequately prepared to include in their classroom management. Those teachers who made up Group 5 rated "relate information to students" and "maintain an adequate supplies inventory" (both with a mean of 2.500) as

Table 29A

Item(s) Rated "Most Adequately Prepared" by Participants for 'General Methodology'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	3	use audio-visual teaching aides	4.300
	7	develop a system for organizing student personnel	3.933
Group 5 -	3	use audio-visual teaching aides	4.167
	5	relate information to students	4.167
Group 6 -	1	develop a yearly program plan	
	3	use audio-visual teaching aides	4.714

Total Mean = 3.624

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

two items where their preparation was less than adequate.

Electricity/Electronics Basics

For the content area 'Electricity/Electronics Basics' there were 11 items

Table 29B

Item(s) Rated "Least Adequately Prepared" by Participants for 'General Methodology'

(N = 43)

Industrial Arts	Item(s) Rated "Least Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
Group 4 -	11	follow ordering procedures according to budget	2.800
	8	satisfactorily deal with student injury	2.833
Group 5 -	11	follow ordering procedures according to budget	2.167
	5	relate information to students	2.500
	10	maintain an adequate supplies inventory	2.500
Group 6 -	11	follow ordering procedures according to budget	3.429
	8	satisfactorily deal with student injury	3.714
	9	maintain a smooth operating laboratory equipment inventory	3.714

Total Mean = 3.624

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

participants were to rate. These items could be placed under the broad headings: demonstrate the relationship between electricity and magnetism; analyze, measure and graphically represent direct and alternating current circuits; and demonstrate the process of troubleshooting and repairing electrical/electronic equipment.

According to data in Table 30, Group 6 teachers rated themselves to be the

Table 30

Group Attitudes Toward Preparation to Teach 'Electricity/Electronics Basics'

Industrial Arts Teacher Group	Group Attitude Toward 'Electricity/Electronics Basics' Preparation			
	Number	Mean	Median	Std. Dev.
Group 4 -	29	3.483	3.727	1.293
Group 5 -	7	3.584	4.000	1.410
Group 6 -	7	4.248	4.091	0.432
Total	43	3.664	3.909	1.286

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

best prepared to teach this content area (mean = 4.248). They were followed by Group 5 educators with a mean of 3.584 and Group 4 instructors with a mean of 3.483. The total group mean of 3.664 indicates that the mean for Group 6 participants was above the mean. Those that comprised Groups 5 and 4 were below this statistical measure for this content area.

In Table 30A are content area items rated "most adequately prepared" by

Table 30A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Electricity/Electronics Basics'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	9	define electronic symbols	3.793
	2	analyze direct current circuits	3.759
	4	calculate electrical measurements	3.759
	5	define electrical symbols	3.759
Group 5 -	2	analyze direct current circuits	4.000
	4	calculate electrical measurements	4.000
Group 6 -	5	define electrical symbols	5.000
	3	analyze direct current circuit components	4.857

Total Mean = 3.664

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

each teacher group. Group 4 members indicated by their rating the following four items for which they were most adequately prepared to teach: "define electronic symbols" (mean = 3.793), "analyze direct current circuits" (mean = 3.759), "calculate electronic measurements" (mean = 3.759), and "define electronic symbols" (mean = 3.759). Teachers in Group 5 rated "analyze direct current circuits" (mean = 4.000) and "calculate electrical measurements" (mean = 4.000) as items they were most adequately prepared to teach. The items Group 6 participants were most adequately prepared to teach included "define electrical symbols" (mean = 5.000) and "analyze direct current circuit components" (mean = 4.857).

The 'Electricity/Electronics Basics' items that participating teachers felt they were least adequately prepared to teach are shown in Table 30B. Members of all three groups through their ratings indicated "demonstrate the process of diagnosis, dismantling and assembly" (Group 4 mean = 2.724, Group 5 mean = 2.857, Group 6 mean = 4.143) and "demonstrate repairing electrical/electronic equipment" (Group 4 mean = 2.759, Group 5 mean = 2.857, Group 6 mean = 4.143) as two weak items in their preparation.

Group 6 participants, by rating "demonstrate calculations of electronic equipment with a mean of 4.143, identified a third item they were not properly prepared to teach.

Communications

Content area items placed under 'Communications' were grouped into these classifications: preparation to demonstrate electronic amplification, check system performance using different inputs, and demonstrate communication using radio and television waves. In Table 31 are data which indicate that Group 6 teachers considered their preparation to teach Communications to be the best (mean = 3.300). This mean is above the group mean of 2.705. Group 4 rated their preparation with a mean of 2.655 which was lower than the mean for

Table 30B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Electricity/Electronics Basics'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	11	demonstrate the process of diagnosis, dismantling and assembly	2.724
	10	demonstrate repairing electrical/ electronic equipment	2.759
Group 5 -	10	demonstrate repairing electrical/ electronic equipment	2.857
	11	demonstrate the process of diagnosis, dismantling and assembly	2.857
Group 6 -	10	demonstrate repairing electrical/ electronic equipment	4.000
	11	demonstrate the process of diagnosis, dismantling and assembly	4.143
	8	demonstrate calculations of electronic equipment	4.143

Total Mean = 3.664

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Group 6. The Group 5 mean of 2.350 was the lowest of all group means as well as the total mean.

The items rated "most adequately prepared" for the 'Communications' content area by members of all three groups of senior high school industrial arts teachers were used to assemble Table 31A. All three groups of instructors rated "construct a simple amplifier circuit" (Group 4 mean = 3.034, Group 5 mean = 2.667, Group 6 mean = 3.500) to be an item they were most adequately prepared to teach. Those teachers who made up Group 4 rated "demonstrate amplification of audio systems" (mean = 2.862) while those in Group 5 rated "check system performance using different inputs" (mean = 2.667) as additional items they were "most adequately prepared" to teach. Group 6 members selected four additional items to be among their "most adequately prepared"

Table 31

Group Attitudes Toward Preparation to Teach 'Communications'

Industrial Arts	Group Attitude Toward 'Communications' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	29	2.655	2.400	1.346
Group 5 -	6	2.350	2.400	1.216
Group 6 -	6	3.300	3.400	1.620
Total	41	2.705	2.800	1.362

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

performances: "demonstrate transmission of radio waves" (mean = 3.500), "demonstrate reception of radio waves" (mean = 3.500), "demonstrate the use of an R.F. oscillator" (mean = 3.500) and "identify applications of radio communication" (mean = 3.500).

Computers

The 'Computers' content area contained 11 items which could be catalogued under these broad headings: display expertise of computer systems, display expertise of computer operation and display expertise of computer programming. The data listed in Table 32 show that members of

Table 31A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Communications'

(N = 41)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	1	construct a simple amplifier circuit	3.034
	4	demonstrate amplification of audio systems	2.862
Group 5 -	1	construct a simple amplifier circuit	2.667
	3	check system performance using different inputs	2.667
Group 6 -	1	construct a simple amplifier circuit	3.500
	6	demonstrate transmission of radio waves	3.500

Table 31A (continued) <u>Items Rated "Most Adequately Prepared" by Participants to Teach 'Communications'</u>

<u>(N = 41)</u>

Industrial Arts Teach Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
	7	demonstrate reception of radio waves	3.500
	8	demonstrate the use of an R.F. oscillator	3.500
	9	identify applications of radio communication	3.500

Total Mean = 2.705

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Group 6 and Group 4 had a mean of 2.982 and 2.875 respectively. Both these means are slightly above the total mean of 2.847. The mean of 2.749 for Group 5 was the only one below the total mean.

Those items that each group considered to be the "most adequately prepared" for teaching 'Computers' are part of the data presented in Table 32A. Group 4 teachers identified the items "demonstrate computer uses" mean = 3.167) and "demonstrate computer language flow charting" (mean = 3.133) as being most adequately prepared. "Describe computer processes" (mean = 3.000), "describe computer terminology" (mean = 2.750) and "demonstrate computer language flow charting" (mean = 2.750) were computer items that members of Group 5 rated most adequately prepared to teach. Group 6 rated

Table 31B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Communications'

(N = 41)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	10	demonstrate communications using a television system	2.345
	4	demonstrate amplification of audio systems	2.517
Group 5 -	6	demonstrate transmission of radio waves	2.167
	7	demonstrate reception of radio waves	2.167
	8	demonstrate the use of an R.F.	2.167
	9	identify applications of radio communication	2.167
Group 6 -	10	demonstrate communications using a television system	2.833

Total Mean = 2.705

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

"demonstrate the concept of logic circuits" (mean = 3.400) and "describe numeric functions" (mean = 3.400) as being the most adequate items they could teach.

Table 32

<u>Group Attitudes Toward Preparation to Teach 'Computers'</u>

Industrial Arts	Group Attitude Toward 'Computers' Preparation			
Teacher Group Std. Dev.	Number		Mean	Median
Group 4 -	29	2.875	3.364	1.472
Group 5 -	4	2.477	2.409	0.562
Group 6 -	5	2.982	3.545	1.901
Total	38	2.847	3.045	1.440

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Content area items identified by all three teacher groups to be those they were least adequately prepared to teach are displayed in Table 32B. All three groups identified "analyse analogue computers" (Group 4 mean = 2.517, Group 5 mean = 2.000, Group 6 mean = 2.600) as their weakest items of preparation. The least prepared item recognized by Group 4 participants was to "analyze conversion systems" (mean = 2.379). Teachers prepared at other Canadian institutions who comprised Group 5 rated these additional three items they were least adequately prepared to teach: "demonstrate the concept of logic circuits" (mean = 2.250), "analyze digital computers" (mean = 2.250) and "analyze conversion systems" (mean = 2.250). An additional three items were also selected by members from Group 6. These items were to: "analyze digital

Table 32A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Computers' (N = 38)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	6	demonstrate computer uses	3.167
	10	demonstrate computer language flow charting	3.133
Group 5 -	9	describe computer processes	3.000
	8	describe computer terminology	2.750
	10	demonstrate computer language flow charting	2.750
Group 6 -	1	demonstrate the concept of logic circuits	3.400
	11	describe numeric functions	3.400

Total Mean = 2.847

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Table 32B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Computers'

(N = 38)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	4	analyze conversion systems	2.379
	3	analyze analogue computers	2.517
Group 5 -	3	analyze analogue computers	2.000
	1	demonstrate the concept of logic circuits	2.250
	2	analyze digital computers	2.250
	4	analyze conversion systems	2.250
Group 6 -	2	analyze digital computers	2.600
	3	analyze analogue computers	2.600
	5	identify computer classifications	2.600

Total Mean = 2.847

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

computers" (mean = 2.600), "analyze analogue computers" (mean = 2.600) and "identify computer classifications" (mean = 2.600).

Power Sources

The subject category named 'Power Sources' contained items that asked participants to rate their preparedness to teach internal combustion engines and other energy sources; demonstrate expertise to repair small engines using small engines precision measuring tools, repair tools, manuals and purchased parts; and maintain smooth operating mechanical transmission devices. Table 33 includes data that illustrate the group means, along with other statistical

Table 33

Group Attitudes Toward Preparation to Teach 'Power Sources'

Industrial Arts	Group Attitude Toward 'Power Sources' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	30	3.418	3.773	1.270
Group 5 -	5	3.027	3.364	1.492
Group 6 -	7	4.896	4.909	0.845
Total	42	3.618	4.000	1.347

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

measures, to measure the perceived readiness of each group to teach items in this content area. From these data it is evident that Group 6 participants rated themselves to be the best prepared (mean = 4.986) to teach items in the 'Power Sources' area. Group 4 respondents with a mean of 3.418 followed Group 6 and the members of Group 5 had the lowest mean (3.027) for this category. The total mean was 3.618. This mean indicates that teachers in Group 4 and 5 place their preparation to teach this content area below the mean while Group 6 educators with a higher mean placed their education above this measure of average combined performance.

The items for the 'Power Sources' content area that members of all three teacher groups considered "most adequately prepared" to teach are categorized in Table 33A. Participants of all three groups rated to "identify forms of internal combustion engines" as an item they were most adequately prepared to teach. The Group 4 mean for this item was 4.167; Group 5, 3.800; and Group 6, 5.143. Group 4 rated this additional item "identify alternate forms of energy sources" (mean = 4.033) in the "most adequately prepared" category. Group 5 included "describe electric motor theory" (mean = 4.200) as an additional best prepared item. Group 6 rated their preparation to "discuss characteristics of electricity" (mean = 5.000) and "demonstrate the safe use of small engines repair tools" (mean = 5.000) as most adequate.

The content area items considered to be the least adequately prepared by participants are presented in Table 33B. Members of Group 4 by their ratings indicated they were least adequately prepared to teach these two items: "demonstrate the procedure for ordering repair parts" (mean = 2.500) and "maintain smooth operation of mechanical transmission devices" (mean = 2.633). Three of the 11 items for this content area were considered by members of Group 5 to be items they were least adequately prepared to teach. Among these items were "maintiain smooth operation of small engines", "demonstrate the safe use of small engine repair tools", and "maintain smooth operation of mechanical transmission devices", all with a 2.400 mean. Group 6 members

Table 33A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Power Sources'

(N = 42)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	1	identify forms of internal combustion engines	4.167
	3	identify alternate forms of energy sources	4.033
Group 5 -	4	describe electric motor theory	4.200
	1	identify forms of internal combustion engines	3.800
Group 6 -	1	identify forms of internal combustion engines	5.143
	2	discuss characteristics of electricity	5.000
	7	demonstrate the safe use of small engines repair tools	5.000

Total Mean = 3.618

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

rated "identify alternate forms of energy sources" as a least prepared item, with a mean of 4.714.

Table 33B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Power Sources'

(N = 42)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 4 -	10	demonstrate the procedure for ordering repair parts	2.500
	11	maintain smooth operation of mechanical transmission devices	2.633
Group 5 -	5	maintain smooth operation of small engines	2.400
	7	demonstrate the safe use of small engine repair tools	2.400
	11	maintain smooth operation of mechanical transmission devices	2.400
Group 6 -	3	identify alternate forms of energy sources	4.714

Total Mean = 3.618

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Fluid Power

Items in the 'Fluid Power' content area of the questionnaire asked participants to rate their preparation to discuss scientific laws affecting fluid circuits, diagnose automotive hydraulic systems, operate pneumatic tools, and describe operationally air conditioning and pollution control systems. Teachers who were prepared at non-Canadian institutions and formed Group 6 had the highest mean (3.299) for all three groups which indicated they felt they were the best prepared to teach Fluid Power. Group 5 teachers, who were those prepared at other Canadian institutions, had a mean of 2.750. Senior high school industrial arts teachers who formed Group 4 had a mean of 2.476, which was the lowest mean of all three groups. Data for this observation are presented in Table 34. These data show the means for Groups 5 and 6 to be above the total group mean of 2.648 while the mean for Group 4 was below the total mean.

The items that all group participants rated best prepared to teach by their respective teacher education program are listed in Table 34A. An analysis of these data show that teachers in Group 4 were best prepared to teach two of the eleven items: "discuss Pascal's Law in hydraulics" (mean = 3.172) and "operate pneumatic controls" (mean = 3.138). Those in Group 5 rated best prepared "discuss Pascal's Law in hydraulics" (mean = 3.500) and "discuss the operation of automatic transmissions" (mean = 3.000). According to members of Group 6 the items they were most adequately prepared to teach were "operate pneumatic controls" (mean = 3.857); and "dismantle, analyze and assemble a hydraulic jack system" (mean = 3.714).

The items all three groups of teachers rated least adequately prepared by their teacher preparation are included in Table 34B. Group 4 and Group 5 participants rated themselves least adequately prepared to teach "service air conditioning systems" (Group 4 mean = 1.759, Group 5 mean = 2.250). Teachers in all three groups included "identify pollution control systems" (Group 4 mean = 2.000, Group 5 mean = 2.500, Group 6 mean = 3.000) in the "least adequately prepared" category. Group 5 instructors also placed "describe air

Table 34

Group Attitudes Toward Preparation to Teach 'Fluid Power'

Industrial Arts	Group Attitude Toward 'Fluid Power' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	29	2.476	2.455	1.140
Group 5 -	4	2.750	2.727	1.295
Group 6 -	7	3.299	3.455	1.462
Total	40	2.648	2.455	1.220

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

conditioning theory of operation" (mean = 2.500) in this category.

Mechanical Systems

The items that comprise the content area 'Mechanical Systems' could be placed under these broad headings: define concepts of power, discuss key elements to transmission devices, describe function and classification of lubricants, define the purpose and classification of seals, and diagnose a standard transmission. Data from Table 35 reveal Group 6 with a mean of 3.922 and Group 5 with a mean of 3.626 considered that their preparation was most adequate to teach items in this content area. The mean for both of these groups was higher than the total group mean of 3.004. With a 2.685 mean members

Table 34A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Fluid Power'

(N = 40)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	1	discuss Pascal's Law in hydraulics	3.172
	7	operate pneumatic controls	3.138
Group 5 -	1	discuss Pascal's Law in hydraulics	3.500
	5	discuss the operation of automic transmissions	3.000
Group 6 -	7	operate pneumatic controls	3.857
	2	dismantle, analyze and assemble a hydraulic jack system	3.714

Total Mean = 2.648

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

from Group 4 indicated their preparation to teach 'Mechanical Systems' to be the least adequate.

The items from this content area that respondents considered they were best prepared to teach were used to organize data in Table 35A. Instructors in all three groups rated item 1, "define concepts of power" (Group 4 mean = 3.567, Group 5 mean = 4.200, Group 6 mean = 4.429), as being most adequately

Table 34B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Fluid Power'

(N = 40)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	10	service air conditioning systems	1.759
	11	identify pollution control systems	2.000
Group 5 -	10	service air conditioning systems	2.250
	11	identify pollution control systems	2.500
	9	describe air conditioning theory of operation	2.500
Group 6 -	11	identify pollution control systems	3.000

Total Mean = 2.648

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

prepared to teach. In addition, Group 4 members placed item 3 "discuss various gear drives" (mean = 3.300) in the "most adequately prepared" category. In that category of teacher preparedness, members from Group 5 placed "describe the classification of lubricants" (mean = 4.200).

Those who participated in the research rated items they were least adequately prepared to teach. These data are set out in Table 35B. Senior high

Table 35

Group Attitudes Toward Preparation to Teach 'Mechanical Systems'

Industrial Arts	Group Attitude Toward 'Mechanical Systems' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	30	2.685	2.818	1.224
Group 5 -	5	3.626	3.727	1.483
Group 6 -	7	3.922	3.636	1.276
Total	42	3.004	3.091	1.334

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

school industrial arts teachers in Groups 4 and 5 decided to add "dismantle, analyze and assemble a standard transmission" (Group 4 mean = 1.733, Group 5 mean = 3.000) to this category. Group 4 also included these two items, which were the same two items rated by Group 6: "differentiate between static and dynamic seals", "and functionally describe various seals" (Group 4 means = 2.200, Group 6 means =3.714). A second item for which Group 5 teachers felt their preparation was inadquate was "discuss various mechanical linkage drives" (mean = 3.200).

Woods

Items listed under 'Woods' asked participants to asses their preparation for the development of their skills to discuss the derivation of wood from its source

Table 35A

<u>Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Mechanical Systems'</u>

(N = 42)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 4 -	1	define concepts of power	3.567
	3	discuss various gear drives	3.300
Group 5 -	1	define concepts of power	4.200
	8	describe the classifiaction of lubricants	4.200
Group 6 -	1	define concepts of power	4.429

Total Mean = 3.004

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

to a usable material; demonstrate procedures involved in laying out, processing and assembling wood for a product; and demonstrate wood finishing techniques. The group ratings for the extent that participants felt they were prepared to teach this subject are shown in Table 36. Members of Group 6 with the highest mean of 4.403, and teachers in Group 4 with the second highest mean of 4.345 felt their preparation to teach woods as a material was sufficient.

The total mean for this content area was 4.312. Teachers in Group 5 with a mean of 4.078 considered themselves to be the least adequately prepared to teach woodworking.

Table 35B

<u>Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Mechanical Systems'</u>

(N = 42)

Industrial Arts	Item(s) Rated "Least Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
Group 4 -	11	dismantle, analyze and assemble a standard transmission	1.753
	9	differentiate between static and dynamic seals	2.200
	10	functionally describe various seals	2.200
Group 5 -	11	dismantle, analyze and assemble a standard transmission	3.000
	4	discuss various mechanical linkage drives	3.200
Group 6 -	9	differentiate between static and dynamic seals	3.714
	10	functionally describe various seals	3.714

Total Mean = 3.004

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Table 36

Group Attitudes Toward Prepara:ion to Teach 'Woods'

Industrial Arts Teacher Group	Group Attitude Toward 'Woods' Preparation			
	Number	Mean	Median	Std. Dev.
Group 4 -	30	4.345	4.364	1.205
Group 5 -	7	4.078	4.455	1.555
Group 6 -	7	4.403	5.000	1.454
Total	44	4.312	4.455	1.274

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Content area items for 'Woods' that were listed by the three groups of high school Industrial Arts teachers for which they were the best qualified by their preservice preparation are part of Table 36A. All three groups of educators rated item 10 "shape wood by using material removal equipment" (Group 4 mean = 4.633, Group 5 mean = 4.286, Group 6 mean = 4.571) as the item they were most adequately prepared to teach. Group 4 instructors also rated "demonstrate layout in wood" (mean = 4.655) as an item of most adequate preparation. Teachers from Group 5 and Group 6 rated "describe elements of design in product planning" (Group 5 mean = 4.286, Group 6 mean = 4.857) as a most adequate ability. An additional item rated by Group 5 participants as being most adequate in their preparation was item 11 "demonstrate wood finishing techniques" (mean = 4.286). Group 6 respondents felt they were most

Table 36A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Woods'

(N = 44)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 4 -	5	demonstrate layout in wood	4.655
	10	shape wood by using material removal equipment	4.633
Group 5 -	4	describe elements of design in product planning	4.286
	10	shape wood by using material removal equipment	4.286
	11	demonstrate wood finishing techniques	4.286
Group 6 -	4	describe elements of design in product planning	4.857
	5	demonstrate layout in wood	4.571
	10	shape wood by using material removal equipment	4.571

Total Mean = 4.312

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

adequately prepared to "demonstrate layout in wood" (mean = 4.571).

Items for the content area 'Woods' that were rated by the three groups to be the least adequately prepared by their preservice preparation programs are illustrated in Table 36B. Group 4 educators rated "demonstrate mechanical fastening devices" (mean = 4.100) and "demonstrate wood finishing techniques" (mean = 4.167) as least adequately prepared items. To Group 5 instructors item 1 "identify sources of wood" (mean = 3.714) was a least adequately prepared item. Teachers comprising Group 6 chose the two items "demonstrate wood forming techniques" (mean = 3.857) and "demonstrate wood separation using chip removal and non-chip removal tools" (mean = 4.143) to be those they were least adequately prepared to teach.

Plastics

The 11 items for the 'Plastics' content could be placed under one of these three broad headings: trace the derivation of plastics from their sources to workable materials, display the methods involved in producing a finished product from plastics supplies, and explain characteristics of plastics materials. How participants rated these items in relation to their preparation are included in Table 37. Data from this table show that Group 4 teachers, with a mean of 4.176 which was above the total mean of 3.890, viewed their preparation to be the best for this content area. Both Group 6 (mean = 3.740) and Group 5 (mean = 2.636) teachers rated their training programs to be below this measure of this central tendency.

Items for the 'Plastics' content area that group members rated to be their most adequately prepared behaviors are presented in Table 37A. It is evident from an analysis of these data that participants in Group 4 and 5 picked "form plastics materials by molding" (Group 4 mean = 4.533, Group 5 mean = 3.000) and "form plastics materials by shaping" (Group 4 mean = 4.500, Group 5 mean

Table 36B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Woods'

(N = 44)

Industrial Arts	Item(s) Rated "Least Adequately Prepared"		
Teacher Group	Item No.	Description	Mean
Group 4 -	8	demonstrate mechanical fastening devices	4.100
	11	demonstrate wood finishing techniques	4.167
Group 5 -	1	identify sources of wood	3.714
Group 6 -	7	demonstrate wood forming techniques	3.857
	6	demonstrate wood separation using chip removal and non-chip removal tools	4.143

Total Mean = 4.312

Group 4 -senior high school teachers prepared at the Universityu of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

= 3.000) to be items they were best prepared to teach. Group 5 teachers added item 9 "describe methods of bonding plastics" (mean = 3.000) to their list of most adequately prepared items.

In Table 37B are data which list the content area items that members of all three groups rated to be least adequately prepared by their teacher education program. Instructors in Group 4 and Group 5 considered item 11 "demonstrate

Table 37

<u>Group Attitudes Toward Preparation to Teach 'Plastics'</u>

Industrial Arts Teacher Group	Group Attitude Toward 'Plastics' Preparation			
	Number	Mean	Median	Std. Dev.
Group 4 -	30	4.176	4.091	1.219
Group 5 -	6	2.636	2.318	1.647
Group 6 -	7	3.740	4.000	1.622
Total	43	3.890	4.000	1.418

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

expertise in the selection of plastics materials" (Group 4 mean = 3.633, Group 5 mean = 2.167) to be a weak item in their preparation. Group 4 educators also declared "perform simple tests on plastics materials" (mean = 3.833) as an item for which they were least adequately prepared. According to teachers in group 5, the item "demonstrate physical forms of plastics" (mean = 2.333) was one for which their preparation was inadequate. Teachers in Group 6 classified items 1, 3, 4 and 5 (all with a mean of 3.571) as those for which their preparation was inadequate. These respective items were "identify sources of plastics", "describe types of plastics", "describe properties of plastics", and "demonstrate physical forms of plastics".

Table 37A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Plastics'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	8	form plastics materials by molding	4.533
	7	form plastics materials by shaping	4.500
Group 5 -	7	form plastics materials by shaping	3.000
	8	form plastics materials by molding	3.000
	9	describe methods of bonding plastics	3.000
Group 6 -		six items had the highest mean and included all of the items mentioned in the previous two groups; since six is more than one-half the number of items, none have been identified to be most adequately prepared	

Total Mean = 3.890

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Metals

The 11 items in the 'Metals' content area asked participants to scale their preparation for being able to track a metal from its source to its preparation as a workable material, describe characteristics of metal, and demonstrate the operations that can be used to process the material called metal when completing a product. Table 38 displays data representing the attitudes of each

Table 37B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Plastics'

(N = 43)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	11	demonstrate expertise in the selection of plastics materials	3.633
	6	perform simple tests on plastics materials	3.833
Group 5 -	11	demonstrate expertise in the selection of plastics materials	2.167
	5	demonstrate physical forms of plastics	2.333
Group 6 -	1	identify sources of plastics	3.571
	3	describe types of plastics	3.571
	4	describe properties of plastics	3.571
	5	demonstrate physical forms of plastics	3.571

Total Mean = 3.890

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

with a mean of 3.633. The total group mean for the 'Metals' content area was 3.872.

Item(s) for this area rated as "most adequately prepared" by all three groups

Table 38

Group Attitudes Toward Preparation to Teach 'Metals'

Industrial Arts	Group Attitude Toward 'Metals' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	30	3.703	3.909	1.255
Group 5 -	6	3.633	3.627	1.621
Group 6 -	6	4.955	5.000	0.738
Total	42	3.872	4.000	1.305

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

are contained in Table 38A. All three groups of teachers rated the seventh item "demonstrate layout on metal" (Group 4 mean = 3.966, Group 5 mean = 4.333, Group 6 mean = 5.167) as a most adequately prepared item. Other items that received a "most adequately prepared" rating were:

9 "demonstrate metal forming processes"; Group 4 mean = 3.933.

8 "demonstrate metal separation using chip removal and non-chip removal tools"; Group 5 mean = 4.000 and Group 6 mean = 5.167.

6 "describe elements in product design"; Group 6 mean = 5.167.

11 "demonstrate metal combining techniques"; Group 6 mean = 5.167.

Items rated by members of all three groups at the opposite end of the continuum of their preparation are set forth in Table 38B. All three groups of teachers rated item 2 "identify methods of extracting metal" (Group 4 mean =

Table 38A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Metals'

(N = 42)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared"		
	Item No.	Description	Mean
Group 4 -	7	demonstrate layout on metal	3.966
	9	demonstrate metal forming processes	3.933
Group 5 -	7	demonstrate layout on metal	4.333
	8	demonstrate metal separation using chip removal and non-chip removal tools	4.000
Group 6 -	6	describe elements of design in product planning	5.167
	7	demonstrate layout on metal	5.167
	8	demonstrate metal separation using chip removal and non-chip removal tools	5.167
	11	demonstrate metal combining techniques	5.167

Total Mean = 3.872

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

3.300, Group 5 mean = 3.333, Group 6 mean = 4.500) as an item of least adequate preparation. Those in Group 4 added item 11 "demonstrate metal

Table 38B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Metals'

(N = 42)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	2	identify methods of extracting metal	3.300
	11	demonstrate metal combining techniques	3.367
Group 5 -	1	identify sources of metal	3.000
	2	identify methods of extracting metal	3.333
Group 6 -	2	identify methods of extracting metal	4.500
	10	demonstrate metal conditioning processes	4.667

Total Mean = 3.872

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

combining techniques" (mean = 3.367) in this category. Group 5 instructors added "identify sources of metal" (mean = 3.000) while members of Group 6 included "demonstrate metal conditioning processes" (mean = 4.667) as items for which their preparation was less than adequate.

Hot Metals

The items that comprised the 'Hot Metals' content area requested participants to rate their preparation along a continuum ranging from "least adequately prepared" to "most adequately prepared". The 11 items could be placed into anyone of the following calssifications: identify and properly use arc welding equipment, identify and properly use oxy-acetylene equipment, prepare metal for welding, identify weld faults, and demonstrate expertise in casting metal using foundry equipment. The means that portray the degrees of perceived preparedness for the entire category by the three groups of senior high school Industrial Arts teachers are found in Table 39. When compared to the total mean of 3.477, Group 6 educators with a mean of 4.970 rated their preparation to teach Hot Metals highest, followed by Group 5 instructors who

Table 39

Group Attitudes Toward Preparation to Teach 'Hot Metals'

Industrial Arts	Group Attitude Toward 'Hot Metals' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	30	3.182	3.364	1.399
Group 5 -	5	3.455	3.364	1.984
Group 6 -	6	4.970	5.000	0.657
Total	41	3.477	3.545	1.505

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

had a mean of 3.455. Teachers in Group 4 had a mean of 3.182 which was the lowest of all three groups.

The item(s) considered by the three groups to be the most adequately prepared while in teacher education are displayed in Table 39A. According to ratings by teachers in Group 4, "cast a product" (mean = 3.632) and "describe foundry casting methods" (mean = 3.567) were two items they were most adequately prepared to teach. Those teachers in Group 5 rated five items they felt were best prepared by their preparation program. These items were: (1) "demonstrate the proper use of arc welding equipment" (mean = 4.200), (2) "perform various arc welds" (mean = 4.000), (3) "demonstrate the proper use of oxy-acetylene equipment" (mean = 4.000), (4) "perform various oxy-acetylene welds" (mean = 4.000) and (5) "prepare basic metal joints used for welding" (mean = 4.000). According to ratings by members of Group 6, items (1) "demonstrate the proper use of arc welding equipment" (mean = 5.167) and (2) "perform various arc welds" (mean = 5.167) were rated most adequately prepared.

How all three groups rated items they considered to be least adequately prepared to teach are part of the content in Table 39B. Data in this table show that Group 6 rated 4 of the 11 items as those they were least adequately prepared to teach. These items with their common mean of 4.833 were item 7 "describe solutions to weld faults", item 9 "demonstrate the proper use of foundty equipment", item 10 "cast a product" and item 11 "perform cast metal finishing techniques". Members of both Group 4 and 5 gave 2 of the 11 items a "least adequately prepared" rating. Group 4 gave these ratings to item 7 "describe solutions to weld faults", mean = 2.467 and item 6 "identify weld faults", mean = 2.733. Those in Group 5 rated item 8 "describe foundry casting methods" and item 11 "perform cast metal product finishing techniques", both with a 2.600 mean as "least adequately prepared" items.

Table 39A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Hot Metals'

(N = 41)

Industrial Arts Teacher Group	Items Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	10	cast a product	3.632
	8	describe foundry casting methods	3.567
Group 5 -	1	demonstrate the proper use of arc welding equipment	4.200
	2	perform various arc welds	4.000
	3	demonstrate the proper use of oxy-acetylene welding equipment	4.000
	4	perform various oxy-acetylene welds	4.000
	5	prepare basic metal joints used for welding	4.000
Group 6 -	1	demonstrate the proper use of arc welding equipment	5.167
	2	perform various arc welds	5.167

Total Mean = 3.477

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Table 39B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Hot Metals'

(N = 41)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	7	Describe solutions to weld faults	2.467
	6	identify weld faults	2.733
Group 5 -	8	describe foundry casting methods	2.600
	11	perform cast metal product finishing techniques	2.600
Group 6 -	7	describe solutions to weld faults	4.833
	9	demonstrate the proper use of foundry equipment	4.833
	10	cast a product	4.833
	11	perform cast metal product finishing techniques	4.833

Total Mean = 3.477

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Drafting

The content area 'Drafting' listed 11 items for which participants rated their preparation to teach. Data in Table 40 indicated the total mean for this category was 3.327; the mean for Group 6 was 4.662; for Group 5, 3.327; and for Group 4, 2.993.

Table 40

<u>Group Attitudes Toward Preparation to Teach 'Drafting'</u>

Industrial Arts	Group Attitude Toward 'Drafting' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	28	2.993	3.045	1.288
Group 5 -	5	3.327	2.636	1.955
Group 6 -	7	4.662	4.545	0.813
Total	40	3.327	3.500	1.429

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Drafting items deemed to be the best prepared by their teacher education programs for the three groups were placed in Table 40A. Teachers of Group 4 rated "produce various mechanical projections" (mean = 3.893) and "perform correct mechanical drafting procedures in image generation" (mean = 3.821) as items in the "most adequately prepared" category. Instructors from Group 5 placed items 1, 3, and 4 (all with a mean of 4.000) in this category: "demonstrate principles of design in mechanical drafting image creation", "perform correct mechanical drafting procedures in image generation", and "produce various mechanical projections". Group 6 educators indicated "demonstrate principles

Table 40A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Drafting'

(N = 40)

Industrial Arts Teacher Group	Item No.	Description	Mean
	Item(s) Rated "Most Adequately Prepared"		
Group 4 -	4	produce various mechanical projections	3.893
	3	perform correct mechanical drafting procedures in image creation	3.821
Group 5 -	1	demonstrate principles of design in mechanical drafting image creation	4.000
	3	perform correct mechanical drafting procedures in image generation	4.000
	4	produce various mechanical projections	4.000
Group 6 -	1	demonstrate principles of design in mechanical drafting image creation	5.286
	2	describe how to care for drafting equipment	5.286

Total Mean = 3.327

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

of design in mechanical drafting image creation" (mean = 5.286) and "describe how to care for drafting equipment" (mean = 5.286) as items of most adequate preparation.

The content area items that were rated "least adequately prepared" by the three groups of teachers are classified in Table 40B. Participants of all three groups by their rating indicated "information using photogrammetry" (Group 4 mean = 1.893, Group 2 mean = 2.800, Group 3 mean = 3.286) to be an item of least adequate preparation. Other items the members of the three groups placed in this category were: "draft cartographic projections" (Group 4 mean = 2.036, Group 5 mean = 2.800, Group 6 mean = 3.714). To these items members of Group 5 added "perform correct architectural drafting procedures in image generation" (mean = 2.800).

Printing

The 'Printing' portion of the questionnaire listed items that participants rated according to how they perceived their preparation to perform correct procedures in image generation and reproduction using relief printing, screen printing and offset printing processes; select appropriate finishing techniques; and demonstrate expertise in the selection of printing supplies.

It should be evident from data in Table 41 that Group 6 teachers (mean = 3.773) viewed their preparation to be the most adequate. The total mean for all three groups was 3.541. Teachers associated with Group 4 had a mean of 3.715. Group 5 instructors had the lowest mean (1.932) for all three groups.

The content area items that group members considered most adequately prepared to teach while they were in training are presented in Table 41A. According to these data members of Groups 4 and 6 rated "perform correct procedures in relief printing image generation" (Group 4 mean = 3.931, Group 6 mean = 4.167) as most adequate. Members of Group 4 through their rating picked "perform relief printing reproduction processes" (mean = 4.034) to be an item they were most adequately prepared to teach. Another item that Group 6

Table 40B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Drafting'

(N =40)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared"		
	Item No.	Description	Mean
Group 4 -	6	transfer information using photogrammetry	1.893
	7	draft cartographic projections	2.036
Group 5 -	6	transfer information using photogrammetry	2.800
	7	draft cartographic projections	2.800
	8	perform correct architectural drafting procedures in image generation	2.800
Group 6 -	6	transfer information using photogrammetry	3.286
	7	draft cartographic projections	3.714

Total Mean = 3.327

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

teachers placed in the "most adequately prepared" category was "demonstrate principles of design in relief printing image creation" (mean = 4.167). Group 5 respondents labelled six items to have the highest mean (2.250). Since this number is greater than one-half the total number of items listed, no few performances were identified to be the most adequately prepared.

Table 41

Group Attitudes Toward Preparation to Teach 'Printing'

Industrial Arts Teacher Group	Group Attitude Toward 'Printing' Preparation			
	Number	Mean	Median	Std. Dev.
Group 4 -	29	3.715	3.909	1.392
Group 5 -	4	1.932	1.864	1.082
Group 6 -	6	3.773	3.682	0.796
Total	39	3.541	3.818	1.382

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

At the opposite end of the scale, particpants acknowledged content area items that they considered least adequately prepared to teach. These items were used to assemble Table 41B. It is evident from an analysis of these data that Group 6 rated only 1 item of the 11 as one which they were least adequately prepared to teach. Teachers in Group 4 rated two items "demonstrate expertise in the selection of printing supplies", mean = 2.966 and "select appropriate finishing techniques", mean = 3.414 as items of least adequate preparation. The four items with their mean that were rated by teachers of Group 5 are shown in the table.

Table 41A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Printing'

(N = 39)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	3	perform relief printing reproduction processes	4.034
	2	perform correct procedures in relief printing image generation	3.931
Group 5 -		six items had the highest value; since six is more than one-half the number of items, none have been identified to be the most adequately prepared	2.250
Group 6 -	1	demonstrate principles of design in relief printing image generation	4.167
	2	perform correct procedures in relief printing image generation	4.167

Total Mean = 3.541

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at no-Canadian institutions

Photography

The 'Photography' content area like other content areas contained items that participants could rate to determine the adequacy of their preparation for

Table 41B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Printing'

(N = 39)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	11	demonstrate expertise in the selection of printing supplies	2.966
	10	select appropriate finishing techniques	3.414
Group 5 -	7	demonstrate principles of design in offset printing image creation	1.500
	8	perform correct procedures in offset printing image generation	1.500
	9	perform offset printing reproduction processes	1.500
	10	select appropriate finishing techniques	1.500
Group 6 -	4	demonstrate principles of design in screen printing image creation	3.333

Total Mean = 3.541

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

teaching industrial arts in the secondary schools of the province. The broad categories containing these items for 'Photography' were: demonstrate elements of composition for image creation in (black and white, and color) photography; demonstrate photographic image generation, conversion, and reproduction; demonstrate print finishing tecniques; and demonstrate expertise in the selection of photographic supplies. The degree of readiness perceived by members of each group to teach this visual form of cummunication is scheduled in Table 42 which lists a total mean of 3.366. The content area mean for Group 4, which was 3.618, was above the total mean of 3.366. Group 6 with a content area mean of 2.982 followed teachers in Group 4. The mean for Group 5 was 1.955 which was the lowest mean of all groups.

Table 42

Group Attitudes Toward Preparation to Teach 'Photography'

Industrial Arts	Group Attitude Toward 'Photography' Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	30	3.618	4.000	1.329
Group 5 -	4	1.955	1.409	1.417
Group 6 -	5	2.982	3.182	1.318
Total	39	3.366	4.000	1.410

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Table 42A contains data which list the performance items that the three groups identified to be "most adequately prepared" as preservice teachers. Of the 11 items listed, Group 4 teachers rated two "create finished black and white prints" (mean = 4.267) and "demonstrate print finishing techniques" (mean = 4.033) as items they were most adequately prepared to teach. Group 6 rated the four items "demonstrate elements of composition in black and white image creation", "demonstrate photographic image generation", "demonstrate photographic image conversion", and "demonstrate reproduction techniques", all with a mean of 3.400, as items that received adequate preparation. Instructors in Group 5 also rated "demonstrate types of photography in image creation" (mean = 2.500) in the category of most adequate preparation.

The content area items participants considered the least adequately prepared are presented in Table 42B. Members who formed Groups 4 and 6 rated "create finished color photographic products" (Group 4 mean = 3.200, Group 6 mean = 2.400) to be a least adequately prepared item. Group 4 respondents placed item 11 "demonstrate expertise in the selection of photographic supplies" (mean = 3.033) in that category. An additional item that members of Group 6 rated as "least adequately prepared" to teach was "prepare a portifolio of prints" (mean = 2.400). Group 5 evaluators listed eight items (mean = 1.750) to be their least prepared; since this number excludes only three behaviors, none were selected for this category but were assumed to be indicators of general performance.

Process Photography

Similar to other content areas of the questionnaire 'Process Photography' contained 11 items that participants rated in order to determine their perceived preparedness for teaching the area. The items were grouped under these broad headings: demonstrate line photography image creation, generation, conversion and reproduction; demonstrate halftone photography image creation, generation, conversion and reproduction; use appropriate finishing

Table 42A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Photography'

(N = 39)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	8	create finished black and white prints	4.267
	7	demonstrate print finishing techniques	4.033
Group 5 -	3	demonstrate types of photography in image creation	2.500
Group 6 -	1	demonstrate elements of composition in black and white image creation	3.400
	4	demonstrate photographic image generation	3.400
	5	demonstrate photographic image conversion	3.400
	6	demonstrate image reproduction techniques	3.400

Total Mean = 3.366

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

techniques and demonstrate expertise in the selection of process photography

Table 42B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Photography'

(N = 39)

Industrial Arts Teacher Group	Item No.	Description	Mean
	Item(s) Rated "Least Adequately Prepared"		
Group 4 -	11	demonstrate expertise in the selection of photographic supplies	3.033
	9	create finished color photographic products	3.200
Group 5 -		eight items had the lowest value; since eight is more than one-half the number of items, none have been identified to be the least adequately prepared	1.750
Group 6 -	9	create finished color photographic projections	2.400
	10	prepare a portfolio of prints	2.400

Total Mean = 3.366

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

supplies. The extent to which the three teacher groups viewed themselves to be prepared to teach students the items of this subject category is shown in Table 43 (total mean = 3.275). Group 4 with a mean of 3.586 rated their preservice training highest; Group 6 with a mean of 3.091second. The mean of 1.250 for

Group 5 supervisors indicates these teachers rated their preparation to teach Process Photography lowest.

Table 43

Group Attitudes Toward Preparation to Teach 'Process Photography'

Industrial Arts	Attitude Toward Content Area Preparation			
Teacher Group	Number	Mean	Median	Std. Dev.
Group 4 -	29	3.586	3.818	1.400
Group 5 -	4	1.250	1.000	0.500
Group 6 -	5	3.091	3.455	1.594
Total	38	3.275	3.409	1.517

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Process photography items rated "most adequately prepared" by the three teacher groups were used to design Table 43A. Group 4 rated items 9 and 2 "demonstrate reproduction using the offset press" (mean = 3.828) and "produce layouts for line photographv image generation" (mean = 3.759) as items they were most adequately prepared to teach. Teachers from Group 5 rated all eleven items with the same mean so none were identified to be better prepared. Group 6 instructors identified five of the 11 items they were best prepared to teach. These items all had the same mean of 3.200: "demonstrate line photography processes in image conversion", "prepare line photography

Table 43A

Item(s) Rated "Most Adequately Prepared" by Participants to Teach 'Process Photography'

(N = 38)

Industrial Arts Teacher Group	Item(s) Rated "Most Adequately Prepared" Item No.	Description	Mean
Group 4 -	9	demonstrate reproduction using the offset press	3.828
	2	produce layouts for line photography image generation	3.759
Group 5 -		all items had the same mean	1.250
Group 6 -	3	demonstrate line photography processes in image conversion	3.200
	4	prepare line photography layouts for offset reproduction	3.200
	5	demonstrate principles of design in halftone photography image creation	3.200
	8	prepare halftone photography layouts for offset reproduction	3.200
	9	demonstrate reproduction using the offset press	3.200

Total Mean = 3.275

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

layouts for offset reproduction", "demonstrate principles of design in halftone photography image creation", "prepare halftone photography layouts for offset reproduction", and "demonstrate reproduction using the offset press".

In table 43B are data which show the content area items that participants considered to be "least adequately prepared" by their teacher education program. The items placed in this category by members of Group 4 were "demonstrate expertise in the selection of process photography supplies" (mean = 3.069) and "produce sketches for halftone photography image generation" (mean = 3.448). Data in this table show Group 5 participants scaled all 11 items with the same mean of 1.250, consequently, none of the items could be labelled the least adequately prepared. Similarly, Group 6 respondents categorized six of the 11 items to have the same lowest mean (3.000). Because six is more than one-half of the 11 items, none of the items were considered to be at the minimum level of the preparation scale but rather to be representative of the majority of the performance items.

Content Area Ratings by Program

Attitude measurements of the three groups of senior high school Industrial Arts teachers toward their preparation for the sixteen content areas are presented in Tables 44, 44A, 44B and 44C. These content areas listed in Part B of the Industrial Education 10, 20, 30 questionnaire were arranged in descending order of the mean. In each table the mean, median and standard deviation are the statistical measurements used to record the level of preparedness perceived by each group of senior high school teachers toward their teacher education program for each of the sixteen content areas. Data for the total group of teachers are scheduled in Table 44; information for Group 4 teachers are presented in Table 44A. Similar data for Group 5 educators can be

Table 43B

Item(s) Rated "Least Adequately Prepared" by Participants to Teach 'Process Photography'

(N = 38)

Industrial Arts Teacher Group	Item(s) Rated "Least Adequately Prepared" Item No.	Description	Mean
Group 4 -	11	demonstrate expertise in the selection of process photography supplies	3.069
	6	produce sketches for halftone photography image generation	3.448
Group 5 -		all items had the same mean	1.250
Group 6 -		six items had the lowest value; since six is more than one-half the number of items, none have been identified to be the least adequately prepared	3.000

Total Mean = 3.275

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

found in Table 44B, and for Group 6 instructors in Table 44C.

Table 44 displays the ratings from highest to lowest (according to the mean) of the perceived preparation of all participants for the sixteen content areas listed in Part B of the senior high school questionnaire.

Table 44

Ratings of Senior High School Industrial Arts Teachers Toward Preparation to Teach 16 Content Areas

(N = 44)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Woods	44	4.312	4.455	1.274
Plastics	43	3.890	4.000	1.418
Metals	42	3.872	4.000	1.305
Electricity/Electronics Basics	43	3.664	3.909	1.286
General Content	41	3.639	3.909	1.040
General Methodology	43	3.624	3.727	0.896
Power Sources	42	3.618	4.000	1.347
Printing	39	3.541	3.818	1.382
Hot Metals	41	3.477	3.545	1.505
Photography	39	3.366	4.000	1.410
Drafting	40	3.327	3.500	1.429
Process Photography	38	3.275	3.409	1.517
Mechanical Systems	42	3.004	3.091	1.334
Computers	38	2.847	3.045	1.440
Communications	41	2.705	2.800	1.362
Fluid Power	40	2.648	2.455	1.220

Members of the total group recognized their preparation for 'Woods' (4.312), 'Plastics' (3.890), 'Metals' (3.872) and 'Electricity/Electronics Basics' (3.664) to be the best, followed by their preparation for 'General Content' (3.639), 'General Methodology' (3.624), 'Power Sources' (3.618) and 'Printing' (3.541). The third highest rated four content areas were 'Hot Metals' (3.477), 'Photography' (3.366), 'Drafting' (3.327) and 'Process Photography' (3.275); the lowest rated was 'Mechanical Systems' (3.004), 'Computers' (2.847), 'Communications' (2.705) and 'Fluid Power' (2.648).

The attitudes of senior high school Industrial Arts teachers prepared at the University of Alberta toward their preparation for each of the content areas is presented in Table 44A. When a comparative analysis of the means for subject categories in this table is made, it becomes evident that teachers in Group 4 rated their preparation to teach 'Woods' (4.345), 'Plastics' (4.176), 'Printing' (3.715) and 'Metals' (3.703) as best. These subject areas were followed by 'Photography' (3.618), 'Process Photography' (3.586), 'General Methodology' (3.546) and 'General Content' (3.520) in the hierarchy of preparedness. Teachers in this group scaled 'Electricity/Electronics Basics' (3.483), 'Power Sources' (3.418), 'Hot Metals' (3.182) and 'Drafting' (2.993) as items they felt were their third highest developed performances. These same teachers viewed that their competencies for the content areas 'Computers' (2.875), 'Mechanical Systems' (2.685), 'Communications' (2.655) and 'Fluid Power' (2.476) were the least adequately prepared to teach.

The attitudes of Group 5 senior high school Industrial Arts teachers prepared at other Canadian institutions toward their preparation to teach this subject area is represented in Table 44B. These Group 5 educators rated their skills to teach the content areas 'Woods' (4.078), 'Mechanical Systems' (3.636), 'Metals' (3.633) and 'Electricity/Electronics Basics' (3.584) to be the best prepared. The

Table 44A

Ratings of Group 4* Industrial Arts Teachers Toward Preparation to Teach 16 Content Areas

(N = 30)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Woods	30	4.345	4.364	1.205
Plastics	30	4.176	4.091	1.219
Printing	29	3.715	3.909	1.392
Metals	30	3.703	3.909	1.255
Photography	30	3.618	4.000	1.339
Process Photography	29	3.586	3.818	1.400
General Methodology	30	3.546	3.682	0.938
General Content	29	3.520	3.818	1.065
Electricity/ Electronics Basics	29	3.483	3.727	1.293
Power Sources	30	3.418	3.773	1.270
Hot Metals	30	3.182	3.364	1.399
Drafting	28	2.993	3.045	1.288
Computers	29	2.875	3.364	1.472
Mechanical Systems	30	2.685	2.818	1.224
Communications	29	2.655	2.400	1.346
Fluid Power	29	2.476	2.455	1.140

*Group 4 -senior high school industrial arts teachers prepared at the University of Alberta

Table 44B

Ratings of Group 5* Industrial Arts Teachers Toward Preparation to Teach 16 Content Areas

(N = 7)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Woods	7	4.078	4.455	1.555
Mechanical Systems	5	3.636	3.727	1.483
Metals	6	3.633	3.627	1.621
Electricity/Electronics Basics	7	3.584	4.000	1.410
General Content	5	3.473	3.545	1.351
Hot Metals	5	3.455	3.364	1.984
General Methodology	6	3.364	3.455	0.756
Drafting	5	3.327	2.636	1.955
Power Sources	5	3.027	3.364	1.492
Fluid Power	4	2.750	2.727	1.295
Plastics	6	2.636	2.318	1.647
Computers	4	2.477	2.409	0.562
Communications	6	2.350	2.400	1.216
Photography	4	1.955	1.409	1.417
Printing	4	1.932	1.864	1.082
Process Photography	4	1.250	1.000	0.500

*Group 5 -senior high school industrial arts teachers prepared at other Canadian institutions four content areas that Group 5 instructors rated to be second highest prepared were 'General Content' (3.473), 'Hot Metals' (3.455), 'General Methodology' (3.364) and 'Drafting' (3.327). These content areas were followed by 'Power Sources' (3.027), 'Fluid Power' (2.750), 'Plastics' (2.636), 'Computers' (2.477), 'Communications' (2.350), 'Photography' (1.955), 'Printing' (1.932) and 'Process Photography' (1.250).

The attitudes of senior high school Industrial Arts teachers prepared at non-Canadian institutions toward their industrial arts teacher education program are found in Table 44C. The Group 6 educators that made up this group rated their preparation to deliver lessons in the content areas 'Hot Metals' (4.970), 'Metals' (4.955), 'Power Sources' (4.896) and 'Drafting' (4.662) to be the highest, followed by 'Electricity/Electronics Basics' (4.492), 'Woods' (4.403), 'General Content' (4.248) and 'General Methodology' (4.182). The cluster of content areas rated to be third highest in terms of preparation by Group 6 teachers were 'Mechanical Systems' (3.922), 'Printing' (3.773), 'Plastics' (3.740) and 'Communications' (3.300). 'Fluid Power' (3.299), 'Process Photography' (3.091), 'Photgraphy' (2.982) and 'Computers' (2.982) were rated as content areas Group 6 teachers were least adequately prepared to teach.

A comparison of the responses of preparedness (by each group of teachers toward the content areas that made up their program) for this study to the findings of the Ross study in 1976 was accomplished by creating Tables 45, 45A, 45B and 45C to arrange the content areas of each group in the order created by descending values of the median. As stated in Chapter IV, responses in the Ross study were converted from the six-point Likert scale to a dichotomous scale which recorded as either 'inadequate' or 'adequate' the preparation of each group of teachers for each content area. In order to compare the findings of this study to that of Ross (1976), interpretation of the

Table 44C

Ratings of Group 6* Industrial Arts Teachers Toward Preparation to Teach 16 Content Areas

(N = 7)

Content Area	Rating of Content Area Preparation			
	Number	Total Mean	Median	Standard Deviation
Hot Metals	6	4.970	5.000	0.657
Metals	6	4.955	5.000	0.738
Power Sources	7	4.896	4.909	0.845
Drafting	7	4.662	4.545	0.813
Electricity/Electronics Basics	7	4.494	4.364	0.907
Woods	7	4.403	5.000	1.454
General Content	7	4.248	4.091	0.432
General Methodology	7	4.182	4.364	0.658
Mechanical Systems	7	3.922	3.636	1.276
Printing	6	3.773	3.682	0.796
Plastics	7	3.740	4.000	1.622
Communications	6	3.300	3.400	1.620
Fluid Power	7	3.299	3.455	1.462
Process Photography	5	3.091	3.455	1.594
Computers	5	2.982	3.545	1.901
Photography	5	2.982	3.182	1.318

*Group 6 -senior high school industrial arts teachers prepared at non-Canadian institutions median (statistical measure representing the midpoint of responses) for each content area was used to determine ratings of 'inadequate' or 'adequate'. A median value of 3.500 or higher would represent 'adequate', since this value is the midpoint in the Likert scale; and a median value below 3.500 would record 'inadequate'. A rating value of one-half or more of the sixteen content areas at either 'inadequate' or 'adequate' could be used to indicate the value of preparation for the total program for each group of teachers.

The medians in Table 45 indicated that the total group of teachers rated themselves to be adequately prepared to teach eleven of the sixteen content areas: 'Woods' (4.455), 'Plastics' (4.000), 'Metals' (4.000), 'Power Sources' (4.000), 'Photography' (4.000), 'Electricity/Electronics Basics' (3.909), 'General Content' (3.909), 'Printing' (3.818), 'General Methodology' (3.727), 'Hot Metals' (3.545) and 'Drafting' (3.500). Preparation to teach the remaining five content areas was considered by these teachers to be inadequate: 'Process Photography' (3.409), 'Mechanical Systems' (3.091), 'Computers' (3.045), 'Communications' (2.800) and 'Fluid Power' (2.455).

Table 45A presents data that include medians rating content areas for Group 4 participants. These University of Alberta prepared teachers rated their preparation for the following ten content areas to be adequate: 'Woods' (4.364), 'Plastics' (4.091), 'Photography' (4.000), 'Printing' (3.909), 'Metals' (3.909), 'Process Photography' (3.818), 'General Content' (3.818), 'Power Sources' (3.773), 'Electricity/Electronics Basics' (3.727) and 'General Methodology' (3.682). Median ratings for the remaining six content areas indicated that Group 4 participants considered themselves inadequately prepared to teach: 'Hot Metals' (3.364), 'Computers (3.364), 'Drafting' (3.045), 'Mechanical Systems' (2.818), 'Fluid Power' (2.455) and 'Communications' (2.400).

Table 45

3 Groups of Senior High School Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 44)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Woods	44	4.455	Printing	39	3.818
Plastics	43	4.000	General Methodology	43	3.727
Metals	42	4.000	Drafting	40	3.500
Power Sources	42	4.000	Process Photography	38	3.409
Photography	39	4.000	Mechanical Systems	42	3.091
Hot Metals	43	4.000	Computers	38	3.045
Electricity/ Electronics Basics	43	3.909	Communications	41	2.800
General Content	41	3.909	Fluid Power	40	2.455

The rated preparations of Group 5 participants to teach the content areas that make up the Alberta Senior High School Industrial Education Curriculum are listed in Table 45B. These teachers prepared at other Canadian institutions perceived themselves to be adequately prepared to teach five of the sixteen content areas: 'Woods' (4.455), 'Electricity/Electronics Basics' (4.000), 'Mechanical Systems' (3.727), 'Metals' (3.627), and 'General Content' (3.545).

Table 45A

Group 4* Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 30)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Woods	30	4.364	Electricity/ Electronics Basics	29	3.727
Plastics	30	4.091	General Methodology	30	3.682
Photography	30	4.000	Hot Metals	30	3.364
Printing	29	3.909	Computers	29	3.364
Metals	30	3.909	Drafting	28	3.045
Process Photography	29	3.818	Mechanical Systems	30	2.818
General Content	29	3.818	Fluid Power	29	2.455
Power Sources	30	3.773	Communications	29	2.400

*Group 4 -senior high school industrial arts teachers prepared at the University of Alberta

Group 5 members rated their preparation for the remaining eleven content areas to be inadequate: 'General Methodology' (3.455), 'Hot Metals' (3.364), 'Power Sources' (3.364), 'Fluid Power' (2.727), 'Drafting' (2.636), 'Computers' (2.409), 'Communications' (2.400), 'Plastics' (2.318), 'Printing' (1.864), 'Photography' (1.409) and 'Process Photography' (1.000).

Table 45C contains data which display the ratings teachers prepared in non-Canadian institutions had toward teaching the content areas found in Part B of the senior high school questionnaire. The medians listed in this table indicated that Group 6 participants rated their preparation adequate to teach twelve of the sixteen content areas: 'Hot Metals' (5.000), 'Metals' (5.000), 'Woods' (5.000), 'Power Sources' (4.909), 'Drafting' (4.545), 'Electricity/Electronics Basics'

Table 45B

Group 5* Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 7)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Woods	7	4.455	Fluid Power	4	2.727
Electricity/ Electronics Basics	7	4.000	Drafting	5	2.636
Mechanical Systems	5	3.727	Computers	4	2.409
Metals	6	3.627	Communications	6	2.400
General Content	5	3.545	Plastics	6	2.318
General Methodology	6	3.455	Printing	6	1.864
Hot Metals	5	3.364	Photography	4	1.409
Power Sources	5	3.364	Process Photography	4	1.000

*Group 5 -senior high school industrial arts teachers prepared at other Canadian institutions

(4.364), 'General Methodology' (4.364), 'General Content' (4.091), 'Plastics' (4.000), 'Printing' (3.682), 'Mechanical Systems' (3.636) and 'Computers' (3.545). These teachers rated 'inadequate' their preparation for: 'Fluid Power' (3.455), 'Process Photography' (3.455), 'Communications' (3.400) and 'Photography' (3.182).

A simple count of the 'adequate' preparations for the sixteen content areas

Table 45C

Group 6* Industrial Arts Teacher Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 7)

	Rating Toward Content Area Preparation				
Content Area	Number	Median	Content Area	Number	Median
Hot Metals	6	5.000	Plastics	7	4.000
Metals	6	5.000	Printing	6	3.682
Woods	7	5.000	Mechanical Systems	7	3.636
Power Sources	7	4.909	Computers	5	3.545
Drafting	7	4.545	Fluid Power	7	3.455
Electricity/ Electronics Basics	7	4.364	Process Photography	5	3.455
General Methodology	7	4.364	Communications	6	3.400
General Content	7	4.091	Photography	5	3.182

*Group 6 -senior high school industrial arts teachers prepared at non-Canadian institutions that comprise a program were made to determine the adequacy of the total program. A midpoint median of 3.500 was the criteria used to measure adequacy of preparation for each content area. A median above this central statistical measure indicated that the content area was adequately prepared for participants to teach. University of Alberta prepared industrial arts teachers rated themselves adequately prepared to teach ten (more than one-half) of the content areas that made up a total high school industrial arts program. Industrial arts teachers who received their teacher education at other Canadian institutions felt adequately prepared to teach five (less than one-half) of the content areas that comprised Alberta high school Industrial Arts. Industrial arts teachers prepared at non-Canadian institutions considered themselves to be adequately prepared to teach twelve (more than one-half) of the sixteen content areas that made up Part B of the high school industrial arts questionnaire. Part of the findings of the Ross (1976) study revealed that Canadian prepared high school industrial arts teachers perceived themselves to be adequately prepared to teach less than one-half the content areas that comprised high school industrial arts whereas those prepared outside Canada felt adequately prepared to teach one-half or more of these content areas.

Group Comparisons by Content Area

The perceived preparations of the three groups of senior high school Industrial Arts (Education) teachers for each content area are presented in Table 46. Group comparisons were made for each content area using medians as indicators of preparation since sample populations for two of the three groups of teachers was too small to make accurate quantitative measurements using oneway ANOVA's and Scheffé tests for significant differences between pairs of groups at a probability level equal to or less than 0.050.

Table 46

Comparisons of Senior High School Industrial Arts Teacher Group Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 44)

Content Area	Number	Median	Content Area	Number	Median
Woods			General Methodology		
Group 4 -	30	4.364	Group 4 -	30	3.682
Group 5 -	7	4.455	Group 5 -	6	3.455
Group 6 -	7	5.000	Group 6 -	7	4.364
Plastics			Hot Metals		
Group 4 -	30	4.091	Group 4 -	30	3.364
Group 5 -	6	2.318	Group 5 -	5	3.364
Group 6 -	7	4.000	Group 6 -	6	5.000
Metals			Drafting		
Group 4 -	30	3.909	Group 4 -	28	3.045
Group 5 -	6	3.627	Group 5 -	5	2.636
Group 6 -	6	5.000	Group 6 -	7	4.545
Power Sources			Process Photography		
Group 4 -	30	3.773	Group 4 -	29	3.818
Group 5 -	5	3.364	Group 5 -	4	1.000
Group 6 -	7	4.909	Group 6 -	6	3.455

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Table 46 (continued)

Comparisons of Senior High School Industrial Arts Teacher Group Ratings Toward Their Preparation to Teach Alberta Industrial Education

(N = 44)

Content Area	Number	Median	Content Area	Number	Median
Photography			Mechanical Systems		
Group 4 -	30	4.000	Group 4 -	30	2.818
Group 5 -	4	1.409	Group 5 -	5	3.727
Group 6 -	5	3.182	Group 6 -	7	3.636
Electricity/Electronics Basics			Computers		
Group 4 -	29	3.727	Group 4 -	29	3.364
Group 5 -	7	4.000	Group 5 -	9	2.409
Group 6 -	7	4.364	Group 6 -	5	3.545
General Content			Communications		
Group 4 -	29	3.818	Group 4 -	29	2.400
Group 5 -	5	3.545	Group 5 -	6	2.400
Group 6 -	7	4.091	Group 6 -	6	3.400
Printing			Fluid Power		
Group 4 -	29	3.909	Group 4 -	29	2.455
Group 5 -	4	1.864	Group 5 -	4	2.727
Group 6 -	6	3.682	Group 6 -	7	3.455

Group 4 -senior high school teachers prepared at the University of Alberta
Group 5 -senior high school teachers prepared at other Canadian institutions
Group 6 -senior high school teachers prepared at non-Canadian institutions

Noticeable differences in median measurements existed between Groups 4 and 5 (with Group 4 median measurements being higher) for the content areas 'Plastics' (4.091, 2.318), 'Photography' (4.000, 1.409), 'Printing' (3.909, 1.864), 'Process Photography' (3.818, 1.000), 'Computers' (3.364, 2.409). The Group 5 median was higher than the Group 4 median for the content area 'Mechanical Systems' (3.727, 2.818). Median ratings for the remaining ten content areas showed no marked difference in preparation.

Group 6 median ratings were higher than those of Group 4 for the following content areas: 'Woods' (5.000, 4.364), 'Metals' (5.000, 3.909), 'Power Sources' (4.909, 3.773), 'Hot Metals' (5.000, 3.364), 'Drafting' (4.545, 3.045), 'Mechanical Systems' (3.636, 2.818), 'Communications' (3.400, 2.400) and 'Fluid Power' (3.455, 2.455). The Group 4 median was higher than the Group 6 median for the content area 'Photography' (4.000, 3.182). The median ratings between these two groups for the remaining seven content areas showed little difference in preparation.

The greatest difference in median ratings existed between Group 5 and Group 6 , with Group 6 showing higher ratings, for the majority of the content areas: 'Plastics' (4.000, 2.318), 'Metals' (5.000, 3.627), 'Power Sources' (4.909, 3.364), 'Photography' (3.182, 1.409), 'General Content' (4.091, 3.545), 'Printing' (3.682, 1.864), 'General Methodology' (4.364, 3.455), 'Hot Metals' (5.000, 3.364), 'Drafting' (4.545, 2.636), 'Process Photography' (3.455, 1.000), 'Computers' (3.545, 2.409), 'Communications' (3.400, 2.400) and 'Fluid Power' (3.455, 2.727). The remaining three content areas showed little difference in preparation.

CHAPTER VI

RESEARCH FINDINGS

Demographic Information

An analysis of the information generated by Part A of the instruments reveals that the typical industrial arts teacher in Alberta was a male who was 35 to 45 years of age and possessed a Bachelor of Education degree. This teacher had 11 or more years experience teaching industrial arts and had a teaching assignment where both junior high and senior high school students were taught. This dual teaching assignment was a result of the industrial arts teacher being employed in a junior-senior high school or in a high school receiving junior high school students for industrial education. This typical teacher completed the industrial arts program that was offered at the University of Alberta.

Synthesis of Research Data

The means for each of the sixteen content areas that comprised the junior high school industrial arts program were assembled to provide a composite picture of the adequacy of preparation of each group for teaching junior high school industrial arts in Alberta. The same was done with the means for the sixteen content areas that made up the senior high school industrial arts program. The 'mean' measurement, however, was recognized by the researcher to be appropriate only for the synthesis of the content areas analyzed for each junior and senior high school group in this study.

Generalizations from the small sample population in this study would not be accurate, and the ambiguity of interpretation of the Likert scale used to measure responses imply that the 'mean' is not the most appropriate statistical measure to use for program comparisons.

The findings of the research data for this thesis were assembled for comparison with the findings of the study completed by Ross in 1976. The statistical measure used for this comparison was the median, since the median provided the best match for rating responses of adequacy in this study to those created in the Ross study which used a dichotomous scale.

Quantitative measures produced by the mean for each group in each content area were inappropriate for testing null hypothesis because of small sample sizes. In their place were used median measures to serve as indicators of preparation for teaching industrial arts in Alberta.

Preparation for Teaching Junior High School Content Areas

In this study junior high school industrial arts teachers prepared at the University of Alberta considered themselves to be adequately prepared to teach more than one-half (nine) of the sixteen content areas that made up the Alberta curriculum for Junior High School Industrial Education. This information was obtained by analyzing the Group 1 means for all the content areas listed in Table 25A and selecting those that had a mean of 3.500 or higher. The number 3.500 represents the midpoint between the extremes of the Likert scale.

Junior high school industrial arts teachers prepared at other Canadian institutions rated themselves to be adequately trained, according to Table 25B, to teach less than one-half (four) of the sixteen content areas that make up the junior high school industrial education curriculum.

Junior high school teachers prepared at non-Canadian institutions viewed themselves to be prepared to teach more than one-half (eleven) of the sixteen content areas comprising the junior high school industrial arts curriculum in Alberta.

Preparation for Teaching Senior High School Content Areas

Senior high school teachers prepared at the University of Alberta considered themselves to be prepared to teach one-half (eight) of the content areas (see Table 44A) that make up the Alberta curriculum for Senior High School Industrial Education.

Senior high school teachers prepared at other Canadian institutions rated themselves to be adequately prepared to teach less than one-half (four) of the sixteen content areas (see Table 44B) that comprised industrial arts in Alberta.

Senior high school teachers prepared at non-Canadian institutions scaled themselves to be adequately prepared to teach more than one-half (eleven) of the sixteen content areas that are listed on the senior high school questionnaire and scheduled in Table 44C.

The findings of Ross stated that teachers prepared at non-Canadian institutions felt adequately prepared to teach more than one-half the content areas while those teaches prepared at Canadian instituitons considered themselves to be prepared to teach less than one-half the content areas that made up the curriculum for senior high school industrial arts.

Preparation of Total Programs for Teaching Junior High School Students

Comparisons of total program preparations (for teaching industrial arts to junior high school students) in this study with the programs in the Ross study can best be done using the medians of current content areas to compare with the dichotomous scales created by Ross. Ross converted the responses from his six-point Likert scale to a dichotomous scale of 'inadequae' and 'adequate'. Considering all median values above the midpoint of 3.500 to be 'adequate' and all median values below this number to be 'inadequate' would produce the best match for comparison of results between the two studies. A rating of more than one-half the sixteen content areas at either 'inadequate' or 'adequate' could be used to reflect the preparation for the entire program.

University of Alberta prepared teachers (see Table 26A) displayed 'adequate' medians for eleven of the sixteen content areas that were listed in the junior high school questionnaire. These 'adequate' ratings reflected an adequate preparation of the the entire program for teaching industrial arts to junior high school students.

According to data found in Table 26B, teachers prepared at other Canadian institutions presented 'adequate' medians for two of the sixteen content areas found in the junior high school questionnaire. 'Adequate' ratings for two of the sixteen content areas represented an inadequate preparation to teach junior high school industrial arts.

Teachers prepared at non-Canadian institutions listed 'adequate' medians (see Table 26C) for eleven of the content areas contained in the junior high school instrument. A rating of 'adequate' for eleven of the sixteen areas indicated adequate preparation for the entire program to teach junior high school industrial arts.

Ross reported that the teachers prepared outside Canada were adequately prepared to teach more than one-half the content areas; the teachers prepared in Canadian institutions were prepared to teach less than one-half the content areas that made up the curriculum for junior high school industrial arts.

Preparation of Total Programs for Teaching Senior High School Students

Teachers prepared at the University of Alberta showed 'adequate' medians (see Table 45A) for ten of the sixteen content areas found on the senior high school questionnaire. This 'adequate' preparation for more than one-half the content areas depicted an adequate preparation for teaching the entire high school industrial arts program.

Teachers prepared at other Canadian institutions listed median values of greater than 3.500 (according to Table 45B) for five of the content area scheduled on the senior high school instrument. Since adequate preparations for five content areas is less than one-half the total sixteen, the teachers in this group were not considered to be adequately prepared to teach industrial arts to senior high school students.

Teachers prepared at non-Canadian institutions displayed, according to Table 46B, adequate median values for twelve of the sixteen content areas which substantiated adequate preparations for teaching the entire high school industrial arts program.

The findings of Ross stated that teachers prepared at non-Canadian institutions felt adequately prepared to teach more than one-half the content areas while those teachers prepared at Canadian institutions considered themselves to be prepared to teach less than one-half the content areas that made up the curriculum for senior high school industrial arts in the province.

Testing Null Hypotheses

Three null hypotheses were developed for the testing of the attitudes of Alberta industrial arts teachers prepared at the University of Alberta, other

Canadian institutions, and non-Canadian institutions toward their preparation to teach industrial education (non-vocational) in Alberta.

The first null hypothesis developed for this study stated that there is no significant difference between the attitudes of industrial arts graduates from the University of Alberta and industrial arts graduates from other Canadian institutions toward the preparation they received to teach industrial education (non-vocational) in Alberta.

The second null hypothesis developed for the study stated that there is no significant difference between the industrial arts graduates of the University of Alberta and industrial arts graduates from non-Canadian institutions toward the preparation they received to teach industrial education (non-vocational) in Alberta.

The third null hypothesis developed for the study stated that there is no significant difference between the attitudes of industrial arts graduates from other Canadian institutions and industrial arts graduates from non-Canadian institutions toward the preparation they received to teach industrial education (non-vocational) in Alberta.

These null hypotheses could not be accepted or rejected because sample population sizes for two of three groups in the study were too small to test for significant differences.

Comparing Group Preparations for Trends

Group medians for each content area comprising the junior high school industrial arts program were assembled in Table 27. The same was done in Table 46 for group medians representing content area preparations found in the senior high school industrial arts program in the province.

Data in Table 27 reveal the content area 'Technical Drawing' was perceived by junior high school industrial arts teachers educated at non-Canadian institutions to be the best prepared and noticeably above median measurements for junior high school industrial arts teachers prepared in Canada. Non-Canadian prepared industrial arts teachers also rated their preparation for traditional junior high school content areas such as 'Woods', 'Electricity & Magnetism', 'Metals', and 'Small Engines' to be slightly higher than those prepared at the University of Alberta and considerably higher than those prepared at other Canadian institutions. A similar rating is expressed by these three groups of junior high school industrial arts teachers for the content area 'General Methodology'. All three groups of teachers rated their preparation for teaching 'Power Transmission', 'Utilization', 'Electronics - Computers', and 'Reaction Propulsion' to be inadequate. Comparisons of medians for the remaining eight content areas show no noticeable difference between the ratings of University of Alberta prepared junior high school industrial arts teachers and those prepared at non-Canadian institutions. Teachers prepared at other Canadian institutions, however, rated their preparation to teach industrial arts noticeably lower than the other two groups for nearly all of the content areas.

Data in Table 46 indicate that senior high school industrial arts teachers prepared at non-Canadian institutions also rated their preparation for teaching traditional content areas such as 'Woods', 'Metals', 'Hot Metals', 'Power Sources' and 'Drafting' to be higher than Canadian prepared senior high school industrial arts teachers. University of Alberta prepared industrial arts teachers rated themselves the best prepared for the content areas 'Photography', 'Printing', and 'Process Photography'. All three groups of teachers perceived their preparation for 'Communications' and 'Fluid Power' to be inadequate. No marked difference in preparation was made between the three groups of senior high school industrial arts teachers for five of the remaining six content areas. Teachers prepared at other Canadian institutions rated their preparation noticeably lower than the other two groups of teachers for the content area 'Computers'.

CHAPTER VII

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND OBSERVATIONS

The previous six chapters of this thesis provided the general components for taking a problem statement from its presentation to the interpretation of the research findings.

Chapter I presented the general framework and problem statement for the study, along with the signifance of the research, its limitations, and operational definitons required for clarification of information. The remainder of that chapter outlined the instrumentation, the research population and the methodology exercised in the implementation of the research.

Chapter II provided an overview of the evolution of industrial arts in Alberta from the turn of the century to the late 1980's; the preparation of teachers for this subject area since Alberta became a province in 1905; and a review of literature that was related to this research.

Chapter III supplied an analysis of Part A of the information collected with the research questionnaires. Tables were constructed to display demographic information of junior and senior high school industrial arts teacher groups formulated for the study.

Chapter IV analyzed the data collected with Part B of the junior high school research questionnaire. The tables created in this section of the report display the attitudes of the three groups of junior high school industrial arts teachers toward their preparation to teach industrial arts in this province.

Chapter V presented an analysis of the information collected with Part B of the senior high school research questionnaire. The tables generated in this section of the study display the atttitudes of senior high school industrial arts teachers toward their preparation to teach industrial arts to students in Grades 10, 11, and 12.

Chapter VI reports the research findings of this study. Part of the data gathered by this study was to develop findings which were compared to some of the findings of the Ross study completed in 1976. The three null hypotheses developed for this research could not be accepted or rejected because of small population samples.

Chapter VII summarizes the general components of the research report, presents the conclusions, provides recommendations for further research, and lists observations of the researcher that were not supported by any of the findings of the research.

Summary

This portion of the chapter provides a synopsis of the purpose of the research, the related research and the procedures used to obtain research data.

The Problem

The purpose of this study was to replicate as near as possible the Ross study to determine the attitudes of industrial arts teachers instructing Grades 7, 8, 9 Industrial Education, and Industrial Education 10, 20, 30 during the 1988 - 89 school year toward their teacher preparation.

Sub-problems

The purpose of this study was accomplished with the use of three sub-problems:

Identify if differences in attitudes existed between University of Alberta graduates and graduates from other Canadian institutions toward the preparation they received to teach industrial education (non-vocational) in Alberta.

Determine if differences in attitudes existed between University of Alberta graduates and graduates from non-Canadian institutions toward the preparation they received to teach industrial education (non-vocational) in Alberta.

Ascertain if differences in attitudes existed between graduates from other Canadian institutions and graduates from non-Canadian institutions toward the preparation they received to teach industrial education (non-vocational) in Alberta.

Null Hypotheses

Statistical research used to determine relationships between variables in the problem statement required that these relationships be stated in the form of null hypotheses and then tested for significant differences. The sub-problems stated as null hypotheses took the following form:

There is no significant difference between the attitudes of industrial arts graduates from the University of Alberta and industrial arts graduates from other Canadian institutions toward the preparation they received to teach industrial education in Alberta.

There is no significant difference between the attitudes of industrial arts graduates from the University of Alberta and industrial arts graduates from non-Canadian institutions toward the preparation they received to teach industrial education in Alberta.

There is no significant difference between the attitudes of industrial arts graduates from other Canadian institutions and industrial arts graduates from non-Canadian institutions toward the preparation they received to teach industrial education in Alberta.

The population

The research population consisted of three categories of people: school superintendents of all jurisdictions in Alberta during the 1988 - 89 school year; all Alberta junior high school teachers of Grades 7, 8, 9 Industrial Education during the 1988 - 89 school year; and all Alberta senior high school teachers of Industrial Education 10, 20, 30 series of courses during the 1988 - 89 school year. The random sample selected from this aggregate population consisted of 62 superintendents, 75 junior high school teachers of Grade 7, 8, 9 Industrial Education and 75 senior high school teachers of Industrial Education 10, 20, 30 series of courses. Individuals who returned responses and participated in the study were 48 superintendents, 48 junior high school teachers and 44 senior high school teachers. The roles of the superintendents consisted of giving approval to the researcher for involving select industrial education teachers in their jurisdiction to participate in the study. The roles of the teachers were to complete and return the appropriate questionnaires that were mailed to them.

Related Literature

The related literature for this study traced the evolution of industrial arts from the turn of the century to its current status, and outlined teacher preparation for this practical subject since the creation of the province. Teacher education for industrial arts shifted from training during summer sessions in normal schools to four year preparation at the University of Alberta.

Other studies fitting into the framework of this research provided a historical development of industrial arts as a subject and addressed topics concerning the implementation of industrial arts in multiple-activity laboratories.

Methodology

Two questionnaires were developed for information retrieval in this study; one for junior high school industrial arts teachers, and the other for senior high school industrial arts teachers. Each questionnaire contained two parts: Part A was designed to collect demographic information and Part B included statements that would measure the attitudes of junior high school or senior high school industrial arts teachers toward their preparation. A six point Likert scale was used to record responses and the labels used on the points were: "no value", "most inadequate", "inadequate", "adequate", "most adequate", and "excellent".

The questionnaires were pilot tested prior to being used in the study by two individuals from the Curriculum Design Branch, Alberta Education and then revised according to their recommendations.

Randomly selected superintendents of school jurisdictions in Alberta were contacted for permission to allow industrial arts teachers in their employ to participate in the study. Upon receipt of the superintendent's approval, a letter was sent to the appropriate school principal informing this school administrator that one of the industrial arts teachers was selected to receive a copy of the instrument. A day later, a copy of the appropriate questionnaire along with a covering letter and a stamped return envelope was sent to the teacher concerned.

Letters sent to superintendents yielded a rate of return of 66%. A follow-up letter increased the rate of return to 77%. The response from teacher participants yielded an 81% rate of return. No follow-up letter was sent to increase the number of replies because the questionnaires were not codified. Of the 98 returned questionnaires, 92 were usable for data processing.

Instrument responses were coded by the researcher and delivered to personnel at the Department of Educational Research Services, University of Alberta for keypunching. Programs were selected from the Statistical Package for the Social Sciences (SPSSX) to process the data and present tables displaying frequencies, percentages, means, medians, standard deviations, Analyses of Variance and/or Scheffé tests for significant differences.

Data was prepared for comparison with part of the findings of the study by Ross (1976) and for testing of the null hypotheses developed for this study.

Conclusions

An analysis of the demographic information collected for this study revealed that a characteristic teacher was a 35 to 45 year old male who possessed a Bachelor of Education degree, reached 11 or more years teaching experience and had a teaching assignment that contained both junior high school and senior high school industrial education (non-vocational) students.

A comparison of part of the research data from this study with part of the findings from the study developed by Ross (1976) indicated a change in the preceptions of preparedness of industrial arts teachers prepared at the University of Alberta. These teachers considered themselves adequately prepared to teach less than one-half the content areas that comprised industrial arts curriculum. These teachers now viewed themselves to be adequately prepared to teach more than one-half of the content areas that are contained in the junior and senior high school curriculum for industrial arts. A change also occured in the preceptions of non-University of Alberta prepared industrial arts teachers: those prepared at other Canadian institutions considered themselves no longer prepared to teach one-half or more of the content areas that were part of Alberta junior and senior high school industrial arts curriculums. Teachers prepared outside Canada, though, maintained their rating of being adequately prepared to teach more than one-half of these content areas.

Ross (1976) also concluded in his study that University of Alberta prepared industrial arts teachers considered themselves capable of teaching industrial arts to junior high school students but not senior high school students. The majority of non-University of Alberta prepared industrial arts teachers perceived themselves to be capable of teaching this subject to both junior and senior high school students. The results of this study reveal that University of Alberta prepared and non-Canadian institutions prepared industrial arts teachers rated themselves adequately prepared to teach industrial arts to both junior and senior high school students. Teachers prepared at other Canadian institutions, though, rated their preparation to be inadequate for teaching Alberta industrial arts to either junior high or senior high school students.

Recommendations

The following reccommendations were made from the results of this study:

Future researchers could consider a study that would identify the changes occuring to the provincial Industrial Education (non-vocational) Curriculum and the implications these changes would have to the teacher preparation program offered at the University of Alberta. Those who wish to replicate this or the Ross study must take into consideration the following: the professional maturation of the population of industrial arts teachers in the province; curriculum changes initiated by the curriculum branch of the Department of Education; new and emergent technologies that may impact as content organizers for this subject area; and the formal and informal inservice activities with which a teacher may become involved. Future researchers are provided with the following cautionary note: it was most difficult to convert attitudes into program.

The Department of Adult, Career and Technology Education should periodically survey employed industrial arts teachers to interpret the match between the educational product (graduating student) and the requirements for teaching the subject area in the secondary schools. An open communication policy should be maintained between stakeholders in non-vocational Industrial Education. The encouragement of enrollment in accredited graduate courses that allowed for development of more depth or upgrading by practising industrial arts teachers designing their own professional development could be a component worthy of consideration by the Department.

Personnel from the Curriculum Design Branch should survey existing school programs in Alberta; seek input from superintendents, principals, practicing teachers, students and taxpayers regarding the needs that should be met by non-vocational Industrial Education; and provide curriculums to implement these changes. An evergreen policy would need to be in place so that equipment, facility and software could be developed or upgraded and maintained to be kept on the cutting edge of technology.

School administrators should recognize the educational needs that could be met by non-vocational Industrial Education programs and provide facility to implement these programs. Professional development funding and time should be made available to teachers so that the maximum benefit to students can be realized.

Industrial arts teachers should seek to update their preparation and facility at every possible opportunity in order to accommodate the latest relevant and practical technologies into their programs.

The Industrial Education Council should maintain an active communication link with the Department of Adult, Career and Technology Education; with personnel from the Curriculum Design Branch of Alberta Education and with practicing Industrial Education (non-vocational) teachers in order to develop inservice sessions to upgrade teachers. The practice of offering yearly two day conventions in choice Alberta locations should be continued and school boards should be encouraged to allow all Industrial Education teachers to attend.

Observations

The change in attitude among University of Alberta prepared industrial arts teachers (to be more adequately prepared) could be attributed to maturation from both a professional and personal perspective. An analysis of the research instrument after the completion of the data gathering phase of the study revealed that a statement to identify inservice activities had been omitted.

Ross completed his study in 1976 which involved industrial arts teachers who completed their teacher preparation earlier than 1975. It is possible that some members of that population were among those randomly selected to participate in this study. This created a research population overlap which could have influenced the attitudes of these unidentifiable teachers toward their preparation, experience and performance to teach the different items.

Industrial arts teachers prepared outside Canada perceived themselves to be slightly better prepared for teaching many of the traditional content areas than those prepared at the University of Alberta or other Canadian institutions. This perception by teachers prepared at non-Canadian institutions could be the result of a unit shop approach in universities where these teachers acquired their skill base to teach the learning content. The multiple-activity organizational plan prepared teachers with a greater breadth of subject material to include non-conventional content areas. This was at a sacrifice to the depth per content area.

Industrial arts at the secondary school level in Alberta is exploratory and is taught in a multple-activity laboratory. This organizational plan provides the learning environment for an industrial arts laboratory that allows for the coverage of greater content with less money being invested in equipment. Preparing teachers for industrial arts in Alberta is best done in a multiple-activity laboratory in order to teach this organizational plan as well as the content associated with this subject area. Preservice industrial arts teachers educated at the University of Alberta were prepared in multiple-activity laboratories and consequently do rate themselves better prepared for some of the non-conventional content areas.

Teachers prepared at institutions outside Canada may rate their preparation excessively high because they are competing in a market with eligible provincially prepared instructors.

Preparation for teaching industrial arts (now called industrial education) in Alberta requires breadth because an aspiring teacher must be adequately prepared for an initial teaching assignment in any or a combination of the content areas offered in the secondary school industrial education curriculum. Since no teacher possesses in-depth knowledge and skill in all content areas, adequate preparation with an opportunity for further development would take priority over an in-depth preparation of a limited number of content areas that may not match the job description attained.

Most teachers show a preference for a combination of content areas but these content areas may not be vocationally related. Opportunities need to exist for preservice teachers to develop depth in content areas of their choice by designing their own independent study courses.

Aiming for the best possible industrial arts teacher preparation with existing personnel and facility may require consideration of "the least prepared" items identified by participants in Groups 1 and 4 in this study. Realizing changing requirements in preparation because of advances in technology (such as 'Computers') may require supplementary placement in an industrial setting for a short period of time. Some content areas such as 'Reaction Propulsion' and 'Industrial Simulation' are not commonplace and should not be given equal preparatory time to more common content areas. Other content areas are being dropped from the provincial curriculum (such as Plastics and Foundry) and should therefore have less emphasis placed on them.

A study such as this one provides insight into the perceptions of practicing industrial arts teachers. Preparation for the practical aspect may differ from that of the theoretical aspect in that certain parts of a school curriculum may be more important and require more attention than other parts. A measurement of responses from practicing industrial arts teachers is a suitable technique for recognizing those parts of content areas that are important to teaching industrial arts in Alberta.

Should this study be repeated at a later date, a change to the Likert scale for responses would be essential. The scale intervals adopted for this study from that of Ross created disparities in interpretation. Ross converted his responses to a dichotomous scale so the terms used were not as crucial to his study as they were to this one. The intervals would need to be changed if used again from 'no value', 'most inadequate', 'inadequate', 'adequate', 'most adequate' and 'excellent' to intervals with less severe increments. The first interval below the midpoint, called 'inadequate', could very well accumulate the majority of responses since a content area preparation would not need to lack much information to receive this rating. An assembly of several of these content area ratings could label a total program as being 'inadequate' when in actuality it could be commendable.

The long term values that had been placed on traditional content areas are diminishing. New technologies such as Robotics, Laser Technology, Fibre-optics, and the ever-changing technology of Computers are demanding a place in industrial education laboratories.

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APPENDIX A

This appendix contains a list of the school jurisdictions that are located in Alberta, along with the names of the superintendents and the addresses of the school boards. This list was taken from the Alberta Teachers' Association, Members' Handbook, 1988. (pp. 9 - 10).

Alberta School Jurisdictions and Superintendents

Counties

ATHABASCA No 12, Box 540, Athabasca T0G 0B0, 675-2273, T West
BARRHEAD No 11, Box 820, Barrhead T0G 0E0, 674-3331, H L Treleaven
BEAVER No 9, Box 140, Ryley T0B 4A0, 663-3730, W Schoeman
CAMROSE No 22, 5402 48A Avenue, Camrose T4V 0L3, 672-4446, M Stover
FLAGSTAFF No 29, Box 358, Sedgewick T0B 4C0, 384-3537, W Curtis
FORTY MILE No 8, Box 485, Foremost T0K 0X0, 867-3530, R Mitton
GRANDE PRAIRIE No 1, 8611 108 Street, Grande Prairie T8V 4C5, 532-9722, J D MacNeill
LAC STE ANNE No 28, Box 219, Sangudo T0E 2A0, 785-3411, L A Truckey
LACOMBE No 14, Drawer 1330, Lacombe T0C 1S0, 782-6601, M Kurtz
LAMONT No 30, Box 150, Lamont T0B 2R0, 895-2233, R A Wiznura
LEDUC No 25, 4301 50 Street, Leduc T9E 2X3, 986-2251, R MacDonald
LETHBRIDGE No 26, 905 Fourth Avenue South, Lethbridge T1J 4E4, 328-5525, J S Phelps
MINBURN No 27, Box 1283, Vegreville T0B 4L0, 632-3485, J Cooper
MOUNTAIN VIEW No 17, PO Bag 100, Didsbury T0M 0W0, 335-3311, B J S Cant
NEWELL No 4, Box 130, Brooks T0J 0J0, 362-3171, R Grab
PAINTEARTH No 18, Box 509, Castor T0C 0X0, 882-4002, L Cavers
PARKLAND No 31, PO Bag 250, Stony Plain T0E 2G0, 963-2231, M W Tkachuk
PONOKA No 3, Box 1830, Ponoka T0C 2H0, 783-3333, E T Yates
RED DEER No 23, Box 920, Red Deer T4N 5H3, 347-3364, R E Cope
SMOKY LAKE No 13, Box 310, Smoky Lake T0A 3C0, 656-3730, K Riegel
ST PAUL No 19, Box 100, St Paul T0A 3A0, 645-3301, T Cabaj
STETTLER No 6, Box 1270, Stettler T0C 2L0, 742-4441, G Bushrod
STRATHCONA No 20, 2001 Sherwood Drive, Sherwood Park T8A 3W7, 464-8111, G Welch
THORHILD No 7, Box 10, Thorhild T0A 3J0, 398-3741, J Topolnisky
TWO HILLS No 21, Box 490, Two Hills T0B 4K0, 657-3358, D Yakimowich
VERMILION RIVER No 24, Box 69, Kitscoty T0B 2P0, 846-2244, A Anderson
VULCAN No 2, Box 180, Vulcan T0L 2B0, 485-2241, C R Elle
WARNER No 5, Box 90, Warner T0K 2L0, 642-3636, J Waddell
WETASKIWIN No 10, Box 6960, Wetaskiwin T9A 2G5, 352-3321, W C McCarthy
WHEATLAND No 16, Box 90, Strathmore T0J 3H0, 934-3321, D G McKinnon

School Divisions

ACADIA No 8, Box 269, Oyen T0J 2J0, 664-3817 (to be appointed)
BERRY CREEK No 1, Box 580, Hanna T0J 1P0, 854-4481, R M Warrington
CARDSTON No 2, Box 10, Cardston T0K 0K0, 653-4991, B Nielson
CROWSNEST PASS No 63, Box 568, Blairmore T0K 0E0, 562-8825, J W Terriff
CYPRESS No 4, 147 Sixth Street SE, Medicine Hat T1A 1G7, 527-5516, D H Christensen
DRUMHELLER VALLEY No 62, Box 1839, Drumheller T0J 0Y0, 823-5131, H Wescott
EAST SMOKY No 54, PO Bag 2, Valleyview T0H 3N0, 524-3887, D Thomas
FAIRVIEW No 50, PO Bag 1590, Fairview T0H 1L0, 835-2591, D Allison
FOOTHILLS No 38, Box 400, High River T0L 1B0, 652-3001, D A Lynn
FORT VERMILION No 52, PO Bag 1, Fort Vermilion T0H 1N0, 927-3766, M Davenport
HIGH PRAIRIE No 48, Box 870, High Prairie T0G 1E0, 523-3337, V Evans
LAC LA BICHE No 51, Box 870, Lac La Biche T0A 2C0, 623-4414, P Ponich
MOUNT RUNDLE No 64, Box 699, Canmore T0L 0M0, 678-5545, B Decoux
NEUTRAL HILLS No 16, Box 509, Castor T0C 0X0, 577-3626, L Cavers
NORTHLAND No 61, Box 1440, Peace River T0H 2X0, 624-2060, B Callaghan
PEACE RIVER No 10, Box 339, Peace River T0H 2X0, 624-3601, G Tagg
PINCHER CREEK No 29, Box 219, Pincher Creek T0K 1W0, 627-3044, J Sacher
PROVOST No 33, Box 178, Provost T0B 3S0, 753-2155, D A Boddy
RANGELAND No 9, Box 580, Hanna T0J 1P0, 854-4481, R M Warrington
ROCKY MOUNTAIN No 15, PO Bag 8000, Rocky Mountain House T0M 1T0, 845-3376, B Findlater
ROCKY VIEW No 41, Box 3910, Postal Station B, Calgary T2M 4M5, 276-5526, H C Parr
SPIRIT RIVER No 47, Box 99, Spirit River T0H 3G0, 864-3741, R F Welch
STARLAND No 30, Box 1570, Drumheller T0J 0Y0, 823-2290, W Doyle
STURGEON No 24, 9820 104 Street, Morinville T0G 1P0, 939-4341, R D Thiessen
TABER No 6, Box 1239, Taber T0K 2G0, 223-3547, L Ross
THREE HILLS No 60, Box 310, Trochu T0M 2C0, 442-3055, E W Skuba
WAINWRIGHT No 32, Box 1530, Wainwright T0B 4P0, 842-6144, W H Webb
WESTLOCK No 37, Box 130, Westlock T0G 2L0, 422-2054, S Schmold
WILLOW CREEK No 28, Box 1959, Claresholm T0L 0T0, 625-3356, A MacLeod
YELLOWHEAD No 12, Box 1570, Edson T0E 0P0, 723-4471, K Puhlmann

Public School Districts

BANFF No 102, Box 748, Banff T0L 0C0, 762-5581, G J Percy
BROOKS No 2092, Box 2169, Brooks T0J 0J0, 362-2023, D Gillespie
CALGARY No 19, 515 Macleod Trail SE, Calgary T2G 2L9, 294-8211, A J H Newberry

CAMROSE No 1315, 6211 48 Avenue, Camrose T4V 0K4, 672-5594, W Janzen
DEVON No 4972, Box 400, Devon T0C 1E0, 987-3367, L Throndson
EDMONTON No 7, Centre for Education, One Kingsway, Edmonton T5H 4G9, 429-8000, M A Strembitsky
EXSHAW No 1699, Box 340, Exshaw T0L 2C0, 673-3656, B Henry
FORT McMURRAY No 2833, 9401 Franklin Avenue, Fort McMurray T9H 3Z7, 743-3705, R W Prather
GRANDE CACHE No 5258, Box 591, Grande Cache T0E 0Y0, 827-3970, T Wendel
GRANDE PRAIRIE No 2357, 10213 99 Street, Grande Prairie T8V 2H3, 532-4491, D R Taylor
GROVEDALE No 4910, Box 99, Spirit River T0H 3G0, 864-3741, R Welch
JASPER No 3063, Box 520, Jasper T0E 1E0, 852-3356, H Jepson
LAKELAND No 5460, PO Bag 1001, Bonnyville T9N 2J7, 826-3145, W Hayduk (acting)
LEDUC No 297, 1 Alexandra Park, Leduc T9E 4C4, 986-7515, N C Gannon
LEGAL No 1738, Box 210, Legal T0G 1L0, 961-4022, R H Martin
LETHBRIDGE No 51, 433 15 Street South, Lethbridge T1J 2Z5, 327-4521, G Probe (acting)
MEDICINE HAT No 76, 601 First Avenue SW, Medicine Hat T1A 4Y7, 526-1323, H Storlien
RED DEER No 104, 4747 53 Street, Red Deer T4N 2E6, 343-1405, K A Jesse
REDCLIFF No 2283, 147 Sixth Street SE, Medicine Hat T1A 1G7, 527-5516, D H Christensen
ST ALBERT No 3, 6 Saint Vital Avenue, St Albert T8N 1K2, 459-7711, J Nearing
ST ISIDORE No 5054, Box 122, St Isidore T0H 3B0, J Moquin, 624-8855
ST PAUL No 2228, Box 5000, St Paul T0A 3A0, 645-3323, F X Boulet
STETTLER No 1475, Box 1420, Stettler T0C 2L0, 742-3331, W P Baergen
STIRLING No 647, Box 390, Stirling T0K 2E0, 756-3355, S Huxley
SWAN HILLS No 5109, Box 1200, Swan Hills T0G 2C0, 333-2855, H L Treleaven
THIBAULT No 35, Box 600, Morinville T0G 1P0, 939-3060, L Lucente
WATERTON PARK No 4233, 200 Fifth Avenue South, Lethbridge T1J 4C7, 381-5243, B Gommeringer
WETASKIWIN No 264, 4710 55 Street, Wetaskiwin T9A 3B7, 352-6018, G P Johnson
WHITECOURT No 2736, Box 1888, Whitecourt T0E 2L0, 778-2800, L Larson

Protestant Separate School Districts

GLEN AVON No 5, Box 5000, St Paul T0A 3A0, 645-3323, F X Boulet
ST ALBERT No 6, 60 Sir Winston Churchill Avenue, St Albert T8N 0G4, 458-2060, L Beaudry

Roman Catholic Separate School Districts

ASSUMPTION No 50, 92 Manor Drive, Sherwood Park T8A 2J1, 467-1031, F X Bischoff
BEAVERLODGE No 68, 10715 102 Street, Grande Prairie T8V 2X1, 532-3013, D E Grant
BOW ISLAND No 82, 1251 First Avenue SW, Medicine Hat T1A 8B4, 527-2292, P Glashan
CALGARY No 1, 300 Sixth Avenue SE, Calgary T2G 0G5, 298-1411, J McCarthy
CAMROSE No 60, 4931 48 Street, Camrose T4V 1L7, 672-2977, S Grywalski
COALDALE No 73, Box 1330, Coaldale T0K 0L0, 345-3373, S Huxley
DRAYTON VALLEY No 111, 4521 56 Street, Westaskiwin T9A 1V5, 352-7250, V Keates
DRUMHELLER No 25, Box 880, Drumheller T0J 0Y0, 823-8155, B Wilson
EDMONTON No 7, 9807 106 Street, Edmonton T5K 1C2, 441-6000, J Brosseau
EDSON No 153, 831 56 Street, Edson T0E 0P0, 723-6444, R Burns
FAIRVIEW No 35, Box 729, Fairview T0H 1L0, 835-5199, N J Blaskovits
FORT McMURRAY No 32, 9809 Main Street, Fort McMurray T9H 1T7, 743-3325, G A Heck
FORT SASKATCHEWAN No 104, 9526 89 Street, Fort Saskatchewan T8L 2X7, 998-4622, R E Leight
FORT VERMILION No 26, Box 729, Fairview T0H 1L0, 835-5199, N J Blaskovits
GRANDE PRAIRIE No 28, 10715 102 Street, Grande Prairie T8V 2X1, 532-3013, D E Grant
HIGH PRAIRIE No 56, Box 789, High Prairie T0G 1E0, 523-3771, L T Remillard
HINTON No 155, Box 846, Hinton T0E 1B0, 865-2820, J Collins
KILLAM No 49, Box 1240, Wainwright T0B 4P0, 842-3992, G Bunz
LAKELAND No 150, Box 6310, Bonnyville T9N 2G9, 826-3235, R E Lowery
LEDUC No 132, Box 3628, Leduc T9E 6M4, 986-2500, K Dick
LETHBRIDGE No 9, 534 18 Street South, Lethbridge T1J 3E7, 329-0365, R Himsl
McLENNAN No 30, Box 480, Falher T0H 1M0, 837-2545, J Sheasgreen
MEDICINE HAT No 21, 1251 First Avenue SW, Medicine Hat T1A 8B4, 527-2292, P Glashan
NORTH PEACE RIVER No 43, Box 35, Peace River T0H 2X0, 624-3956, T D Halbert
PICTURE BUTTE No 79, Box 85, Picture Butte T0K 1V0, 732-4359, S Huxley
PINCHER CREEK No 18, Box 1450, Pincher Creek T0K 1W0, 627-3488, W S Lencucha
PONOKA No 95, 4521 56 Street, Wetaskiwin T9A 1V5, 352-7250, V Keates
PROVOST No 65, Box 1240, Wainwright T0B 4P0, 842-3992, G Bunz
RED DEER No 17, Box 5016, Red Deer T4N 6R6, 343-1055, J Docherty
ROCKY MOUNTAIN No 131, 5735 58 Street, Rocky Mountain House T0M 1T0, 845-2836, C Emard
SEXSMITH No 51, 10715 102 Street, Grande Prairie T8V 2X1, 532-3015, D E Grant
SHERWOOD PARK No 105, 2017 Brentwood Blvd, Sherwood Park T8A 0X2, 467-8896, D F Clarkson
SPIRIT RIVER No 36, Box 729, Fairview T0H 1L0, 835-5199, N J Blaskovits
SPRUCE GROVE No 128, Box 4265, Spruce Grove T7X 3B4, 962-5627, L Hlushak
STONY PLAIN No 151, Box 1770, Stony Plain T0E 2G0, 963-3885, J Collins
TABER No 54, Box 279, Taber T0K 2G0, 223-4489, W S Lencucha
THERESETTA No 23, Box 509, Castor T0C 0X0, 882-3151, L Cavers
VALLEYVIEW No 84, Box 565, Falher T0H 1M0, 837-2545, J Sheasgreen
VEGREVILLE No 16, Box 1240, Wainwright T0B 4P0, 632-6821, G Bunz
VERMILION No 97, Box 1240, Wainwright T0B 4P0, 842-3992, G Bunz
WAINWRIGHT No 31, Box 1240, Wainwright T0B 4P0, 842-3992, G Bunz
WESTLOCK No 110, Box 430, Westlock T0G 2L0, 349-3816, R H Martin
WETASKIWIN No 15, 4521 56 Street, Wetaskiwin T9A 1V5, 352-7250, V Keates
WHITECOURT No 94, PO Bag 2300, Whitecourt T0E 2L0, 778-5666, V Dikaitis

APPENDIX B

This appendix includes a copy of the correspondence used to implement the research instrument for this study. The implementation of this research instrument involved sending letters to select superintendents to secure their cooperation in the study. Also included in this appendix is a copy of the follow-up letter sent to delinquent superintendents.

University of Alberta
Edmonton
Canada T6G 2G5

Department of Industrial and Vocational Education
Faculty of Education

633 Education Building South, Telephone (403) 492-3678

April 27, 1989

Superintendent of Schools

Dear Sir:

At the present time I am teaching Industrial Education 10, 20, 30 at Memorial High School, Stony Plain. In addition to my teaching responsibilities, I am enrolled in the Faculty of Graduate Studies and Research at The University of Alberta.

In order to fulfill the requirements for a Master of Education degree, I have elected to complete a thesis. The title of the research is "Attitudes of Industrial Education Teachers Toward Their Teacher Education".

I would like you to cooperate in this study by granting me permission to survey a sample of the industrial education teachers employed in your jurisdiction by having them complete a questionnaire.

The questionnaire is a two part instrument for both junior and senior high school teachers. The first part of both instruments is generic and asks for teacher background information. The second part asks the industrial education teachers (non-vocational) to rate their preparation for teaching and for a list of terminal performances.

For your information, a copy of both questionnaires is enclosed.

It would be appreciated if I could have your response by May 15 so that I may continue to work within the timeline established for the study.

Thank you for your cooperation.

Sincerely yours

Russ Roskewich

University of Alberta
Edmonton
Canada T6G 2G5

Department of Industrial and Vocational Education
Faculty of Education
633 Education Building South, Telephone (403) 492-3678

May 24, 1989

Superintendent of Schools

Dear :

On April 27, a letter was sent to you requesting you to cooperate in a research study that I am conducting at The University of Alberta. The purpose of that letter was to ask your cooperation to involve a sample of non-vocational industrial education teachers of your school jurisdiction in the research.

The deadline established for your response has lapsed. Since I am working on an extremely tight research timeline, it would be appreciated if I could have your approval by June 8, 1989.

The research design for the study calls for the data collection phase to be completed by June 22, 1989. Unless that deadline is met, the study will have to be extended into the 1989-90 school year which I would like to avoid.

If you have already mailed your reply, please ignore this letter.

Thank you for your cooperation.

Sincerely yours

Russ Roskewich

APPENDIX C

In this appendix can be found copies of correspondence that were used with those who supplied data for analysis.

University of Alberta
Edmonton
Canada T6G 2G5

Department of Industrial and Vocational Education
Faculty of Education
633 Education Building South. Telephone (403) 492-3678

May 7, 1989

, Principal

Dear :

I have been informed by the Superintendent of Schools or his designate of your school jurisdiction that it is permissible for me to survey an industrial education teacher (non-vocational) who teaches in your school. The purpose of this letter is to inform you that in the immediate future I will be sending a research questionnaire for that teacher to execute.

The questionnaire is a two part instrument which should take the teacher approximately one-half hour to complete. The first part of the questionnaire asks for demographic information of the teacher. The second part asks the teacher to rate items directed at teacher preparation.

The collected data will be analyzed and used to prepare my master's thesis which is entitled "Attitudes of Industrial Education Teachers Toward Their Teacher Education".

Thank you for your cooperation.

Sincerely yours

Russ Roskewich

University of Alberta
Edmonton

Department of Industrial and Vocational Education
Faculty of Education

Canada T6G 2G5

633 Education Building South, Telephone (403) 492-3678

May 11, 1989

, Teacher

Dear :

At the present time I am teaching Industrial Education 10, 20, 30 at Memorial High School, Stony Plain. In addition to my teaching responsiblities, I am enrolled in the Faculty of Graduate Studies and Research at The University of Alberta.

In order to fulfill the requirements for a Master of Education degree, I have elected to complete a thesis. The title of the research is "Attitudes of Industrial Education Teachers Toward Their Teacher Education".

You have been randomly selected to become involved in this study. The enclosed questionnaire should take you approximately one-half hour to complete. The data that you provide will be treated as confidential and will be destroyed at the conclusion of the research. All participants will be anonymous and anyone may withdraw from the study at any time without prejudice.

The timeline established for the study is that all completed instruments be returned by May 30, 1989. Please honour that date and when you have completed the questionnaire, place it in the enclosed self-addressed envelope.

A copy of the abstract will be sent to those who participate.

Sincerely yours

Russ roskewich

APPENDIX D

This appendix contains a copy of the instrument sent to selected industrial arts teachers who taught Junior High School Grade 7, 8, 9 Industrial Education.

GRADES 7, 8, 9 INDUSTRIAL EDUCATION
INFORMATION FOR PARTICIPANTS

PURPOSE OF THE STUDY:

THE PURPOSE OF THIS RESEARCH IS TO DETERMINE THE VALUE YOU PLACE ON YOUR TEACHER EDUCATION PROGRAM IN PREPARING YOU TO TEACH INDUSTRIAL EDUCATION IN ALBERTA. YOUR INPUT WOULD BE COMPILED WITH THOSE OF OTHERS SELECTED FOR THIS STUDY, AND CONCLUSIONS DERIVED COULD BE PRESENTED FOR CONSIDERATION BY DECISION MAKERS OF THE INDUSTRIAL EDUCATION TEACHER PREPARATION PROGRAM OFFERED AT THE UNIVERSITY OF ALBERTA.

YOUR ROLE IN THE STUDY:

YOU ARE ASKED TO COOPERATE IN THE STUDY BY COMPLETING THE ATTACHED QUESTIONNAIRE WHICH CONSISTS OF TWO PARTS. THE FIRST PART ASKS FOR BACKGROUND INFORMATION ABOUT YOU AND YOUR TEACHER EDUCATION PROGRAM. THIS INFORMATION IS SIGNIFICANT TO DEVELOP A PROFILE OF THOSE INVOLVED IN THE RESEARCH.

TO COMPLETE THE BACKGROUND INFORMATION PORTION OF THE QUESTIONNAIRE, SIMPLY FOLLOW THE DIRECTIONS PROVIDED.

THE SECOND PART INCLUDES A SECTION LABELLED 'GENERAL CONTENT' AND 'GENERAL METHODOLOGY'. BOTH OF THESE CATEGORIES REFER TO THE COMPETENCIES A TEACHER NEEDS FOR ORGANIZING AND PRESENTING INSTRUCTIONAL CONTENT TO A LEARNER. ALSO IN THIS PART IS A LISTING OF STUDENT TERMINAL BEHAVIORS FOUND IN THE CURRICULUM GUIDES FOR JUNIOR HIGH SCHOOL GRADES 7, 8, 9 INDUSTRIAL EDUCATION.

TO COMPLETE THIS PORTION OF THE QUESTIONNAIRE, READ EACH STATEMENT WITH UNDERSTANDING AND CIRCLE THE NUMBER WHICH BEST REFLECTS YOUR ATTITUDE TOWARD THAT PHRASE. THE NUMBERS HAVE THE FOLLOWING MEANING:

1. no value 2. most inadequate 3. inadequate
4. adequate 5. most adequate 6. excellent

PLEASE PROCEED TO PART A AND COMPLETE THE BACKGROUND QUESTIONS.

PART A

BACKGROUND INFORMATION:

YOUR ANSWERS TO THE FOLLOWING STATEMENTS WILL HELP TO DEVELOP A PROFILE FOR THOSE WHO PARTICIPATE IN THE RESEARCH. PLEASE CIRCLE THE LETTER OR NUMBER OF THE BEST ANSWER.

1. YOU ARE CURRENTLY TEACHING:
   a. GRADES 7, 8, 9 INDUSTRIAL EDUCATION
   b. INDUSTRIAL EDUCATION 10, 20, 30 SERIES OF COURSES

2. PLEASE CIRCLE THE NUMBER OF YEARS YOU HAVE TAUGHT INDUSTRIAL ARTS (INDUSTRIAL EDUCATION) IN ALBERTA:

   1 2 3 4 5 6 7 8 9 10 12 14 16 18 20 or more

3. THE HIGHEST DEGREE FOR WHICH YOU HAVE ATTAINED CREDIT IS:
   a. BACHELOR OF EDUCATION DEGREE
   b. BACHELOR OF EDUCATION/AFTER DEGREE
   c. MASTER OF EDUCATION DEGREE
   d. OTHER ____________________

4. YOUR BACHELOR DEGREE IS IN:
   a. INDUSTRIAL ARTS
   b. VOCATIONAL EDUCATION
   c. OTHER ____________________

5. THE TEACHER EDUCATION PROGRAM WHICH PREPARED YOU TO TEACH IN THIS SUBJECT AREA WAS:
   a. INDUSTRIAL ARTS
   b. VOCATIONAL EDUCATION
   c. OTHER ____________________

6. PLEASE INDICATE THE NUMBER OF YEARS OF TEACHER EDUCATION THAT PREPARED YOU TO TEACH INDUSTRIAL ARTS (INDUSTRIAL EDUCATION): 1 2 3 4 5 6 7 8 9

7. PLEASE IDENTIFY AND RANK THE INSTITUTION(S) MAINLY RESPONSIBLE FOR YOUR PREPARATION:
   a. UNIVERSITY OF ALBERTA ( ) 1, 2, 3
   b. OTHER CANADIAN INSTITUTIONS ( ) 1, 2, 3
   c. NON-CANADIAN INSTITUTIONS ( ) 1, 2, 3

   IF A GRADUATE OF THE PROGRAM AT THE UNIVERSITY OF ALBERTA, PLEASE GIVE THE YEAR OF GRADUATION: 19_____

8. PLEASE LIST OTHER SOURCES OF YOUR PREPARATION: ______________________________

PLEASE PROCEED TO PART B AND RESPOND TO EACH STATEMENT.

PART B

HOW DO YOU VALUE YOUR TEACHER EDUCATION TO PREP'^E YOU TO TEACH:

1. no value 2. most inadequate 3. inadequate 4. adequate 5. most adequate 6. excellent

(circle a number on each scale)

GENERAL CONTENT: What value was your teacher education in preparing you to	no value					excellent
- describe elements of consumer awareness	1	2	3	4	5	6
- identify environmental implications of laboratory curriculum content	1	2	3	4	5	6
- be able to interpret graphic drawings	1	2	3	4	5	6
- identify measuring systems	1	2	3	4	5	6
- locate information on career-related opportunities	1	2	3	4	5	6
- describe societal implications of laboratory curriculum content	1	2	3	4	5	6
- describe technological implications of laboratory curriculum content	1	2	3	4	5	6
- provide a historical development of disciplines in cuuriculum content used	1	2	3	4	5	6
- be able to maintain a safe working laboratory environment	1	2	3	4	5	6
- identify safety practices	1	2	3	4	5	6
- explain function of Worker's Compensation Act	1	2	3	4	5	6

GENERAL METHODOLOGY: What value was your teacher education in preparing you to	no value					excellent
- develop a yearly program plan	1	2	3	4	5	6
- develop a daily lesson plan	1	2	3	4	5	6
- use audio-visual teaching aides	1	2	3	4	5	6
- construct evaluative tests to include measurements of psychomotor, cognitive and affective development	1	2	3	4	5	6
- relate information to students	1	2	3	4	5	6
- motivate students	1	2	3	4	5	6
- develop a system for organizing student personnel	1	2	3	4	5	6
- satisfactorily deal with student injury	1	2	3	4	5	6
- maintain a smooth operating laboratory equipment inventory	1	2	3	4	5	6
- maintain an adequate supplies inventory	1	2	3	4	5	6
- follow ordering procedures according to budget	1	2	3	4	5	6

SMALL ENGINES: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- examine various internal combustion engines	1	2	3	4	5	6
- examine an internal combustion engine	1	2	3	4	5	6
- properly disassemble a small engine	1	2	3	4	5	6
- examine major sub-systems of a small engine	1	2	3	4	5	6
- properly assemble a small engine	1	2	3	4	5	6
- safely operate a small engine	1	2	3	4	5	6
- analyze the power output of a small engine	1	2	3	4	5	6
- analyze the hazards of a small engine	1	2	3	4	5	6
- properly troubleshoot a small engine	1	2	3	4	5	6
- tune-up a small engine	1	2	3	4	5	6
- properly store a small engine	1	2	3	4	5	6

POWER TRANSMISSION: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- illustrate various forms of energy	1	2	3	4	5	6
- identify energy input in mechanical systems	1	2	3	4	5	6
- identify energy input in fluid power systems	1	2	3	4	5	6
- identify various mechanical control devices	1	2	3	4	5	6
- identify various fluid power control devices	1	2	3	4	5	6
- identify various mechanical transmission devices	1	2	3	4	5	6
- identify various fluid power transmission devices	1	2	3	4	5	6
- identify mechanical output	1	2	3	4	5	6
- identify fluid power output	1	2	3	4	5	6
- identify mechanical energy transformation	1	2	3	4	5	6
- identify fluid power energy transformation	1	2	3	4	5	6

REACTION PROPULSION: What value was your teacher education in preparing you to	no value					excellent
- discuss design principles relating to reaction propulsion devices	1	2	3	4	5	6
- design a model rocket from supplied information	1	2	3	4	5	6
- design a model CO_2 car from supplied information	1	2	3	4	5	6
- use the SI system of measurement in product development (model rocket, CO_2 car)	1	2	3	4	5	6
- use separation tools in product material preparation (model rocket, CO_2 car)	1	2	3	4	5	6
- use suitable combining processes in product assembly (model rocket, CO_2 car)	1	2	3	4	5	6
- provide performance tests on assembled products (model rocket, CO_2 car)	1	2	3	4	5	6
- perform comparative tests on assembled student products (model rocket, CO_2 car)	1	2	3	4	5	6
- discuss the use of chemical energy in the production of power	1	2	3	4	5	6
- use electrical energy for ignition of fuel	1	2	3	4	5	6
- use mechanical energy for starting engines	1	2	3	4	5	6

ELECTRICITY & MAGNETISM: What value was your teacher education in preparing you to	no value					excellent
- know the theory of electron movement	1	2	3	4	5	6
- identify sources of electricity	1	2	3	4	5	6
- describe the nature of magnetism	1	2	3	4	5	6
- explain the relationship between electricity and magnetism	1	2	3	4	5	6
- draw schematic diagrams of basic electrical circuits	1	2	3	4	5	6
- differentiate between series and parallel circuits	1	2	3	4	5	6
- demonstrate electrical measurements	1	2	3	4	5	6
- use various on/off switching devices	1	2	3	4	5	6
- identify overload protection devices	1	2	3	4	5	6
- use directional control devices	1	2	3	4	5	6
- operate electro-magnetic devices	1	2	3	4	5	6

UTILIZATION: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- discuss the utilization of converted electrical energy	1	2	3	4	5	6
- convert electrical energy to mechanical energy	1	2	3	4	5	6
- convert electrical energy to heat energy	1	2	3	4	5	6
- convert electrical energy to light energy	1	2	3	4	5	6
- convert electrical energy to chemical energy	1	2	3	4	5	6
- convert electrical energy to sound energy	1	2	3	4	5	6
- use converted electrical energy	1	2	3	4	5	6
- list safety procedures for servicing appliances	1	2	3	4	5	6
- identify unsafe electrical conditions	1	2	3	4	5	6
- troubleshoot electrical appliances for defects	1	2	3	4	5	6
- identify repairs to correct malfunctioning electrical appliances	1	2	3	4	5	6

ELECTRONICS - COMPUTERS: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- identify electronic components	1	2	3	4	5	6
- assemble oscillator circuits	1	2	3	4	5	6
- review regulations on signal transmission devices	1	2	3	4	5	6
- assemble communications devices	1	2	3	4	5	6
- extract radio signals	1	2	3	4	5	6
- discuss phonograph systems	1	2	3	4	5	6
- describe computer development	1	2	3	4	5	6
- use various computer input devices	1	2	3	4	5	6
- use various computer output devices	1	2	3	4	5	6
- describe components of a computer central processing unit	1	2	3	4	5	6
- describe elements of computer programming	1	2	3	4	5	6

3

WOODS: What value was your teacher education in preparing you to	no value					excellent
- identify sources of wood	1	2	3	4	5	6
- describe wood extraction processes	1	2	3	4	5	6
- identify characteristics of woods	1	2	3	4	5	6
- identify properties of woods	1	2	3	4	5	6
- use the metric system in product development	1	2	3	4	5	6
- use wood separation processes	1	2	3	4	5	6
- use wood forming processes	1	2	3	4	5	6
- use wood conditioning processes	1	2	3	4	5	6
- demonstrate wood combining using adhesives	1	2	3	4	5	6
- use wood coating processes	1	2	3	4	5	6
- use mechanical fastening devices	1	2	3	4	5	6

METALS: What value was your teacher education in preparing you to	no value					excellent
- describe sources of metals	1	2	3	4	5	6
- describe metals extraction processes	1	2	3	4	5	6
- describe metals refining processes	1	2	3	4	5	6
- describe alloying processes	1	2	3	4	5	6
- identify properties of metals	1	2	3	4	5	6
- use the metric system in product development	1	2	3	4	5	6
- use metal separation processes	1	2	3	4	5	6
- use metal forming processes	1	2	3	4	5	6
- identify metal conditioning using heat	1	2	3	4	5	6
- use metal combining processes	1	2	3	4	5	6
- use metal coating materials	1	2	3	4	5	6

PLASTICS: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- describe plastics sources	1	2	3	4	5	6
- describe plastics extraction processes	1	2	3	4	5	6
- describe plastics refining processes	1	2	3	4	5	6
- identify properties of plastics	1	2	3	4	5	6
- use the metric system in product development	1	2	3	4	5	6
- use plastics separation processes	1	2	3	4	5	6
- use plastics forming processes	1	2	3	4	5	6
- explain plastics conditioning using heat	1	2	3	4	5	6
- identify plastics adhesive/cohesive combining processes	1	2	3	4	5	6
- use plastics mechanical combining processes	1	2	3	4	5	6
- use plastics coating processes	1	2	3	4	5	6

EARTHS: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- list sources of earths materials	1	2	3	4	5	6
- explain earths extraction processes	1	2	3	4	5	6
- identify refining processes of earths materials	1	2	3	4	5	6
- use the metric system in product development	1	2	3	4	5	6
- prepare earths materials for molding	1	2	3	4	5	6
- use earths separation processes	1	2	3	4	5	6
- use earths forming procedures	1	2	3	4	5	6
- use earths conditioning processes	1	2	3	4	5	6
- identify adhesion/cohesion combining procedures	1	2	3	4	5	6
- use earths finishing procedures	1	2	3	4	5	6
- use mechanical fastening devices	1	2	3	4	5	6

PRINTING: What value was your teacher education in preparing you to	no value					excellent
- identify principles of product design	1	2	3	4	5	6
- use the printer's point system of measurement	1	2	3	4	5	6
- accurately assemble an image form	1	2	3	4	5	6
- prepare a direct image transfer	1	2	3	4	5	6
- prepare a photographic master	1	2	3	4	5	6
- prepare a relief printing master	1	2	3	4	5	6
- prepare a silkscreening stencil	1	2	3	4	5	6
- demonstrate the offset process of printing	1	2	3	4	5	6
- demonstrate the relief process of printing	1	2	3	4	5	6
- demonstrate the silkscreening process of printing	1	2	3	4	5	6
- use common finishing procedures	1	2	3	4	5	6

PHOTOGRAPHY: What value was your teacher education in preparing you to	no value					excellent
- demonstrate light control on a camera	1	2	3	4	5	6
- explain the composition of light sensitive materials	1	2	3	4	5	6
- plan a product in photography	1	2	3	4	5	6
- assemble various photographic images	1	2	3	4	5	6
- describe the chemistry of image conversion	1	2	3	4	5	6
- demonstrate principles of image transfer	1	2	3	4	5	6
- produce prints using advanced altering techniques	1	2	3	4	5	6
- use print finishing procedures	1	2	3	4	5	6
- plan an audio-visual product	1	2	3	4	5	6
- identify multi-media production processes	1	2	3	4	5	6
- explain the principles of audio-visual presentation equipment	1	2	3	4	5	6

TECHNICAL DRAWING: What value was your teacher education in preparing you to	no value					excellent
- explain differences in drafting in different applications	1	2	3	4	5	6
- produce good quality sketches	1	2	3	4	5	6
- interpret isometric pictorial drawings	1	2	3	4	5	6
- interpret orthographic pictorial drawings	1	2	3	4	5	6
- interpret technical drawings	1	2	3	4	5	6
- demonstrate basic drafting skills using drafting instruments	1	2	3	4	5	6
- produce pictorial drawings using drafting instruments	1	2	3	4	5	6
- produce a complete drawing	1	2	3	4	5	6
- use a drafting machine to produce a drawing	1	2	3	4	5	6
- identify methods of duplicating drawings	1	2	3	4	5	6
- reproduce a drawing	1	2	3	4	5	6

INDUSTRIAL SIMULATION: What value was your teacher education in preparing you to	no value					excellent
- trace the development of manufacturing eras	1	2	3	4	5	6
- identify custom or personalized production systems	1	2	3	4	5	6
- identify mass production systems	1	2	3	4	5	6
- discuss the proprietorship system of ownership	1	2	3	4	5	6
- discuss the partnership system of ownership	1	2	3	4	5	6
- discuss the corporation system of ownership	1	2	3	4	5	6
- discuss the nationalization system of ownership	1	2	3	4	5	6
- discuss the function of a research and development department	1	2	3	4	5	6
- discuss the organization of company personnel and production methods	1	2	3	4	5	6
- discuss the function of a marketing department	1	2	3	4	5	6
- discuss the function of a company finance department	1	2	3	4	5	6

APPENDIX E

In this appendix can be found a copy of the instrument that was sent to selected teachers who taught the Senior High School Industrial Education 10, 20, 30 series of courses.

Included in this appendix is a copy of the information sheet that explained to research participants the coding block placed on the instrument.

INDUSTRIAL EDUCATION 10, 20, 30

INFORMATION FOR PARTICIPANTS

PURPOSE OF THE STUDY:

THE PURPOSE OF THIS RESEARCH IS TO DETERMINE THE VALUE YOU PLACE ON YOUR TEACHER EDUCATION PROGRAM IN PREPARING YOU TO TEACH INDUSTRIAL EDUCATION IN ALBERTA. YOUR INPUT WOULD BE COMPILED WITH THOSE OF OTHERS SELECTED FOR THIS STUDY, AND CONCLUSIONS DERIVED COULD BE PRESENTED FOR CONSIDERATION BY DECISION MAKERS OF THE INDUSTRIAL EDUCATION TEACHER PREPARATION PROGRAM OFFERED AT THE UNIVERSITY OF ALBERTA.

YOUR ROLE IN THE STUDY:

YOU ARE ASKED TO COOPERATE IN THE STUDY BY COMPLETING THE ATTACHED QUESTIONNAIRE WHICH CONSISTS OF TWO PARTS. THE FIRST PART ASKS FOR BACKGROUND INFORMATION ABOUT YOU AND YOUR TEACHER EDUCATION PROGRAM. THIS INFORMATION IS SIGNIFICANT TO DEVELOP A PROFILE OF THOSE INVOLVED IN THE RESEARCH.

TO COMPLETE THE BACKGROUND INFORMATION PORTION OF THE QUESTIONNAIRE, SIMPLY FOLLOW THE DIRECTIONS PROVIDED.

THE SECOND PART INCLUDES A SECTION LABELLED 'GENERAL CONTENT' AND 'GENERAL METHODOLOGY'. BOTH OF THESE CATEGORIES REFER TO THE COMPETENCIES A TEACHER NEEDS FOR ORGANIZING AND PRESENTING INSTRUCTIONAL CONTENT TO A LEARNER. ALSO IN THIS PART IS A LISTING OF STUDENT TERMINAL BEHAVIORS FOUND IN THE CURRICULUM GUIDES FOR INDUSTRIAL EDUCATION 10, 20, 30 SERIES OF COURSES.

TO COMPLETE THIS PORTION OF THE QUESTIONNAIRE, READ EACH STATEMENT WITH UNDERSTANDING AND CIRCLE THE NUMBER WHICH BEST REFLECTS YOUR ATTITUDE TOWARD THAT PHRASE. THE NUMBERS HAVE THE FOLLOWING MEANING:

1. no value 2. most inadequate 3. inadequate
4. adequate 5. most adequate 6. excellent

PLEASE PROCEED TO PART A AND COMPLETE THE BACKGROUND QUESTIONS.

5 0 4 1 PART A

BACKGROUND INFORMATION:

YOUR ANSWERS TO THE FOLLOWING STATEMENTS WILL HELP TO DEVELOP A PROFILE FOR THOSE WHO PARTICIPATE IN THE RESEARCH. PLEASE CIRCLE THE LETTER OR NUMBER OF THE BEST ANSWER.

1. YOU ARE CURRENTLY TEACHING:
   a. GRADES 7, 8, 9 INDUSTRIAL EDUCATION
   b. INDUSTRIAL EDUCATION 10, 20, 30 SERIES OF COURSES

2. PLEASE CIRCLE THE NUMBER OF YEARS YOU HAVE TAUGHT INDUSTRIAL ARTS (INDUSTRIAL EDUCATION) IN ALBERTA:

   1 2 3 4 5 6 7 8 9 10 12 14 16 18 20 or more

3. THE HIGHEST DEGREE FOR WHICH YOU HAVE ATTAINED CREDIT IS:
   a. BACHELOR OF EDUCATION DEGREE
   b. BACHELOR OF EDUCATION/AFTER DEGREE
   c. MASTER OF EDUCATION DEGREE
   d. OTHER ____________________

4. YOUR BACHELOR DEGREE IS IN:
   a. INDUSTRIAL ARTS
   b. VOCATIONAL EDUCATION
   c. OTHER ____________________

5. THE TEACHER EDUCATION PROGRAM WHICH PREPARED YOU TO TEACH IN THIS SUBJECT AREA WAS:
   a. INDUSTRIAL ARTS
   b. VOCATIONAL EDUCATION
   c. OTHER ____________________

6. PLEASE INDICATE THE NUMBER OF YEARS OF TEACHER EDUCATION THAT PREPARED YOU TO TEACH INDUSTRIAL ARTS (INDUSTRIAL EDUCATION): 1 2 3 4 5 6 7 8 9

7. PLEASE IDENTIFY AND RANK THE INSTITUTION(S) MAINLY RESPONSIBLE FOR YOUR PREPARATION:
   a. UNIVERSITY OF ALBERTA ( ) 1, 2, 3
   b. OTHER CANADIAN INSTITUTIONS ( ) 1, 2, 3
   c. NON-CANADIAN INSTITUTIONS ( ) 1, 2, 3

   IF A GRADUATE OF THE PROGRAM AT THE UNIVERSITY OF ALBERTA, PLEASE GIVE THE YEAR OF GRADUATION: 19_____

8. PLEASE LIST OTHER SOURCES OF YOUR PREPARATION:____________________________

PLEASE PROCEED TO PART B AND RESPOND TO EACH STATEMENT.

PART B

ЭW DO YOU VALUE YOUR TEACHER EDUCATION TO PREPARF ˙OU TO TEACH:

1. no value 2. most inadequate 3. inadequate 4. adequate

5. most adequate 6. excellent

(circle a number on each scale)

GENERAL CONTENT: What value was your teacher education in preparing you to	no value					excellent
- describe elements of consumer awareness	1	2	3	4	5	6
- identify environmental implications of laboratory curriculum content	1	2	3	4	5	6
- be able to interpret graphic drawings	1	2	3	4	5	6
- identify measuring systems	1	2	3	4	5	6
- locate information on career-related opportunities	1	2	3	4	5	6
- describe societal implications of laboratory curriculum content	1	2	3	4	5	6
- describe technological implications of laboratory curriculum content	1	2	3	4	5	6
- provide a historical development of disciplines in cuuriculum content used	1	2	3	4	5	6
- be able to maintain a safe working laboratory environment	1	2	3	4	5	6
- identify safety practices	1	2	3	4	5	6
- explain function of Worker's Compensation Act	1	2	3	4	5	6

GENERAL METHODOLOGY: What value was your teacher education in preparing you to	no value					excellent
- develop a yearly program plan	1	2	3	4	5	6
- develop a daily lesson plan	1	2	3	4	5	6
- use audio-visual teaching aides	1	2	3	4	5	6
- construct evaluative tests to include measurements of psychomotor, cognitive and affective development	1	2	3	4	5	6
- relate information to students	1	2	3	4	5	6
- motivate students	1	2	3	4	5	6
- develop a system for organizing student personnel	1	2	3	4	5	6
- satisfactorily deal with student injury	1	2	3	4	5	6
- maintain a smooth operating laboratory equipment inventory	1	2	3	4	5	6
- maintain an adequate supplies inventory	1	2	3	4	5	6
- follow ordering procedures according to budget	1	2	3	4	5	6

ELECTRICITY/ELECTRONICS BASICS: What value was your teacher education in preparing you to	no value					excellent
- demonstrate the relationship between electricity and magnetism	1	2	3	4	5	6
- analyze direct current circuits	1	2	3	4	5	6
- analyze direct current circuit components	1	2	3	4	5	6
- calculate electrical measurements	1	2	3	4	5	6
- define electrical symbols	1	2	3	4	5	6
- analyze alternating current circuits	1	2	3	4	5	6
- analyze alternating current circuit components	1	2	3	4	5	6
- demonstrate calculations of electronic measurement	1	2	3	4	5	6
- define electronic symbols	1	2	3	4	5	6
- demonstrate repairing electrical/electronic equipment	1	2	3	4	5	6
- demonstrate the process of diagnosis, dismantling and assembly	1	2	3	4	5	6

COMMUNICATIONS: What value was your teacher education in preparing you to	no value					excellent
- construct a simple amplifier circuit	1	2	3	4	5	6
- demonstrate amplification limitations	1	2	3	4	5	6
- check system performance using different inputs	1	2	3	4	5	6
- demonstrate amplification of audio systems	1	2	3	4	5	6
- experiment with amplification performance	1	2	3	4	5	6
- demonstrate transmission of radio waves	1	2	3	4	5	6
- demonstrate reception of radio waves	1	2	3	4	5	6
- demonstrate the use of an R.F.oscillator	1	2	3	4	5	6
- identify applications of radio communication	1	2	3	4	5	6
- demonstrate communications using a television system	1	2	3	4	5	6

COMPUTERS: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- demonstrate the concept of logic circuits	1	2	3	4	5	6
- analyze digital computers	1	2	3	4	5	6
- analyze analogue computers	1	2	3	4	5	6
- analyze conversion systems	1	2	3	4	5	6
- identify computer classifications	1	2	3	4	5	6
- demonstrate computer uses	1	2	3	4	5	6
- describe modes of operation	1	2	3	4	5	6
- describe computer terminology	1	2	3	4	5	6
- describe computer processes	1	2	3	4	5	6
- demonstrate computer language flow charting	1	2	3	4	5	6
- describe numeric functions	1	2	3	4	5	6

POWER SOURCES: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- identify forms of internal combustion engines	1	2	3	4	5	6
- discuss characteristics of electricity	1	2	3	4	5	6
- identify alternate forms of energy sources	1	2	3	4	5	6
- describe electric motor theory	1	2	3	4	5	6
- maintain smooth operation of small engines	1	2	3	4	5	6
- perform major repairs on small engines	1	2	3	4	5	6
- demonstrate the safe use of small engines repair tools	1	2	3	4	5	6
- demonstrate the safe use of precision measuring instruments	1	2	3	4	5	6
- demonstrate the use of small engines manuals	1	2	3	4	5	6
- demonstrate the procedure for ordering repair parts	1	2	3	4	5	6
- maintain smooth operation of mechanical transmission devices	1	2	3	4	5	6

FLUID POWER: What value was your teacher education in preparing you to	no value					excellent
- discuss Pascal's Law in hydraulics	1	2	3	4	5	6
- dismantle, analyze and assemble a hydraulic jack system	1	2	3	4	5	6
- service hydraulic brake systems	1	2	3	4	5	6
- diagnose power steering systems	1	2	3	4	5	6
- discuss the operation of automatic transmissions	1	2	3	4	5	6
- describe scientific laws affecting pressure in pneumatics	1	2	3	4	5	6
- operate pneumatic controls	1	2	3	4	5	6
- operate air tools	1	2	3	4	5	6
- describe air conditioning theory of operation	1	2	3	4	5	6
- service air conditioning systems	1	2	3	4	5	6
- identify pollution control systems	1	2	3	4	5	6

MECHANICAL SYSTEMS: What value was your teacher education in preparing you to	no value					excellent
- define concepts of power	1	2	3	4	5	6
- discuss various types of clutches in transmission devices	1	2	3	4	5	6
- discuss various gear drives	1	2	3	4	5	6
- discuss various mechanical linkage drives	1	2	3	4	5	6
- describe how various differentials operate under various conditions	1	2	3	4	5	6
- analyze the operating factors of various bearings	1	2	3	4	5	6
- describe the function of lubricants	1	2	3	4	5	6
- describe the classification of lubricants	1	2	3	4	5	6
- differentiate between static and dynamic seals	1	2	3	4	5	6
- functionally describe various seals	1	2	3	4	5	6
- dismantle, analyze and assemble a standard transmission	1	2	3	4	5	6

[5|0|4|3]

WOODS: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- identify sources of wood	1	2	3	4	5	6
- identify methods of processing wood	1	2	3	4	5	6
- describe characteristics of wood	1	2	3	4	5	6
- describe elements of design in product planning	1	2	3	4	5	6
- demonstrate layout on wood	1	2	3	4	5	6
- demonstrate wood separation using chip removal and non-chip removal tools	1	2	3	4	5	6
- demonstrate wood forming techniques	1	2	3	4	5	6
- demonstrate mechanical fastening devices	1	2	3	4	5	6
- utilize various bonding materials in combining	1	2	3	4	5	6
- shape wood by using material removal equipment	1	2	3	4	5	6
- demonstrate wood finishing techniques	1	2	3	4	5	6

PLASTICS: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- identify sources of plastics	1	2	3	4	5	6
- identify methods of processing plastics	1	2	3	4	5	6
- describe types of plastics	1	2	3	4	5	6
- describe properties of plastics	1	2	3	4	5	6
- demonstrate physical forms of plastics	1	2	3	4	5	6
- perform simple tests on plastics materials	1	2	3	4	5	6
- form plastics materials by shaping	1	2	3	4	5	6
- form plastics materials by molding	1	2	3	4	5	6
- describe methods of bonding plastics	1	2	3	4	5	6
- demonstrate various plastics finishing techniques	1	2	3	4	5	6
- demonstrate expertise in the selection of plastics materials	1	2	3	4	5	6

METALS: What value was your teacher education in preparing you to	no value					excellent
- identify sources of metal	1	2	3	4	5	6
- identify methods of extracting metal	1	2	3	4	5	6
- identify methods of processing metal	1	2	3	4	5	5
- describe characteristics of metal	1	2	3	4	5	6
- demonstrate shapes of metal	1	2	3	4	5	6
- describe elements of design in product planning	1	2	3	4	5	6
- demonstrate layout on metal	1	2	3	4	5	6
- demonstrate metal separation using chip removal and non-chip removal tools	1	2	3	4	5	6
- demonstrate metal forming processes	1	2	3	4	5	6
- demonstrate metal conditioning processes	1	2	3	4	5	6
- demonstrate metal combining techniques	1	2	3	4	5	6

HOT METALS: What value was your teacher education in preparing you to	no value					excellent
- demonstrate the proper use of arc welding equipment	1	2	3	4	5	6
- perform various arc welds	1	2	3	4	5	6
- demonstrate the proper use of oxy-acetylene welding equipment	1	2	3	4	5	6
- perform various oxy-acetylene welds	1	2	3	4	5	6
- prepare basic metal joints used for welding	1	2	3	4	5	6
- identify weld faults	1	2	3	4	5	6
- describe solutions to weld faults	1	2	3	4	5	6
- describe foundry casting methods	1	2	3	4	5	6
- demonstrate the proper use of foundry equipment	1	2	3	4	5	6
- cast a product	1	2	3	4	5	6
- perform cast metal product finishing techniques	1	2	3	4	5	6

DRAFTING: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- demonstrate principles of design in mechanical drafting image creation	1	2	3	4	5	6
- describe how to care for drafting equipment	1	2	3	4	5	6
- perform correct mechanical drafting procedures in image generation	1	2	3	4	5	6
- produce various mechanical projections	1	2	3	4	5	6
- perform surveying processes	1	2	3	4	5	6
- transfer information using photogrammetry	1	2	3	4	5	6
- draft cartographic projections	1	2	3	4	5	6
- perform correct architectural drafting procedures in image generation	1	2	3	4	5	6
- make presentation drawings	1	2	3	4	5	6
- create perspective drawings	1	2	3	4	5	6
- demonstrate expertise in the selection of drafting supplies	1	2	3	4	5	6

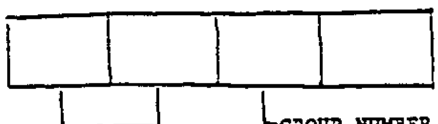
PRINTING: What value was your teacher education in preparing you to	no value 1	2	3	4	5	excellent 6
- demonstrate principles of design in relief printing image creation	1	2	3	4	5	6
- perform correct procedures in relief printing image generation	1	2	3	4	5	6
- perform relief printing reproduction processes	1	2	3	4	5	6
- demonstrate principles of design in screen printing image creation	1	2	3	4	5	6
- perform correct procedures in screen printing image generation	1	2	3	4	5	6
- perform screen printing reproduction processes	1	2	3	4	5	6
- demonstrate principles of design in offset printing image creation	1	2	3	4	5	6
- perform correct procedures in offset printing image generation	1	2	3	4	5	6
- perform offset printing reproduction processes	1	2	3	4	5	6
- select appropriate finishing techniques	1	2	3	4	5	6
- demonstrate expertise in the selection of printing supplies	1	2	3	4	5	6

PHOTOGRAPHY: What value was your teacher education in preparing you to	no value					excellent
- demonstrate elements of composition in black and white image creation	1	2	3	4	5	6
- demonstrate elements of composition in color image creation	1	2	3	4	5	6
- demonstrate types of photography in image creation	1	2	3	4	5	6
- demonstrate photographic image generation	1	2	3	4	5	6
- demonstrate photographic image conversion	1	2	3	4	5	6
- demonstrate image reproduction techniques	1	2	3	4	5	6
- demonstrate print finishing techniques	1	2	3	4	5	6
- create finished black and white prints	1	2	3	4	5	6
- create finished color photographic products	1	2	3	4	5	6
- prepare a portfolio of prints	1	2	3	4	5	6
- demonstrate expertise in the selection of photographic supplies	1	2	3	4	5	6

PROCESS PHOTOGRAPHY: What value was your teacher education in preparing you to	no value					excellent
- demonstrate principles of design in line photography image creation	1	2	3	4	5	6
- produce layouts for line photography image generation	1	2	3	4	5	6
- demonstrate line photography processes in image conversion	1	2	3	4	5	6
- prepare line photography layouts for offset reproduction	1	2	3	4	5	6
- demonstrate principles of design in halftone photography image creation	1	2	3	4	5	6
- produce sketches for halftone photography image generation	1	2	3	4	5	6
- demonstrate halftone photography processes in image conversion	1	2	3	4	5	6
- prepare halftone photography layouts for offset reproduction	1	2	3	4	5	6
- demonstrate reproduction using the offset press	1	2	3	4	5	6
- use appropriate finishing techniques	1	2	3	4	5	6
- demonstrate expertise in the selection of process photography supplies	1	2	3	4	5	6

DEAR PARTICIPANT:

IN THE TOP MARGIN OF THREE PAGES IN YOUR QUESTIONNAIRE YOU WILL FIND A SERIES OF FOUR BLOCKS CONNECTED TOGETHER WITH A NUMBER IN EACH BLOCK. THESE NUMBERS ARE A SET OF CODES FOR THE CARD KEY PUNCH OPERATOR AND DO <u>NOT</u> IDENTIFY ANY INDIVIDUAL RESPONDENT. THE CODES ARE AS FOLLOWS:



— 80 COLUMN CARD 1, 2 or 3

GROUP NUMBER 1, 2, 3 OR 4

- 1 - JUNIOR HIGH SCHOOL URBAN TEACHERS
- 2 - JUNIOR HIGH SCHOOL RURAL TEACHERS
- 3 - SENIOR HIGH SCHOOL URBAN TEACHERS
- 4 - SENIOR HIGH SCHOOL RURAL TEACHERS

MAXIMUM NUMBER OF RESPONDENTS IN A PARTICULAR GROUP (25 OR 50):

- 25 - URBAN TEACHERS
- 50 - RURAL TEACHERS

OCCASIONALLY A NUMBER 1 WILL APPEAR IN THE RIGHT MARGIN, IN LINE WITH A QUESTIONNAIRE ITEM. THIS NUMBER REPRESENTS THE FIRST ITEM THAT APPEARS IN COLUMN <u>ONE</u> OF ONE OF THE THREE 80 COLUMN KEY PUNCH CARDS USED FOR EACH QUESTIONNAIRE.

VITA

NAME: Russel K. Roskewich

PLACE OF BIRTH: Athabasca, Alberta

YEAR OF BIRTH: 1946

POST-SECONDARY EDUCATION: Bachelor of Education degree at the University of Alberta

HONOURS AND AWARDS: Industrial ArtsTeacher of the Year award in 1984
Ten Years Service award in 1989

RELATED WORK EXPERIENCE: Executive member of Epsilon Pi Tau and North Central Teachers' Convention Association

PUBLICATIONS: Nil