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An evaluation of Indiana State University Industrial Arts Education Program by the graduates, 1960-1970

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An evaluation of Indiana State University Industrial Arts Education Program by the graduates, 1960-1970

by

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INTRODUCTION

The School of Technology at Indiana State Univeristy includes the departments of Aero Space, Industrial Professional, Vocational Technical, Industrial Technical, and Industrial Arts Education. The department of Aero Space is concerned with flight instruction and airport management programs. The department of Industrial Professional concentrates on the preparation of industrial competency in the areas of: automotive technology, industrial supervision, manufacturing design, electronics technology, manufacturing supervision, and printing management. The third department, Vocational Technical, prepares teachers for vocational education. The department of Industrial Arts Education is concerned with the preparation of industrial arts teachers. The department of Industrial Technology provides the laboratory experiences needed by students in the other departments.

As previously stated, the prime purpose of the department of Industrial Arts Education is the preparation of teachers. Students in this program have the choice of a 40-hour major or a 52-hour area major. The latter has an option for a concentration of course work in the area of manufacturing, construction, service, and/or communication. Graduates who earned the Bachelor of Science degree are qualified to teach industrial arts education at the elementary and secondary school levels.

In addition to students who are teacher oriented, there are students enrolled in the industrial arts education program who plan to seek employment in business or industry.

Rapid growth of technology has created new concepts and new bodies of knowledge. Educators need to examine this information to determine how it can become a part of a relevant educational program. As stated by Clark, "Industrial arts should be able to relate to the practical and scientific subjects of the world" (3, p. 3).

This is also exemplified by Silvius when he stated:

> Industrial arts education, as well as society in general, is in a period of accelerated change. A contributing factor is the amount of information or knowledge at man's disposal, which has doubled and redoubled in increasingly shorter periods of time. It has been estimated that the total amount of man's knowledge was doubled from the Civil War to World War II, and is doubling now at this rate every seven years. The only constant concept in the world is that of change itself (26, p. 9).

The change that has been observed presents a need for continuous examination of course content and the revision of curriculums.

In order for constructive change to occur, "...support must be gained from staff and students" (29, p. 209). This study gives former students an opportunity to evaluate the curriculum.

Evaluation is a method of making an assessment of a situation and is defined by Cronbach as "the collection and use of information to make decisions about an educational program" (5, p. 91). Another definition is given by Good, "The process of assertaining or judging the value or amount of something by careful appraisal" (12, p. 209).

Statement of the Problem

The problem can be stated as: There is a need to evaluate the industrial arts education program at Indiana State University to determine if it has met the needs of the industrial arts education graduates.

Objectives of the Study

There are two objectives that were to be achieved by this study.

The first objective was to determine the types of positions that were held by the graduates.

The second objective was to determine the degree of importance that was placed on course content in industrial arts education by the graduates.

Purpose of the Study

The purpose of this study was to aid in the development of an improved industrial arts education program at Indiana State University by obtaining the opinions of the graduates relating to their needs and to use these views as a guide to implement curriculum modification.

The findings of this study are expected to be helpful 1) to the industrial arts education student in that it provides a list of positions in which industrial arts education graduates are employed, 2) the data can be used for curriculum modification, and 3) the data will be helpful in counseling undergraduate students.

Delimitations of the Study

This study was limited to the graduates of industrial arts education at Indiana State University who received their Bachelor of Science degree between August 1, 1960 and August 1, 1970 and were employed within the continental limits of the United States.

Assumptions of the Study

It was assumed that a questionnaire will obtain accurate information. Also, it was assumed that the list of industrial arts education graduates that was prepared by the alumni office at Indiana State University was complete and accurate.

Definitions

The following terms are defined in the manner used in this study.

Laboratory Coordinator -- A person who is responsible for instructional content and laboratory facilities within a designated area.

Industrial education -- "A generic term used to designate various types of education of an industrial nature, vocational industrial education, industrial arts, technical education, and apprenticeship training in both public and private schools" (12, p. 285).

Industrial arts education -- "...An area of education dealing with socio-economic problems and occupational opportunities, involving experience with a wide range of materials, tools, processes, products, and occupations typical of an industrial society" (12, p. 41).

Descriptive research -- "The body of research methods designed to allow assessment of certain attributes, properties, or characteristics in a situation at one or more points of time. The object is to describe "what is" at one or more times in the situation of interest" (14, p. 104).

Occupational group -- Any of the eight groups listed by Ann Roe: "service, business contact, organization, technology, outdoor, science, general culture, arts and entertainment" (24, p. 148).

Occupational level -- Any of the six levels identified by Ann Roe as: "professional and managerial I, professional and managerial II, semi-professional, skilled, semi-skilled, unskilled" (24, p. 150).

Nontechnical instruction -- Instruction that is not associated with manipulative activities commonly found in the industrial arts laboratory.

Area-unit-instructional laboratory (unit shop) -- "An organizational plan for teaching a trade or a technical subject where students concentrate on only one type of shop work, or work with only one kind of material" (26, p. 600).

Multiple-activities-instructional laboratory (general shop) -- "A school industrial laboratory designed and equipped to offer instruction in a variety of industrial or technical areas for breadth or depth purposes in industrial education" (26, p. 594).

Innovative program -- An industrial arts program that is a departure from traditional laboratory instruction.

Single-activity-instructional laboratory (general unit shop) -- "Activities centered around a basic material, an occupation, or closely related technologies like wood, metal, printing, drafting, electrical, or power mechanics" (26, p. 558).

Instructional concept -- The development of an understanding of an activity formed by a generalization from particulars under the direction of classroom instruction.

REVIEW OF LITERATURE

The review of literature consists of two sections. The first section is an introduction to research while the second part is a discussion of related studies.

Introduction

The term research is used in education with reference to an understanding of the conditions relating to teaching and learning. Educational research, as defined by Haymann, is "...concerned with producing information which is needed to make improvement in education" (14, p. 3). Lehmann says that "Research is simply controlled inquiry concerning a certain event or events..." (21, p. 2). Best identifies educational research as "...a more systematic structure of investigation, usually resulting in some sort of formal record or procedures and a report of results or conclusions" (2, p. 6).

Descriptive research is concerned with conditions as they exist at a point in time. It describes and interprets what is and as stated by Good "...may include present facts or current conditions concerning the nature of a group of persons, a number of objectives, or a class of events..." (13, p. 192). Descriptive research is also concerned with determining the typical or normal conditions as they exist or are practiced. It was stated by Best that descriptive research is concerned with "...beliefs, points of view, or attitudes that are held; processes that are going on, effects that are being felt; or trends that are developing" (2, p. 102).

Descriptive research can be grouped into several different categories. No category is rigid since a study may have the characteristics of one or more of the groups. The more common groups are identified by Van Dalen as "...(1) survey studies, (2) interrelationship studies, and (3) developmental studies" (30, p. 206).

A frequently employed method of obtaining information about conditions as they exist is the survey. It is pointed out by Galfo and Miller that "Surveys include studies in which a large variety of data related to the subject under investigation is collected..." (10, p. 15).

The interrelationship study tends to determine the relationship between a known fact or condition and the effect that it has upon a recipient. The intent of the study is defined by Van Dalen as an "...endeavor to trace interrelationship's between facts that will provide a deeper insight into the phenomena" (30, p. 218). After completion of the study, the researcher will analyze the data and draw conclusions relating to the reaction of the observed.

The developmental study is concerned with a situation and how it is affected by an existing condition. This type of research is adaptable to individual or group study. Making reference to the developmental study, Van Dalen says, "investigators describe variables in the course of their development over a period of months or years" (30, p. 228).

The term follow-up is often used in reference to research. Best gives a comprehensive description of a follow-up study.

> The follow-up study investigates individuals who have left an institution after having completed a program, a treatment, or a course of study. The study is concerned with what has happened to them, and what has been the impact of the institution and its program upon them. By examining their status or seeking their opinions, one may get some idea of the adequacy or inadequacy of the institution's program. Which course, experiences, or treatments proved to be of value? Which proved to be ineffective or of limited value? Studies of this type enable an institution to evaluate various aspects of its program in light of actual results (2, p. 120).

There are several different methods that can be used to collect data. The four most common methods are identified by Galfo and Miller as the "...questionnaire, interview, content and document analysis, and observation" (10, p. 25).

The questionnaire is a common method of obtaining information for research. One of the particular advantages of the questionnaire is "...to obtain factual data, opinions and attitudes in a structural framework from respondents not contacted on a face-to-face basis" (10, p. 27). In addition, the questionnaire can be "...employed in group work" (14, p. 67). Finally, another advantage of the questionnaire is "...the relative ease and speed with which it can be distributed by mail over a large geographic area..." (17, p. 189).

Questionnaires need to have an appeal to the respondents as expressed by Good.

> The questionnaire study should be important not only to the investigator and to the particular field of knowledge, but also to the respondent, whose psychology of motivation involves his attention, sympathy, interest, cooperation, and honesty in answering questions (13, p. 214).

Lastly, Best says "...the preparation of a good questionnaire takes a great deal of time, ingenuity, and hard work" (2, p. 143).

In summary, a properly constructed questionnaire, taking into consideration the reaction of the respondent, is a useful method of data collection.

Related Studies

In 1971, Kenneth Winters (31) conducted a survey of industrial arts teacher education and technical/technology graduates at Murry State College with implications for curriculum revision.

The purpose of the study was to collect data that would help determine the status of the effectiveness of the industrial arts teacher education program.

Data for this study were collected by a questionnaire. Information pretaining to (1) personal and background information; (2) occupation; (3) analysis and curriculum effectiveness; and (4) adequacy of the overall program was requested.

Findings of the study indicated that approximately two-thirds of the teacher education respondents had taken industrial arts courses in high school. Of the courses taken in high school, the most common were drafting, woods, and general shop. Ninety-one percent of the respondents who were in education indicated that they were interested in doing advanced graduate work or had completed advanced degrees as compared with 63 percent of the technical/technology respondents. Continued education, for both groups, was primarily in the area of industrial education. Forty-seven percent of the educators indicated that they were teaching industrial arts on the high school level while the majority of the respondents in technical/technology were in the engineering classification in a manufacturing or production industry. Salaries for teachers were on the average $2,084 less than for those who were in industry.

The main recommendations for curriculum changes were: the addition of a course in power and auto mechanics, the addition of a course in industrial management, and more emphasis on plastics. Seventy-five percent of the respondents felt that the program was fulfilling the state department objectives.

It was concluded that the industrial arts teacher education program and the technical/technology program, are compatible and can be operated within the same department.

An evaluation of the industrial education program at Iowa State University, 1959-1969, was made by Walter Diedrick (6) in 1971.

The purpose of this study was to determine curriculum emphasis based upon the opinion of the graduates, relative to their needs.

Major objectives of the study were:

1. To group the graduates according to their occupational classification and specific area of work.

2. To determine the degree of importance that is placed on course content within major instructional areas.

3. To determine what course content is considered necessary to enable the graduate to meet the needs of the various occupations (6, p. 4).

Data for this study were obtained by a questionnaire sent to industrial education graduates who received their Bachelor of Science degree at Iowa State University between 1959-1969.

Findings of the study were grouped according to status of the graduate and importance placed on course content.

One hundred thirty-five graduates were employed in industry. The largest area of employment was supervisory positions. One hundred-thirteen respondents indicated that they were employed in education. The most frequent indicated educational position was the high school area unit laboratory.

Areas of content that were identified as essential to important by both groups were algebra, trigonometry, and communication skills. Educators rated industrial arts courses as needed more often than did employers in industry.

The determining of course content, was listed as the most important element in the content of teaching methods courses.

Kenneth Gifford (11) conducted an evaluation of the preparation of industrial arts graduates of South Dakota State University in 1970.

The purpose was to evaluate the industrial arts education program at South Dakota State University.

Data for the study were obtained by a questionnaire sent to graduates and secondary school administrators.

The data reveal that 53 percent of the industrial arts graduates were in education and the most common areas of instruction were woodworking, metalworking, drafting, and electricity/electronics. Respondents considered woodworking, carpentry, and engineering graphics as their most valuable undergraduate courses with only some value for the professional courses. About 50 percent of the administrators indicated that occasional problems in industrial arts included discipline, ability to organize shop work, record keeping, maintenance, and shop finance.

Several conclusions were derived from this study. It was implied that graduates should maintain professional growth by participation in local, state, and national organizations. Also, professional reading should be encouraged. The need was also pointed out to inform administrators of the value of industrial arts education and its function as a part of general education. In addition, industrial arts teachers and South Dakota State University should inform school administrators of occurring changes in industrial arts philosophy, objectives, curriculum, methods, and evaluation.

Other conclusions stated that there should be an attempt to include instruction on mass production, and automation as well as the inclusion of a greater understanding of the importance of metals and how they relate to our technical society. Finally, additional qualified staff should be obtained and there should be an opportunity to do work on the graduate level.

An evaluation of the preparation of the industrial arts teachers education graduates at Colorado State University, 1957 through 1967 was conducted by Edward C. Hein (15) in 1969.

The purpose of the study was to gather information about the graduates so that the staff could more effectively counsel future students. Another purpose was to obtain information about a proposed change to include a nonteaching technical program under the direction of the industrial arts department. Lastly, it would give the former students an opportunity to evaluate the undergraduate courses in relation to their present employment for the purpose of possible curriculum revision.

Data for this study were collected by a questionnaire from a population of industrial arts education graduates who received their degrees between 1957-1967. A 77 percent return was used for the tabulation for this study.

The findings of this study indicated that nearly half of the students transferred to Colorado State University. Approximately one-third of the graduates were engaged in non-educational activity. Nearly one-half of the respondents had earned a second degree while one-fourth had a second degree in progress. Ten percent were working toward a third degree.

Most of the graduates taught courses within their major or minor area. The areas of greatest demand for minors were mathematics and science. The more popular college courses were woodworking and drawing. Woodworking and drawing were also reported by the respondents as the most frequently taught courses.

A survey of the curriculum for industrial arts teacher education at Colorado State College was made by William Erwin (9) in 1963.

The purpose of the study was to determine the effectiveness of the teacher education program and to determine what improvements were needed. Graduates from 1950 to 1960 were selected for this study.

This study was designed to obtain information about the background of the industrial arts graduates, nature of their positions and responsibility, evaluation of the undergraduate program in addition to suggestions for curriculum improvement.

The findings of this study revealed that approximately two-thirds of the graduates were members of professional organizations.

Most of the respondents indicated that they were regular readers of literature in their field but less interest was shown in general education literature.

The graduates reported more interest in technical courses than in professional courses. Some of the respondents taught courses in auto mechanics, stage crafts, girls shop, power mechanics, and general safety. It was determined that there was a need for improvement in the areas of the methods of teaching, shop planning and maintenance, and to develop a better understanding of curriculum problems as they relate to industrial arts.

James Oswald Henry (16) made "An Evaluation of a Teacher Education Program by the Graduates of a State College" in 1964.

The purpose of the study was to make an evaluation of the teacher education program at Old Dominion College. The study included the areas of general subject matter, professional subject matter, and specific subject matter.

Data for the study were collected by a questionnaire mailed to 199 teacher education graduates, 1957-1961 inclusive.

The findings indicated that repetition existed in the professional courses. Several of the tasks and duties performed by teachers were omitted from the methods courses.

The counseling of students for general education courses was less efficient than for courses in other areas.

Specific subject matter courses in art were in need of improvement.

It was recommended that an evaluation should be periodically conducted and that findings of the present study should be referred to the proper administrative authorities.

Arthur Engle (8) conducted an evaluation of the teacher education program at Huron College in 1965.

This study was concerned with determining the effectiveness of the teacher education program. The purposes of the study were: (1) to obtain criticisms and recommendations relating to majors, minors, and personnel services; (2) to obtain information relating to individual social and professional qualities; and (3) to evaluate collected data to determine the feasibility of curriculum modification.

Data for this study were collected by a questionnaire from those who graduated between June 1961 and June 1964.

Elementary graduates found that the professional courses prepared them for lesson planning, projects, and presentation of materials to the class. Secondary majors evaluated professional courses as being helpful or very helpful. Administrators indicated that 60 percent of the graduates were above average in vocational knowledge and information. The majority of graduates felt their preparation was adequate.

Recommendations were made relating to professional education, academic background, and personal services.

Wendell Roy (25) conducted A Comparative Study of Selected Objectives of Industrial Arts in 1963.

The problem was to comparatively examine and determine the degree of accomplishment of three objectives of industrial arts in ninth grade metalworking and woodworking classes. The selected objectives were: interest in industry, appreciation and use, and shop skills and knowledge.

Five schools were randomly selected from each of four group I school systems in Dallas. All students were placed in two major groups, metalworking or woodworking. Each of the two major groups contained two minor sections. One section was for students who had taken metalworking or woodworking and the other section was for students who had not taken metalworking or woodworking.

The data were obtained by a questionnaire from a random sample of 2,000 students.

An analysis of variance statistical treatment was used to process the data. Findings of the study were: (1) ninth grade students who have had metalworking and woodworking courses do make significantly (.01 level) higher grades on an interest in metalworking and woodworking test than students who have not had metalworking and woodworking courses. (2) ninth grade students who have had metalworking and woodworking courses do make significantly (.01 level) higher grades on an appreciation and use of metal and wood products test than students who have not had courses in metalworking and woodworking. (3) ninth grade students who have had courses in woodworking and metalworking do make significantly (.01 level) higher grades on a shop skill and knowledge test than students who have not had courses in woodworking and metalworking.

Kathleen Pittman (23) conducted an Evaluation of a Teacher Education Program by the Graduates of McNeese State College, division of teaching, in 1964.

The purpose of the study was to evaluate the teacher education program by securing, interpreting, and evaluating responses from the graduates to determine to what extent the professional and technical courses adequately prepared the graduate.

Data for the study were collected by a questionnaire from 344 respondents who graduated 1957-1961.

The data were analyzed and placed on tables showing numbers and percentages.

Findings of the study indicated that 33 percent of the graduates reported that professional courses were of little value while 66 percent indicated some value.

Inadequacies relating to student teaching were listed by some respondents. Thirteen percent of the respondents listed education courses as being of little or no importance. Fifty percent indicated a need for additional content courses.

Suggestions were made for the improvement of subject matter courses.

It was concluded that a careful study of the data could result in an improvement of the curriculum.

In 1963 William Bear (1) conducted a study of the Matriculation, Progression and Employment Status of Agricultural Engineering Graduates from the Iowa State University of Science and Technology.

It was assumed that data pretaining to the parents of the graduate, home of the graduate, high school courses, high school grades, the decision to attend Iowa State University, and selection of the agricultural engineering curriculum would provide a better understanding of the graduate.

Data were obtained from 386 graduates who earned the Bachelor of Science degree between July 1, 1942 and July 1, 1962.

Some findings of the study were: 81 percent of the parents were farm owners, operators, or managers. The best predictor of first quarter college grade point average was the high school grade point average. Mathematics and science courses in high school were positively correlated with college grade point average. First employment income was best predicted by cumulative college grade point average. Twenty-six percent of the graduates continued work beyond the baccalaureate degree. Forty percent of the graduates favored a five year program.

In summary, a review of the literature revealed that the questionnaire was used extensively to obtain data for follow-up studies.

One of the purposes of the follow-up study was to evaluate effectiveness of the teacher education program and to determine curriculum modifications.

The findings revealed that the graduates considered the technical courses to be of greater value than professional courses. Professional courses were reported to be repetitious and often omitted instruction needed for teaching. The more popular undergraduate technical courses were woodworking, metalworking, drafting, and metals. Other teaching assignments were in auto mechanics, plastics, stage crafts, general safety, electricity, and electronics.

Graduates who were in industry were employed as engineers or supervisors in manufacturing or production firms.

METHOD OF PROCEDURE

Population

Industrial Arts Education graduates who earned the Bachelor of Science degree between August 1, 1960 and August 1, 1970 were selected for this study. There were 641 graduates during this period. Nineteen addresses were listed by the Alumni Office as lost or invalid leaving a total of 622 to whom questionnaires were sent. Five hundred twenty graduates responded to the questionnaire for an 83 percent return. Of these, several chose not to participate in the study and returned the unanswered questionnaire. A total of 495 questionnaires was used for this study.

The Instrument

The objectives were given careful consideration before the construction of the instrument began. It was decided that the instrument would be most effective if it would include sections on instructional concepts, graduates in education and graduates in business or industry.

The section on instructional concepts was developed to satisfy the objective, to determine the degree of importance placed on course content in industrial arts education by the graduates. An outline for each course listed on the program planning and record form (19) for the industrial arts education student was obtained. In conference with the laboratory coordinator, or class instructor, instructional concepts for each course were identified. These concepts were grouped, with a rating scale, according to instructional areas.

The objective, to determine the types of positions that were held by the graduates, was satisfied by the sections, graduates in education, and graduates in business or industry. Areas of laboratory instruction were selected as they were listed in the Administrative Handbook for the State of Indiana (27, p. 67) and as they were identified by Diedrick (6, p. 243). Topic headings for areas of instruction were selected as they were listed by Silvius and Curry (26, p. 558). One additional classification of innovative programs, as identified by Cochran, (4, p. vi) was included. The position listed by the graduates in business or industry was classified according to the six levels (24, p. 149) and eight occupational groups as organized by Ann Roe (24, p. 151).

The completed questionnaire was evaluated by one graduate student at Iowa State University and seven members of the industrial arts education faculty at Indiana State University. A revised copy was reviewed by four people in the Terre Haute area representative of the population that would respond to the questionnaire. A final revision of the instrument was made, approved, and printed.

The first mailing was completed on October 20, 1972. A follow-up mailing was completed on November 6, 1972, and the third and final mailing was completed on November 28, 1972. As the questionnaires were returned, they were examined and the Data were key punched on 80 column Hollerith cards. Frequency counts of items and occupational classifications were obtained to determine the positions held by the graduates. The degree of importance placed on instructional concepts was presented in percent, mean, and rank for each item.

The Spearman rank correlation coefficient (28, p. 409) was used to determine the association of mean ratings of technical education instructional concepts between instructional areas. This coefficient is based upon the ranks of the two variables and is given by the formula:

$$r_s = 1 - \frac{6 \sum_i d_i^2}{(n - 1)\, n(n + 1)}$$

r_s = Spearman's rank correlation coefficient

d_i = The difference for the ith pair

n = The number of pairs (observations)

A modification of the Lorr-Radhakrishan cluster analysis method (22) was used to group or cluster the 19 instructional areas on the basis of the mean ratings of technical education instructional concepts. Beginning with the correlation matrix of the 19 variables (instructional areas), a listing was made for each variable of those variables which correlated at or above a lower limit of C_e. The value of C_e was set to be 0.60. The variable with the longest associated list was selected as the pivot variable. To the pivot was added the variable with the highest average correlation with all members of the pivot list. The common variable that correlated highest on the average with those already in the cluster was then added to the first pair. The cluster was expanded until all variables with a mean correlation at or exceeding C_e were admitted. Additional clusters were then developed in the same manner from the remaining variables in the matrix. Clusters formed had a minimum of three variables in the cluster. The procedure of setting an upper limit C_u for removal of variables in the residual matrix to prevent cluster overlap was not utilized.

FINDINGS

The findings are presented in two major divisions. These divisions are the status of the graduates and the importance placed on course content.

Status of the Graduates

A review of the list of graduates prepared by the alumni office indicated that former students were living in most of the states in the United States. It was therefore decided to divide the United States into regions, Figure 1. These regions were the northeast, southeast, northcentral, southcentral, northwest, and southwest.

States that were located north of the southern border of Kentucky and Virginia and east of the western border of Kentucky, Indiana, and Michigan were considered the northeast. All states south of the northern border of Tennessee and North Carolina and east of the western border of Tennessee and Mississippi were listed as the southeast. Northcentral United States included: Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin. Arkansas, Louisiana, Oklahoma, and Texas were identified as the south-central region. The northwest region included Idaho, Montana, Oregon, Washington, and Wyoming. The remaining states of California, Colorado, New Mexico, Nevada, and Utah made up the southwest region.

Four hundred ninety-five useable returns were received

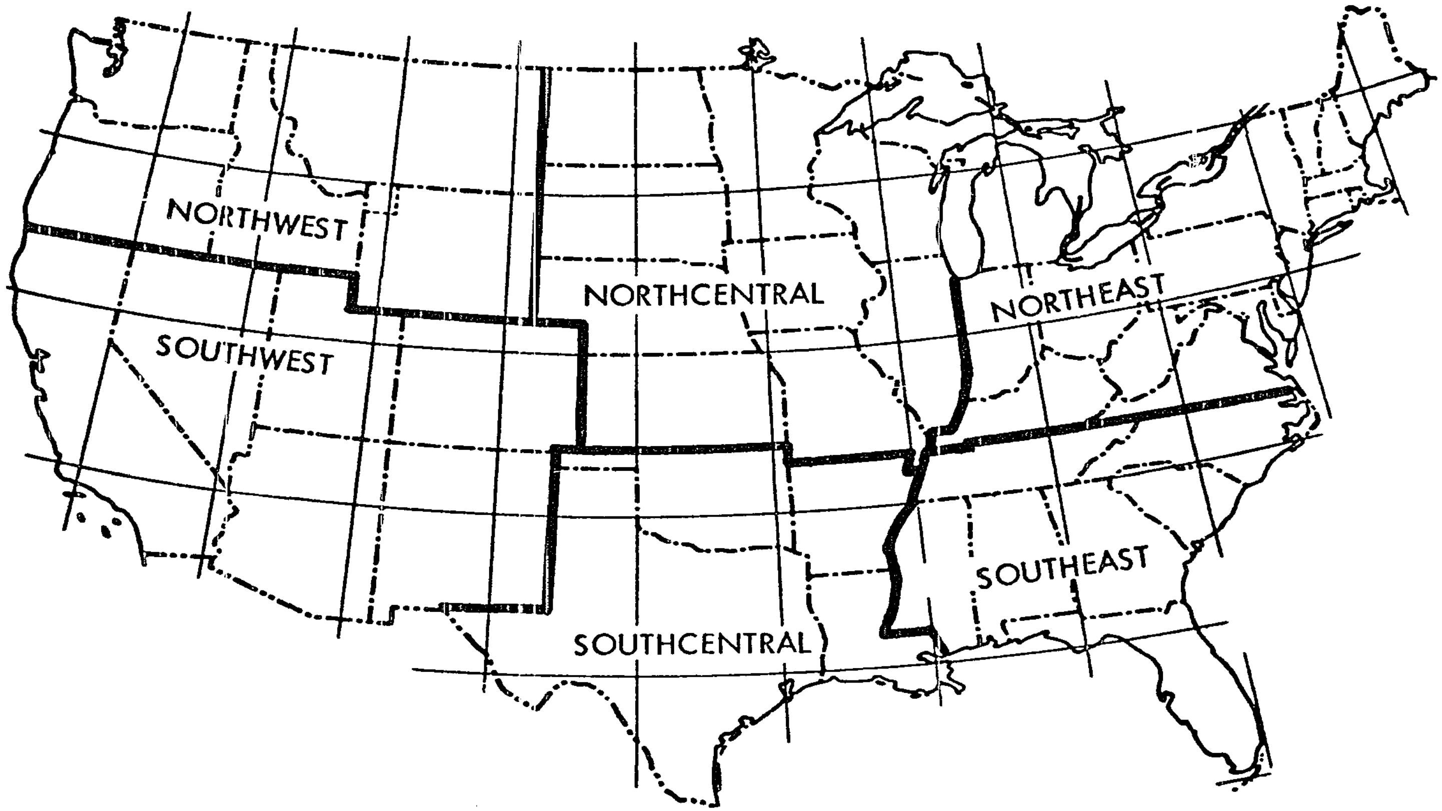

Figure 1. Geographic areas within the United States

from 622 industrial arts education graduates. Three hundred ninety-three, 79.5 percent, indicated that they were employed in education while 102, 20.5 percent, identified with business or industry. The majority of graduates, 351 in education and 78 in business or industry, reported residence in the northeast. No graduates in education resided in the southcentral or northwest region. Graduates in business or industry reported residence in all regions.

Table 1. Geographic location for majors in education and business or industry

	Education		Business or Industry		Totals	
	N	%	N	%	N	%
Northeast	351	89.3	78	76.4	429	86.8
Southeast	6	1.5	2	2.0	8	1.6
Northcentral	27	6.9	14	13.7	41	8.2
Southcentral	0	0.0	1	1.0	1	0.2
Northwest	0	0.0	2	2.0	2	0.4
Southwest	9	2.3	5	4.9	14	2.8
Totals	393	100.0	102	100.0	495	100.0

There were nine classifications for graduates employed in education. The largest number of graduates, 144, were employed in a high school grades 9-12. The next three common classifications in descending order were Jr./Sr. high school, junior high school, and high school 10-12. No graduate was employed in the classification of elementary K-6. Thirteen graduates listed their classification as other. Of these, some indicated that they were teaching in private institutions. Frequencies for each classification were listed in Table 2.

Table 2. Classification of school for graduates in education

School	Number	Percentage
College or university	31	7.9
Vocational school	26	6.6
High school 10-12	47	12.0
High school 9-12	144	36.5
Jr./Sr. high school	51	13.0
Junior high school 7-9	49	12.5
Elementary K-6	0	0.0
Elementary K-8	14	3.6
Middle school	18	4.6
Other	13	3.3
Total	393	100.0

The data in Table 3 reveal that 33.7 percent of the graduates were employed in schools with an enrollment between 501-1000 students. Only 2.5 percent of the graduates reported that they were employed in the three categories of schools with enrollments of 200 or less. Five graduates did not respond to the question.

Industrial arts education was a full time assignment for 314 or 79.9 percent of the graduates in education. Thirty-nine, 9.9 percent, did not respond to the question but indicated that they had other assignments in education. The assignments in industrial arts for graduates in education were recorded in Table 4.

Table 3. Size of school by student population for graduates in education

Population	Number	Percentage
1 - 50	2	0.5
51 - 100	4	1.0
101 - 200	4	1.0
201 - 500	49	12.5
501 - 1000	132	33.7
1001 - 2000	118	30.0
Over 2000	79	20.1
No answer	5	1.2
Total	393	100.0

Table 4. Assignment in industrial arts for graduates in education

Time	Number	Percentage
Full time	314	79.9
3/4 time	9	2.3
1/2 time	15	3.8
1/4 time	16	4.1
No answer	39	9.9
Total	393	100.0

The data in Table 5 reveal the area of instruction for graduates in education. Six areas of instruction were distributed within nine school classifications.

The highest frequency of teaching assignments was reported in the area-unit-instructional laboratory (unit shop). Within this group, technical drawing was most common. Auto mechanics in the high school 9-12 reported the second highest

Table 5. Area of instruction for graduates in education

Area	School classification										
	College or university	Vocational school	High school 10-12	High school 9-12	Jr./Sr. high school	Junior high school 7-9	Elementary K-6	Elementary K-8	Middle school	Other	Total
Innovative program	2	-	-	3	1	6	-	1	1	-	14
Multiple-activities-instructional laboratory (general unit shop)	1	1	1	3	12	14	-	12	10	2	56
Single-activity-instructional laboratory (general unit shop)											
General drawing	1	-	4	16	13	15	-	1	4	-	54
General electricity	-	1	1	8	3	4	-	1	1	-	19
General graphic arts	1	-	4	4	1	6	-	1	2	-	19
General metals	2	-	1	16	10	13	-	1	5	-	48
General plastics	-	-	-	3	1	3	-	-	3	-	10
General power	1	3	5	10	4	3	-	-	-	-	26
General wood	-	1	7	23	15	18	-	1	4	1	70
Other	-	1	2	5	2	2	-	-	1	-	13
Area-unit-instructional laboratory (unit shop)											
Technical drawing	1	3	4	30	8	2	-	-	1	-	49
Architectural drafting	-	3	4	16	4	-	-	-	-	-	27

Table 5 (Continued)

Area	School classification										
	College or university	Vocational school	High school 10-12	High school 9-12	Jr./Sr. high school	Junior high school 7-9	Elementary K-6	Elementary K-8	Middle school	Other	Total
Electricity	-	1	1	12	1	-	-	-	-	-	15
Electronics	2	3	4	12	2	-	-	-	-	-	23
Graphic arts	1	4	7	12	4	3	-	-	-	-	31
Foundry	1	-	-	3	1	-	-	-	-	-	5
Machine shop	1	1	1	20	4	-	-	-	-	-	27
Sheet metal	-	-	-	9	-	1	-	-	-	-	10
Plastics	1	-	2	2	-	1	-	-	-	-	6
Welding	2	2	1	14	1	-	-	-	-	-	20
Auto mechanics	4	8	9	19	5	-	-	-	-	1	46
Fluidics	1	1	-	-	-	-	-	-	-	-	2
Nontechnical											
Professional subjects	2	2	-	1	1	-	-	-	1	-	7
Related subjects	-	1	1	-	-	1	-	-	-	1	4
Guidance or counseling	-	-	1	3	1	1	-	-	-	-	6
Other	5	-	1	1	-	1	-	-	-	1	9
Administration											
Building and grounds	-	-	-	-	1	-	-	-	-	2	3
Business administration	-	-	-	-	-	-	-	-	-	-	-
Coordination	1	1	2	4	-	-	-	-	-	1	9
Director	4	2	-	-	-	-	-	-	-	3	9

Table 5 (Continued)

Area	College or university	Vocational school	High school 10-12	High school 9-12	Jr./Sr. high school	Junior high school 7-9	Elementary K-6	Elementary K-8	Middle school	Other	Total
	School classification										
Principal	-	-	-	2	1	-	-	-	1	-	4
Superintendent	-	-	-	-	-	-	-	-	-	-	-
Supervisor	1	1	1	-	-	2	-	-	-	-	5
Other	5	-	-	4	-	-	-	-	1	1	11

frequency. General drawing was the most frequently taught subject in the single-activity-instructional laboratory (general unit shop). Nontechnical instruction and administrative responsibilities were distributed within the classification.

The frequency of replies for the various categories exceeds 393, which was the total number of graduates who were employed in education. It was concluded that some graduates had educational responsibilities in more than one area.

Table 6 presents a profile of years of service in the present school system. Three years of service was the most frequent with 70 responses, 17.8 percent. Sixty-eight respondents, 17.6 percent, indicated four years of service.

Table 6. Years of service in present school system for graduates in education

Years	Number	Percentage
First year	34	8.7
Second year	39	9.9
Third year	70	17.8
Fourth year	69	17.6
Fifth year	42	10.7
Sixth year	40	10.2
Seventh year	33	8.4
Eighth year	22	5.6
Ninth year	19	4.8
Tenth year	9	2.3
Eleventh year	10	2.5
Twelfth year	6	1.5
Total	393	100.0

The years of teaching for graduates in education is shown in Table 7. The highest frequency and largest percentage was shown in the third year. One respondent indicated that he had been teaching 22 years.

Table 7. Years of teaching for graduates in education

Years	Number	Percentage
First year	4	1.0
Second year	13	3.3
Third year	53	13.5
Fourth year	51	13.0
Fifth year	50	12.7
Sixth year	41	10.4
Seventh year	41	10.4
Eighth year	38	9.7
Ninth year	34	8.7
Tenth year	25	6.4
Eleventh year	18	4.6
Twelfth year	17	4.3
Thirteen or more	1	0.3
No response	7	1.7
Total	393	100.0

Graduate work completed by majors in education and business or industry was recorded in Table 8. One hundred fifty-two, 38.7 percent, of the graduates in education had completed a master's degree. The largest percentage, 34.3 percent, of graduates in business or industry indicated that they had not taken graduate work. Work through the doctoral degree had been completed by graduates in both groups.

Table 8. Graduate work completed by majors in education and business or industry

Graduate work	Education N	Education %	Business or industry N	Business or industry %
None	25	6.4	35	34.3
1-14 hrs. beyond the bachelor's degree	46	11.6	24	23.5
15-29 hrs. beyond the bachelor's degree	60	15.3	12	11.8
Master's degree	152	38.7	20	19.6
1-14 hrs. beyond the master's degree	61	15.5	6	5.9
15-29 hrs. beyond the master's degree	18	4.6	3	2.9
Specialist degree	-	-	-	-
30-44 hrs. beyond the master's degree	14	3.6	1	1.0
45 hrs. or more beyond the master's degree	8	2.0	-	-
Doctoral degree	9	2.3	1	1.0
Total	393	100.0	102	100.0

Table 9 lists the year of graduation for majors in education and business or industry. A chronological observation shows a gradual increase in the number of graduates in education. The number of graduates in business or industry increased to a high of 16, 15.8 percent, in 1967. This high declined to three, 2.9 percent, over a two year period.

Graduates in business or industry were asked to list their occupational title. The titles were then categorized according to the two way classification of occupations as organized by Ann Roe (24), Table 10.

Table 9. Year of graduation for majors employed in education and business or industry

Year of graduation	Education N	Education %	Business or industry N	Business or industry %
1960	6	1.5	3	2.9
1961	24	6.1	7	6.9
1962	25	6.4	4	3.9
1963	23	5.9	13	12.7
1964	45	11.5	12	11.8
1965	37	9.4	9	8.8
1966	44	11.2	14	13.7
1967	32	8.1	16	15.8
1968	41	10.4	12	11.8
1969	56	14.2	9	8.8
1970	60	15.3	3	2.9
Total	393	100.0	102	100.0

Table 10. Two way classification of occupations

Level	Group			
	Service	Business contact	Organization	Technology
Professional managerial I	Counselors Therapist Social workers supervisors	Promoters	U.S. President International bankers	Inventive geniuses Consulting engineers
Professional managerial II	Occupational therapists Social workers	Public relations counselors	Accountants (CPA) Executives Brokers	Engineers Ships' officers
Semi-professional and managerial	Detectives Welfare workers	Salesmen Dealers retail wholesale	Employment managers Owners' catering	Aviators Contractors Foreman
Skilled	Barbers Chefs Policemen	Auctioneers Buyers House canvassers	Cashiers Clerk Salesclerk	Electricians Blacksmith Mechanics
Semi-skilled	Taxi drivers City firemen	Peddlers	Notaries Runners Typists	Delivery men Smelter workers
Unskilled	Elevator operators Watchmen		Messenger boys	Helpers Laborers Wrappers Yardmen

Table 10 (Continued)

Level	Group			
	Service	Business contact	Organization	Technology
Professional managerial I	Consulting specialists	Research scientists Medical specialists	Prophets Scholars	Creative artists Museum curators
Professional managerial II	Applied scientists Landscape architects	Scientists Nurses Pharmacists Veterinarians	Editors Teachers high school elementary	Athletes Designers Music arrangers
Semi-professional and managerial	Farm owners County agents	Technicians medical Chiropractors	Radio announcers Reporters Librarians	Ad writers Interior decorators Showmen
Skilled	Laboratory testers Oil well drillers	Technical assistants	Law clerks	Photographers Advertising artists
Semi-skilled	Gardeners Cowpunchers Miner's helpers	Hospital attendants		Illustrators Showcard writers Stagehands
Unskilled	Dairy hands Farm laborers	Nontechnical helpers		

Graduates listed occupational titles that were recorded in twelve, of the 48, cells of the two way classification. The cells in which occupational titles were entered were listed in Table 11. The highest frequencies, 21, were recorded in the classification of business contact, semi-professional and technology, professional managerial II. Organization, professional managerial I and organization, skilled, each had one entry. Graduates were identified on four levels in the group of "organization".

Table 11. Classification of occupations of graduates in business or industry

Classification of occupation	Number	Percent
Service, professional and managerial II	2	2.0
Business contact, semi-professional	21	20.6
Business contact, skilled	2	2.0
Organization, professional managerial I	1	1.0
Organization, professional managerial II	11	10.8
Organization, semi-professional	10	9.8
Organization, skilled	1	1.0
Technology, professional managerial II	21	20.6
Technology, semi-professional	18	17.6
Technology, skilled	9	8.8
Outdoor, semi-professional	3	2.9
General culture, professional managerial II	3	2.9
Total	102	100.0

Two graduates were classified as service, professional managerial II as listed in Table 12.

Table 12. Positions listed by graduates in business or industry and classified as service, professional and managerial II

Occupation	Number
Manual arts therapists	1
Vocational rehabilitation supervisor	1
Total	2

Fifteen job titles, Table 13, were listed in the group business contact, semi-professional. Five graduates listed their occupational titles as salesman. Some of the items were: automobile, insurance, and excavating equipment.

Table 13. Positions listed by graduates in business or industry and classified as business contact, semi-professional

Occupation	Number
Automobile salesmanager	1
Chemical sales	1
Cost control coordinator	1
Director of purchasing	1
District sales manager	1
Electronic wholesale distributor	1
Excavating equipment dealer	1
Insurance claims representative	1
Market representative	1
Petroleum sales	1
Pharmaceutical sales	2
Real estate sales	2
Sales coordinator	1
Salesman	5
Senior sales engineer	1
Total	21

Two graduates listed their occupational job title as buyer. Their specific area was listed in Table 14.

Table 14. Positions listed by graduates in business or industry and classified as business contact, skilled

Occupation	Number
County government buyer	1
Power transmission equipment buyer	1
Total	2

One occupational job title was listed as organization, professional and managerial I, Table 15.

Table 15. Position listed by graduate in business or industry and classified as organization, professional and managerial I

Occupation	Number
Management consultant	1
Total	1

Table 16 lists eight titles as organization, professional managerial II. Multiple entries were recorded in the occupational titles of president, sales; accountant manager; and vice president, sales.

Table 16. Positions listed by graduates in business or industry and classified as organization, professional and managerial II

Occupation	Number
Accountant manager	2
Accounting executive	1
Distribution and trucking manager	1
District telephone representative	1
President, sales	1
Program manager	2
Systems analyst	1
Vice president, plant operation	1
Vice president, sales	1
Total	11

Table 17 lists ten occupational titles as organization, semi-professional. There were no multiple entries in this classification.

Table 17. Positions listed by graduates in business or industry and classified as organization, semi-professional

Occupation	Number
Furniture shipping manager	1
Machine shop owner	1
Motorcycle dealer	1
Plant layout designer	1
Production management	1
Production schedular	1
Terminal train master	1
Variety discount center owner	1
Water conditioning dealership	1
Wholesale retail sales manager	1
Total	10

On Table 18, organization, skilled contained one entry.

Table 18. Position listed by graduate in business or industry and classified as organization, skilled

Occupation	Number
Shipping clerk	1
Total	1

The group of technology contained occupational titles on three different levels. The level of professional managerial II, Table 19, had the longest list of occupational titles.

Table 19. Positions listed by graduates in business or industry and classified as technology, professional and managerial II

Occupation	Number
Captain, U. S. Army	1
Design engineer	1
Electrical engineer	1
Facilities engineer	1
Maintenance superintendent	1
Marketing representative	1
Materials handling engineer	1
Methods engineer	1
Personnel administration manager	1
Petroleum engineer	1
Plant engineer	1
Plant manager	1
Plant supervisor	1
Processing engineer	1
Product engineer	1
Production control supervisor	1
Public health engineer	1
Real estate appraiser	1
Shop foreman	1

Table 19 (Continued)

Occupation	Number
Systems engineer	1
Time study engineer	1
Total	21

The positions reported by graduates in business or industry and classified as technology, semi-professional were listed in Table 20. Two graduates reported their occupation as contractor.

Table 20. Positions listed by graduates in business or industry and classified as technology, semi-professional

Occupation	Number
Airline pilot	1
Carpenter foreman	1
Contract manager	1
Contractor	2
Construction superintendent	1
Maintenance foreman	1
Maintenance planner	1
Plant foreman	1
Production control assistant	1
Production supervisor	1
Production turn foreman	1
Quality control analyst	1
Quality control supervisor	1
Senior technician	1
Telephone facility department supervisor	1
Warehouse and shipping group leader	1
Zone service manager	1
Total	18

Data in Table 21 reveal that nine graduates were classified as technology, skilled.

Table 21. Positions listed by graduates in business or industry and classified as technology, skilled

Occupation	Number
Carpenter	1
Computer add makeup	1
Machinist	1
Natural gas transmission repairman	1
Overhead lineman	1
Planner operator	1
Plumber	1
Stereotyper	1
Traveling turbine mechanic	1
Total	9

Table 22 lists one occupational title as outdoor, semi-skilled. Three graduates identified farming as their occupation.

Table 22. Position listed by graduates in business or industry and classified as outdoor, semi-professional

Occupation	Number
Farmer	3
Total	3

General cultural, professional managerial II occupational classification were listed on Table 23.

Table 23. Positions listed by graduates in business or industry and classified as general culture, professional managerial II.

Occupation	Number
Apprentice instructor	1
Manager editor	1
Printing supervisor (teacher)	1
Total	3

Table 24 lists the years of service in the present firm for graduates in business or industry. It was observed that as the years of service increase the number of graduates who remain in a position decrease.

Table 24. Years of service in present firm for graduates in business or industry

Years of service	Number	Percent
First year	22	21.7
Second year	16	15.7
Third year	13	12.7
Fourth year	14	13.7
Fifth year	14	13.7
Sixth year	8	7.8
Seventh year	4	3.9
Eighth year	2	2.0
Ninth year	2	2.0
Tenth year	3	2.9
Eleventh year	1	1.0
Twelfth year	3	2.9
Total	102	100.0

Table 25 lists the years of service in the present position for graduates in business or industry. It was observed that the number of graduates who remain in a position decreases as the years of service increase.

Table 25. Years of service in present position for graduates in business or industry

Years in present position	Number	Percent
First year	31	30.1
Second year	21	20.6
Third year	16	15.7
Fourth year	7	6.9
Fifth year	12	11.8
Sixth year	6	5.9
Seventh year	2	2.0
Eighth year	2	2.0
Ninth year	1	1.0
Tenth year	2	2.0
Eleventh year	0	0.0
Twelfth year	2	2.0
Total	102	100.0

The size of a firm in which the graduates in business or industry were employed was recorded in Table 26. The largest percent of graduates are employed in firms with 1-20 employees. The second largest group of graduates are employed in firms with more than 2001 employees.

Several of the graduates in business or industry listed the product associated with their employing firm. The products were listed on Table 27.

Table 26. Number of employees in firm of graduates in business or industry

Employees in firm	Number	Percent
1-20	34	33.4
21-50	8	7.8
51-100	6	5.9
101-250	9	8.8
251-500	8	7.8
501-1000	12	11.8
1001-2000	2	2.0
over 2001	23	22.5
Total	102	100.0

Table 27. Products of employing firm

Manufacturing of wheels and tires for casters	Record and tape manufacturing
Hydraulic cylinder manufacturing	Special machine manufacturing
Color concentrate for plastics	Small appliance
Steel	Diesel engines
Lumber and building materials	Earth moving equipment
Mobile homes	Construction equipment
Semi conductors	Aluminum
Office products	Industrial equipment
Cabinets	Clay products
Corrugated container	Data card manufacturing
	Automobile manufacturing

Importance Placed on Course Content

In the Indiana State University Undergraduate Bulletin (20, p. 297), the curriculum for industrial arts education was divided into two categories. These were: required courses in industrial arts, and courses in industrial technology.

Professional education instructional concepts taught in the industrial arts courses listed in the Indiana State University Undergraduate Bulletin (20, p. 298), were listed on Table 28.

Table 28. Professional education instructional concepts

Concept
Philosophy of industrial arts education
Methods of teaching industrial arts
Evaluation of student progress
Laboratory management
Techniques and procedures for the selection of instructional materials
Course construction
Lesson planning
Theory and organization of the general shop
Principles of laboratory planning
Requisition writing
Micro teaching
Fundamentals of laboratory safety

Technical instructional concepts that were identified from the industrial technical courses listed in the Indiana State University Undergraduate Bulletin (20, p. 305), and the program planning and record form (19) were listed on Table 29.

The instructional concepts for the professional education

Table 29. Technical education instructional concepts

Concept
Fundamentals of technical drawing
Charts and graphs
Computer graphics
Principles of architectural drafting
Industrial arts design
Descriptive geometry
Sources, development, and transmission of power
Automotive repair and maintenance
Tune-up, repair, and care of air cooled engines
Principles of test equipment and electrical diagnosis
Analysis, diagnosis, service, and maintenance of home appliance
Service and repair of vehicle systems
Fundamentals of woodworking
Principles of industrial communications
Methods of storage and retrieval of information
Principles of hydraulics, pneumatics, and fluidics
Theory and application of fluid power
Principles of offset printing, silk screen, and camera operation
Techniques of photographic half tone
Principles of contact and picture printing
Basic electronic circuits
Basic electrical control processes
Electronic communications theory and adaptation of hardware
Integrated circuits
Qualitative electrical theory
Basic metalworking processes
Principles of material joining (welding)
Principles of tool making
Fundamentals of heat treating
Precision measurement
Simulated industrial experience
Investigate, research, and experimentation of technical problems
Systems analysis and activity planning

courses and the technical education courses were rated on a four point scale. Directions, ratings, and their descriptions as they were presented on the questionnaire were as follows:

> Directions: This section should be completed by EVERYONE. Place a check (✓) in the appropriate column to indicate how much value a knowledge of, or an ability in, the following professional and technical areas is to you in performing the responsibilities of your present position. Place a value on the subject matter only, DO NOT ATTEMPT to evaluate on the basis of a specific course you may have had.
>
> 1) No-value: There is no need for this knowledge in your present position.
>
> 2) Desirable: Some knowledge enables you to perform more effectively but is not required for your position.
>
> 3) Important: Some knowledge is needed to carry out the responsibility of your present position.
>
> 4) Essential: A high degree of knowledge is needed to carry out the responsibility of your present position.

The instructional concepts were evaluated in the same order as they appeared on the questionnaire.

The sections of educational occupational classification and area of work were presented first. Business or industry was presented second. Data in the tables were presented in percent, mean, and rank order for each item. A summary of the data was presented in each section. Spearman's rank correlation coefficient and Lorr Radhakrishnan cluster analysis were computed for the technical education instructional concepts (see Appendix C, Tables 117, 118, 119 and 120). Only groups with ten or more responses were presented in table form.

Educational occupational classification

The data presented in tables 30 through 49 are the evaluations by graduates in education according to their school classification. Of the ten school classifications listed on the questionnaire, nine were completed by ten or more graduates. The completed classifications were: college or university, vocational school, high school 10-12, high school 9-12, Jr./Sr. high school, junior high school 7-9, elementary K-8, middle school, and other.

College or university An evaluation of professional education instructional concepts by graduates employed in college or university was presented in Table 30. The concept of evaluation of student progress had the highest mean and a rank of 1.0. The concept of laboratory management and techniques and procedures for the selection of instructional materials both had a mean of 3.26 and a rank of 2.5.

The evaluation of technical education instructional concepts by graduates in college or university is recorded in Table 31. Investigate, research, and experimentation of technical problems was the concept that had a rank of 1.0 and a mean of 2.58. The concepts that had a rank of 2.0 and 3.0 respectively were: simulated industrial experience, and system analysis and activity planning. The means of these concepts were 2.48 and 2.45 respectively.

Table 30. Evaluation of professional education instructional concepts by educational occupational classification--college or university N = 31

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	13	32	26	29	2.71	9.0
Methods of teaching industrial arts	16	19	29	36	2.84	7.0
Evaluation of student progress	0	3	39	58	3.55	1.0
Laboratory management	10	3	39	48	3.26	2.5
Techniques and procedures for the selection of instructional materials	10	10	26	54	3.26	2.5
Course construction	7	19	32	42	3.10	5.0
Lesson planning	7	19	26	48	3.16	4.0
Theory and organization of the general shop	36	46	11	7	1.90	12.0
Principles of laboratory planning	16	23	32	29	2.74	8.0
Requisition writing	26	26	26	22	2.45	10.0
Micro teaching	35	13	49	3	2.19	11.0
Fundamentals of laboratory safety	16	19	22	43	2.90	6.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 31. Evaluation of technical education instructional concepts by educational occupational classification--college or university N = 31

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	19	36	29	16	2.42	4.0
Charts and graphs	29	36	16	19	2.26	8.5
Computer graphics	42	35	13	10	1.90	26.0
Principles of architectural drafting	39	29	19	13	2.06	17.0
Industrial arts design	29	39	16	16	2.19	10.5
Descriptive geometry	35	29	23	13	2.13	15.5
Sources, development, and transmission of power	18	55	14	13	2.19	10.5
Automotive repair and maintenance	35	36	19	10	2.03	18.5
Tune-up, repair, and care of air cooled engines	41	29	14	16	2.03	18.5
Principles of test equipment and electrical diagnosis	38	39	10	13	1.97	22.0
Analysis, diagnosis, service and maintenance of home appliance	58	23	16	3	1.64	32.0
Service and repair of vehicle systems	48	36	3	13	1.81	30.0
Fundamentals of woodworking	35	46	16	3	1.87	27.0
Principles of industrial communications	32	32	26	10	2.13	15.5

Table 31 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	29	35	13	23	2.29	7.0
Principles of hydraulics pneumatics, and fluidics	48	23	13	16	1.97	22.0
Theory and application of fluid power	51	26	10	13	1.84	28.5
Principles of offset printing, silk screen, and camera operations	39	23	28	10	2.16	13.0
Techniques of photographic half tone	48	32	7	13	1.84	28.5
Principles of contact and picture printing	48	32	10	10	1.80	31.0
Basic electronic circuits	23	38	23	16	2.32	6.0
Basic electronic control processes	29	39	19	13	2.16	13.0
Electronic communications theory and adaptation of hardware	41	36	10	13	1.94	24.5
Integrated circuits	35	42	13	10	1.97	22.0
Qualitative electrical theory	54	36	3	7	1.61	33.0
Basic metalworking processes	29	39	19	13	2.16	13.0
Principles of material joining (welding)	22	32	33	13	2.35	5.0
Principles of tool making	38	39	13	10	1.94	24.5

Table 31 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	35	36	23	6	2.00	21.0
Precision measurement	29	36	16	19	2.26	8.5
Simulated industrial experience	32	16	23	29	2.48	2.0
Investigate, research, and experimentation of technical problems	22	26	24	28	2.58	1.0
System analysis and activity planning	29	23	22	26	2.45	3.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

<u>Vocational school</u> Graduates in vocational school listed the concept of course construction as the most important concept with a rank of 1.0 and a mean of 3.38. This was the only concept in Table 32 that had no responses in the 'no-value' category. The concepts of evaluation of student progress, and fundamentals of laboratory safety had a rank of 2.5 and a mean of 3.31.

Table 33 presents a summary of the evaluation of technical education instructional concepts by graduates in vocational school. The concept of fundamentals of technical drawing was

Table 32. Evaluation of professional education instructional concepts by educational occupational classification--vocational school N = 26

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	11	43	27	19	2.54	10.0
Methods of teaching industrial arts	11	19	35	35	2.92	7.0
Evaluation of student progress	4	15	27	54	3.31	2.5
Laboratory management	8	8	38	46	3.23	4.5
Techniques and procedures for the selection of instructional materials	4	12	42	42	3.23	4.5
Course construction	0	12	38	50	3.38	1.0
Lesson planning	4	27	31	38	3.04	6.0
Theory and organization of the general shop	34	39	23	4	1.96	12.0
Principles of laboratory planning	11	23	35	31	2.85	8.0
Requisition writing	19	19	35	27	2.69	9.0
Micro teaching	39	31	23	7	2.00	11.0
Fundamentals of laboratory safety	7	12	23	58	3.31	2.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 33. Evaluation of technical education instructional concepts by educational occupational classification--vocational school N = 26

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	4	35	27	34	2.92	1.0
Charts and graphs	19	46	27	8	2.23	19.0
Computer graphics	46	35	12	7	1.81	31.5
Principles of architectural drafting	30	35	8	27	2.31	14.5
Industrial arts design	42	31	12	15	2.00	28.0
Descriptive geometry	39	31	15	15	2.08	24.5
Sources, development, and transmission of power	31	15	31	23	2.46	10.0
Automotive repair and maintenance	34	23	8	35	2.42	11.0
Tune-up, repair, and care of air cooled engines	31	15	23	31	2.54	9.0
Principles of test equipment and electrical diagnosis	23	27	8	42	2.69	6.0
Analysis, diagnosis, service and maintenance of home appliance	30	27	31	12	2.30	16.0
Service and repair of vehicle systems	30	31	12	27	2.35	12.5
Fundamentals of woodworking	46	31	19	4	1.81	31.5
Principles of industrial communications	31	38	23	8	2.08	24.5

Table 33 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	38	27	27	8	2.04	26.0
Principles of hydraulics pneumatics, and fluidics	31	27	27	15	2.27	17.5
Theory and application of fluid power	30	35	23	12	2.15	22.0
Principles of offset printing, silk screen, and camera operations	42	31	12	15	2.00	28.0
Techniques of photographic half tone	50	19	12	19	2.00	28.0
Principles of contact and picture printing	53	31	4	12	1.73	33.0
Basic electronic circuits	23	27	19	31	2.58	8.0
Basic electronic control processes	19	27	23	31	2.65	7.0
Electronic communications theory and adaptation of hardware	38	39	4	19	2.19	20.5
Integrated circuits	42	27	12	19	2.35	12.5
Qualitative electrical theory	42	35	8	15	1.96	30.0
Basic metalworking processes	39	19	27	15	2.19	20.5
Principles of material joining (welding)	15	19	31	35	2.85	3.0
Principles of tool making	38	23	12	27	2.27	17.5

Table 33 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	46	19	12	23	2.12	23.0
Precision measurement	23	12	19	46	2.88	2.0
Simulated industrial experience	19	23	15	43	2.81	4.0
Investigate, research, and experimentation of technical problems	7	31	35	27	2.77	5.0
System analysis and activity planning	27	31	27	15	2.31	14.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

ranked 1.0 with a mean of 2.92. The instructional concepts of precision measurement, and principles of material joining (welding) were ranked 2.0 and 3.0 respectively with means of 2.88 and 2.85. The largest percent, 46, of 'essential' responses was recorded for precision measurement.

<u>High school 10-12</u> Data contained in Table 34 reveal the value placed on the professional education instructional concepts by graduates in high school 10-12. The concepts of methods of teaching industrial arts, and fundamentals of laboratory safety had a rank of 1.5 and a mean of 3.49. The

Table 34. Evaluation of professional education instructional concepts by educational occupational classification--high school 10-12 N = 47

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	6	32	36	26	2.81	8.0
Methods of teaching industrial arts	2	11	23	64	3.49	1.5
Evaluation of student progress	3	19	23	55	3.32	4.5
Laboratory management	6	4	30	60	3.43	3.0
Techniques and procedures for the selection of instructional materials	6	15	45	34	3.06	6.0
Course construction	0	17	34	49	3.32	4.5
Lesson planning	7	23	36	34	2.98	7.0
Theory and organization of the general shop	32	38	13	17	2.15	11.0
Principles of laboratory planning	8	28	43	21	2.77	9.0
Requisition writing	13	34	30	23	2.64	10.0
Micro teaching	43	34	19	4	1.85	12.0
Fundamentals of laboratory safety	2	13	19	66	3.49	1.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

percent of responses in the 'essential' columns were 64 and 66 respectively. Laboratory management had a rank of 3.0, with a mean of 3.43, and 60 percent of the responses in the 'essential' column.

Technical education instructional concepts, as evaluated by graduates in high school 10-12, were recorded in Table 35. Fundamentals of technical drawing, simulated industrial experience, and basic electronic circuits were identified, in descending rank order, as the instructional concepts that were most valuable to this group. The largest percent, 49, of 'no-value' responses was recorded for the concept of computer graphics.

High school 9-12 The largest frequency of replies were recorded for this school classification. There were 144 graduates who were classified as high school 9-12.

Fundamentals of laboratory safety, laboratory management, and evaluation of student progress were the concepts with the highest recorded mean as summarized in Table 36. There were no responses in the 'no-value' column for the concept of laboratory management. Conversely, the concept of micro teaching had the largest percent, 41, of responses in the 'no-value' column and the smallest percent, 6, in the 'essential' column.

The graduates who listed their educational classification as senior high school 9-12 recorded a rank order of 1.0 for the concept of fundamentals of technical drawing, Table 37. Forty-six graduates, Table 5, reported teaching assignments in

Table 35. Evaluation of technical education instructional concepts by educational occupational classification--high school 10-12 N = 47

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	10	19	26	45	3.04	1.0
Charts and graphs	17	34	40	9	2.15	30.0
Computer graphics	49	19	19	13	1.96	32.0
Principles of architectural drafting	23	30	21	26	2.49	16.0
Industrial arts design	21	26	32	21	2.53	12.0
Descriptive geometry	26	40	19	15	2.23	28.0
Sources, development, and transmission of power	17	30	23	30	2.66	4.0
Automotive repair and maintenance	19	36	17	28	2.53	12.0
Tune-up, repair, and care of air cooled engines	25	26	21	28	2.51	14.0
Principles of test equipment and electrical diagnosis	18	26	28	28	2.64	7.0
Analysis, diagnosis, service and maintenance of home appliance	24	38	21	17	2.32	24.5
Service and repair of vehicle systems	20	36	21	23	2.49	16.0
Fundamentals of woodworking	24	34	21	21	2.40	21.0
Principles of industrial communications	23	26	36	15	2.43	19.5

Table 35 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	19	32	40	9	2.38	22.0
Principles of hydraulics pneumatics, and fluidics	23	43	21	13	2.32	24.5
Theory and application of fluid power	24	40	21	15	2.28	27.0
Principles of offset printing, silk screen, and camera operations	18	26	26	30	2.65	5.0
Techniques of photographic half tone	25	30	17	28	2.47	18.0
Principles of contact and picture printing	21	40	13	26	2.43	19.5
Basic electronic circuits	19	23	24	34	2.72	3.0
Basic electronic control processes	23	32	17	28	2.49	16.0
Electronic communications theory and adaptation of hardware	30	28	23	19	2.32	24.5
Integrated circuits	27	36	18	19	2.32	24.5
Qualitative electrical theory	32	40	9	19	2.15	30.0
Basic metalworking processes	13	34	36	17	2.57	10.0
Principles of material joining (welding)	17	28	40	15	2.53	12.0
Principles of tool making	28	38	28	6	1.87	33.0

Table 35 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	23	47	21	9	2.15	30.0
Precision measurement	14	32	28	26	2.64	7.0
Simulated industrial experience	10	36	18	36	2.79	2.0
Investigate, research, and experimentation of technical problems	16	28	30	26	2.64	7.0
System analysis and activity planning	15	38	19	28	2.60	9.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 36. Evaluation of professional education instructional concepts by educational occupational classification--high school 9-12 N = 144

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	5	48	26	21	2.62	9.0
Methods of teaching industrial arts	2	13	32	53	3.38	4.0
Evaluation of student progress	1	9	39	51	3.39	3.0
Laboratory management	0	15	29	56	3.42	2.0
Techniques and procedures for the selection of instructional materials	6	16	45	33	3.06	6.0
Course construction	2	22	40	36	3.09	5.0
Lesson planning	7	26	36	31	2.92	7.0
Theory and organization of the general shop	22	48	22	8	2.16	11.0
Principles of laboratory planning	7	30	39	24	2.81	8.0
Requisition writing	15	41	23	21	2.51	10.0
Micro teaching	41	34	19	6	1.91	12.0
Fundamentals of laboratory safety	1	10	28	61	3.47	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 37. Evaluation of technical education instructional concepts by educational occupational classification--high school 9-12 N = 144

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	3	19	21	57	3.31	1.0
Charts and graphs	19	46	27	8	2.25	24.5
Computer graphics	43	36	14	7	1.84	33.0
Principles of architectural drafting	18	24	27	31	2.69	9.0
Industrial arts design	7	34	33	26	2.74	7.0
Descriptive geometry	18	36	29	17	2.46	18.0
Sources, development, and transmission of power	11	30	35	24	2.72	8.0
Automotive repair and maintenance	17	31	28	24	2.60	14.0
Tune-up, repair, and care of air cooled engines	21	29	24	26	2.54	17.0
Principles of test equipment and electrical diagnosis	20	25	24	31	2.65	11.5
Analysis, diagnosis, service and maintenance of home appliance	24	40	23	13	2.24	26.0
Service and repair of vehicle systems	23	29	30	18	2.43	19.5
Fundamentals of wood-working	8	31	34	27	2.81	5.0
Principles of industrial communications	16	43	29	12	2.35	21.0

Table 37 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	17	41	34	8	2.34	22.0
Principles of hydraulics pneumatics, and fluidics	25	38	24	13	2.25	24.5
Theory and application of fluid power	28	38	24	10	2.17	28.0
Principles of offset printing, silk screen, and camera operations	28	29	25	18	2.33	23.0
Techniques of photographic half tone	38	29	19	14	2.08	31.0
Principles of contact and picture printing	35	33	16	16	2.13	30.0
Basic electronic circuits	12	27	33	28	2.77	6.0
Basic electronic control processes	12	36	33	19	2.55	16.0
Electronic communications theory and adaptation of hardware	27	38	19	16	2.23	27.0
Integrated circuits	30	38	19	13	2.16	29.0
Qualitative electrical theory	32	35	16	17	2.02	32.0
Basic metalworking processes	8	23	29	40	3.03	3.0
Principles of material joining (welding)	9	22	31	38	2.97	4.0
Principles of tool making	13	32	31	24	2.65	11.5

Table 37 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	18	29	26	27	2.63	13.0
Precision measurement	5	22	35	38	3.05	2.0
Simulated industrial experience	11	35	29	25	2.67	10.0
Investigate, research, and experimentation of technical problems	13	37	28	22	2.58	15.0
System analysis and activity planning	14	42	30	14	2.43	19.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

general drawing or technical drawing. The ranks of 2.0 and 3.0 were recorded for the concepts of precision measurement, and basic metalworking processes. The highest percent, 43, of 'no-value' responses was recorded for the concept of computer graphics.

<u>Jr./Sr. high school</u> Fifty-one graduates listed their school classification as Jr./Sr. high school. This was the second largest group in the classification of schools for graduates in education. Educational assignments within the group were distributed as follows: innovative program, 1;

multiple-activities-instructional laboratory, 12; single-activity-instructional laboratory, 49; area-unit-instructional laboratory, 30; nontechnical instruction, 1; and administration, 2.

Figures in Table 38 indicate that the graduates who had an educational assignment in Jr./Sr. high school considered the concept of fundamentals of laboratory safety to be the most important, rank of 1.0. The concept of methods of teaching industrial arts had a rank of 2.0, and laboratory management had a rank of 3.0.

The concept of fundamentals of technical drawing was ranked 1.0 by the graduates who were employed in Jr./Sr. high school, Table 39. In contrast, the concept of computer graphics was ranked 33.0. Only 6 percent of the graduates reported this concept as 'essential'. Fundamentals of woodworking was ranked 2.0 while the concept of basic metal-working processes was ranked 3.0.

Junior high school   Forty-nine graduates listed their occupational classification as junior high school 7-9. Eighty-nine respondents reported teaching assignments in the single-activity-instructional laboratory. The most common assignment in this classification was general drawing, with a frequency of 15. Two people reported administrative responsibilities.

The concept of fundamentals of laboratory safety, Table 40 was ranked 1.0 by the group. Sixty-one percent of the responses were rated 'essential'. Methods of teaching

Table 38. Evaluation of professional education instructional concepts by educational occupational classification--Jr./Sr. high school N = 51

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	8	43	29	20	2.61	8.0
Methods of teaching industrial arts	2	8	37	53	3.41	2.0
Evaluation of student progress	2	9	41	48	3.33	4.0
Laboratory management	0	12	41	47	3.35	3.0
Techniques and procedures for the selection of instructional materials	4	16	43	37	2.35	11.0
Course construction	2	12	53	33	3.18	5.0
Lesson planning	2	23	47	28	3.04	6.0
Theory and organization of the general shop	8	41	35	16	2.59	9.0
Principles of laboratory planning	2	37	47	14	2.73	7.0
Requisition writing	15	35	26	24	2.57	10.0
Micro teaching	37	39	16	8	1.94	12.0
Fundamentals of laboratory safety	2	9	28	61	3.45	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 39. Evaluation of technical education instructional concepts by educational occupational classification--Jr./Sr. high school N = 51

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	3	16	22	59	3.35	1.0
Charts and graphs	23	45	26	6	2.14	25.5
Computer graphics	43	29	22	6	1.90	33.0
Principles of architectural drafting	15	29	34	22	2.61	8.0
Industrial arts design	14	26	36	24	2.71	7.0
Descriptive geometry	21	26	33	20	2.51	14.0
Sources, development, and transmission of power	14	35	31	20	2.57	10.0
Automotive repair and maintenance	22	36	20	22	2.41	17.0
Tune-up, repair, and care of air cooled engines	20	28	30	22	2.53	13.0
Principles of test equipment and electrical diagnosis	25	25	24	26	2.49	15.5
Analysis, diagnosis, service and maintenance of home appliance	20	39	33	8	2.29	22.0
Service and repair of vehicle systems	28	29	31	12	2.27	23.5
Fundamentals of woodworking	6	18	29	47	3.18	2.0
Principles of industrial communications	24	29	37	10	2.33	20.5

Table 39 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	19	43	28	10	2.27	23.5
Principles of hydraulics pneumatics, and fluidics	29	37	24	10	2.14	25.5
Theory and application of fluid power	31	41	20	8	2.04	28.0
Principles of offset printing, silk screen, and camera operations	21	39	24	16	2.33	20.5
Techniques of photographic half tone	37	37	14	12	2.00	29.0
Principles of contact and picture printing	39	35	14	12	1.98	30.0
Basic electronic circuits	12	31	29	28	2.73	6.0
Basic electronic control processes	22	29	37	12	2.39	18.5
Electronic communications theory and adaptation of hardware	29	43	20	8	2.06	27.0
Integrated circuits	39	35	20	6	1.92	31.5
Qualitative electrical theory	41	37	10	12	1.92	31.5
Basic metalworking processes	8	24	28	40	3.02	3.0
Principles of material joining (welding)	6	22	41	31	2.98	4.0
Principles of tool making	17	35	28	20	2.49	15.5

Table 39 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	16	37	23	24	2.55	12.0
Precision measurement	8	33	33	26	2.76	5.0
Simulated industrial experience	16	31	33	20	2.57	10.0
Investigate, research, and experimentation of technical problems	10	37	39	14	2.57	10.0
System analysis and activity planning	18	31	45	6	2.39	18.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 40. Evaluation of professional education instructional concepts by educational occupational classification--junior high school 7-9 N = 49

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	12	33	41	14	2.57	10.0
Methods of teaching industrial arts	2	4	35	59	3.51	2.0
Evaluation of student progress	4	10	39	47	3.29	4.0
Laboratory management	2	12	39	47	3.31	3.0
Techniques and procedures for the selection of instructional materials	8	12	38	42	3.12	5.0
Course construction	2	20	45	33	3.08	6.0
Lesson planning	6	22	47	25	2.90	7.0
Theory and organization of the general shop	14	39	39	8	2.41	11.0
Principles of laboratory planning	14	22	52	12	2.61	9.0
Requisition writing	12	31	37	20	2.65	8.0
Micro teaching	28	39	29	4	2.08	12.0
Fundamentals of laboratory safety	4	0	35	61	3.53	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

industrial arts was ranked 2.0. Theory and organization of the general shop had a rank of 11.0 with 8 percent of the responses reported as 'essential'.

The fundamentals of technical drawing, Table 41, was ranked 1.0 by graduates in junior high school 7-9. The instructional concepts of fundamentals of woodworking and basic metalworking processes were ranked 2.0 and 3.0 respectively. Both instructional concepts had 43 percent of the responses in the 'essential' column. For the concept of integrated circuits, a relatively high percent of responses were recorded as 'no-value'.

Elementary K-8 Fourteen respondents identified with elementary K-8. Twelve graduates listed the multiple-activities-instructional-laboratory as their teaching assignment. One graduate was teaching in an innovative program.

Methods of teaching industrial arts and fundamentals of laboratory safety had a rank of 1.5, Table 42. Fifty percent of the graduates rated these concepts 'essential'. Six instructional concepts had a mean of 3.00 or larger.

The concepts of basic metalworking processes, fundamentals of woodworking, and fundamentals of technical drawing were ranked 1.0 through 3.0 respectively, Table 43. The percent of responses in the 'essential' category were: 79, 71, and 65, respectively. In contrast, there were no 'essential' responses for fifteen instructional concepts. The

Table 41. Evaluation of technical education instructional concepts by educational occupational classification--junior high school 7-9 N = 49

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	2	14	43	41	3.22	1.0
Charts and graphs	20	58	16	6	2.08	20.0
Computer graphics	49	33	12	6	1.76	28.0
Principles of architectural drafting	12	29	49	10	2.57	7.0
Industrial arts design	14	25	43	18	2.65	5.0
Descriptive geometry	25	49	18	8	2.10	18.0
Sources, development, and transmission of power	27	33	38	2	2.16	15.5
Automotive repair and maintenance	36	33	25	6	2.00	24.0
Tune-up, repair, and care of air cooled engines	37	29	22	12	2.10	18.0
Principles of test equipment and electrical diagnosis	38	25	29	8	2.06	21.0
Analysis, diagnosis, service and maintenance of home appliance	36	31	25	8	2.04	22.5
Service and repair of vehicle systems	45	37	12	6	1.80	27.0
Fundamentals of woodworking	8	14	35	43	3.12	2.0
Principles of industrial communications	20	27	31	22	2.51	8.0

Table 41 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	26	45	15	14	2.16	15.5
Principles of hydraulics pneumatics, and fluidics	49	35	12	4	1.71	29.0
Theory and application of fluid power	59	31	6	4	1.55	31.0
Principles of offset printing, silk screen, and camera operations	27	35	16	22	2.35	11.5
Techniques of photographic half tone	46	30	14	10	1.88	26.0
Principles of contact and picture printing	41	29	16	14	2.04	22.5
Basic electronic circuits	22	33	31	14	2.37	9.5
Basic electronic control processes	30	33	33	4	2.10	18.0
Electronic communications theory and adaptation of hardware	47	39	12	2	1.69	30.0
Integrated circuits	53	41	6	0	1.53	32.5
Qualitative electrical theory	56	35	6	3	1.53	32.5
Basic metalworking processes	14	14	29	43	3.00	3.0
Principles of material joining (welding)	22	23	29	26	2.59	6.0
Principles of tool making	26	35	29	10	2.22	14.0

Table 41 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	31	25	30	14	2.29	13.0
Precision measurement	20	35	35	10	2.34	11.5
Simulated industrial experience	12	29	26	33	2.80	4.0
Investigate, research, and experimentation of technical problems	24	31	29	16	2.37	9.5
System analysis and activity planning	29	28	31	12	1.96	25.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 42. Evaluation of professional education instructional concepts by educational occupational classification--elementary K-8 N = 14

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	14	50	29	7	2.29	10.0
Methods of teaching industrial arts	0	21	29	50	3.29	1.5
Evaluation of student progress	7	14	29	50	3.21	3.5
Laboratory management	7	14	29	50	3.21	3.5
Techniques and procedures for the selection of instructional materials	14	7	58	21	2.86	7.5
Course construction	7	14	43	36	3.07	5.0
Lesson planning	7	7	65	21	3.00	6.0
Theory and organization of the general shop	7	36	21	36	2.86	7.5
Principles of laboratory planning	21	29	36	14	2.43	9.0
Requisition writing	43	22	14	21	2.14	11.0
Micro teaching	64	22	7	7	1.57	12.0
Fundamentals of laboratory safety	7	7	36	50	3.29	1.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 43. Evaluation of technical education instructional concepts by educational occupational classification--elementary K-8 N = 14

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	21	14	65	3.43	3.0
Charts and graphs	57	29	14	0	1.57	28.0
Computer graphics	79	14	7	0	1.29	32.0
Principles of architectural drafting	14	21	51	14	2.64	6.0
Industrial arts design	7	43	36	14	2.57	8.0
Descriptive geometry	29	71	0	0	1.71	25.0
Sources, development, and transmission of power	36	28	36	0	2.00	20.0
Automotive repair and maintenance	29	64	7	0	1.79	23.0
Tune-up, repair, and care of air cooled engines	36	57	7	0	1.71	25.0
Principles of test equipment and electrical diagnosis	36	28	29	7	2.07	19.0
Analysis, diagnosis, service and maintenance of home appliance	14	58	21	7	2.21	15.5
Service and repair of vehicle systems	57	36	7	0	1.50	29.5
Fundamentals of woodworking	0	14	15	71	3.51	2.0
Principles of industrial communications	21	36	36	7	2.29	13.0

Table 43 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	21	36	43	0	2.21	15.5
Principles of hydraulics pneumatics, and fluidics	71	29	0	0	1.29	32.0
Theory and application of fluid power	71	29	0	0	1.29	32.0
Principles of offset printing, silk screen, and camera operations	7	29	36	28	2.86	5.0
Techniques of photographic half tone	57	36	7	0	1.50	29.5
Principles of contact and picture printing	43	50	0	7	1.71	25.0
Basic electronic circuits	7	14	29	50	3.21	4.0
Basic electronic control processes	7	57	29	7	2.36	11.0
Electronic communications theory and adaptation of hardware	14	57	29	0	2.14	17.5
Integrated circuits	29	57	14	0	1.86	22.0
Qualitative electrical theory	50	43	0	7	1.64	27.0
Basic metalworking processes	7	0	14	79	3.64	1.0
Principles of material joining (welding)	14	36	43	7	2.43	10.0
Principles of tool making	7	72	21	0	2.14	17.5

Table 43 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	7	43	36	14	2.57	8.0
Precision measurement	7	65	21	7	2.29	13.0
Simulated industrial experience	14	36	29	21	2.57	8.0
Investigate, research, and experimentation of technical problems	21	29	50	0	2.29	13.0
System analysis and activity planning	43	29	21	7	1.93	21.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

instructional concept of computer graphics had the largest percent, 79, of 'no-value' responses.

Middle school The instructional concepts of fundamentals of laboratory safety and methods of teaching industrial arts were considered the two most important professional instructional concept by respondents in the middle school, Table 44. There were no 'no-value' responses recorded for fundamentals of laboratory safety.

Table 45 records how the graduates employed in the middle school responded to the technical education instructional

Table 44. Evaluation of professional education instructional concepts by educational occupational classification--middle school N = 18

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	17	33	39	11	2.44	10.5
Methods of teaching industrial arts	5	6	45	44	3.28	2.0
Evaluation of student progress	6	17	50	27	3.00	5.5
Laboratory management	6	11	44	39	3.17	3.0
Techniques and procedures for the selection of instructional materials	0	22	45	33	3.11	4.0
Course construction	11	28	39	22	2.72	9.0
Lesson planning	0	28	44	28	3.00	5.5
Theory and organization of the general shop	0	33	45	22	2.89	7.0
Principles of laboratory planning	6	39	22	33	2.83	8.0
Requisition writing	22	28	33	17	2.44	10.5
Micro teaching	50	33	11	6	1.72	12.0
Fundamentals of laboratory safety	0	11	44	45	3.33	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 45. Evaluation of technical education instructional concepts by educational occupational classification--middle school N = 18

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	16	39	45	3.28	3.0
Charts and graphs	11	72	11	6	2.11	20.5
Computer graphics	38	56	6	0	1.67	32.0
Principles of architectural drafting	11	39	28	22	2.61	7.0
Industrial arts design	6	33	39	22	2.78	5.5
Descriptive geometry	22	55	11	12	2.11	20.5
Sources, development, and transmission of power	16	56	22	6	2.17	18.5
Automotive repair and maintenance	11	67	5	17	2.28	15.5
Tune-up, repair, and care of air cooled engines	22	44	17	17	2.28	15.5
Principles of test equipment and electrical diagnosis	39	39	22	0	1.83	27.0
Analysis, diagnosis, service and maintenance of home appliance	28	50	11	11	2.06	22.5
Service and repair of vehicle systems	22	56	22	0	2.00	24.5
Fundamentals of woodworking	0	6	22	72	3.67	1.0
Principles of industrial communications	16	34	44	6	2.39	12.0

Table 45 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	33	22	28	17	2.50	9.5
Principles of hydraulics pneumatics, and fluidics	44	39	17	0	1.72	30.5
Theory and application of fluid power	44	39	17	0	1.72	30.5
Principles of offset printing, silk screen, and camera operations	11	22	33	34	2.89	4.0
Techniques of photographic half tone	39	28	28	5	2.00	24.5
Principles of contact and picture printing	39	33	28	0	1.88	26.0
Basic electronic circuits	33	11	28	28	2.50	9.5
Basic electronic control processes	33	33	28	6	2.06	22.5
Electronic communications theory and adaptation of hardware	39	44	17	0	1.78	28.5
Integrated circuits	50	28	17	5	1.78	28.5
Qualitative electrical theory	50	50	0	0	1.50	33.0
Basic metalworking processes	5	6	28	61	3.45	2.0
Principles of material joining (welding)	17	22	28	33	2.78	5.5
Principles of tool making	27	28	28	17	2.33	13.0

Table 45 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	22	22	45	11	2.44	11.0
Precision measurement	39	11	33	17	2.28	15.5
Simulated industrial experience	17	22	50	11	2.56	8.0
Investigate, research, and experimentation of technical problems	28	28	33	11	2.28	15.5
System analysis and activity planning	28	39	22	11	2.17	18.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

concepts. The instructional concepts of fundamentals of woodworking, basic metalworking processes, and fundamentals of technical drawing were ranked the highest. There were no 'essential' responses for eight of the instructional concepts.

<u>Other</u> Thirteen respondents classified themselves in an educational institution listed as other. The reported educational assignments within the group were: multiple-activities-instructional laboratory, general woods, auto mechanics, related subjects, buildings and grounds, coordination, and director.

The professional education instructional concepts, Table 46, that received the three highest ranks were: fundamentals of laboratory safety, evaluation of student progress, and techniques and procedures for the selection of instructional materials. As an instructional concept, fundamentals of laboratory safety had a mean of 3.17 and 58 percent of the responses recorded as 'essential'. The highest percent 58, of 'no-value' responses was recorded for micro teaching. This instructional concept had a rank of 12.0 and a mean of 1.67.

Educators who classified themselves as others, evaluated technical education instructional concepts as recorded in Table 47. The concept of fundamentals of technical drawing was ranked 1.0. Investigate, research, and experimentation of technical problems was the concept that had a rank of 2.0. Twelve instructional concepts were not rated as 'essential' by the group. Conversely, three instructional concepts were not rated as 'no-value'.

The data in Table 48 reveal that the concept of fundamentals of laboratory safety was ranked 1.0 through 6.0. The instructional concept of methods of teaching industrial arts was ranked 1.5 through 7.0. The graduates in the school classification of college or university and vocational school placed less emphasis on this concept, rank of 7.0.

The data in Table 49 reveal that the instructional concept of fundamentals of technical drawing was ranked high, 1.0

Table 46. Evaluation of professional education instructional concepts by educational occupational classification--other N = 13

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	25	50	8	17	2.17	11.0
Methods of teaching industrial arts	25	17	16	42	2.75	5.5
Evaluation of student progress	17	8	25	50	3.08	2.0
Laboratory management	17	33	8	42	2.92	4.0
Techniques and procedures for the selection of instructional materials	17	8	33	42	3.00	3.0
Course construction	17	33	17	33	2.67	7.0
Lesson planning	25	0	50	25	2.75	5.5
Theory and organization of the general shop	33	17	33	17	2.33	9.5
Principles of laboratory planning	8	42	42	8	2.50	8.0
Requisition writing	25	25	42	8	2.33	9.5
Micro teaching	58	25	8	9	1.67	12.0
Fundamentals of laboratory safety	17	8	17	58	3.17	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 47. Evaluation of technical education instructional concepts by educational occupational classification--other N = 13

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	25	58	17	2.92	1.0
Charts and graphs	8	67	17	8	2.25	14.0
Computer graphics	50	33	17	0	1.67	33.0
Principles of architectural drafting	8	33	42	17	2.67	4.0
Industrial arts design	16	25	42	17	2.58	6.5
Descriptive geometry	17	50	25	8	2.42	8.5
Sources, development, and transmission of power	25	50	17	8	2.08	23.5
Automotive repair and maintenance	25	42	25	8	2.17	18.5
Tune-up, repair, and care of air cooled engines	17	50	33	0	2.17	18.5
Principles of test equipment and electrical diagnosis	17	50	33	0	2.17	18.5
Analysis, diagnosis, service and maintenance of home appliance	33	50	17	0	1.83	29.5
Service and repair of vehicle systems	17	50	33	0	2.17	18.5
Fundamentals of woodworking	25	33	17	25	2.42	8.5
Principles of industrial communications	25	25	42	8	2.33	11.0

Table 47 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	33	25	25	17	2.25	14.0
Principles of hydraulics pneumatics, and fluidics	41	42	17	0	1.75	31.5
Theory and application of fluid power	42	41	17	0	1.75	31.5
Principles of offset printing, silk screen, and camera operations	25	50	17	8	2.08	23.5
Techniques of photographic half tone	41	42	8	9	1.83	29.5
Principles of contact and picture printing	34	33	33	0	2.00	26.0
Basic electronic circuits	0	67	33	0	2.33	11.0
Basic electronic control processes	8	67	25	0	2.17	18.5
Electronic communications theory and adaptation of hardware	33	34	25	8	2.08	23.5
Integrated circuits	33	42	25	0	1.92	27.5
Qualitative electrical theory	8	67	17	8	2.25	14.0
Basic metalworking processes	0	50	33	17	2.67	4.0
Principles of material joining (welding)	8	33	42	17	2.67	4.0
Principles of tool making	25	58	17	0	1.92	27.5

Table 47 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	25	50	17	8	2.08	23.5
Precision measurement	33	17	33	17	2.33	11.0
Simulated industrial experience	25	42	25	8	2.17	18.5
Investigate, research, and experimentation of technical problems	8	34	33	25	2.75	2.0
System analysis and activity planning	8	42	33	17	2.58	6.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 48. Evaluation of professional instructional concepts by rank and mean for school classification N = 393

Instructional concepts	School classification			
	College or university N = 31	Vocational school N = 26	High school 10-12 N = 47	High school 9-12 N = 144
Philosophy of industrial arts education	9.0[a] 2.71[b]	10.0 2.54	8.0 2.81	9.0 2.62
Methods of teaching industrial arts	7.0 2.84	7.0 2.92	1.5 3.49	4.0 3.38
Evaluation of student progress	1.0 3.55	2.5 3.31	4.5 3.32	3.0 3.39
Laboratory management	2.5 3.26	4.5 3.23	3.0 3.43	2.0 3.42
Techniques and procedures for the selection of instructional materials	2.5 3.26	4.5 3.23	6.0 3.06	6.0 3.06
Course construction	5.0 3.10	1.0 3.38	4.5 3.32	5.0 3.09
Lesson planning	4.0 3.16	6.0 3.04	7.0 2.98	7.0 2.92
Theory and organization of the general shop	12.0 1.90	12.0 1.96	11.0 2.15	11.0 2.16
Principles of laboratory planning	8.0 2.74	8.0 2.85	9.0 2.77	8.0 2.81
Requisition writing	10.0 2.45	9.0 2.69	10.0 2.64	10.0 2.51
Micro teaching	11.0 2.19	11.0 2.00	12.0 1.85	12.0 1.91
Fundamentals of laboratory safety	6.0 2.90	2.5 3.31	1.5 3.49	1.0 3.47

[a]Rank.

[b]Mean.

School classification				
Jr./Sr. high school N = 51	Junior high school 7-9 N = 49	Elementary K-8 N = 14	Middle school N = 18	Other N = 13
8.0 2.61	10.0 2.57	10.0 2.29	10.5 2.44	11.0 2.17
2.0 3.41	2.0 3.51	1.5 3.29	2.0 3.28	5.5 2.75
4.0 3.33	4.0 3.29	3.5 3.21	5.5 3.00	2.0 3.08
3.0 3.35	3.0 3.31	3.5 3.21	3.0 3.17	4.0 2.92
11.0 2.35	5.0 3.12	7.5 2.86	4.0 3.11	3.0 3.00
5.0 3.18	6.0 3.08	5.0 3.07	9.0 2.72	7.0 2.67
6.0 3.04	7.0 2.90	6.0 3.00	5.5 3.00	5.5 2.75
9.0 2.59	11.0 2.41	7.5 2.86	7.0 2.89	9.5 2.33
7.0 2.73	9.0 2.61	9.0 2.43	8.0 2.83	8.0 2.50
10.0 2.57	8.0 2.65	11.0 2.14	10.5 2.44	9.5 2.33
12.0 1.94	12.0 2.08	12.0 1.57	12.0 1.72	12.0 1.67
1.0 3.45	1.0 3.53	1.5 3.29	1.0 3.33	1.0 3.17

Table 49. Evaluation of technical instructional concepts by rank and mean for school classification N = 393

Instructional concepts	School classification: College or university N = 31	Vocational school N = 26	High school 10-12 N = 47	High school 9-12 N = 144
Fundamentals of technical drawing	4.0[a] 2.42[b]	1.0 2.92	1.0 3.04	1.0 3.31
Charts and graphs	8.5 2.26	19.0 2.23	30.0 2.15	24.5 2.25
Computer graphics	26.0 1.90	31.5 1.81	32.0 1.96	33.0 1.84
Principles of architectural drafting	17.0 2.06	14.5 2.31	16.0 2.49	9.0 2.69
Industrial arts design	10.5 2.19	28.0 2.00	12.0 2.53	7.0 2.74
Descriptive geometry	15.5 2.13	24.5 2.08	28.0 2.23	18.0 2.46
Sources, development, and transmission of power	10.5 2.19	10.0 2.46	4.0 2.66	8.0 2.72
Automotive repair and maintenance	18.5 2.03	11.0 2.42	12.0 2.53	14.0 2.60
Tune-up, repair, and care of air cooled engines	18.5 2.03	9.0 2.54	14.0 2.51	17.0 2.54
Principles of test equipment and electrical diagnosis	22.0 1.97	6.0 2.69	7.0 2.64	11.5 2.65
Analysis, diagnosis, service and maintenance of home appliance	32.0 1.64	16.0 2.30	24.5 2.32	26.0 2.24
Service and repair of vehicle systems	30.0 1.81	12.5 2.35	16.0 2.49	19.5 2.43

[a]Rank.

[b]Mean.

School classification				
Jr./Sr. high school N = 51	Junior high school 7-9 N = 49	Elementary K-8 N = 14	Middle school N = 18	Other N = 13
1.0 3.35	1.0 3.22	3.0 3.43	3.0 3.28	1.0 2.92
25.5 2.14	20.0 2.08	28.0 1.57	20.5 2.11	14.0 2.25
33.0 1.90	28.0 1.76	32.0 1.29	32.0 1.67	33.0 1.67
8.0 2.61	7.0 2.57	6.0 2.64	7.0 2.61	4.0 2.67
7.0 2.71	5.0 2.65	8.0 2.57	5.5 2.78	6.5 2.58
14.0 2.51	18.0 2.10	25.0 1.71	20.5 2.11	8.5 2.42
10.0 2.57	15.5 2.16	20.0 2.00	18.5 2.17	23.5 2.08
17.0 2.41	24.0 2.00	23.0 1.79	15.5 2.28	18.5 2.17
13.0 2.53	18.0 2.10	25.0 1.71	15.5 2.28	18.5 2.17
15.5 2.49	21.0 2.06	19.0 2.07	27.0 1.83	18.5 2.17
22.0 2.29	22.5 2.04	15.5 2.21	22.5 2.06	29.5 1.83
23.5 2.27	27.0 1.80	29.5 1.50	24.5 2.00	18.5 2.17

Table 49 (Continued)

Instructional concepts	School classification: College or university N = 31	Vocational school N = 26	High school 10-12 N = 47	High school 9-12 N = 144
Fundamentals of woodworking	27.0 1.87	31.5 1.81	21.0 2.40	5.0 2.81
Principles of industrial communications	15.5 2.13	24.5 2.08	19.5 2.43	21.0 2.35
Methods of storage and retreival of information	7.0 2.29	26.0 2.04	22.0 2.38	22.0 2.34
Principles of hydraulics pneumatics, and fluidics	22.0 1.97	17.5 2.27	24.5 2.32	24.5 2.25
Theory and application of fluid power	28.5 1.84	22.0 2.15	27.0 2.28	28.0 2.17
Principles of offset printing, silk screen, and camera operations	13.0 2.16	28.0 2.00	5.0 2.65	23.0 2.33
Techniques of photographic half tone	28.5 1.84	28.0 2.00	18.0 2.47	31.0 2.08
Principles of contact and picture printing	31.0 1.80	33.0 1.73	19.5 2.43	30.0 2.13
Basic electronic circuits	6.0 2.32	8.0 2.58	3.0 2.72	6.0 2.77
Basic electronic control processes	13.0 2.16	7.0 2.65	16.0 2.49	16.0 2.55
Electronic communications theory and adaptation of hardware	24.5 1.94	20.5 2.19	24.5 2.32	27.0 2.23
Integrated circuits	22.0 1.97	12.5 2.35	24.5 2.32	29.0 2.16
Qualitative electrical theory	33.0 1.61	30.0 1.96	30.0 2.15	32.0 2.02
Basic metalworking processes	13.0 2.16	20.5 2.19	10.0 2.57	3.0 3.03

School classification				
Jr./Sr. high school N = 51	Junior high school N = 49	Elementary K-8 N = 14	Middle school N = 18	Other N = 13
2.0 3.18	2.0 3.12	2.0 3.51	1.0 3.67	8.5 2.42
20.5 2.33	8.0 2.51	13.0 2.29	12.0 2.39	11.0 2.33
23.5 2.27	15.5 2.16	15.5 2.21	9.5 2.50	14.0 2.25
25.5 2.14	29.0 1.71	32.0 1.29	30.5 1.72	31.5 1.75
28.0 2.04	31.0 1.55	32.0 1.29	30.5 1.72	31.5 1.75
20.5 2.33	11.5 2.35	5.0 2.86	4.0 2.89	23.5 2.08
29.0 2.00	26.0 1.88	29.5 1.50	24.5 2.00	29.5 1.83
30.0 1.98	22.5 2.04	25.0 1.71	26.0 1.88	26.0 2.00
6.0 2.73	9.5 2.37	4.0 3.21	9.5 2.50	11.0 2.33
18.5 2.39	18.0 2.10	11.0 2.36	22.5 2.06	18.5 2.17
27.0 2.06	30.0 1.69	17.5 2.14	28.5 1.78	23.5 2.08
31.5 1.92	32.5 1.53	22.0 1.86	28.5 1.78	27.5 1.92
31.5 1.92	32.5 1.53	27.0 1.64	33.0 1.50	14.0 2.25
3.0 3.02	3.0 3.00	1.0 3.64	2.0 3.45	4.0 2.67

Table 49 (Continued)

	School classification			
	College or university N = 31	Vocational school N = 26	High school 10-12 N = 47	High school 9-12 N = 144
Principles of material joining (welding)	5.0 2.35	3.0 2.85	12.0 2.53	4.0 2.97
Principles of tool making	24.5 1.94	17.5 2.27	33.0 1.87	11.5 2.65
Fundamentals of heat treating	21.0 2.00	23.0 2.12	30.0 2.15	13.0 2.63
Precision measurement	8.5 2.26	2.0 2.88	7.0 2.64	2.0 3.05
Simulated industrial experiences	2.0 2.48	4.0 2.81	2.0 2.79	10.0 2.67
Investigate, research, and experimentation of technical problems	1.0 2.58	5.0 2.77	7.0 2.64	15.0 2.58
System analysis and activity planning	3.0 2.45	14.5 2.31	9.0 2.60	19.5 2.43

School classification				
Jr./Sr. high school N = 51	Junior high school N = 49	Elementary K-8 N = 14	Middle school N = 18	Other N = 13
4.0 2.98	6.0 2.59	10.0 2.43	5.5 2.78	4.0 2.67
15.5 2.49	14.0 2.22	17.5 2.14	13.0 2.33	27.5 1.92
12.0 2.55	13.0 2.29	8.0 2.57	11.0 2.44	23.5 2.08
5.0 2.76	11.5 2.34	13.0 2.29	15.5 2.28	11.0 2.33
10.0 2.57	4.0 2.80	8.0 2.57	8.0 2.56	18.5 2.17
10.0 2.57	9.5 2.37	13.0 2.29	15.5 2.28	2.0 2.75
18.5 2.39	25.0 1.96	21.0 1.93	18.5 2.17	6.5 2.58

through 4.0, with a range in the means from 2.92 to 3.43. Basic metalworking processes was the instructional concept that was ranked 1.0 through 4.0 in six of the school classifications. The school classification of college or university, vocational school, and high school 10-12 ranked the instructional concept of fundamentals of technical drawing 13.0, 20.5, 10.0 respectively. The instructional concept of fundamentals of woodworking ranked high, 1.0 through 9.0, in six school classifications. In three school classifications, the instructional concept of fundamentals of woodworking was ranked, 27.0, 31.5, and 21.0 respectively.

<u>Area of work</u>

The data in tables 50 through 100 were the evaluations of the graduates in education according to area of work. The six areas of work were: innovative program, multiple-activities-instructional laboratory, single-activity-instructional laboratory, area-unit-instructional laboratory, nontechnical instruction, and administration. Innovative program, multiple-activities-instructional laboratory, nontechnical instructional, and administration were combined on one summary table.

<u>Innovative program</u> A mean of 3.14 was recorded for the instructional concept of evaluation of student progress. A large percent, 64, of the replies in the 'essential' column was recorded for the concept of fundamentals of laboratory safety. The percent, mean, and rank for profes-

sional education instructional concepts were recorded in Table 50.

Data in Table 51 disclose the evaluation of technical education instructional concepts. The instructional concept of simulated industrial experience was ranked 1.0.

Multiple-activities-instructional laboratory Data in Table 52 reveal the evaluation of the professional education instructional concepts. Methods of teaching industrial arts was ranked 1.0 with 61 percent of the responses recorded as 'essential'.

Contained in Table 53 are data which reveal that the instructional concept of fundamentals of woodworking, fundamentals of technical drawing, and basic metalworking processes were ranked consecutively 1.0, 2.0, and 3.0 by the graduates in multiple-activities-instructional laboratory.

Single-activity-instructional laboratory The graduates who reported teaching responsibilities in single-activity-instructional laboratory were grouped according to their instructional assignment. These instructional assignments were: 1) general drawing, 2) general electricity, 3) general graphic arts, 4) general metals, 5) general plastics, 6) general power, 7) general wood, and 8) other.

General drawing Data in Table 54 reveal that the fundamentals of laboratory safety and laboratory management were ranked as the most important instructional concepts. Six instructional concepts had a mean larger than 3.00. The least

Table 50. Evaluation of professional education instructional concepts by educational area of work--innovative program N = 14

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	14	14	36	36	2.93	5.5
Methods of teaching industrial arts	7	7	7	79	3.57	1.0
Evaluation of student progress	7	7	50	36	3.14	4.0
Laboratory management	7	22	14	57	3.21	3.0
Techniques and procedures for the selection of instructional materials	14	21	22	43	2.93	5.5
Course construction	14	21	43	22	2.71	9.0
Lesson planning	7	36	28	29	2.79	8.0
Theory and organization of the general shop	29	21	36	14	2.36	11.0
Principles of laboratory planning	14	21	29	36	2.86	7.0
Requisition writing	21	29	29	21	2.50	10.0
Micro teaching	50	7	29	14	2.07	12.0
Fundamentals of laboratory safety	7	0	29	64	3.50	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 51. Evaluation of technical education instructional concepts by educational area of work--innovative program N = 14

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	14	57	29	3.14	4.5
Charts and graphs	14	43	36	7	2.36	22.0
Computer graphics	36	36	21	7	2.00	28.5
Principles of architectural drafting	21	21	36	22	2.57	19.0
Industrial arts design	0	21	36	43	3.21	3.0
Descriptive geometry	7	36	36	21	2.71	15.5
Sources, development, and transmission of power	14	50	29	7	2.29	24.0
Automotive repair and maintenance	43	29	14	14	2.00	28.5
Tune-up, repair, and care of air cooled engines	50	22	14	14	1.93	30.0
Principles of test equipment and electrical diagnosis	29	43	21	7	2.07	27.0
Analysis, diagnosis, service and maintenance of home appliance	57	22	7	14	1.79	33.0
Service and repair of vehicle systems	43	36	14	7	1.86	31.5
Fundamentals of wood-working	0	28	43	29	3.00	6.5
Principles of industrial communications	0	36	35	29	2.93	9.0

Table 51 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	7	43	21	29	2.71	15.5
Principles of hydraulics pneumatics, and fluidics	36	21	14	29	2.36	22.0
Theory and application of fluid power	36	29	14	21	2.21	25.0
Principles of offset printing, silk screen, and camera operations	7	36	14	43	2.93	9.0
Techniques of photographic half tone	36	7	29	28	2.50	20.0
Principles of contact and picture printing	14	21	36	29	2.79	12.5
Basic electronic circuits	7	21	43	29	2.93	9.0
Basic electronic control processes	7	21	58	14	2.79	12.5
Electronic communications theory and adaptation of hardware	14	29	36	21	2.64	17.5
Integrated circuits	36	29	21	14	2.14	26.0
Qualitative electrical theory	36	50	7	7	1.86	31.5
Basic metalworking processes	0	29	43	28	3.00	6.5
Principles of material joining (welding)	7	29	43	21	2.79	12.5
Principles of tool making	14	29	36	21	2.64	17.5

Table 51 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	21	36	29	14	2.36	22.0
Precision measurement	7	29	43	21	2.79	12.5
Simulated industrial experience	0	21	0	79	3.57	1.0
Investigate, research, and experimentation of technical problems	0	29	14	57	3.29	2.0
System analysis and activity planning	14	7	29	50	3.14	4.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 52. Evaluation of professional education instructional concepts by educational area of work--multiple-activities-instructional laboratory N = 56

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	13	32	32	23	2.66	10.0
Methods of teaching industrial arts	2	3	34	61	3.54	1.0
Evaluation of student progress	3	9	38	50	3.34	3.0
Laboratory management	2	16	39	43	3.23	4.0
Techniques and procedures for the selection of instructional materials	7	18	41	34	3.02	6.5
Course construction	2	23	46	29	3.02	6.5
Lesson planning	5	16	47	32	3.05	5.0
Theory and organization of the general shop	9	30	38	23	2.75	8.0
Principles of laboratory planning	11	30	38	21	2.70	9.0
Requisition writing	20	36	21	23	2.48	11.0
Micro teaching	41	39	14	6	1.84	12.0
Fundamentals of laboratory safety	4	5	32	59	3.46	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 53. Evaluation of technical education instructional concepts by educational area of work--multiple-activities-instructional laboratory N = 56

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	14	29	57	3.43	2.0
Charts and graphs	37	45	13	5	1.86	28.0
Computer graphics	52	30	18	0	1.66	33.0
Principles of architectural drafting	13	30	41	16	2.61	10.0
Industrial arts design	7	38	37	18	2.73	7.0
Descriptive geometry	29	39	23	9	2.13	23.0
Sources, development, and transmission of power	12	36	41	11	2.50	13.0
Automotive repair and maintenance	11	55	21	13	2.36	17.0
Tune-up, repair, and care of air cooled engines	14	42	23	21	2.52	12.0
Principles of test equipment and electrical diagnosis	25	27	39	9	2.32	18.5
Analysis, diagnosis, service and maintenance of home appliance	21	48	20	11	2.20	22.0
Service and repair of vehicle systems	29	37	30	4	2.09	24.5
Fundamentals of woodworking	0	9	25	66	3.57	1.0
Principles of industrial communications	23	29	41	7	2.32	18.5

Table 53 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	29	32	25	14	2.25	20.5
Principles of hydraulics pneumatics, and fluidics	43	39	16	2	1.77	31.0
Theory and application of fluid power	45	41	12	2	1.71	32.0
Principles of offset printing, silk screen, and camera operations	11	32	34	23	2.70	8.0
Techniques of photographic half tone	39	43	13	5	1.84	29.0
Principles of contact and picture printing	30	41	18	11	2.09	24.5
Basic electronic circuits	10	20	36	34	2.93	4.0
Basic electronic control processes	18	32	43	7	2.39	15.5
Electronic communications theory and adaptation of hardware	25	48	23	4	2.05	26.0
Integrated circuits	34	46	16	4	1.89	27.0
Qualitative electrical theory	41	47	5	7	1.79	30.0
Basic metalworking processes	5	9	27	59	3.39	3.0
Principles of material joining (welding)	9	25	39	27	2.84	5.0
Principles of tool making	12	39	38	11	2.46	14.0

Table 53 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	11	25	43	21	2.75	6.0
Precision measurement	20	30	25	25	2.55	11.0
Simulated industrial experience	12	32	36	20	2.62	9.0
Investigate, research, and experimentation of technical problems	21	29	39	11	2.39	15.5
System analysis and activity planning	25	34	32	9	2.25	20.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 54. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general drawing N = 54

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	7	44	32	17	2.57	11.0
Methods of teaching industrial arts	0	11	41	48	3.37	3.5
Evaluation of student progress	2	11	35	52	3.37	3.5
Laboratory management	2	7	37	54	3.43	2.0
Techniques and procedures for the selection of instructional materials	4	15	39	42	3.20	5.0
Course construction	4	19	44	33	3.07	6.0
Lesson planning	6	22	46	26	2.93	7.0
Theory and organization of the general shop	9	32	46	13	2.63	9.0
Principles of laboratory planning	0	32	50	18	2.87	8.0
Requisition writing	13	37	28	22	2.59	10.0
Micro teaching	33	41	22	4	1.96	12.0
Fundamentals of laboratory safety	0	9	33	58	3.48	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

important instructional concept was micro teaching with a mean of 1.96.

It was observed in Table 55 that the concept of fundamentals of technical drawing had a rank of 1.0. Sixty-seven percent of the respondents rated this instructional concept as 'essential'. Fundamentals of woodworking was ranked 2.0 with 50 percent of the responses in the 'essential' column. Eight instructional concepts had a recorded mean of less than 2.00. Qualitative electrical theory was recorded as the least important concept with a mean of 1.59.

General electricity Data in Table 56 disclose that the concept of fundamentals of laboratory safety was ranked the most important by the graduates in general electricity. Micro teaching was rated as the least important concept with a mean of 1.63. No respondent considered this concept 'essential'. Five instructional concepts had a mean larger than 3.00.

The importance placed on technical instructional concepts by graduates who had assignments in general electricity was recorded in Table 57. Basic electronic circuits was ranked 1.0 with a mean of 3.21. Five instructional concept had a mean of 3.00 or larger. The concept of computer graphics was ranked 33. Fifty-eight percent of the respondents reported that this concept was of 'no-value'. Four instructional concepts had a mean of less than 1.99.

Table 55. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general drawing N = 54

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	7	26	67	3.59	1.0
Charts and graphs	11	57	26	6	2.26	16.5
Computer graphics	44	37	13	6	1.80	29.0
Principles of architectural drafting	9	22	41	28	2.87	3.5
Industrial arts design	9	31	43	17	2.67	6.0
Descriptive geometry	16	43	22	19	2.43	9.0
Sources, development, and transmission of power	24	35	30	11	2.28	15.0
Automotive repair and maintenance	35	30	26	9	2.09	23.0
Tune-up, repair, and care of air cooled engines	30	31	30	9	2.19	20.5
Principles of test equipment and electrical diagnosis	39	30	22	9	2.02	25.0
Analysis, diagnosis, service and maintenance of home appliance	26	37	28	9	2.20	18.5
Service and repair of vehicle systems	37	35	24	4	1.94	27.0
Fundamentals of woodworking	6	13	31	50	3.26	2.0
Principles of industrial communications	11	44	30	15	2.48	8.0

Table 55 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	24	47	20	9	2.15	22.0
Principles of hydraulics pneumatics, and fluidics	48	37	11	4	1.70	31.0
Theory and application of fluid power	48	39	9	4	1.69	32.0
Principles of offset printing, silk screen, and camera operations	28	30	24	18	2.33	13.0
Techniques of photographic half tone	39	30	20	11	2.04	24.0
Principles of contact and picture printing	37	39	13	11	1.98	26.0
Basic electronic circuits	20	37	24	19	2.41	10.0
Basic electronic control processes	28	37	24	11	2.19	20.5
Electronic communications theory and adaptation of hardware	41	39	9	11	1.91	28.0
Integrated circuits	44	43	9	4	1.72	30.0
Qualitative electrical theory	54	37	5	4	1.59	33.0
Basic metalworking processes	9	26	34	31	2.87	3.5
Principles of material joining (welding)	13	28	33	26	2.72	5.0
Principles of tool making	19	48	22	11	2.26	16.5

Table 55 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	22	47	20	11	2.20	18.5
Precision measurement	11	41	33	15	2.32	14.0
Simulated industrial experience	15	35	32	18	2.54	7.0
Investigate, research, and experimentation of technical problems	20	37	26	17	2.39	11.0
System analysis and activity planning	20	37	30	13	2.35	12.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 56. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general electricity N = 19

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	5	58	32	5	2.37	11.0
Methods of teaching industrial arts	0	16	42	42	2.95	6.0
Evaluation of student progress	11	5	42	42	3.16	4.0
Laboratory management	5	5	37	53	3.37	2.0
Techniques and procedures for the selection of instructional materials	5	5	53	37	3.21	3.0
Course construction	5	26	32	37	3.00	5.0
Lesson planning	11	21	52	16	2.73	7.0
Theory and organization of the general shop	5	42	37	16	2.63	8.5
Principles of laboratory planning	0	47	42	11	2.63	8.5
Requisition writing	5	53	26	16	2.53	10.0
Micro teaching	53	31	16	0	1.63	12.0
Fundamentals of laboratory safety	0	10	37	53	3.42	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 57. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general electricity N = 19

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	16	53	31	3.16	2.0
Charts and graphs	21	74	5	0	1.84	30.0
Computer graphics	58	32	5	5	1.58	33.0
Principles of architectural drafting	16	26	53	5	2.47	12.5
Industrial arts design	16	32	47	5	2.42	16.5
Descriptive geometry	31	37	21	11	2.11	25.5
Sources, development, and transmission of power	5	53	26	16	2.53	8.5
Automotive repair and maintenance	21	37	21	21	2.42	16.5
Tune-up, repair, and care of air cooled engines	16	32	26	26	2.63	7.0
Principles of test equipment and electrical diagnosis	26	27	21	26	2.47	12.5
Analysis, diagnosis, service and maintenance of home appliance	16	42	16	26	2.53	8.5
Service and repair of vehicle systems	37	37	16	10	2.00	28.0
Fundamentals of woodworking	11	21	21	47	3.03	4.0
Principles of industrial communications	16	42	26	16	2.42	19.0

Table 57 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	32	42	21	5	2.21	23.0
Principles of hydraulics pneumatics, and fluidics	32	47	11	10	2.00	28.0
Theory and application of fluid power	36	37	16	11	2.00	28.0
Principles of offset printing, silk screen, and camera operations	37	32	15	16	2.11	25.5
Technique of photographic half tone	58	21	5	16	1.79	31.5
Principles of contact and picture printing	58	21	5	16	1.79	31.5
Basic electronic circuits	5	11	42	42	3.21	1.0
Basic electronic control processes	5	21	42	32	3.00	5.5
Electronic communications theory and adaptation of hardware	21	32	21	26	2.52	10.0
Integrated circuits	31	37	11	21	2.21	23.0
Qualitative electrical theory	37	26	11	26	2.26	21.0
Basic metalworking processes	0	21	42	37	3.16	3.0
Principles of material joining (welding)	11	31	32	26	2.74	6.0
Principles of tool making	16	42	26	16	2.42	16.5

Table 57 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	10	53	21	16	2.42	16.5
Precision measurement	11	37	47	5	2.47	12.5
Simulated industrial experience	16	42	21	21	2.47	12.5
Investigate, research, and experimentation of technical problems	26	37	21	16	2.26	20.0
System analysis and activity planning	21	47	21	11	2.21	23.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

<u>General graphic arts</u> The data in Table 58 reveal that fundamentals of laboratory safety was ranked 1.0 by graduates in general graphic arts. Evaluation of student progress and laboratory management were the instructional concepts that were ranked 2.5 with a mean of 3.47. Eight instructional concepts had a mean that exceeded 3.00. Micro teaching was ranked 12.0 with a mean of 2.26.

Information in Table 59 discloses the importance of instructional concepts as rated by graduates in general graphic arts. Principles of offset printing, silk screen, and camera

Table 58. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general graphic arts N = 19

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	16	42	31	11	2.37	11.0
Methods of teaching industrial arts	5	10	32	53	3.32	4.0
Evaluation of student progress	5	11	16	68	3.47	2.5
Laboratory management	5	5	26	64	3.47	2.5
Techniques and procedures for the selection of instructional materials	11	5	37	47	3.21	5.0
Course construction	16	0	37	47	3.16	6.5
Lesson planning	5	11	47	37	3.16	6.5
Theory and organization of the general shop	16	32	47	5	2.42	10.0
Principles of laboratory planning	0	21	58	21	3.00	8.0
Requisition writing	11	37	26	26	2.68	9.0
Micro teaching	21	37	37	5	2.26	12.0
Fundamentals of laboratory safety	5	0	32	63	3.53	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 59. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general graphic arts N = 19

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	5	11	42	42	3.21	2.0
Charts and graphs	16	58	21	5	2.16	20.0
Computer graphics	42	37	10	11	1.89	27.5
Principles of architectural drafting	15	16	53	16	2.68	7.5
Industrial arts design	11	31	37	21	2.68	7.5
Descriptive geometry	11	57	21	11	2.32	15.0
Sources, development, and transmission of power	37	32	21	10	2.05	23.0
Automotive repair and maintenance	42	26	21	11	2.00	25.0
Tune-up, repair, and care of air cooled engines	47	16	26	11	2.00	25.0
Principles of test equipment and electrical diagnosis	42	26	21	11	2.00	25.0
Analysis, diagnosis, service and maintenance of home appliance	21	53	21	5	2.11	22.0
Service and repair of vehicle systems	42	42	11	5	1.79	30.0
Fundamentals of woodworking	0	32	26	42	3.11	3.0
Principles of industrial communications	26	37	21	16	2.26	17.5

Table 59 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	21	53	16	10	2.16	20.0
Principles of hydraulics pneumatics, and fluidics	47	32	16	5	1.79	30.0
Theory and application of fluid power	53	31	11	5	1.68	32.0
Principles of offset printing, silk screen, and camera operations	0	26	16	58	3.32	1.0
Techniques of photographic half tone	16	26	16	42	2.84	6.0
Principles of contact and picture printing	16	21	21	42	2.89	4.5
Basic electronic circuits	26	37	21	16	2.26	17.5
Basic electronic control processes	37	42	16	5	1.89	27.5
Electronic communications theory and adaptation of hardware	47	32	16	5	1.79	30.0
Integrated circuits	48	42	5	5	2.16	20.0
Qualitative electrical theory	58	37	0	5	1.53	33.0
Basic metalworking processes	11	26	26	37	2.89	4.5
Principles of material joining (welding)	10	37	32	21	2.63	9.5
Principles of tool making	15	53	16	16	2.31	16.0

Table 59 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	10	53	21	16	2.42	12.0
Precision measurement	16	37	42	5	2.37	13.5
Simulated industrial experience	16	31	27	26	2.63	9.5
Investigate, research, and experimentation of technical problems	16	47	21	16	2.37	13.5
System analysis and activity planning	11	42	37	10	2.47	11.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

operations was ranked 1.0. Fundamentals of technical drawing and fundamentals of woodworking ranked 2.0 and 3.0 respectively. Seven instructional concepts had a mean of 1.99 or less. Conversely, three instructional concepts had a mean greater than 3.00.

General metals The data in Table 60 reveal that the graduates who were in general metals placed the greatest emphasis on the instructional concept of fundamentals of laboratory safety. Methods of teaching industrial arts was given a rank of 2.0. Seven instructional concepts had a mean

Table 60. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general metals N = 48

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	10	38	35	17	2.29	11.0
Methods of teaching industrial arts	2	6	29	63	3.52	2.0
Evaluation of student progress	2	6	46	46	3.35	4.0
Laboratory management	2	8	38	52	3.40	3.0
Techniques and procedures for the selection of instructional materials	8	10	40	42	3.15	6.0
Course construction	4	15	35	46	3.23	5.0
Lesson planning	4	15	50	31	3.08	7.0
Theory and organization of the general shop	6	35	38	21	2.73	10.0
Principles of laboratory planning	4	31	43	22	2.85	8.0
Requisition writing	13	25	35	27	2.77	9.0
Micro teaching	40	27	25	8	2.02	12.0
Fundamentals of laboratory safety	4	4	25	67	3.54	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

greater than 3.00

The concept of basic metalworking processes was ranked 1.0, Table 61, by graduates in general metals. Seventy-one percent of the graduates listed this concept as 'essential'. The concept of fundamentals of technical drawing was ranked 2.0. Conversely, the concept of computer graphics was ranked 33.0. No respondent considered this concept to be 'essential'.

General plastics It was interesting to note that the graduates in general plastics, Table 62, considered the instructional concept of laboratory management the most important. Ninety percent of the responses were in the 'essential' column. Nine instructional concepts had a mean of 3.00 or greater. Seven instructional concepts had 50 percent or more of the responses in the 'essential' column.

The data in Table 63 reveal that the graduates in general plastics had the highest regard for the instructioanl concept of fundamentals of woodworking. There were no responses in the 'essential' column for ten of the concepts. Thirteen instructional concepts had a recorded mean of less than 1.99.

General power It can be observed from the data in Table 64 that the graduates in general power considered the instructional concept of fundamentals of laboratory safety most important. Sixty-nine percent of the responses were in the 'essential' column. Methods of teaching industrial arts was ranked 2.0. Seven instructional concepts had a mean of 3.00 or larger. The 'no-value' column had relatively few

Table 61. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general metals N = 48

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	2	12	29	57	3.40	2.0
Charts and graphs	16	65	15	4	2.06	24.5
Computer graphics	56	38	6	0	1.50	33.0
Principles of architectural drafting	21	23	35	21	2.56	11.0
Industrial arts design	10	27	46	17	2.69	8.0
Descriptive geometry	24	50	14	12	2.17	23.0
Sources, development, and transmission of power	15	42	31	12	2.42	12.5
Automotive repair and maintenance	25	33	25	17	2.33	15.5
Tune-up, repair, and care of air cooled engines	23	33	27	17	2.38	14.0
Principles of test equipment and electrical diagnosis	29	33	19	19	2.27	18.5
Analysis, diagnosis, service and maintenance of home appliance	21	38	35	6	2.27	18.5
Service and repair of vehicle systems	29	40	27	4	2.06	24.5
Fundamentals of woodworking	6	27	31	36	2.96	6.0
Principles of industrial communications	25	40	25	10	2.21	21.5

Table 61 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	21	42	29	8	2.25	20.0
Principles of hydraulics pneumatics, and fluidics	29	46	21	4	2.00	26.0
Theory and application of fluid power	37	48	13	2	1.79	27.5
Principles of offset printing, silk screen, and camera operations	29	34	23	14	2.21	21.5
Techniques of photographic half tone	50	29	13	8	1.79	27.5
Principles of contact and picture printing	53	31	10	6	1.71	31.5
Basic electronic circuits	16	23	42	19	2.63	10.0
Basic electronic control processes	19	38	35	8	2.33	15.5
Electronic communications theory and adaptation of hardware	40	48	10	2	1.75	30.0
Integrated circuits	44	44	10	2	1.71	31.5
Qualitative electrical theory	46	40	6	8	1.77	29.0
Basic metalworking processes	4	0	25	71	3.63	1.0
Principles of material joining (welding)	4	8	35	53	3.35	3.0
Principles of tool making	8	27	36	29	2.85	7.0

Table 61 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	4	25	31	40	3.06	4.0
Precision measurement	2	25	42	31	3.02	5.0
Simulated industrial experience	13	31	33	23	2.67	9.0
Investigate, research, and experimentation of technical problems	12	50	21	17	2.42	12.5
System analysis and activity planning	23	34	33	10	2.31	17.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 62. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general plastics N = 10

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	10	30	60	0	2.50	11.0
Methods of teaching industrial arts	10	0	30	60	3.40	3.0
Evaluation of student progress	10	20	20	50	3.10	7.5
Laboratory management	0	10	0	90	3.80	1.0
Techniques and procedures for the selection of instructional materials	20	0	30	50	3.10	7.5
Course construction	10	0	40	50	3.30	4.5
Lesson planning	10	10	40	40	3.10	7.5
Theory and organization of the general shop	10	10	60	20	2.90	10.0
Principles of laboratory planning	0	20	50	30	3.10	7.5
Requisition writing	0	30	20	50	3.50	2.0
Micro teaching	20	50	20	10	2.20	12.0
Fundamentals of laboratory safety	10	0	40	50	3.30	4.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 63. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general plastics N = 10

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	30	20	50	3.20	2.0
Charts and graphs	20	50	20	10	2.20	14.5
Computer graphics	50	40	0	10	1.70	26.5
Principles of architectural drafting	20	20	30	30	2.70	5.0
Industrial arts design	20	20	50	10	2.50	8.0
Descriptive geometry	10	70	10	10	2.20	14.5
Sources, development, and transmission of power	30	70	0	0	1.70	26.5
Automotive repair and maintenance	40	60	0	0	1.60	29.5
Tune-up, repair, and care of air cooled engines	30	40	10	20	2.20	14.5
Principles of test equipment and electrical diagnosis	70	30	0	0	1.30	32.5
Analysis, diagnosis, service and maintenance of home appliance	50	40	10	0	1.60	29.5
Service and repair of vehicle systems	70	30	0	0	1.30	32.5
Fundamentals of woodworking	0	30	10	60	3.30	1.0
Principles of industrial communications	20	40	40	0	2.20	14.5

Table 63 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	20	40	20	20	2.40	10.5
Principles of hydraulics pneumatics, and fluidics	40	40	20	0	1.80	23.0
Theory and application of fluid power	50	40	10	0	1.60	29.5
Principles of offset printing, silk screen, and camera operations	30	40	10	20	2.20	14.5
Techniques of photographic half tone	30	50	10	10	2.00	20.0
Principles of contact and picture printing	30	40	10	20	2.20	14.5
Basic electronic circuits	40	50	0	10	1.80	23.0
Basic electronic control processes	40	40	20	0	1.80	23.0
Electronic communications theory and adaptation of hardware	50	40	10	0	1.60	29.5
Integrated circuits	40	50	0	10	1.80	23.0
Qualitative electrical theory	40	50	0	10	1.80	23.0
Basic metalworking processes	40	10	20	30	2.40	10.5
Principles of material joining (welding)	40	0	30	30	2.50	8.0
Principles of tool making	40	20	30	10	2.10	18.5

Table 63 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	30	40	20	10	2.10	18.5
Precision measurement	20	20	50	10	2.50	8.0
Simulated industrial experience	20	20	30	30	2.70	5.0
Investigate, research, and experimentation of technical problems	20	20	30	30	2.70	5.0
System analysis and activity planning	10	20	40	30	2.90	3.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 64. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general power N = 26

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	0	46	35	19	2.73	10.0
Methods of teaching industrial arts	0	4	42	54	3.50	2.0
Evaluation of student progress	4	12	42	42	3.23	5.5
Laboratory management	0	4	50	46	3.42	3.0
Techniques and procedures for the selection of instructional materials	0	15	47	38	3.23	5.5
Course construction	0	12	46	42	3.31	4.0
Lesson planning	0	23	50	27	3.04	7.0
Theory and organization of the general shop	4	54	27	15	2.54	11.0
Principles of laboratory planning	4	35	34	27	2.85	8.0
Requisition writing	0	50	23	27	2.77	9.0
Micro teaching	38	35	27	0	1.88	12.0
Fundamentals of laboratory safety	0	4	27	69	3.65	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

responses.

The data in Table 65 reveal that the instructional concept of sources, development, and transmission of power was ranked 1.0 by graduates with assignments in general power. Fifty percent of the responses were in the 'essential' column. No responses were recorded in the 'no-value' column. Tune-up, repair, and care of air-cooled engines was ranked 2.0. Six instructional concepts had a mean of 3.00 or larger.

General wood It was noted in Table 66 that the instructional concept of techniques and procedures for the selection of instructional materials was ranked 1.0. Fundamentals of laboratory safety had a rank of 2.0. Fifty-four percent of the responses were in the 'essential' column. Micro teaching was ranked 12.0 with 3 percent of the responses in the 'essential' column and 41 percent of the responses in the 'no-value' column.

According to the data in Table 67, 64 percent of the graduates in general wood rated the instructional concept of fundamentals of woodworking as 'essential'. Forty-seven percent of the graduates rated fundamentals of technical drawing as 'essential'. These instructional concepts had a rank of 1.0 and 2.0 respectively.

Other The data in Table 68 reveal that the graduates who had teaching assignments identified as other rated laboratory management as the most important instructional concept. Sixty-nine percent of the responses were in the 'essential'

Table 65. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general power
N = 26

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	19	50	31	3.12	4.0
Charts and graphs	11	73	12	4	2.08	29.0
Computer graphics	50	35	11	4	1.69	33.0
Principles of architectural drafting	23	31	35	11	2.35	24.0
Industrial arts design	15	35	31	19	2.54	18.5
Descriptive geometry	31	19	35	15	2.35	24.0
Sources, development, and transmission of power	0	8	42	50	3.42	1.0
Automotive repair and maintenance	11	8	35	46	3.15	3.0
Tune-up, repair, and care of air cooled engines	0	8	46	46	3.38	2.0
Principles of test equipment and electrical diagnosis	15	19	23	43	2.92	9.5
Analysis, diagnosis, service and maintenance of home appliance	19	27	31	23	2.58	16.0
Service and repair of vehicle systems	11	19	35	35	2.92	9.5
Fundamentals of woodworking	8	31	38	23	2.77	12.0
Principles of industrial communications	11	35	42	12	2.54	18.5

Table 65 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	15	35	46	4	2.38	22.0
Principles of hydraulics pneumatics, and fluidics	11	35	35	19	2.62	14.0
Theory and application of fluid power	12	31	38	19	2.65	13.0
Principles of offset printing, silk screen, and camera operations	31	35	19	15	2.19	28.0
Techniques of photographic half tone	43	27	19	11	2.00	31.0
Principles of contact and picture printing	38	38	16	8	1.94	32.0
Basic electronic circuits	4	23	38	35	3.04	6.0
Basic electronic control processes	8	19	46	27	2.92	9.5
Electronic communications theory and adaptation of hardware	23	39	23	15	2.31	26.0
Integrated circuits	27	35	27	11	2.23	27.0
Qualitative electrical theory	38	35	12	15	2.04	30.0
Basic metalworking processes	0	19	54	27	3.08	5.0
Principles of material joining (welding)	4	19	58	19	2.92	9.5
Principles of tool making	15	35	27	23	2.58	16.0

Table 65 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	8	54	23	15	2.46	20.5
Precision measurement	4	27	42	27	2.93	7.0
Simulated industrial experience	8	42	35	15	2.58	16.0
Investigate, research, and experimentation of technical problems	15	47	15	23	2.46	20.5
System analysis and activity planning	15	42	35	8	2.34	24.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 66. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, general wood N = 70

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	10	48	31	11	2.44	11.0
Methods of teaching industrial arts	3	9	33	55	3.41	3.0
Evaluation of student progress	3	11	36	50	3.33	5.0
Laboratory management	4	11	30	55	3.34	4.0
Techniques and procedures for the selection of instructional materials	6	7	51	36	3.71	1.0
Course construction	3	19	40	38	3.14	6.0
Lesson planning	3	23	47	27	2.99	7.0
Theory and organization of the general shop	11	37	40	12	2.53	10.0
Principles of laboratory planning	3	36	44	17	2.76	8.0
Requisition writing	10	38	31	21	2.64	9.0
Micro teaching	41	43	13	3	1.77	12.0
Fundamentals of laboratory safety	3	4	39	54	3.44	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 67. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, general wood N = 70

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	3	10	40	47	3.31	2.0
Charts and graphs	20	60	17	3	2.03	23.0
Computer graphics	53	33	10	4	1.66	32.5
Principles of architectural drafting	14	30	36	20	2.61	6.0
Industrial arts design	11	26	40	23	2.74	4.0
Descriptive geometry	20	46	20	14	2.29	13.0
Sources, development, and transmission of power	29	27	34	10	2.26	15.0
Automotive repair and maintenance	39	21	27	13	2.14	22.0
Tune-up, repair, and care of air cooled engines	34	26	24	16	2.21	20.0
Principles of test equipment and electrical diagnosis	44	23	20	13	2.01	24.0
Analysis, diagnosis, service and maintenance of home appliance	31	32	26	11	2.17	21.0
Service and repair of vehicle systems	50	24	16	10	1.86	29.0
Fundamentals of woodworking	4	9	23	64	3.47	1.0
Principles of industrial communications	23	43	21	13	2.24	18.0

Table 67 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	21	40	26	13	2.30	12.0
Principles of hydraulics pneumatics, and fluidics	39	38	17	6	1.90	26.0
Theory and application of fluid power	46	37	11	6	1.77	31.0
Principles of offset printing, silk screen, and camera operations	32	30	21	17	2.24	18.0
Techniques of photographic half tone	46	30	14	10	1.89	27.0
Principles of contact and picture printing	45	31	13	11	1.91	25.0
Basic electronic circuits	27	32	24	17	2.31	11.0
Basic electronic control processes	29	30	30	11	2.24	18.0
Electronic communications theory and adaptation of hardware	42	37	14	7	1.87	28.0
Integrated circuits	41	42	10	7	1.83	30.0
Qualitative electrical theory	51	37	6	6	1.66	32.5
Basic metalworking processes	17	19	23	41	2.89	3.0
Principles of material joining (welding)	19	24	31	26	2.64	5.0
Principles of tool making	21	40	29	10	2.27	14.0

Table 67 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	27	35	24	14	2.26	16.0
Precision measurement	13	43	34	10	2.41	8.0
Simulated industrial experience	21	32	21	26	2.51	7.0
Investigate, research, and experimentation of technical problems	23	33	28	16	2.37	9.0
System analysis and activity planning	21	36	30	13	2.34	10.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 68. Evaluation of professional education instructional concepts by educational area of work--single-activity-instructional laboratory, other N = 13

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	15	47	23	15	2.38	12.0
Methods of teaching industrial arts	15	7	31	47	3.08	6.0
Evaluation of student progress	15	7	39	39	3.00	7.5
Laboratory management	0	8	23	69	3.62	1.0
Techniques and procedures for the selection of instructional materials	8	0	23	69	3.54	2.0
Course construction	7	0	31	62	3.46	3.0
Lesson planning	8	0	46	46	3.31	5.0
Theory and organization of the general shop	15	23	31	31	2.77	10.0
Principles of laboratory planning	8	23	46	23	2.85	9.0
Requisition writing	7	23	31	39	3.00	7.5
Micro teaching	15	31	39	15	2.54	11.0
Fundamentals of laboratory safety	7	0	39	54	3.38	4.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

column. The concept of techniques and procedures for the selection of instructional materials was ranked 2.0 with 69 percent of the responses in the 'essential' column.

An evaluation of technical education instructional concepts was recorded in Table 69. Principles of hydraulics, pneumatics, and fluidics was the concept that was ranked 1.0. Four concepts had a mean of less than 1.99.

The data in Table 70 reveal that professional instructional concepts were, in general, ranked the same by graduates in all areas of instruction. The largest range in rank, 2.0 through 10.0, occurred for the instructional concept of requisition writing.

The data in Table 71 reveal that the technical instructional concept of fundamentals of technical drawing was ranked high, 1.0 through 4.0, by the graduates in all areas of instruction. Other technical instructional concepts ranked high were fundamentals of woodworking and basic metalworking processes, 1.0 through 12.0.

Area-unit-instructional laboratory Nine of the twelve instructional areas had ten or more responses. These were: 1) technical drawing, 2) architectural drafting, 3) electricity, 4) electronics, 5) graphic arts, 6) machine shop, 7) sheet metal, 8) welding, and 9) auto mechanics.

Technical drawing The evaluation of student progress was ranked 1.0 by graduates who had teaching assignments in technical drawing, Table 72. Fifty-five percent of the

Table 69. Evaluation of technical education instructional concepts by educational area of work--single-activity-instructional laboratory, other N = 13

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	8	23	15	54	3.15	2.0
Charts and graphs	23	38	31	8	2.23	21.5
Computer graphics	54	46	0	0	1.46	33.0
Principles of architectural drafting	23	15	39	23	2.62	9.5
Industrial arts design	15	31	54	0	2.38	17.0
Descriptive geometry	15	46	31	8	2.31	19.0
Sources, development, and transmission of power	8	31	61	0	2.54	13.0
Automotive repair and maintenance	15	46	31	8	2.31	19.0
Tune-up, repair, and care of air cooled engines	23	23	31	23	2.54	13.0
Principles of test equipment and electrical diagnosis	23	31	39	7	2.31	19.0
Analysis, diagnosis, service and maintenance of home appliance	31	46	23	0	1.92	30.0
Service and repair of vehicle systems	23	54	15	8	2.08	25.0
Fundamentals of woodworking	15	23	23	39	2.84	5.0
Principles of industrial communications	31	46	15	8	2.00	28.0

Table 69 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	15	46	39	0	2.23	21.5
Principles of hydraulics pneumatics, and fluidics	15	46	31	8	3.31	1.0
Theory and application of fluid power	15	62	15	8	2.15	23.0
Principles of offset printing, silk screen, and camera operations	39	31	23	7	2.00	28.0
Techniques of photographic half tone	46	23	31	0	1.85	31.5
Principles of contact and picture printing	30	39	31	0	2.00	28.0
Basic electronic circuits	23	31	7	39	2.62	9.5
Basic electronic control processes	23	31	15	31	2.34	17.0
Electronic communications theory and adaptation of hardware	23	46	31	0	2.08	25.0
Integrated circuits	23	46	31	0	2.08	25.0
Qualitative electrical theory	23	69	8	0	1.85	31.5
Basic metalworking processes	23	23	23	31	2.85	3.5
Principles of material joining (welding)	23	23	23	31	2.62	9.5
Principles of tool making	23	15	54	8	2.46	15.0

Table 69 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	15	31	31	23	2.62	9.5
Precision measurement	15	8	54	23	2.85	3.5
Simulated industrial experience	8	31	46	15	2.69	6.5
Investigate, research, and experimentation of technical problems	0	46	39	15	2.69	6.5
System analysis and activity planning	23	16	46	15	2.54	13.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 70. Evaluation of professional instructional concepts by rank and mean for single-activity-instructional laboratory N = 259

Instructional concepts	General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
	Area of instruction							
Philosophy of industrial arts education	11.0[a] 2.57[b]	11.0 2.37	11.0 2.37	11.0 2.29	11.0 2.50	10.0 2.73	11.0 2.44	12.0 2.38
Methods of teaching industrial arts	3.5 3.37	6.0 2.95	4.0 3.32	2.0 3.52	3.0 3.40	2.0 3.50	3.0 3.41	6.0 3.08
Evaluation of student progress	3.5 3.37	4.0 3.16	2.5 3.47	4.0 3.35	7.5 3.10	5.5 3.23	5.0 3.33	7.5 3.00
Laboratory management	2.0 3.43	2.0 3.37	2.5 3.47	3.0 3.40	1.0 3.80	3.0 3.42	4.0 3.34	1.0 3.62
Techniques and procedures for the selection of instructional materials	5.0 3.20	3.0 3.21	5.0 3.21	6.0 3.15	7.5 3.10	5.5 3.23	1.0 3.71	2.0 3.54
Course construction	6.0 3.07	5.0 3.00	6.5 3.16	5.0 3.23	4.5 3.30	4.0 3.31	6.0 3.14	3.0 3.46

[a]Rank.

[b]Mean.

Table 70 (Continued)

Instructional concepts	Area of instruction							
	General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
Lesson planning	7.0 2.93	7.0 2.73	6.5 3.16	7.0 3.08	7.5 3.10	7.0 3.04	7.0 2.99	5.0 3.31
Theory and organization of the general shop	9.0 2.63	8.5 2.63	10.0 2.42	10.0 2.73	10.0 2.90	11.0 2.54	10.0 2.53	10.0 2.77
Principles of laboratory planning	8.0 2.87	8.5 2.63	8.0 3.00	8.0 2.85	7.5 3.10	8.0 2.85	8.0 2.76	9.0 2.85
Requisition writing	10.0 2.59	10.0 2.53	9.0 2.68	9.0 2.77	2.0 3.50	9.0 2.77	9.0 2.64	7.5 3.00
Micro teaching	12.0 1.96	12.0 1.63	12.0 2.26	12.0 2.02	12.0 2.20	12.0 1.88	12.0 1.77	11.0 2.54
Fundamentals of laboratory safety	1.0 3.48	1.0 3.42	1.0 3.53	1.0 3.54	4.5 3.30	1.0 3.65	2.0 3.44	4.0 3.38

Table 71. Evaluation of technical instruction concepts by rank and mean for single-activity-instructional laboratory N = 259

Instructional concepts	Area of instruction: General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
Fundamentals of technical drawing	1.0[a] 3.59[b]	2.0 3.16	2.0 3.21	2.0 3.40	2.0 3.20	4.0 3.12	2.0 3.31	2.0 3.15
Charts and graphs	16.5 2.26	30.0 1.84	20.0 2.16	24.5 2.06	14.5 2.20	29.0 2.08	23.0 2.03	21.5 2.23
Computer graphics	29.0 1.80	33.0 1.58	27.5 1.89	33.0 1.50	26.5 1.70	33.0 1.69	32.5 1.66	33.0 1.46
Principles of architectural drafting	3.5 2.87	12.5 2.47	7.5 2.68	11.0 2.56	5.0 2.70	24.0 2.35	6.0 2.61	9.5 2.62
Industrial arts design	6.0 2.67	16.5 2.42	7.5 2.68	8.0 2.69	8.0 2.50	18.5 2.54	4.0 2.74	17.0 2.38
Descriptive geometry	9.0 2.43	25.5 2.11	15.0 2.32	23.0 2.17	14.5 2.20	24.0 2.35	13.0 2.29	19.0 2.31

[a]Rank.

[b]Mean.

Table 71 (Continued)

Instructional concepts	Area of instruction							
	General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
Sources, development, and transmission of power	15.0 2.28	8.5 2.53	23.0 2.05	12.5 2.42	26.5 1.70	1.0 3.42	15.0 2.26	13.0 2.54
Automotive repair and maintenance	23.0 2.09	16.5 2.42	25.0 2.00	15.5 2.33	29.5 1.60	3.0 3.15	22.0 2.14	19.0 2.31
Tune-up, repair, and care of air cooled engines	20.5 2.19	7.0 2.63	25.0 2.00	14.0 2.38	14.5 2.20	2.0 3.38	20.0 2.21	13.0 2.54
Principles of offset printing, silk screen, and camera operations	13.0 2.33	25.5 2.11	1.0 3.32	21.5 2.21	14.5 2.20	28.0 2.19	18.0 2.24	28.0 2.00
Techniques of photographic half tone	24.0 2.04	31.5 1.79	6.0 2.84	27.5 1.79	20.0 2.00	31.0 2.00	27.0 1.89	31.5 1.85
Principles of contact and picture printing	26.0 1.98	31.5 1.79	4.5 2.89	31.5 1.71	14.5 2.20	32.0 1.94	25.0 1.91	28.0 2.00
Basic electronic circuits	10.0 2.41	1.0 3.21	17.5 2.26	10.0 2.63	23.0 1.80	6.0 3.04	11.0 2.31	9.5 2.62
Basic electronic control processes	20.5 2.19	5.5 3.00	27.5 1.89	15.5 2.33	23.0 1.80	9.5 2.92	18.0 2.24	17.0 2.34

Table 71 (Continued)

Instructional concepts	General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
	Area of instruction							
Electronic communications theory and adaptation of hardware	28.0 1.91	10.0 2.52	30.0 1.79	30.0 1.75	29.5 1.60	26.0 2.31	28.0 1.87	25.0 2.08
Integrated circuits	30.0 1.72	23.0 2.21	20.0 2.16	31.5 1.71	23.0 1.80	27.0 2.23	30.0 1.83	25.0 2.08
Qualitative electrical theory	33.0 1.59	21.0 2.26	33.0 1.53	29.0 1.77	23.0 1.80	30.0 2.04	32.5 1.66	31.5 1.85
Basic metalworking processes	3.5 2.87	3.0 3.16	4.5 2.89	1.0 3.63	10.5 2.40	5.0 3.08	3.0 2.89	3.5 2.85
Principles of test equipment and electrical diagnosis	25.0 2.02	12.5 2.47	25.0 2.00	18.5 2.27	32.5 1.30	9.5 2.92	24.0 2.01	19.0 2.31
Analysis, diagnosis, service and maintenance of home appliance	18.5 2.20	8.5 2.53	22.0 2.11	18.5 2.27	29.5 1.60	16.0 2.58	21.0 2.17	30.0 1.92
Service and repair of vehicle systems	27.0 1.94	28.0 2.00	30.0 1.79	24.5 2.06	32.5 1.30	9.5 2.92	29.0 1.86	25.0 2.08

Table 71 (Continued)

Instructional concepts	Area of instruction							
	General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
Fundamentals of woodworking	2.0 3.26	4.0 3.03	3.0 3.11	6.0 2.96	1.0 3.30	12.0 2.77	1.0 3.47	5.0 2.84
Principles of industrial communications	8.0 2.48	19.0 2.42	17.5 2.26	21.5 2.21	14.5 2.20	18.5 2.54	18.0 2.24	28.0 2.00
Methods of storage and retrieval of information	22.0 2.15	23.0 2.21	20.0 2.16	20.0 2.25	10.5 2.40	22.0 2.38	12.0 2.30	21.5 2.23
Principles of hydraulics pneumatics, and fluidics	31.0 1.70	28.0 2.00	30.0 1.79	26.0 2.00	23.0 1.80	14.0 2.62	26.0 1.90	1.0 3.31
Theory and application of fluid power	32.0 1.69	28.0 2.00	32.0 1.68	27.5 1.79	29.5 1.60	13.0 2.65	31.0 1.77	23.0 2.15
Principles of material joining	5.0 2.72	6.0 2.74	9.5 2.63	3.0 3.35	8.0 2.50	9.5 2.92	5.0 2.64	9.5 2.62
Principles of tool making	16.5 2.26	16.5 2.42	16.0 2.31	7.0 2.85	18.5 2.10	16.0 2.58	14.0 2.27	15.0 2.46
Fundamentals of heat treating	18.5 2.20	16.5 2.42	12.0 2.42	4.0 3.06	18.5 2.10	20.5 2.46	16.0 2.26	9.5 2.62

Table 71 (Continued)

Instructional concepts	General drawing N = 54	General electricity N = 19	General graphic arts N = 19	General metals N = 48	General plastics N = 10	General power N = 26	General woods N = 70	Other N = 13
	Area of instruction							
Precision measurement	14.0 2.32	12.5 2.47	13.5 2.37	5.0 3.02	8.0 2.50	7.0 2.93	8.0 2.41	3.5 2.85
Simulated industrial experience	7.0 2.54	12.5 2.47	9.5 2.63	9.0 2.67	5.0 2.70	16.0 2.58	7.0 2.51	6.5 2.69
Investigate, research, and experimentation of technical problems	11.0 2.39	20.0 2.26	13.5 2.37	12.5 2.42	5.0 2.70	20.5 2.46	9.0 2.37	6.5 2.69
System analysis and activity planning	12.0 2.35	23.0 2.21	11.0 2.47	17.0 2.31	3.0 2.90	24.0 2.35	10.0 2.34	13.0 2.54

Table 72. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, technical drawing N = 49

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	8	49	27	16	2.51	9.0
Methods of teaching industrial arts	2	14	33	51	3.33	3.0
Evaluation of student progress	0	10	35	55	3.45	1.0
Laboratory management	0	10	39	51	3.41	2.0
Techniques and procedures for the selection of instructional materials	6	16	39	39	3.10	6.0
Course construction	0	24	37	39	3.14	5.0
Lesson planning	8	30	33	29	2.82	7.0
Theory and organization of the general shop	29	41	16	14	2.16	11.0
Principles of laboratory planning	10	35	41	14	2.59	8.0
Requisition writing	22	33	23	22	2.45	10.0
Micro teaching	37	41	16	6	1.92	12.0
Fundamentals of laboratory safety	6	14	33	47	3.20	4.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

responses were in the 'essential' column. A rank of 2.0 was assigned to the concept of laboratory management. Fifty-one percent of the responses were in the 'essential' column.

The data in Table 73 reveal that the concept of fundamentals of technical drawing was ranked 1.0 with a mean of 3.67. These graduates also ranked the principles of architectural drafting and industrial arts design as 2.0 and 3.0 respectively. The concept of computer graphics was ranked 21.0. Thirty-two percent of the responses were in the 'no-value' column.

Architectural drafting It was interesting to note that the graduates who taught architectural drafting ranked the concept of evaluation of student progress as 1.0, Table 74. Sixty-three percent of the responses were in the 'essential' column. The concept of fundamentals of laboratory safety was ranked 2.0. Sixty-seven percent rated this concept as 'essential'. There were no responses in the 'no-value' column for either concept.

An evaluation of technical education instructional concepts by graduates who had teaching assignments in architectural drafting was recorded in Table 75. The concepts of fundamentals of technical drawing, principles of architectural drafting, and industrial arts design were ranked 1.0 through 3.0 respectively. Eighty-five percent of the respondents rated the fundamentals of technical drawing as 'essential'. The concept of computer graphics was ranked 19.0 with 29 percent of the responses in the 'no-value' column.

Table 73. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, technical drawing N = 49

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	8	16	76	3.67	1.0
Charts and graphs	20	29	39	12	2.43	15.5
Computer graphics	32	27	25	16	2.24	21.0
Principles of architectural drafting	4	6	33	57	3.43	2.0
Industrial arts design	2	22	35	41	3.14	3.0
Descriptive geometry	6	24	43	27	2.90	5.5
Sources, development, and transmission of power	18	39	31	12	2.37	17.0
Automotive repair and maintenance	24	41	25	10	2.20	23
Tune-up, repair, and care of air cooled engines	25	45	18	12	2.18	24.0
Principles of test equipment and electrical diagnosis	27	37	20	16	2.27	19.0
Analysis, diagnosis, service and maintenance of home appliance	26	41	25	8	2.14	25.5
Service and repair of vehicle systems	31	41	20	8	2.06	29.0
Fundamentals of woodworking	2	38	33	27	2.84	8.0
Principles of industrial communications	10	39	41	10	2.51	12.5

Table 73 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	18	45	31	6	2.24	21.0
Principles of hydraulics pneumatics, and fluidics	27	43	20	10	2.14	25.5
Theory and application of fluid power	29	45	18	8	2.06	29.0
Principles of offset printing, silk screen, and camera operations	22	37	25	16	2.35	18.0
Techniques of photographic half tone	29	45	14	12	2.10	27.0
Principles of contact and picture printing	35	45	8	12	1.98	32.0
Basic electronic circuits	18	31	33	18	2.51	12.5
Basic electronic control processes	24	39	25	12	2.24	21.0
Electronic communications theory and adaptation of hardware	35	37	16	12	2.06	29.0
Integrated circuits	33	43	16	8	2.00	31.0
Qualitative electrical theory	37	41	12	10	1.96	33.0
Basic metalworking processes	4	33	30	33	2.92	4.0
Principles of material joining (welding)	8	27	35	30	2.88	7.0
Principles of tool making	16	39	31	14	2.43	15.5

Table 73 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	12	43	25	20	2.53	11.0
Precision measurement	8	28	29	35	2.90	5.5
Simulated industrial experience	10	27	43	20	2.74	9.0
Investigate, research, and experimentation of technical problems	18	25	41	16	2.55	10.0
System analysis and activity planning	20	31	33	16	2.45	14.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 74. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, architectural drafting
N = 27

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	7	37	41	15	2.63	10.0
Methods of teaching industrial arts	4	7	41	48	3.33	4.0
Evaluation of student progress	0	7	30	63	3.56	1.0
Laboratory management	0	7	37	56	3.48	3.0
Techniques and procedures for the selection of instructional materials	4	18	37	41	3.15	6.0
Course construction	0	22	26	52	3.30	5.0
Lesson planning	11	26	26	37	2.89	7.0
Theory and organization of the general shop	33	41	7	19	2.11	11.0
Principles of laboratory planning	11	30	33	26	2.74	8.0
Requisition writing	18	26	26	30	2.67	9.0
Micro teaching	41	33	19	7	1.93	12.0
Fundamentals of laboratory safety	0	15	18	67	3.52	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 75. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, architectural drafting N = 27

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	8	7	85	3.78	1.0
Charts and graphs	7	41	37	15	2.59	13.5
Computer graphics	29	19	33	19	2.41	19.0
Principles of architectural drafting	0	4	26	70	3.67	2.0
Industrial arts design	4	22	26	48	3.19	3.0
Descriptive geometry	4	26	41	29	2.96	7.0
Sources, development, and transmission of power	15	37	30	18	2.52	16.0
Automotive repair and maintenance	26	44	15	15	2.19	26.5
Tune-up, repair, and care of air cooled engines	26	37	22	15	2.26	24.5
Principles of test equipment and electrical diagnosis	22	44	15	19	2.30	22.0
Analysis, diagnosis, service and maintenance of home appliance	18	48	19	15	2.30	22.0
Service and repair of vehicle systems	30	48	11	11	2.04	32.0
Fundamentals of woodworking	0	37	33	30	2.92	8.0
Principles of industrial communications	4	41	37	18	2.70	10.5

Table 75 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	8	44	41	7	2.48	17.5
Principles of hydraulics pneumatics, and fluidics	18	56	19	7	2.15	28.5
Theory and application of fluid power	22	52	19	7	2.11	30.5
Principles of offset printing, silk screen, and camera operations	22	41	22	15	2.30	22.0
Techniques of photographic half tone	19	47	19	15	2.30	20.0
Principles of contact and picture printing	26	52	7	15	2.11	30.5
Basic electronic circuits	11	37	33	19	2.59	13.5
Basic electronic control processes	19	52	14	15	2.26	24.5
Electronic communications theory and adaptation of hardware	22	48	19	11	2.19	26.5
Integrated circuits	26	41	26	7	2.15	28.5
Qualitative electrical theory	30	52	11	7	1.96	33.0
Basic metalworking processes	0	33	30	37	3.04	5.5
Principles of material joining (welding)	0	30	33	37	3.07	4.0
Principles of tool making	11	41	26	22	2.59	13.5

Table 75 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	4	56	18	22	2.59	13.5
Precision measurement	4	33	18	45	3.04	5.5
Simulated industrial experience	4	30	44	22	2.85	9.0
Investigate, research, and experimentation of technical problems	11	26	44	19	2.70	10.5
System analysis and activity planning	15	41	26	18	2.48	17.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

<u>Electricity</u> The data in Table 76 reveal that the fundamentals of laboratory safety was regarded as the most important instructional concept. Evaluation of student progress was ranked 2.0 with 60 percent of the responses in the 'essential' column. Of less importance was the concept of micro teaching with a rank of 12.0 and 33 percent of the responses in the 'no-value' column.

An evaluation of technical education instructional concepts by graduates who had assignments in electricity was recorded in Table 77. These graduates ranked basic electronic

Table 76. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, electricity N = 15

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	13	20	13	54	3.07	6.5
Methods of teaching industrial arts	13	7	27	53	3.20	3.5
Evaluation of student progress	0	20	20	60	3.40	2.0
Laboratory management	7	13	33	47	3.20	3.5
Techniques and procedures for the selection of instructional materials	0	27	40	33	3.07	6.5
Course construction	7	26	40	27	2.87	8.5
Lesson planning	0	20	47	33	3.13	5.0
Theory and organization of the general shop	13	40	40	7	2.40	11.0
Principles of laboratory planning	13	20	33	34	2.87	8.5
Requisition writing	20	33	27	20	2.47	10.0
Micro teaching	33	47	7	13	2.00	12.0
Fundamentals of laboratory safety	0	13	20	67	3.53	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 77. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, electricity N = 15

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	27	20	53	3.27	4.5
Charts and graphs	7	33	60	0	2.53	19.5
Computer graphics	27	40	26	7	2.13	31.0
Principles of architectural drafting	13	47	20	20	2.47	24.0
Industrial arts design	13	27	27	33	2.80	11.0
Descriptive geometry	26	27	20	27	2.47	24.0
Sources, development, and transmission of power	13	20	54	13	2.67	13.5
Automotive repair and maintenance	27	7	53	13	2.53	19.5
Tune-up, repair, and care and air cooled engines	26	7	40	27	2.67	13.5
Principles of test equipment and electrical diagnosis	13	7	33	47	3.13	7.5
Analysis, diagnosis, service, and maintenance of home appliance	7	13	40	40	3.13	7.5
Service and repair of vehicle systems	27	13	40	20	2.53	19.5
Fundamentals of woodworking	7	33	47	13	2.67	13.5
Principles of industrial communications	13	27	60	0	2.47	24.0

Table 77 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	20	20	53	7	2.47	24.0
Principles of hydraulics pneumatics, and fluidics	20	27	53	0	2.33	27.0
Theory and application of fluid power	27	20	53	0	2.67	28.5
Principles of offset printing, silk screen, and camera operations	27	33	40	0	21.3	31.0
Techniques of photographic half tone	47	13	40	0	1.93	33.0
Principles of contact and picture printing	40	13	40	7	2.13	31.0
Basic electronic circuits	0	0	47	53	3.53	1.0
Basic electronic control processes	0	0	53	47	3.47	2.0
Electronic communications, theory, and adaptation of hardware	0	13	33	54	3.40	3.0
Integrated circuits	0	13	53	34	3.20	6.0
Qualitative electrical theory	0	33	34	33	3.00	10.0
Basic metalworking processes	7	33	47	13	2.67	13.5
Principles of material joining (welding)	0	27	40	33	3.07	9.0
Principles of tool making	27	26	40	7	2.27	28.5

Table 77 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	20	27	33	20	2.53	19.5
Precision measurement	7	6	40	47	3.27	4.5
Simulated industrial experience	13	27	33	27	2.73	12.0
Investigate, research, and experimentation of technical problems	13	27	47	13	2.60	17.0
System analysis and activity planning	20	27	40	13	2.47	24.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

circuits and basic electrical control processes as 1.0 and 2.0 respectively. All responses were in the 'essential' and 'important' columns. The concept of electronic communications, theory, and adaptation of hardware had a rank of 3.0. Fifty-four percent of the responses were in the 'essential' column.

Electronics The data in Table 78 reveal that the graduates in electronics rated the concept of fundamentals of laboratory safety as the most important. Sixty-nine percent of the responses were in the 'essential' column. The concept of evaluation of student progress was ranked 2.0. Sixty-one

Table 78. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, electronics N = 23

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	13	30	31	26	2.70	9.0
Methods of teaching industrial arts	17	9	35	39	2.96	7.5
Evaluation of student progress	0	9	30	61	3.52	2.0
Laboratory management	9	8	35	48	3.22	4.5
Techniques and procedures for the selection of instructional materials	0	13	48	39	3.26	3.0
Course construction	4	17	31	48	3.22	4.5
Lesson planning	4	26	30	40	3.04	6.0
Theory and organization of the general shop	17	57	17	9	2.17	11.0
Principles of laboratory planning	13	17	31	39	2.96	7.5
Requisition writing	17	26	39	18	2.56	10.0
Micro teaching	44	22	17	17	2.09	12.0
Fundamentals of laboratory safety	0	9	22	69	3.61	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

percent of the responses were in the 'essential' column. Six of the twelve means were greater than 3.00. Micro teaching was the concept that had the largest percent, 44, of the responses in the 'no-value' column.

The evaluation of technical education instructional concepts by the graduates who were in electronics was recorded in Table 79. The concept of basic electronic circuits was ranked 1.0 with a mean of 3.78. Electronic communications, theory, and adaptation of hardware was the concept that was ranked 3.0. Basic electronic control processes had a rank of 2.0 and a mean of 3.70. Techniques of photographic half tone was the concept that was rated the least important.

Graphic arts The data in Table 80 reveal the evaluation of professional education instructional concepts as they were reported by the graduates who were employed in graphic arts. The concept of fundamentals of laboratory safety was ranked 1.0 with a mean of 3.42. This concept had the highest percent, 55, of 'essential' responses. Methods of teaching industrial arts was ranked 2.0 with 48 percent of the responses in the 'essential' column. Micro teaching was the concept that was considered to be the least important.

The data in Table 81 reveal the evaluation of technical education instructional concepts as they were evaluated by the graduates in graphic arts. These graduates rated the concept of principles of offset printing, silk screen, and camera operations as the most important. Eighty-four percent

Table 79. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, electronics N = 23

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	48	13	39	2.91	9.0
Charts and graphs	4	35	40	21	2.78	11.0
Computer graphics	26	35	35	4	2.17	22.5
Principles of architectural drafting	36	48	8	8	1.91	28.5
Industrial arts design	30	35	22	13	2.17	22.5
Descriptive geometry	35	26	17	22	2.26	19.0
Sources, development, and transmission of power	13	30	44	13	2.57	15.5
Automotive repair and maintenance	35	34	22	9	2.04	25.5
Tune-up, repair, and care of air cooled engines	48	17	22	13	2.00	27.0
Principles of test equipment and electrical diagnosis	9	13	17	61	3.30	6.0
Analysis, diagnosis, service and maintenance of home appliance	13	17	26	44	3.00	7.0
Service and repair of vehicle systems	30	39	22	9	2.09	24.0
Fundamentals of woodworking	30	40	26	4	2.04	25.5
Principles of industrial communications	22	17	48	13	2.52	17.0

Table 79 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	13	26	44	17	2.65	12.5
Principles of hydraulics pneumatics, and fluidics	22	35	39	4	2.26	19.5
Theory and application of fluid power	26	30	40	4	2.22	21.0
Principles of offset printing, silk screen, and camera operations	39	35	26	0	1.87	30.5
Techniques of photographic half tone	48	30	22	0	1.74	33.0
Principles of contact and picture printing	48	26	22	4	1.83	32.0
Basic electronic circuits	0	0	22	78	3.78	1.0
Basic electronic control processes	0	4	22	74	3.70	2.0
Electronic communications theory and adaptation of hardware	0	13	9	78	3.65	3.0
Integrated circuits	0	9	26	65	3.57	4.0
Qualitative electrical theory	0	17	22	61	3.43	5.0
Basic metalworking processes	13	44	35	8	2.39	18.0
Principles of material joining (welding)	8	48	22	22	2.57	15.5
Principles of tool making	39	35	22	4	1.91	28.5

Table 79 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	44	35	13	8	1.87	30.5
Precision measurement	13	35	26	26	2.65	12.5
Simulated industrial experience	4	22	48	26	2.96	8.0
Investigate, research, and experimentation of technical problems	9	17	52	22	2.87	10.0
System analysis and activity planning	13	30	40	17	2.61	14.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 80. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, graphic arts N = 31

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	6	48	39	7	2.46	10.0
Methods of teaching industrial arts	0	13	39	48	3.35	2.0
Evaluation of student progress	3	13	45	39	3.19	4.0
Laboratory management	0	19	29	52	3.32	3.0
Techniques and procedures for the selection of instructional materials	0	23	48	29	3.06	5.0
Course construction	3	26	35	36	3.03	6.0
Lesson planning	7	42	25	26	2.71	7.0
Theory and organization of the general shop	36	48	13	3	1.84	11.0
Principles of laboratory planning	16	29	32	23	2.61	8.0
Requisition writing	19	36	22	23	2.48	9.0
Micro teaching	55	19	19	7	1.77	12.0
Fundamentals of laboratory safety	0	13	32	55	3.42	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 81. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, graphic arts N = 31

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	13	29	32	26	2.71	6.0
Charts and graphs	29	39	29	3	2.06	18.0
Computer graphics	35	42	10	13	2.00	20.5
Principles of architectural drafting	35	23	29	13	2.19	13.0
Industrial arts design	26	26	29	19	2.42	9.0
Descriptive geometry	35	48	10	7	1.87	24.5
Sources, development, and transmission of power	32	42	16	10	2.03	19.0
Automotive repair and maintenance	38	52	3	7	1.77	28.5
Tune-up, repair, and care of air cooled engines	48	36	10	23	1.74	31.0
Principles of test equipment and electrical diagnosis	35	32	10	23	2.19	13.0
Analysis, diagnosis, service and maintenance of home appliance	49	32	16	3	1.74	31.0
Service and repair of vehicle systems	41	36	16	7	1.87	24.5
Fundamentals of woodworking	32	35	23	10	2.10	16.5
Principles of industrial communications	19	26	32	23	2.58	7.0

Table 81 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	23	32	32	13	2.35	10.0
Principles of hydraulics pneumatics, and fluidics	48	29	13	10	1.84	26.0
Theory and application of fluid power	51	29	7	13	1.81	27.0
Principles of offset printing, silk screen, and camera operations	0	3	13	84	3.81	1.0
Techniques of photographic half tone	3	7	9	81	3.68	2.0
Principles of contact and picture printing	10	10	6	74	3.45	3.0
Basic electronic circuits	26	48	10	16	2.16	15.0
Basic electronic control processes	36	41	13	10	1.97	22.0
Electronic communications theory and adaptation of hardware	48	32	13	7	1.77	28.5
Integrated circuits	48	35	10	7	1.74	31.0
Qualitative electrical theory	55	35	3	7	1.61	33.0
Basic metalworking processes	29	39	16	16	2.19	13.0
Principles of material joining (welding)	38	26	23	13	2.10	16.5
Principles of tool making	39	35	13	13	2.00	20.5

Table 81 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	45	25	23	7	1.90	23.0
Precision measurement	29	26	29	16	2.32	11.0
Simulated industrial experience	16	29	13	42	2.81	5.0
Investigate, research, and experimentation of technical problems	7	25	26	42	3.03	4.0
System analysis and activity planning	19	32	26	23	2.52	8.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

of the responses were in the 'essential' column. The concept of techniques of photographic half tone was ranked 2.0 with a mean of 3.68.

Machine shop The concept of laboratory management was ranked 1.0 by the graduates who had assignments in machine shop, Table 82. Sixty-three percent of the responses were in the 'essential' column. Fundamentals of laboratory safety was ranked 2.0 by the same group. There were no responses in the 'no-value' column for either concept. Six instructional concepts had a mean of 3.00 or greater.

Table 82. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, machine shop N = 27

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	7	37	37	19	2.67	8.5
Methods of teaching industrial arts	4	7	30	59	3.44	3.5
Evaluation of student progress	0	7	41	52	3.44	3.5
Laboratory management	0	7	30	63	3.56	1.0
Techniques and procedures for the selection of instructional materials	8	7	44	41	3.19	5.0
Course construction	0	22	45	33	3.11	6.0
Lesson planning	11	19	37	33	2.93	7.0
Theory and organization of the general shop	22	44	30	4	2.15	11.0
Principles of laboratory planning	15	26	37	22	2.67	8.5
Requisition writing	11	41	22	26	2.63	10.0
Micro teaching	41	37	15	7	1.89	12.0
Fundamentals of laboratory safety	0	11	30	59	3.48	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

It was interesting to note that the data in Table 83 reveal that the graduates who had teaching assignments in machine shop considered the concept of basic metalworking processes the most important. Sixty-seven percent of the responses were in the 'essential' column. Principles of metal joining (welding) was the concept that had a rank of 2.0. Computer graphics was considered to be the least important concept by this group.

Sheet metal   Graduates who had assignments in sheet metal ranked laboratory management as the most important professional education instructional concept. Sixty percent of the responses were in the 'essential' column, Table 84. Fundamentals of laboratory safety and evaluation of student progress were the concepts ranked 2.0 and 3.0 respectively. Theory and organization of the general shop had a rank of 12.0. There were no responses in the 'essential' column for this concept.

Data in Table 85 reveal that the graduates who had teaching assignments in sheet metal ranked the three most important technical education instructional concepts as follows: 1) basic metalworking processes, 2) principles of material joining (welding), and 3) fundamentals of technical drawing. There were no responses in the 'essential' column for thirteen of the instructional concepts.

Welding   The data in Tables 86 and 87 reveal how the graduates who had teaching responsibilities in welding rated

Table 83. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, machine shop N = 27

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	4	11	26	59	3.41	4.0
Charts and graphs	11	41	44	4	2.41	19.5
Computer graphics	40	41	19	0	1.78	33.0
Principles of architectural drafting	18	30	37	15	2.48	14.5
Industrial arts design	4	33	41	22	2.81	8.0
Descriptive geometry	18	41	30	11	2.33	23.0
Sources, development, and transmission of power	8	44	41	7	2.48	14.5
Automotive repair and maintenance	15	37	37	11	2.44	17.0
Tune-up, repair, and care of air cooled engines	19	29	30	22	2.56	12.0
Principles of test equipment and electrical diagnosis	18	37	26	19	2.44	17.0
Analysis, diagnosis, service and maintenance of home appliance	11	52	33	4	2.30	25.5
Service and repair of vehicle systems	19	37	33	11	2.37	21.0
Fundamentals of woodworking	8	33	37	22	2.74	9.0
Principles of industrial communications	11	59	19	11	2.30	25.5

Table 83 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	14	41	41	4	2.33	23.0
Principles of hydraulics pneumatics, and fluidics	15	41	33	11	2.41	19.5
Theory and application of fluid power	15	40	30	15	2.44	17.0
Principles of offset printing, silk screen, and camera operations	22	44	30	4	2.15	27.0
Techniques of photographic half tone	37	41	18	4	1.88	31.0
Principles of contact and picture printing	30	44	22	4	2.00	28.0
Basic electronic circuits	4	41	44	11	2.63	10.5
Basic electronic control processes	15	44	33	8	2.33	23.0
Electronic communications theory and adaptation of hardware	30	48	22	0	1.93	30.0
Integrated circuits	40	26	30	4	1.96	29.0
Qualitative electrical theory	37	41	22	0	1.85	32.0
Basic metalworking processes	0	7	26	67	3.59	1.0
Principles of material joining (welding)	0	7	33	60	3.52	2.0
Principles of tool making	0	33	15	52	3.19	6.0

Table 83 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	0	22	26	52	3.30	5.0
Precision measurement	0	18	15	67	3.48	3.0
Simulated industrial experience	7	26	22	45	3.04	7.0
Investigate, research, and experimentation of technical problems	15	26	41	18	2.63	10.5
System analysis and activity planning	15	33	37	15	2.52	13.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 84. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, sheet metal N = 10

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	20	40	20	20	2.40	8.0
Methods of teaching industrial arts	10	0	70	20	3.00	4.5
Evaluation of student progress	0	10	70	20	3.10	3.0
Laboratory management	0	20	20	60	3.40	1.0
Techniques and procedures for the selection of instructional materials	20	10	40	30	2.80	6.0
Course construction	0	20	60	20	3.00	4.5
Lesson planning	20	40	40	0	2.20	9.5
Theory and organization of the general shop	30	60	10	0	1.80	12.0
Principles of laboratory planning	30	20	50	0	2.20	9.5
Requisition writing	30	10	40	20	2.50	7.0
Micro teaching	40	20	30	10	2.10	11.0
Fundamentals of laboratory safety	0	20	40	40	3.20	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 85. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, sheet metal N = 10

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	10	10	30	50	3.20	3.0
Charts and graphs	10	50	40	0	2.30	16.5
Computer graphics	60	20	20	0	1.60	33.0
Principles of architectural drafting	10	30	30	30	2.80	7.5
Industrial arts design	10	20	40	30	2.90	6.0
Descriptive geometry	20	30	40	10	2.40	14.0
Sources, development, and transmission of power	30	30	30	10	2.20	20.0
Automotive repair and maintenance	20	30	40	10	2.40	14.0
Tune-up, repair, and care of air cooled engines	20	30	30	20	2.50	11.0
Principles of test equipment and electrical diagnosis	20	20	40	20	2.60	9.0
Analysis, diagnosis, service and maintenance of home appliance	10	60	30	0	2.20	20.0
Service and repair of vehicle systems	20	50	20	10	2.20	20.0
Fundamentals of woodworking	0	60	30	10	2.50	11.0
Principles of industrial communications	10	60	10	20	2.40	14.0

Table 85 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	30	40	20	10	2.10	24.0
Principles of hydraulics pneumatics, and fluidics	30	30	40	0	2.10	24.0
Theory and application of fluid power	30	20	50	0	2.20	20.0
Principles of offset printing, silk screen, and camera operations	40	30	30	0	1.90	27.0
Techniques of photographic half tone	40	30	30	0	1.90	27.0
Principles of contact and picture printing	40	40	20	0	1.80	30.0
Basic electronic circuits	20	40	40	0	2.20	20.0
Basic electronic control processes	40	30	30	0	1.90	27.0
Electronic communications theory and adaptation of hardware	40	50	10	0	1.70	32.0
Integrated circuits	40	40	20	0	1.80	30.0
Qualitative electrical theory	30	60	10	0	1.80	30.0
Basic metalworking processes	0	20	0	80	3.60	1.0
Principles of material joining (welding)	10	10	10	70	3.40	2.0
Principles of tool making	20	20	20	40	2.80	7.5

Table 85 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	10	30	0	60	3.10	4.0
Precision measurement	10	30	10	50	3.00	5.0
Simulated industrial experience	20	30	30	20	2.50	11.0
Investigate, research, and experimentation of technical problems	20	40	30	10	2.30	16.5
System analysis and activity planning	30	40	20	10	2.10	24.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 86. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, welding N = 20

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	10	45	25	20	2.55	8.0
Methods of teaching industrial arts	5	10	35	50	3.30	3.0
Evaluation of student progress	0	15	50	35	3.20	4.0
Laboratory management	0	15	30	55	3.40	1.0
Techniques and procedures for the selection of instructional materials	15	15	35	35	2.90	6.0
Course construction	0	15	55	30	3.15	5.0
Lesson planning	15	15	55	15	2.70	7.0
Theory and organization of the general shop	30	45	20	5	2.00	11.0
Principles of laboratory planning	20	25	50	5	2.40	9.0
Requisition writing	30	25	25	20	2.35	10.0
Micro teaching	40	45	15	0	1.75	12.0
Fundamentals of laboratory safety	5	10	30	55	3.35	2.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 87. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, welding N = 20

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	5	20	15	60	3.30	3.0
Charts and graphs	30	30	40	0	2.10	21.0
Computer graphics	60	20	15	5	1.65	29.5
Principles of architectural drafting	20	15	25	40	2.85	5.5
Industrial arts design	15	35	20	30	2.65	9.5
Descriptive geometry	20	35	40	5	2.30	17.0
Sources, development, and transmission of power	15	25	45	15	2.60	12.0
Automotive repair and maintenance	20	25	30	25	2.60	12.0
Tune-up, repair, and care of air cooled engines	25	20	40	15	2.45	14.0
Principles of test equipment and electrical diagnosis	25	25	35	15	2.40	15.0
Analysis, diagnosis, service and maintenance of home appliance	20	45	30	5	2.20	20.0
Service and repair of vehicle systems	20	45	25	10	2.25	19.0
Fundamentals of woodworking	0	45	35	20	2.75	7.5
Principles of industrial communications	25	55	15	5	2.00	23.0

Table 87 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	35	40	20	5	1.95	26.0
Principles of hydraulics pneumatics, and fluidics	30	45	20	5	2.00	23.0
Theory and application of fluid power	30	50	15	5	1.95	26.0
Principles of offset printing, silk screen, and camera operations	35	35	25	5	2.00	23.0
Techniques of photographic half tone	50	30	20	0	1.70	28.0
Principles of contact and picture printing	50	35	15	0	1.65	29.5
Basic electronic circuits	20	40	30	10	2.30	17.0
Basic electronic control processes	30	45	25	0	1.95	26.0
Electronic communications theory and adaptation of hardware	50	40	10	0	1.60	32.0
Integrated circuits	50	40	10	0	1.60	32.0
Qualitative electrical theory	45	50	5	0	1.60	32.0
Basic metalworking processes	5	15	20	60	3.35	2.0
Principles of material joining (welding)	0	10	15	75	3.65	1.0
Principles of tool making	15	30	20	35	2.75	7.5

Table 87 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	0	30	20	50	3.20	4.0
Precision measurement	10	30	25	35	2.85	5.5
Simulated industrial experience	25	15	30	30	2.65	9.5
Investigate, research, and experimentation of technical problems	15	35	25	25	2.60	12.0
System analysis and activity planning	25	35	25	15	2.30	17.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

the professional and technical instructional concepts. The three most important professional education instructional concept, according to rank, were: 1) laboratory management, 2) fundamentals of laboratory safety, and 3) methods of teaching industrial arts. Also, the technical education instructional concepts, ranked according to their importance, were: 1) principles of material joining (welding), 2) basic metalworking processes, and 3) fundamentals of technical drawing.

<u>Auto mechanics</u> The data in Table 88 reveal that the professional education concept of fundamentals of laboratory safety was ranked 1.0 by the graduates who had teaching assignments in auto mechanics. Sixty-nine percent of the responses were in the 'essential' column. The instructional concept of laboratory management was ranked 2.0. Conversely, micro teaching was ranked 12.0 with 48 percent of the responses in the 'no-value' column.

It was interesting to note that the data in Table 89 reveal that the instructional concept of automotive repair and maintenance was ranked 1.0 by graduates who had teaching assignments in auto mechanics. Concepts that were ranked 2.0 and 3.0 respectively were: tune-up, repair, and care of air cooled engines and principles of test equipment and electrical diagnosis. All three concepts had a high percentage of responses in the 'essential' column.

The data in Table 90 reveal that professional education instructional concepts were ranked consistently by graduates in all areas of instruction. The instructional concept of fundamentals of laboratory safety was ranked 1.0 through 4.0. Micro teaching was the instructional concept with the rank of 11.0 and 12.0 and a range in the mean from 1.77 to 2.10.

The data in Table 91 reveal that the instructional concept of fundamentals of technical drawing was ranked 1.0 through 10.0 by the graduates in area-unit-instructional laboratory. Technical education instructional concepts that were directly

Table 88. Evaluation of professional education instructional concepts by educational area of work--area-unit-instructional laboratory, auto mechanics N = 46

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	9	44	24	23	2.63	9.0
Methods of teaching industrial arts	7	17	24	52	3.22	4.0
Evaluation of student progress	2	15	29	54	3.35	3.0
Laboratory management	2	9	28	61	3.48	2.0
Techniques and procedures for the selection of instructional materials	0	17	46	37	3.20	5.5
Course construction	0	20	41	39	3.20	5.5
Lesson planning	4	28	33	35	2.98	7.0
Theory and organization of the general shop	39	40	17	4	1.87	11.0
Principles of laboratory planning	6	28	40	26	2.85	8.0
Requisition writing	17	41	22	20	2.43	10.0
Micro teaching	48	29	17	6	1.83	12.0
Fundamentals of laboratory safety	0	9	22	69	3.61	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 89. Evaluation of technical education instructional concepts by educational area of work--area-unit-instructional laboratory, auto mechanics N = 46

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	6	33	28	33	2.87	10.0
Charts and graphs	22	43	28	7	2.20	22.5
Computer graphics	63	26	9	2	1.50	33.0
Principles of architectural drafting	33	39	17	11	2.07	28.0
Industrial arts design	35	41	20	4	1.93	29.0
Descriptive geometry	26	35	26	13	2.26	19.5
Sources, development, and transmission of power	0	11	28	61	3.50	4.0
Automotive repair and maintenance	0	4	20	76	3.72	1.0
Tune-up, repair, and care of air cooled engines	2	7	15	76	3.65	2.0
Principles of test equipment and electrical diagnosis	2	9	22	67	3.54	3.0
Analysis, diagnosis, service and maintenance of home appliance	24	41	26	9	2.20	22.5
Service and repair of vehicle systems	0	13	26	61	3.48	5.0
Fundamentals of woodworking	28	42	17	13	2.16	25.0
Principles of industrial communications	30	37	22	11	2.13	26.0

Table 89 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	30	37	26	7	2.09	27.0
Principles of hydraulics pneumatics, and fluidics	11	22	26	41	2.98	9.0
Theory and application of fluid power	13	24	30	33	2.83	12.0
Principles of offset printing, silk screen, and camera operations	55	26	15	4	1.70	30.0
Techniques of photographic half tone	59	26	11	4	1.61	31.0
Principles of contact and picture printing	61	28	4	7	1.57	32.0
Basic electronic circuits	2	17	35	46	3.24	7.0
Basic electronic control processes	10	26	36	28	2.80	13.0
Electronic communications theory and adaptation of hardware	22	46	17	15	2.26	19.5
Integrated circuits	20	41	19	20	2.39	16.0
Qualitative electrical theory	28	41	15	16	2.17	24.0
Basic metalworking processes	13	20	37	30	2.85	11.0
Principles of material joining (welding)	9	4	48	39	3.17	8.0
Principles of tool making	28	40	15	17	2.22	21.0

Table 89 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	31	28	24	17	2.28	18.0
Precision measurement	7	10	33	50	3.26	6.0
Simulated industrial experience	20	28	22	30	2.63	14.0
Investigate, research, and experimentation of technical problems	17	35	28	20	2.50	15.0
System analysis and activity planning	22	37	24	17	2.37	17.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 90. Evaluation of professional instructional concepts by rank and mean for area-unit-instructional laboratory N = 248

Instructional concepts	Area of instruction: Technical drawing N = 49	Architectural drafting N = 27	Electricity N = 15	Electronics N = 23
Philosophy of industrial arts education	9.0[a] 2.51[b]	10.0 2.63	6.5 3.07	9.0 2.70
Methods of teaching industrial arts	3.0 3.33	4.0 3.33	3.5 3.20	7.5 2.96
Evaluation of student progress	1.0 3.45	1.0 3.56	2.0 3.40	2.0 3.52
Laboratory management	2.0 3.41	3.0 3.48	3.5 3.20	4.5 3.22
Techniques and procedures for the selection of instructional materials	6.0 3.10	6.0 3.15	6.5 3.07	3.0 3.26
Course construction	5.0 3.14	5.0 3.30	8.5 2.87	4.5 3.22
Lesson planning	7.0 2.82	7.0 2.89	5.0 3.13	6.0 3.04
Theory and organization of the general shop	11.0 2.16	11.0 2.11	11.0 2.40	11.0 2.17
Principles of laboratory planning	8.0 2.59	8.0 2.74	8.5 2.87	7.5 2.96
Requisition writing	10.0 2.45	9.0 2.67	10.0 2.47	10.0 2.56
Micro teaching	12.0 1.92	12.0 1.93	12.0 2.00	12.0 2.09
Fundamentals of laboratory safety	4.0 3.20	2.0 2.52	1.0 3.53	1.0 3.61

[a]Rank.

[b]Mean.

Area of instruction				
Graphic arts N = 31	Machine shop N = 27	Sheet metal N = 10	Welding N = 20	Auto mechanics N = 46
10.0 2.46	8.5 2.67	8.0 2.40	8.0 2.55	9.0 2.63
2.0 3.35	3.5 3.44	4.5 3.00	3.0 3.30	4.0 3.22
4.0 3.19	3.5 3.44	3.0 3.10	4.0 3.20	3.0 3.35
3.0 3.32	1.0 3.56	1.0 3.40	1.0 3.40	2.0 3.48
5.0 3.06	5.0 3.19	6.0 2.80	6.0 2.90	5.5 3.20
6.0 3.03	6.0 3.11	4.5 3.00	5.0 3.15	5.5 3.20
7.0 2.71	7.0 2.93	9.5 2.20	7.0 2.70	7.0 2.98
11.0 1.84	11.0 2.15	12.0 1.80	11.0 2.00	11.0 1.87
8.0 2.61	8.5 2.67	9.5 2.20	9.0 2.40	8.0 2.85
9.0 2.48	10.0 2.63	7.0 2.50	10.0 2.35	10.0 2.43
12.0 1.77	12.0 1.89	11.0 2.10	12.0 1.75	12.0 1.83
1.0 3.42	2.0 3.48	2.0 3.20	2.0 3.35	1.0 3.61

Table 91. Evaluation of technical instructional concepts by rank and mean for area-unit-instructional laboratory N = 248

Instructional concepts	Area of instruction: Technical drawing N = 49	Architectural drafting N = 27	Electricity N = 15	Electronics N = 23
Fundamentals of technical drawing	1.0[a] 3.67[b]	1.0 3.78	4.5 3.27	9.0 2.91
Charts and graphs	15.5 2.43	13.5 2.59	19.5 2.53	11.0 2.78
Computer graphics	21.0 2.24	19.0 2.41	31.0 2.13	22.5 2.17
Principles of architectural drafting	2.0 3.43	2.0 3.67	24.0 2.47	28.5 1.91
Industrial arts design	3.0 3.14	3.0 3.19	11.0 2.80	22.5 2.17
Descriptive geometry	5.5 2.90	7.0 2.96	24.0 2.47	19.5 2.26
Sources, development, and transmission of power	17.0 2.37	16.0 2.52	13.5 2.67	15.5 2.57
Automotive repair and maintenance	23.0 2.20	26.5 2.19	19.5 2.53	25.5 2.04
Tune-up, repair, and care of air cooled engines	24.0 2.18	24.5 2.26	13.5 2.67	27.0 2.00
Principles of test equipment and electrical diagnosis	19.0 2.27	22.0 2.30	7.5 3.13	6.0 3.30

[a]Rank.

[b]Mean.

Area of instruction				
Graphic arts N = 31	Machine shop N = 27	Sheet metal N = 10	Welding N = 20	Auto mechanics N = 46
6.0 2.71	4.0 3.41	3.0 3.20	3.0 3.30	10.0 2.87
18.0 2.06	19.5 2.41	16.5 2.30	21.0 2.10	22.5 2.20
20.5 2.00	33.0 1.78	33.0 1.60	29.5 1.65	33.0 1.50
13.0 2.19	14.5 2.48	7.5 2.80	5.5 2.85	28.0 2.07
9.0 2.42	8.0 2.81	6.0 2.90	9.5 2.65	29.0 1.93
24.5 1.87	23.0 2.33	14.0 2.40	17.0 2.30	19.5 2.26
19.0 2.03	14.5 2.48	20.0 2.20	12.0 2.60	4.0 3.50
28.5 1.77	17.0 2.44	14.0 2.40	12.0 2.60	1.0 3.72
31.0 1.74	12.0 2.56	11.0 2.50	14.0 2.45	2.0 3.65
13.0 2.19	17.0 2.44	9.0 2.60	15.0 2.40	3.0 3.54

Table 91 (Continued)

Instructional concepts	Area of instruction: Technical drawing N = 49	Architectural drafting N = 27	Electricity N = 15	Electronic N - 23
Analysis, diagnosis service and maintenance of home appliance	25.5 2.14	22.0 2.30	7.5 3.13	7.0 3.00
Service and repair of vehicle systems	29.0 2.06	32.0 2.04	19.5 2.53	24.0 2.09
Fundamentals of woodworking	8.0 2.84	8.0 2.92	13.5 2.67	25.5 2.04
Principles of industrial communications	12.5 2.51	10.5 2.70	24.0 2.47	17.0 2.52
Methods of storage and retrieval of information	21.0 2.24	17.5 2.48	24.0 2.47	12.5 2.65
Principles of hydraulics pneumatics, and fluidics	25.5 2.14	28.5 2.15	27.0 2.33	19.5 2.26
Theory and application of fluid power	29.0 2.06	30.5 2.11	28.5 2.67	21.0 2.22
Principles of offset printing, silk screen and camera operations	18.0 2.35	22.0 2.30	31.0 2.13	30.5 1.87
Techniques of photographic half tone	27.0 2.10	20.0 2.30	33.0 1.93	33.0 1.74
Principles of contact and picture printing	32.0 1.98	30.5 2.11	31.5 2.13	32.0 1.83
Basic electronic circuits	12.5 2.51	13.5 2.59	1.0 3.53	1.0 3.78
Basic electronic control processes	21.0 2.24	24.5 2.26	2.0 3.47	2.0 3.70

Area of instruction				
Graphic arts N = 31	Machine shop N = 27	Sheet metal N = 10	Welding N = 20	Auto mechanics N = 46
31.0	25.5	20.0	20.0	22.5
1.74	2.30	2.20	2.20	2.20
24.5	21.0	20.0	19.0	5.0
1.87	2.37	2.20	2.25	3.48
16.5	9.0	11.0	7.5	25.0
2.10	2.74	2.50	2.75	2.16
7.0	25.5	14.0	23.0	26.0
2.58	2.30	2.40	2.00	2.13
10.0	23.0	24.0	26.0	27.0
2.35	2.33	2.10	1.95	2.09
26.0	19.5	24.0	23.0	9.0
1.84	2.41	2.10	2.00	2.98
27.0	17.0	20.0	26.0	12.0
1.81	2.44	2.20	1.95	2.83
1.0	27.0	27.0	23.0	30.0
3.81	2.15	1.90	2.00	1.70
2.0	31.0	27.0	28.0	31.0
3.68	1.88	1.90	1.70	1.61
3.0	28.0	30.0	29.5	32.0
3.45	2.00	1.80	1.65	1.57
15.0	10.5	20.0	17.0	7.0
2.16	2.63	2.20	2.30	3.24
22.0	23.0	27.0	26.0	13.0
1.97	2.33	1.90	1.95	2.80

Table 91 (Continued)

Instructional concepts	Area of instruction: Technical drawing N = 49	Architectural drafting N = 27	Electricity N = 15	Electronics N = 23
Electronic communications theory and adaptation of hardware	29.0 2.06	26.5 2.19	3.0 3.40	3.0 3.65
Integrated circuits	31.0 2.00	28.5 2.15	6.0 3.20	4.0 3.57
Qualitative electrical theory	33.0 1.96	33.0 1.96	10.0 3.00	5.0 3.43
Basic metalworking processes	4.0 2.92	5.5 3.04	13.5 2.67	18.0 2.39
Principles of material joining (welding)	7.0 2.88	4.0 3.07	9.0 3.07	15.5 2.57
Principles of tool making	15.5 2.43	13.5 2.59	28.5 2.27	28.5 1.91
Fundamentals of heat treating	11.0 2.53	13.5 2.59	19.5 2.27	30.5 1.91
Precision measurement	5.5 2.90	5.5 3.04	4.5 3.27	12.5 2.65
Simulated industrial experiences	9.0 2.74	9.0 2.85	12.0 2.73	8.0 2.98
Investigate, research, and experimentation of technical problems	10.0 2.55	10.5 2.70	17.0 2.60	10.0 2.87
System analysis and activity planning	14.0 2.45	17.5 2.48	24.0 2.47	14.0 2.61

Area of instruction				
Graphic arts N = 31	Machine shop N = 27	Sheet metal N = 10	Welding N = 20	Auto mechanics N = 46
28.5 1.77	30.0 1.93	32.0 1.70	32.0 1.60	19.5 2.26
31.0 1.74	29.0 1.96	30.0 1.80	32.0 1.60	16.0 2.39
33.0 1.61	32.0 1.85	30.0 1.80	32.0 1.60	24.0 2.17
13.0 2.19	1.0 3.59	1.0 3.60	2.0 3.35	11.0 2.85
16.5 2.10	2.0 3.52	2.0 3.40	1.0 3.65	8.0 3.17
20.5 2.00	6.0 3.19	7.5 2.80	7.5 2.75	21.0 2.22
23.0 1.90	5.0 3.30	4.0 3.10	4.0 3.20	18.0 2.28
11.0 2.32	3.0 3.48	5.0 3.00	5.5 2.85	6.0 3.26
5.0 2.81	7.0 3.04	11.0 2.50	9.5 2.65	14.0 2.63
4.0 3.03	10.5 2.63	16.5 2.30	12.0 2.60	15.0 2.50
8.0 2.52	13.0 2.52	24.0 2.10	17.0 2.30	17.0 2.37

related to an area of instruction were ranked 1.0, 2.0, and 3.0 respectively.

Nontechnical instruction The graduates who had assignments in nontechnical instruction were listed as follows: 1) professional subjects, 2) related subjects, 3) guidance or counseling, and 4) other. Since the frequency in each category was less than 10, they were combined into the area of nontechnical instruction.

It was interesting to observe that graduates who had assignments in nontechnical instruction rated the concept of techniques and procedures for the selection of instructional materials as the most important, Table 92. Conversely, theory and organization of the general shop was considered to be the least important concept.

The fundamentals of technical drawing was the technical instructional concept that was considered the most important by the graduates in nontechnical instruction. The mean for this concept was 2.65. Theory and application of fluid power was considered to be the least important concept with a mean of 1.82, Table 93.

Administration The graduates who had responsibilities in administration were listed as follows: 1) buildings and grounds, 2) business administrator, 3) coordinator, 4) director, 5) principal, 6) superintendent, 7) supervisor, and 8) other. The number of responses in each listing was small; therefore, they were combined into the area of administration.

Table 92. Evaluation of professional education instructional concepts by educational area of work--nontechnical instruction N = 26

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	15	35	23	27	2.61	8.0
Methods of teaching industrial arts	8	19	23	50	3.15	3.0
Evaluation of student progress	8	12	38	42	3.15	3.0
Laboratory management	19	4	46	31	2.88	7.0
Techniques and procedures for the selection of instructional materials	4	8	42	46	3.61	1.0
Course construction	4	23	50	23	2.92	5.5
Lesson planning	0	12	61	27	3.15	3.0
Theory and organization of the general shop	31	42	15	12	2.08	12.0
Principles of laboratory planning	15	27	46	12	2.53	9.0
Requisition writing	23	31	27	19	2.42	10.0
Micro teaching	27	27	38	8	2.27	11.0
Fundamentals of laboratory safety	15	23	16	46	2.92	5.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 93. Evaluation of technical education instructional concepts by educational area of work--nontechnical instruction N = 26

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	23	23	19	35	2.65	1.0
Charts and graphs	27	42	27	4	2.08	27.0
Computer graphics	35	46	8	11	1.96	31.0
Principles of architectural drafting	27	23	31	19	2.42	5.5
Industrial arts design	27	46	15	12	2.11	26.0
Descriptive geometry	23	38	27	12	2.27	14.0
Sources, development, and transmission of power	23	42	15	20	2.30	10.0
Automotive repair and maintenance	27	31	19	23	2.38	7.0
Tune-up, repair, and care of air cooled engines	35	26	19	20	2.23	17.0
Principles of test equipment and electrical diagnosis	35	27	26	12	2.15	22.5
Analysis, diagnosis, service and maintenance of home appliance	35	23	31	11	2.19	19.5
Service and repair of vehicle systems	38	27	27	8	2.04	28.5
Fundamentals of woodworking	35	19	42	4	2.15	22.5
Principles of industrial communications	27	27	35	11	2.30	10.0

Table 93 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	27	35	27	11	2.23	17.0
Principles of hydraulics pneumatics, and fluidics	42	23	23	12	2.04	28.5
Theory and application of fluid power	50	23	23	4	1.82	33.0
Principles of offset printing, silk screen, and camera operations	31	38	10	16	2.15	22.5
Techniques of photographic half tone	30	27	23	20	2.30	10.0
Principles of contact and picture printing	27	42	11	20	2.23	17.0
Basic electronic circuits	23	19	38	20	2.54	3.0
Basic electronic control processes	36	11	42	11	2.30	10.0
Electronic communications theory and adaptation of hardware	34	27	23	16	2.19	19.5
Integrated circuits	38	34	16	12	2.00	30.0
Qualitative electrical theory	46	27	20	7	1.88	32.0
Basic metalworking processes	46	11	23	20	2.15	22.5
Principles of material joining (welding)	38	19	20	23	2.27	14.0
Principles of tool making	34	31	23	12	2.12	25.0

Table 93 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	38	19	20	23	2.27	14.0
Precision measurement	35	19	26	20	2.30	10.0
Simulated industrial experience	23	31	19	27	2.50	4.0
Investigate, research, and experimentation of technical problems	20	27	27	26	2.61	2.0
System analysis and activity planning	23	34	20	23	2.42	5.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

The data in Table 94 reveal that the graduates who were in administration considered the professional instructional concept of evaluation of student progress the most important. Methods of teaching industrial arts was the concept that was ranked 2.0. Forty-two percent of the responses were in the 'essential' column.

Fundamentals of technical drawing was the technical education instruction concept that was ranked most important by respondents in administration, Table 95. Conversely, principles of hydraulics, pneumatics, and fluidics and theory and

Table 94. Evaluation of professional education instructional concepts by educational area of work--administration N = 41

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	7	46	20	27	2.66	7.0
Methods of teaching industrial arts	12	22	24	42	2.96	2.0
Evaluation of student progress	10	10	39	41	3.12	1.0
Laboratory management	15	22	29	34	2.83	4.5
Techniques and procedures for the selection of instructional materials	22	17	24	37	2.76	6.0
Course construction	14	20	29	37	2.88	3.0
Lesson planning	17	17	32	34	2.83	4.5
Theory and organization of the general shop	22	44	24	10	2.02	11.0
Principles of laboratory planning	12	32	47	9	2.54	9.5
Requisition writing	24	17	32	27	2.58	8.0
Micro teaching	39	32	24	5	1.94	12.0
Fundamentals of laboratory safety	17	29	12	42	2.54	9.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 95. Evaluation of technical education instructional concepts by educational area of work--administration N = 41

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	10	24	32	34	2.90	1.0
Charts and graphs	22	49	20	9	2.17	26.0
Computer graphics	34	37	5	24	2.20	24.0
Principles of architectural drafting	17	27	24	32	2.71	4.0
Industrial arts design	24	37	22	17	2.31	16.5
Descriptive geometry	17	42	17	24	2.48	10.0
Sources, development, and transmission of power	22	37	29	12	2.34	14.0
Automotive repair and maintenance	24	34	27	15	2.31	16.5
Tune-up, repair, and care of air cooled engines	27	24	32	17	2.39	13.0
Principles of test equipment and electrical diagnosis	32	29	22	17	2.24	20.0
Analysis, diagnosis, service and maintenance of home appliance	24	38	29	9	2.24	20.0
Service and repair of vehicle systems	34	30	29	7	2.14	27.0
Fundamentals of woodworking	29	32	29	10	2.20	24.0
Principles of industrial communications	29	32	22	17	2.26	18.0

Table 95 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	29	32	27	12	2.22	22.0
Principles of hydraulics pneumatics, and fluidics	32	39	19	10	2.07	32.0
Theory and application of fluid power	41	39	15	5	1.83	33.0
Principles of offset printing, silk screen, and camera operations	29	37	27	7	2.12	29.0
Techniques of photographic half tone	34	34	19	13	2.09	31.0
Principles of contact and picture printing	29	39	22	10	2.12	29.0
Basic electronic circuits	15	27	34	24	2.68	6.5
Basic electronic control processes	19	29	39	13	2.44	12.0
Electronic communications theory and adaptation of hardware	22	39	24	15	2.32	15.0
Integrated circuits	24	44	20	12	2.20	24.0
Qualitative electrical theory	27	43	20	10	2.12	29.0
Basic metalworking processes	20	22	27	31	2.70	5.0
Principles of material joining (welding)	7	34	35	24	2.76	2.0
Principles of tool making	24	38	21	17	2.24	20.0

Table 95 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	24	27	27	22	2.46	11.0
Precision measurement	20	24	24	32	2.68	6.5
Simulated industrial experience	17	27	22	34	2.73	3.0
Investigate, research, and experimentation of technical problems	17	35	16	32	2.63	8.0
System analysis and activity planning	17	35	24	24	2.56	9.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

application of fluid power were the two concepts ranked the least important.

The data in Table 96 reveal that the instructional concept of methods of teaching industrial arts was ranked 1.0 in two of the four instructional areas. Fundamentals of laboratory safety was the instructional concept with the largest range in rank, 1.0 to 9.5, and the largest range in mean, 2.54 to 3.50.

Table 97 discloses that the technical education instructional concepts of fundamentals of technical drawing, basic

Table 96. Evaluation of professional instructional concepts by rank and mean for innovative program, multiple-activities-instructional laboratory, nontechnical, and administration N = 137

Instructional concepts	Area of instruction			
	Innovative program N = 14	Multiple-activities-instr. lab. N = 56	Nontechnical N = 26	Administration N = 41
Philosophy of industrial arts education	5.5[a] 2.93[b]	10.0 2.66	8.0 2.61	7.0 2.66
Methods of teaching industrial arts	1.0 3.57	1.0 3.54	3.0 3.15	2.0 2.96
Evaluation of student progress	4.0 3.14	3.0 3.34	3.0 3.15	1.0 3.12
Laboratory management	3.0 3.21	4.0 3.23	7.0 2.88	4.5 2.83
Techniques and procedures for the selection of instructional materials	5.5 2.93	6.5 3.02	1.0 3.61	6.0 2.76
Course construction	9.0 2.71	6.5 3.02	5.5 2.92	3.0 2.88
Lesson planning	8.0 2.79	5.0 3.05	3.0 3.15	4.5 2.83
Theory and organization of the general shop	11.0 2.36	8.0 2.75	12.0 2.08	11.0 2.02
Principles of laboratory planning	7.0 2.86	9.0 2.70	9.0 2.53	9.5 2.54
Requisition writing	10.0 2.50	11.0 2.48	10.0 2.42	8.0 2.58
Micro teaching	12.0 2.07	12.0 1.84	11.0 2.27	12.0 1.94
Fundamentals of laboratory safety	2.0 3.50	2.0 3.46	5.5 2.92	9.5 2.54

[a]Rank.

[b]Mean.

Table 97. Evaluation of technical instructional concepts by rank and mean for innovative program, multiple-activities-instructional laboratory, nontechnical, and administration N = 137

Instructional concepts	Area of instruction: Innovative program N = 14	Multiple-activities-instr. lab. N = 56	Nontechnical N = 26	Administration N = 41
Fundamentals of technical drawing	4.5[a] 3.14[b]	2.0 3.43	1.0 2.65	1.0 2.90
Charts and graphs	22.0 2.36	28.0 1.86	27.0 2.08	26.0 2.17
Computer graphics	28.5 2.00	33.0 1.66	31.0 1.96	24.0 2.20
Principles of architectural drafting	19.0 2.57	10.0 2.61	5.5 2.42	4.0 2.71
Industrial arts design	3.0 3.21	7.0 2.73	26.0 2.11	16.5 2.31
Descriptive geometry	15.5 2.71	23.0 2.13	14.0 2.27	10.0 2.48
Sources, development, and transmission of power	24.0 2.29	13.0 2.50	10.0 2.30	14.0 2.34
Automotive repair and maintenance	28.5 2.00	17.0 2.36	7.0 2.38	16.5 2.31
Tune-up, repair, and care of air cooled engines	30.0 1.93	12.0 2.52	17.0 2.23	13.0 2.39
Principles of test equipment and electrical diagnosis	27.0 2.07	18.5 2.32	22.5 2.15	20.0 2.24

[a]Rank.

[b]Mean.

Table 97 (Continued)

Instructional concepts	Area of instruction			
	Innovative program N = 14	Multiple-activities-instr. lab. N = 56	Nontechnical N = 26	Administration N = 41
Analysis, diagnosis, service and maintenance of home appliance	33.0 1.79	22.0 2.20	19.5 2.19	20.0 2.24
Service and repair of vehicle systems	31.5 1.86	24.5 2.09	28.5 2.04	27.0 2.14
Fundamentals of woodworking	6.5 3.00	1.0 3.57	22.5 2.15	24.0 2.20
Principles of industrial communications	9.0 2.93	18.5 2.32	10.0 2.30	18.0 2.26
Methods of storage and retrieval of information	15.5 2.71	20.5 2.25	17.0 2.23	22.0 2.22
Principles of hydraulics pneumatics, and fluidics	22.0 2.36	31.0 1.77	28.5 2.04	32.0 2.07
Theory and application of fluid power	25.0 2.21	32.0 1.71	33.0 1.82	33.0 1.83
Principles of offset printing, silk screen, and camera operations	9.0 2.93	8.0 2.70	22.5 2.15	29.0 2.12
Techniques of photographic half tone	20.0 2.50	29.0 1.84	10.0 2.30	31.0 2.09
Principles of contact and picture printing	12.5 2.79	24.5 2.09	17.0 2.23	29.0 2.12
Basic electronic circuits	9.0 2.93	4.0 2.93	3.0 2.54	6.5 2.68
Basic electronic control processes	12.5 2.79	15.5 2.39	10.0 2.30	12.0 2.44

Table 97 (Continued)

Instructional concepts	Area of instruction: Innovative program N = 14	Multiple-activities-instr. lab. N = 56	Nontechnical N = 26	Administration N = 41
Electronic communications theory and adaptation of hardware	17.5 2.64	26.0 2.05	19.5 2.19	15.0 2.32
Integrated circuits	26.0 2.14	27.0 1.89	30.0 2.00	24.0 2.20
Qualitative electrical theory	31.5 1.86	30.0 1.79	32.0 1.88	29.0 2.12
Basic metalworking processes	6.5 3.00	3.0 3.39	22.5 2.15	5.0 2.70
Principles of material joining (welding)	12.5 2.79	5.0 2.84	14.0 2.27	2.0 2.76
Principles of tool making	17.5 2.64	14.0 2.46	25.0 2.12	20.0 2.24
Fundamentals of heat treating	22.0 2.36	6.0 2.75	14.0 2.27	11.0 2.46
Precision measurement	12.5 2.79	11.0 2.55	10.0 2.30	6.5 2.68
Simulated industrial experience	1.0 3.57	9.0 2.62	4.0 2.50	3.0 2.73
Investigate, research, and experimentation of technical problems	2.0 3.29	15.5 2.39	2.0 2.61	8.0 2.63
System analysis and activity planning	4.5 3.14	20.5 2.25	5.5 2.42	9.0 2.56

electronic circuits, and simulated industrial experience had a range in rank from 1.0 to 9.0.

The data in Table 98 reveal that the mean and rank for the professional education instructional concepts remained stable throughout the ten year period. The largest range in the rank, 1.0 through 4.0, occurred in the instructional concept of methods of teaching industrial arts. The largest range in mean 2.27 to 3.26, occurred in the instructional concept of lesson planning.

<u>An evaluation of professional and technical education instructional concepts</u>

The evaluation of the professional and technical instructional concepts by 393 graduates in education was recorded in tables 99 and 100.

<u>Professional education</u> The data in Table 99 reveal how the graduates in education evaluated the professional education instructional concepts. Educators considered the concept of laboratory safety the most important with a rank of 1.0 and a mean of 3.40. Fifty-eight percent of the responses were in the 'essential' column. The concepts of evaluation of student progress and laboratory management were ranked 2.5 with a mean of 3.33.

<u>Technical education</u> The data in Table 100 reveal how the graduates in education evaluated the technical instructional concepts. The concepts ranked 1.0 through 4.0 were:

Table 98. Evaluation of professional education instructional concepts by graduates in education listed by rank and mean for year of graduation N = 393

Instructional concepts	Year of graduation 1960-62 N = 55	1963-64 N = 68	1965-66 N = 81	1967-68 N = 73	1969-70 N = 116
Philosophy of industrial arts education	9.0[a] 2.67[b]	9.0 2.71	8.0 2.78	9.0 2.61	10.0 2.35
Methods of teaching industrial arts	4.0 3.24	2.0 3.48	1.0 3.36	4.0 3.28	2.0 3.25
Evaluation of student progress	1.0 3.46	4.0 3.44	2.0 3.35	3.0 3.38	4.0 3.18
Laboratory management	3.0 3.36	2.0 3.48	4.0 3.18	2.0 3.49	3.0 3.24
Techniques and procedures for the selection of instructional materials	5.5 3.18	7.0 3.06	6.0 3.11	6.0 3.22	5.0 3.06
Course construction	5.5 3.18	6.0 3.17	5.0 3.16	5.0 3.27	6.0 2.96
Lesson planning	7.0 3.11	5.0 3.26	7.0 2.93	7.0 3.08	7.0 2.27
Theory and organization of the general shop	11.0 2.29	11.0 2.36	11.0 2.25	11.0 2.37	11.0 2.21
Principles of laboratory planning	8.0 2.86	8.0 2.80	9.0 2.65	8.0 2.87	8.0 2.66
Requisition writing	10.0 2.66	10.0 2.46	10.0 2.45	10.0 2.54	10.0 2.62
Micro teaching	12.0 1.75	12.0 1.80	12.0 1.77	12.0 2.05	12.0 2.10
Fundamentals of laboratory safety	2.0 3.38	2.0 3.48	3.0 3.24	1.0 3.53	1.0 3.38

[a]Rank.

[b]Mean.

Table 99. Evaluation of professional education instructional concepts by graduates in education N = 393

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	9	41	30	20	2.60	9.0
Methods of teaching industrial arts	4	12	32	52	3.31	4.0
Evaluation of student progress	3	11	36	50	3.33	2.5
Laboratory management	3	12	33	52	3.33	2.5
Techniques and procedures for the selection of instructional materials	6	14	42	38	3.10	6.0
Course construction	3	19	40	38	3.11	5.0
Lesson planning	6	23	40	31	2.96	7.0
Theory and organization of the general shop	21	42	25	12	2.27	11.0
Principles of laboratory planning	9	29	41	21	2.74	8.0
Requisition writing	17	34	28	21	2.53	10.0
Micro teaching	41	32	21	6	1.92	12.0
Fundamentals of laboratory safety	4	10	28	58	3.40	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 100. Evaluation of technical education instructional concepts by graduates in education N = 393

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	5	20	27	48	3.17	1.0
Charts and graphs	21	46	25	8	2.20	24.0
Computer graphics	46	32	15	7	1.82	33.0
Principles of architectural drafting	20	28	29	23	2.56	9.0
Industrial arts design	15	32	32	21	2.59	8.0
Descriptive geometry	23	38	24	15	2.29	21.0
Sources, development, and transmission of power	18	34	30	18	2.49	11.0
Automotive repair and maintenance	23	36	21	20	2.37	18.0
Tune-up, repair, and care of air cooled engines	26	30	23	21	2.38	16.0
Principles of test equipment and electrical diagnosis	26	28	23	23	2.43	12.0
Analysis, diagnosis, service and maintenance of home appliance	28	38	24	10	2.16	25.0
Service and repair of vehicle systems	29	34	23	14	2.22	23.0
Fundamentals of woodworking	14	27	28	31	2.76	4.0
Principles of industrial communications	21	35	32	12	2.34	20.0

Table 100 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	22	38	29	11	2.27	22.0
Principles of hydraulics pneumatics, and fluidics	34	36	20	10	2.07	27.0
Theory and application of fluid power	36	36	19	9	2.00	31.0
Principles of offset printing, silk screen, and camera operations	26	31	23	20	2.37	18.0
Techniques of photographic half tone	30	40	16	14	2.03	29.0
Principles of contact and picture printing	37	34	15	14	2.05	28.0
Basic electronic circuits	16	29	29	26	2.65	6.5
Basic electronic control processes	21	34	29	16	2.40	13.5
Electronic communications theory and adaptation of hardware	33	38	17	12	2.08	26.0
Integrated circuits	36	37	17	10	2.01	30.0
Qualitative electrical theory	42	38	10	10	1.88	32.0
Basic metalworking processes	13	23	28	36	2.87	2.0
Principles of material joining (welding)	14	24	33	29	2.77	3.0
Principles of tool making	22	36	26	16	2.37	18.0

Table 100 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	23	32	26	19	2.40	13.5
Precision measurement	14	27	31	28	2.71	5.0
Simulated industrial experience	15	31	27	27	2.65	6.5
Investigate, research, and experimentation of technical problems	16	23	41	20	2.55	10.0
System analysis and activity planning	20	35	30	15	2.39	15.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

fundamentals of technical drawing, basic metalworking processes, principles of metal joining (welding), and fundamentals of woodworking. The largest percent of the responses for these concepts were in the 'essential' and 'desirable' column.

Business or industry

Business contact, semi-professional; organization, managerial II; organization, semi-professional; technical, professional managerial II; and technical, semi-professional; were the classifications in business or industry that had ten or more responses.

Business contact semi-professional The data in Table 101 reveal that the graduates in business or industry--business contact, semi-professional ranked the concept of lesson planning the most important. Fourteen percent of the responses were in the 'essential' column. Twenty-nine percent of the respondents considered this concept to be of 'no-value'. It can be observed that there was a larger percent of responses in the 'no-value' and 'desirable' columns then there were in the 'important' and 'essential' columns.

Data in Table 102 reveal the evaluation of technical education instructional concepts by the graduates who were employed in business contact, semi-professional. The two instructional concepts ranked 1.0 and 2.0 respectively were: fundamentals of technical drawing and charts and graphs. It was observed that the percent of responses in the 'no-value' column was larger than the percent of responses in the 'essential' column. The mean for fourteen instructional concepts was less than 1.99.

Organization, professional and managerial II Data in Table 103 reveal how the professional instructional concepts were evaluated by the graduates who were in organization, professional managerial II. The instructional concepts ranked 1.0 and 2.0 respectively were: fundamentals of laboratory safety, and requisition writing. Eighteen percent of the responses for both concepts were in the 'essential' column. The largest percent of responses were in the 'no-value' and

Table 101. Evaluation of professional education instructional concepts by graduates in business or industry--business contact, semi-professional N = 21

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	38	62	0	0	1.62	11.0
Methods of teaching industrial arts	52	24	5	19	1.90	7.0
Evaluation of student progress	33	33	24	10	2.10	3.5
Laboratory management	43	33	14	10	1.90	7.0
Techniques and procedures for the selection of instructional materials	33	33	24	10	2.10	3.5
Course construction	38	38	19	5	1.90	7.0
Lesson planning	29	33	24	14	2.24	1.0
Theory and organization of the general shop	48	33	19	0	1.71	10.0
Principles of laboratory planning	42	29	29	0	1.86	9.0
Requisition writing	29	38	28	5	2.10	3.5
Micro teaching	61	29	5	5	1.52	12.0
Fundamentals of laboratory safety	43	29	5	23	2.10	3.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 102. Evaluation of technical education instructional concepts by graduates in business or industry--business contact, semi-professional N = 21

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	24	19	38	19	2.81	1.0
Charts and graphs	24	14	48	14	2.52	2.0
Computer graphics	47	24	24	5	1.86	26.5
Principles of architectural drafting	33	19	34	14	2.29	6.0
Industrial arts design	38	19	38	5	2.10	9.5
Descriptive geometry	33	38	19	10	2.05	14.0
Sources, development, and transmission of power	38	29	23	10	2.05	14.0
Automotive repair and maintenance	38	29	28	5	2.00	17.5
Tune-up, repair, and care of air cooled engines	38	33	24	5	1.95	21.0
Principles of test equipment and electrical diagnosis	38	33	24	5	1.95	21.0
Analysis, diagnosis, service and maintenance of home appliance	38	29	28	5	2.00	17.5
Service and repair of vehicle systems	38	33	19	10	2.00	17.5
Fundamentals of woodworking	38	29	28	5	2.00	17.5
Principles of industrial communications	23	24	48	5	2.33	4.5

Table 102 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	33	39	14	14	2.10	9.5
Principles of hydraulics pneumatics, and fluidics	47	24	19	10	1.90	23.0
Theory and application of fluid power	48	28	14	10	1.85	26.5
Principles of offset printing, silk screen, and camera operations	33	33	24	10	2.09	9.5
Techniques of photographic half tone	47	29	14	10	1.86	26.5
Principles of contact and picture printing	43	29	19	9	1.95	21.0
Basic electronic circuits	24	43	33	0	2.10	9.5
Basic electronic control processes	24	48	28	0	2.05	14.0
Electronic communications theory and adaptation of hardware	29	33	38	0	2.09	9.5
Integrated circuits	38	38	24	0	1.86	26.5
Qualitative electrical theory	38	43	19	0	1.81	30.0
Basic metalworking processes	43	33	19	5	1.86	26.5
Principles of material joining (welding)	52	29	14	5	1.86	26.5
Principles of tool making	43	48	5	4	1.71	33.0

Table 102 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	42	43	10	5	1.76	31.5
Precision measurement	52	29	10	9	1.76	31.5
Simulated industrial experience	29	33	38	0	2.09	9.5
Investigate, research, and experimentation of technical problems	19	38	33	10	2.33	4.5
System analysis and activity planning	24	24	38	14	2.43	3.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 103. Evaluation of professional education instructional concepts by graduates in business or industry--organization, professional and managerial II
N = 11

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	64	18	9	9	1.64	8.5
Methods of teaching industrial arts	55	36	0	9	1.64	8.5
Evaluation of student progress	36	46	9	9	1.91	5.0
Laboratory management	37	36	18	9	2.00	3.5
Techniques and procedures for the selection of instructional materials	55	27	9	9	1.73	6.5
Course construction	55	27	9	9	1.73	6.5
Lesson planning	37	36	18	9	2.00	3.5
Theory and organization of the general shop	73	18	9	0	1.36	12.0
Principles of laboratory planning	55	36	9	0	1.55	10.0
Requisition writing	37	36	9	18	2.09	2.0
Micro teaching	64	27	9	0	1.45	11.0
Fundamentals of laboratory safety	28	36	18	18	2.27	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

'desirable' columns. Eight of the means were less than 1.99.

Data in Table 104 reveal how graduates in organization, professional and managerial II responded to the technical instructional concepts. The three instructional concepts listed as most important, according to rank, were; charts and graphs, fundamentals of technical drawing, and principles of architectural drafting.

Organization, semi-professional The data in Table 105 reveal how the graduates in organization, semi-professional evaluated the professional education instructional concepts. Fundamentals of laboratory safety was the concept ranked as most important by this group. Twenty percent of the responses were in the 'essential' column. It was observed that a high percent of the responses were in the 'no-value' column.

Data in Table 106 reveal how technical education instructional concepts were evaluated by graduates in organization, semi-professional. The concepts of fundamentals of technical drawing and investigate, research, and experimentation of technical problems had a rank of 1.0 and 2.0 respectively. It was observed that there were a higher percent of responses in the 'no-value' column than in the 'essential' column.

Technical, professional managerial II The data in Table 107 reveal that the graduates who were in technology, professional managerial II considered the instructional concept of fundamentals of laboratory safety the most important. Laboratory management and requisition writing were the concepts

Table 104. Evaluation of technical education instructional concepts by graduates in business or industry--organization, professional and managerial II
N = 11

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	37	36	27	2.91	2.0
Charts and graphs	9	18	27	46	3.09	1.0
Computer graphics	37	27	27	9	2.09	13.0
Principles of architectural drafting	9	28	36	27	2.82	3.0
Industrial arts design	27	37	18	18	2.27	7.5
Descriptive geometry	27	46	18	9	2.09	13.0
Sources, development, and transmission of power	46	18	18	18	2.09	13.0
Automotive repair and maintenance	46	27	18	9	1.91	19.0
Tune-up, repair, and care of air cooled engines	73	9	18	0	1.45	30.5
Principles of test equipment and electrical diagnosis	55	18	18	9	1.82	21.0
Analysis, diagnosis, service and maintenance of home appliance	82	0	18	0	1.36	32.0
Service and repair of vehicle systems	64	18	18	0	1.54	28.5
Fundamentals of woodworking	55	27	9	9	1.73	23.5
Principles of industrial communications	46	18	18	18	2.09	13.0

Table 104 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	37	36	0	27	2.18	9.5
Principles of hydraulics pneumatics, and fluidics	64	18	9	9	1.63	26.0
Theory and application of fluid power	73	27	0	0	1.27	33.0
Principles of offset printing, silk screen, and camera operations	46	18	18	18	2.09	13.0
Techniques of photographic half tone	64	18	9	9	1.64	26.0
Principles of contact and picture printing	73	9	9	9	1.55	28.5
Basic electronic circuits	28	18	27	27	2.55	5.0
Basic electronic control processes	37	18	27	18	2.27	7.5
Electronic communications theory and adaptation of hardware	36	37	18	9	2.00	17.0
Integrated circuits	36	46	0	18	2.00	17.0
Qualitative electrical theory	46	27	9	18	2.00	17.0
Basic metalworking processes	55	18	27	0	1.73	23.5
Principles of material joining (welding)	46	27	27	0	1.82	21.0
Principles of tool making	54	46	0	0	1.45	30.5

Table 104 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	45	46	9	0	1.64	26.0
Precision measurement	46	36	9	9	1.82	21.0
Simulated industrial experience	55	0	18	27	2.18	9.5
Investigate, research, and experimentation of technical problems	37	18	18	27	2.36	6.0
System analysis and activity planning	27	9	37	27	2.64	4.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 105. Evaluation of professional education instructional concepts by graduates in business or industry--organization, semi-professional N = 10

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	60	20	10	10	1.70	8.0
Methods of teaching industrial arts	40	40	0	20	2.00	3.5
Evaluation of student progress	60	20	10	10	1.70	8.0
Laboratory management	20	50	30	0	2.10	2.0
Techniques and procedures for the selection of instructional materials	50	10	30	10	2.00	3.5
Course construction	50	30	20	0	1.70	8.0
Lesson planning	40	50	10	0	1.70	8.0
Theory and organization of the general shop	60	30	10	0	1.50	11.0
Principles of laboratory planning	50	30	20	0	1.70	8.0
Requisition writing	30	60	10	0	1.80	5.0
Micro teaching	70	30	0	0	1.30	12.0
Fundamentals of laboratory safety	30	10	40	20	2.50	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 106. Evaluation of technical education instructional concepts by graduates in business or industry--organization, semi-professional N = 10

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	10	40	30	20	2.60	1.0
Charts and graphs	20	50	20	10	2.20	13.0
Computer graphics	30	50	10	10	2.00	19.5
Principles of architectural drafting	30	30	40	0	2.10	16.0
Industrial arts design	30	30	30	10	2.20	13.0
Descriptive geometry	40	30	30	0	1.90	23.5
Sources, development, and transmission of power	10	60	10	20	2.40	4.5
Automotive repair and maintenance	40	30	20	10	2.00	19.5
Tune-up, repair, and care of air cooled engines	50	40	0	10	1.70	30.5
Principles of test equipment and electrical diagnosis	30	30	20	20	2.30	8.5
Analysis, diagnosis, service and maintenance of home appliance	40	40	20	0	1.80	27.0
Service and repair of vehicle systems	30	30	30	10	2.20	13.0
Fundamentals of woodworking	50	30	10	10	1.80	27.0
Principles of industrial communications	20	30	40	10	2.40	4.5

Table 106 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	20	40	30	10	2.30	8.5
Principles of hydraulics pneumatics, and fluidics	30	30	30	10	2.20	13.0
Theory and application of fluid power	40	30	20	10	2.00	19.5
Principles of offset printing, silk screen, and camera operations	50	30	20	0	1.70	30.5
Techniques of photographic half tone	70	20	10	0	1.40	32.5
Principles of contact and picture printing	70	20	10	0	1.40	32.5
Basic electronic circuits	30	50	10	10	2.00	19.5
Basic electronic control processes	30	50	10	10	2.00	19.5
Electronic communications theory and adaptation of hardware	30	50	10	10	2.00	19.5
Integrated circuits	50	30	10	10	1.80	27.0
Qualitative electrical theory	50	30	10	10	1.80	27.0
Basic metalworking processes	30	30	20	20	2.30	8.5
Principles of material joining (welding)	30	20	40	10	2.30	8.5
Principles of tool making	50	20	20	10	1.90	23.5

Table 106 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	50	20	30	0	1.80	27.0
Precision measurement	40	10	20	30	2.40	4.5
Simulated industrial experience	40	10	40	10	2.20	13.0
Investigate, research, and experimentation of technical problems	30	20	20	30	2.50	2.0
System analysis and activity planning	20	30	40	10	2.40	4.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 107. Evaluation of professional education instructional concepts by graduates in business or industry--technology, professional and managerial II
N = 21

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	57	33	10	0	1.90	4.0
Methods of teaching industrial arts	43	33	14	10	1.76	8.5
Evaluation of student progress	43	38	19	0	1.76	8.5
Laboratory management	29	42	19	10	2.10	2.0
Techniques and procedures for the selection of instructional materials	43	33	24	0	1.81	6.5
Course construction	62	14	19	5	1.67	11.0
Lesson planning	47	29	14	10	1.86	5.0
Theory and organization of the general shop	38	43	19	0	1.81	6.5
Principles of laboratory planning	38	52	10	0	1.71	10.0
Requisition writing	33	43	10	14	2.05	3.0
Micro teaching	71	24	0	5	1.38	12.0
Fundamentals of laboratory safety	29	38	14	19	2.38	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

ranked 2.0 and 3.0 respectively. It was observed that the highest percent of responses were in the 'no-value' and 'desirable' column. Micro teaching was the concept that was considered to be the least important.

The evaluation of technical instructional concept by graduates in technology, professional managerial II was recorded in Table 108. The concept considered most important was principles of hydraulics, pneumatics, and fluidics. Thirty-eight percent of the graduates considered this concept 'essential'. Fundamentals of technical drawing was the concept that had a rank of 2.0.

Technology, semi-professional The data in Table 109 reveal that graduates in technology, semi-professional rated the professional instructional concept of fundamentals of laboratory safety as the most important. Thirty-nine percent of the graduates rated this concept as 'essential'. Laboratory management and requisition writing were the concepts ranked 2.0 and 3.0 respectively.

Data in Table 110 disclose how the graduates in technology, semi-professional evaluated the technical instructional concepts. Fundamentals of technical drawing and investigate, research, and experimentation of technical problems were ranked 1.5 with a mean of 3.28. Fifty percent of the responses were in the 'essential' column.

Table 108. Evaluation of technical education instructional concepts by graduates in business or industry--technology, professional and managerial II N = 21

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	5	14	48	33	3.10	2.0
Charts and graphs	10	14	47	29	2.95	6.5
Computer graphics	19	24	38	19	2.58	19.5
Principles of architectural drafting	24	38	19	19	2.33	24.0
Industrial arts design	24	14	29	33	3.00	3.5
Descriptive geometry	19	24	24	33	2.71	14.0
Sources, development, and transmission of power	5	19	62	14	2.86	10.0
Automotive repair and maintenance	29	28	29	14	2.29	25.0
Tune-up, repair, and care of air cooled engines	33	33	24	10	2.09	28.0
Principles of test equipment and electrical diagnosis	19	14	38	29	2.76	12.0
Analysis, diagnosis, service and maintenance of home appliance	48	33	19	0	1.71	31.0
Service and repair of vehicle systems	24	24	38	14	2.43	21.5
Fundamentals of woodworking	47	24	19	10	1.90	29.0
Principles of industrial communications	5	47	24	24	2.67	17.0

Table 108 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	19	29	14	38	2.71	14.0
Principles of hydraulics pneumatics, and fluidics	0	24	38	38	3.14	1.0
Theory and application of fluid power	0	29	47	24	2.95	6.5
Principles of offset printing, silk screen, and camera operations	57	19	14	10	1.76	30.0
Techniques of photographic half tone	66	24	10	0	1.43	33.0
Principles of contact and picture printing	62	33	0	5	1.47	32.0
Basic electronic circuits	5	33	33	29	2.86	10.0
Basic electronic control processes	5	33	19	43	3.00	3.5
Electronic communications theory and adaptation of hardware	29	28	33	10	2.24	26.0
Integrated circuits	24	29	33	14	2.38	23.0
Qualitative electrical theory	43	14	29	14	2.14	27.0
Basic metalworking processes	10	37	29	24	2.67	17.0
Principles of material joining (welding)	5	38	38	19	2.71	14.0
Principles of tool making	10	42	19	29	2.67	17.0

Table 108 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	28	24	24	24	2.43	21.5
Precision measurement	14	14	33	39	2.95	6.5
Simulated industrial experience	14	24	24	38	2.86	10.0
Investigate, research, and experimentation of technical problems	5	24	43	28	2.95	6.5
System analysis and activity planning	24	24	24	28	2.57	19.5

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 109. Evaluation of professional education instructional concepts by graduates in business or industry--technology, semi-professional N = 18

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	50	39	11	0	1.61	9.5
Methods of teaching industrial arts	50	28	22	0	1.72	6.5
Evaluation of student progress	50	33	17	0	1.67	8.0
Laboratory management	17	39	22	22	2.50	2.0
Techniques and procedures for the selection of instructional materials	55	22	17	6	1.72	6.5
Course construction	50	39	11	0	1.61	9.5
Lesson planning	66	17	11	6	1.56	11.0
Theory and organization of the general shop	50	27	17	6	1.78	5.0
Principles of laboratory planning	38	39	17	6	1.89	4.0
Requisition writing	39	11	17	33	2.44	3.0
Micro teaching	89	11	0	0	1.11	12.0
Fundamentals of laboratory safety	17	22	22	39	2.83	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 110. Evaluation of technical education instructional concepts by graduates in business or industry--technology, semi-professional N = 18

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	0	22	28	50	3.28	1.5
Charts and graphs	17	33	22	28	2.61	14.5
Computer graphics	44	28	11	17	2.00	27.0
Principles of architectural drafting	17	22	39	22	2.67	11.5
Industrial arts design	11	45	22	22	2.55	16.5
Descriptive geometry	22	33	28	17	2.39	21.0
Sources, development, and transmission of power	17	33	28	22	2.55	16.5
Automotive repair and maintenance	38	28	17	17	2.11	25.0
Tune-up, repair, and care of air cooled engines	50	17	28	5	1.89	29.0
Principles of test equipment and electrical diagnosis	17	27	28	28	2.67	11.5
Analysis, diagnosis, service and maintenance of home appliance	61	22	17	0	1.56	30.0
Service and repair of vehicle systems	39	22	22	17	2.17	24.0
Fundamentals of woodworking	45	11	22	22	2.22	25.0
Principles of industrial communications	22	11	45	22	2.67	11.5

Table 110 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	22	17	33	28	2.67	11.5
Principles of hydraulics pneumatics, and fluidics	23	28	16	33	2.61	14.5
Theory and application of fluid power	28	22	22	28	2.50	18.0
Principles of offset printing, silk screen, and camera operations	67	22	11	0	1.44	31.0
Techniques of photographic half tone	72	28	0	0	1.28	33.0
Principles of contact and picture printing	66	28	6	0	1.39	32.0
Basic electronic circuits	11	17	50	22	2.83	6.5
Basic electronic control processes	22	6	50	22	2.72	9.0
Electronic communications theory and adaptation of hardware	44	28	17	11	1.94	28.0
Integrated circuits	44	22	17	17	2.05	26.0
Qualitative electrical theory	33	34	11	22	2.22	22.5
Basic metalworking processes	6	33	33	28	2.83	6.5
Principles of material joining (welding)	11	34	22	33	2.78	8.0
Principles of tool making	22	33	22	23	2.44	19.5

Table 110 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	39	11	17	33	2.44	19.5
Precision measurement	22	6	28	44	2.94	5.0
Simulated industrial experience	11	11	22	56	3.22	3.0
Investigate, research, and experimentation of technical problems	6	11	33	50	3.28	1.5
System analysis and activity planning	0	28	33	39	3.11	4.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

<u>An evaluation of instructional concepts by graduates in business or industry</u>

The evaluation of professional and technical instructional concepts by 102 graduates in business or industry was recorded in tables 111 and 112.

<u>Professional education</u> The data in Table 111 reveal that the graduates in business or industry considered the concept of fundamentals of laboratory safety the most important. Laboratory management and requisition writing were ranked 2.0 and 3.0 respectively.

Table 111. Evaluation of professional education instructional concepts by graduates in business or industry
N = 102

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Philosophy of industrial arts education	50	39	7	4	1.64	11.0
Methods of teaching industrial arts	48	29	11	12	1.86	8.0
Evaluation of student progress	42	31	19	8	1.92	6.0
Laboratory management	28	39	19	14	2.17	2.0
Techniques and procedures for the selection of instructional materials	42	27	23	8	1.95	5.0
Course construction	48	28	16	8	1.85	9.0
Lesson planning	43	29	15	13	1.97	4.0
Theory and organization of the general shop	47	30	18	5	1.80	10.0
Principles of laboratory planning	40	40	16	4	1.87	7.0
Requisition writing	34	33	19	14	2.12	3.0
Micro teaching	73	20	4	3	1.39	12.0
Fundamentals of laboratory safety	27	27	20	26	2.45	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Technical education An evaluation of technical education instructional concepts by graduates in business or industry was recorded in Table 112. Fundamentals of technical drawing was the concept considered the most important. Least important, as evaluated by the group, was the concept of analysis, diagnosis, service, and maintenance of home appliance.

Comparison of mean and rank

The comparison of the mean and rank of the professional instructional concepts and technical instructional concepts as evaluated by 393 graduates in education and 102 graduates in business or industry was recorded in tables 113 and 114.

Professional instructional concepts The graduates in education and business or industry ranked the concept of fundamentals of laboratory safety as the most important. The means for this concept were 3.40 and 2.45 respectively, Table 113. There was close agreement between the two groups relating to the rank of the concept of laboratory management, 2.5 and 2.0 respectively. The respective means were 3.33 and 2.17. Micro teaching was the concept that was ranked 12.0 by both groups with respective means of 1.92 and 1.39.

Technical instructional concepts Graduates in education and business or industry gave a rank of 1.0 to the concept of fundamentals of technical drawing, Table 114. The respective means were 3.17 and 2.90. Simulated industrial experiences was

Table 112. Evaluation of technical education instructional concepts by graduates in business or industry N = 102

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of technical drawing	10	22	37	31	2.90	1.0
Charts and graphs	17	27	36	20	2.59	3.0
Computer graphics	37	28	25	10	2.06	25.5
Principles of architectural drafting	23	28	31	18	2.44	10.0
Industrial arts design	24	29	28	19	2.42	11.0
Descriptive geometry	26	35	23	16	2.28	18.0
Sources, development, and transmission of power	21	30	31	18	2.46	8.0
Automotive repair and maintenance	34	26	28	12	2.17	20.0
Tune-up, repair, and care of air cooled engines	44	27	21	8	1.92	29.5
Principles of test equipment and electrical diagnosis	26	30	27	17	2.33	17.0
Analysis, diagnosis, service and maintenance of home appliance	47	29	21	3	1.50	33.0
Service and repair of vehicle systems	35	26	27	12	2.15	21.5
Fundamentals of woodworking	41	25	22	12	2.04	27.5
Principles of industrial communications	23	27	37	13	2.41	12.0

Table 112 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Methods of storage and retrieval of information	24	35	21	20	2.35	14.5
Principles of hydraulics pneumatics, and fluidics	28	27	25	20	2.35	14.5
Theory and application of fluid power	32	28	24	16	2.22	19.0
Principles of offset printing, silk screen, and camera operations	46	25	19	10	1.92	29.5
Techniques of photographic half tone	60	22	12	6	1.66	31.0
Principles of contact and picture printing	58	25	11	6	1.65	32.0
Basic electronic circuits	16	31	34	19	2.56	4.0
Basic electronic control processes	20	29	30	21	2.52	6.0
Electronic communications theory and adaptation of hardware	32	32	26	10	2.12	24.0
Integrated circuits	37	30	21	12	2.06	25.5
Qualitative electrical theory	39	28	22	11	2.04	27.5
Basic metalworking processes	24	31	28	17	2.37	13.0
Principles of material joining (welding)	27	28	29	16	2.34	16.0
Principles of tool making	31	36	19	14	2.14	22.0

Table 112 (Continued)

Instructional concepts	Rating 1 %	2 %	3 %	4 %	Mean	Rank
Fundamentals of heat treating	36	29	19	16	2.13	23.0
Precision measurement	29	22	23	26	2.45	9.0
Simulated industrial experience	26	21	27	26	2.51	7.0
Investigate, research, and experimentation of technical problems	16	28	31	25	2.64	2.0
System analysis and activity planning	20	27	32	21	2.54	5.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 113. Evaluation of professional education instructional concepts by graduates in education and business or industry N = 495

Instructional concepts	Education Mean	Education Rank	Business or Industry Mean	Business or Industry Rank
Philosophy of industrial arts education	2.60	9.0	1.64	11.0
Methods of teaching industrial arts	3.31	4.0	1.86	8.0
Evaluation of student progress	3.33	2.5	1.92	6.0
Laboratory management	3.33	2.5	2.17	2.0
Techniques and procedures for the selection of instructional materials	3.10	6.0	1.95	5.0
Course construction	3.11	5.0	1.85	9.0
Lesson planning	2.96	7.0	1.97	4.0
Theory and organization of the general shop	2.27	11.0	1.80	10.0
Principles of laboratory planning	2.74	8.0	1.87	7.0
Requisition writing	2.53	10.0	2.12	3.0
Micro teaching	1.92	12.0	1.39	12.0
Fundamentals of laboratory safety	3.40	1.0	2.45	1.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

Table 114. Evaluation of technical education instructional concepts by graduates in education and business or industry N = 495

Instructional concepts	Education Mean	Education Rank	Business or Industry Mean	Business or Industry Rank
Fundamentals of technical drawing	3.17	1.0	2.90	1.0
Charts and graphs	2.20	24.0	2.59	3.0
Computer graphics	1.82	33.0	2.06	25.5
Principles of architectural drafting	2.56	9.0	2.44	10.0
Industrial arts design	2.59	8.0	2.42	11.0
Descriptive geometry	2.29	21.0	2.28	18.0
Sources, development, and transmission of power	2.49	11.0	2.46	8.0
Automotive repair and maintenance	2.37	18.0	2.17	20.0
Tune-up, repair, and care of air cooled engines	2.38	16.0	1.92	29.5
Principles of test equipment and electrical diagnosis	2.43	12.0	2.33	17.0
Analysis, diagnosis, service and maintenance of home appliance	2.16	25.0	1.50	33.0
Service and repair of vehicle systems	2.22	23.0	2.15	21.0
Fundamentals of woodworking	2.76	4.0	2.04	27.5
Principles of industrial communications	2.34	20.0	2.41	12.0

Table 114 (Continued)

Instructional concepts	Education Mean	Education Rank	Business or Industry Mean	Business or Industry Rank
Methods of storage and retrieval of information	2.27	22.0	2.35	14.5
Principles of hydraulics pneumatics, and fluidics	2.07	27.0	2.35	14.5
Theory and application of fluid power	2.00	31.0	2.22	19.0
Principles of offset printing, silk screen, and camera operations	2.37	18.0	1.92	29.5
Techniques of photographic half tone	2.03	29.0	1.66	31.0
Principles of contact and picture printing	2.05	28.0	1.65	32.0
Basic electronic circuits	2.65	6.5	2.56	4.0
Basic electronic control processes	2.40	13.5	2.52	6.0
Electronic communications theory and adaptation of hardware	2.08	26.0	2.12	24.0
Integrated circuits	2.01	30.0	2.06	25.5
Qualitative electrical theory	1.88	32.0	2.04	27.5
Basic metalworking processes	2.87	2.0	2.37	13.0
Principles of material joining (welding)	2.77	3.0	2.34	16.0
Principles of tool making	2.37	18.0	2.14	22.0

Table 114 (Continued)

Instructional concepts	Education Mean	Education Rank	Business or Industry Mean	Business or Industry Rank
Fundamentals of heat treating	2.40	13.5	2.13	23.0
Precision measurement	2.71	5.0	2.45	9.0
Simulated industrial experience	2.65	6.5	2.51	7.0
Investigate, research, and experimentation of technical problems	2.55	10.0	2.64	2.0
Systems analysis and activity planning	2.39	15.0	2.54	5.0

Rating scale
1) No-value
2) Desirable
3) Important
4) Essential

the concept that was ranked 6.5 and 7.0 with respective means of 2.65 and 2.51.

The data in Table 115 reveal that the concept fundamentals of laboratory safety was ranked high, 1.0 through 3.5, by the graduates in business or industry. Conversely, the instructional concept of laboratory management was ranked 2.0 by three of the five occupational classifications.

Table 115. Evaluation of professional education instructional concepts by graduates in business or industry--occupational classification N = 81

Instructional concepts	Occupational classification: Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization, semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Philosophy of industrial arts education	11.0[a] 1.62[b]	8.5 1.64	8.0 1.70	4.0 1.90	9.5 1.61
Methods of teaching industrial arts	7.0 1.90	8.5 1.64	3.5 2.00	8.5 1.76	6.5 1.72
Evaluation of student progress	3.5 2.10	5.0 1.91	8.0 1.70	8.5 1.76	8.0 1.67
Laboratory management	7.0 1.90	3.5 2.00	2.0 2.10	2.0 2.10	2.0 2.50
Techniques and procedures for the selection of instructional materials	3.5 2.10	6.5 1.73	3.5 2.00	6.5 1.81	6.5 1.72
Course construction	7.0 1.90	6.5 1.73	8.0 1.70	11.0 1.67	9.5 1.61

[a]Rank.

[b]Mean.

Table 115 (Continued)

Instructional concepts	Occupational classification: Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Lesson planning	1.0 2.24	3.5 2.00	8.0 1.70	5.0 1.86	11.0 1.56
Theory and organization of the general shop	10.0 1.71	12.0 1.36	11.0 1.50	6.5 1.81	5.0 1.78
Principles of laboratory planning	9.0 1.86	10.0 1.55	8.0 1.70	10.0 1.71	4.0 1.89
Requisition writing	3.5 2.10	2.0 2.09	5.0 1.80	3.0 2.05	3.0 2.44
Micro teaching	12.0 1.52	11.0 1.45	12.0 1.30	12.0 1.38	12.0 1.11
Fundamentals of laboratory safety	3.5 2.10	1.0 2.27	1.0 2.50	1.0 2.38	1.0 2.83

The data in Table 116 reveal that the technical instructional concept of fundamentals of technical drawing was ranked high, 1.0 through 2.0, by all occupational classifications. Investigate, research, and experimentation of technical problems was the instructional concept ranked 1.5 to 6.5 by all occupational classifications.

Table 116. Evaluation of technical education instructional concepts by graduates in business or industry--occupational classification N = 81

Instructional concepts	Occupational classification				
	Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization, semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Fundamentals of technical drawing	1.0[a] 2.81[b]	2.0 2.91	1.0 2.60	2.0 3.10	1.5 3.28
Charts and graphs	2.0 2.52	1.0 3.09	13.0 2.20	6.5 2.95	14.5 2.61
Computer graphics	26.5 1.86	13.0 2.09	19.5 2.00	19.5 2.58	27.0 2.00
Principles of architectural drafting	6.0 2.29	3.0 2.82	16.0 2.10	24.0 2.33	11.5 2.67
Industrial arts design	9.5 2.10	7.5 2.27	13.0 2.20	3.5 3.00	16.5 2.55
Descriptive geometry	14.0 2.05	13.0 2.09	23.5 1.90	14.0 2.71	21.0 2.39

[a]Rank.

[b]Mean.

Table 116 (Continued)

Instructional concepts	Occupational classification				
	Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization, semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Sources, development, and transmission of power	14.0 2.05	13.0 2.09	4.5 2.40	10.0 2.86	16.5 2.55
Automotive repair and maintenance	17.5 2.00	19.0 1.91	19.5 2.00	25.0 2.29	25.0 2.11
Tune-up, repair, and care of air cooled engines	21.0 1.95	30.5 1.45	30.5 1.70	28.0 2.09	29.0 1.89
Principles of test equipment and electrical diagnosis	21.0 1.95	21.0 1.82	8.5 2.30	12.0 2.76	11.5 2.67
Analysis, diagnosis, service and maintenance of home appliance	17.5 2.00	32.0 1.36	27.0 1.80	31.0 1.71	30.0 1.56
Service and repair of vehicle systems	17.5 2.00	28.5 1.54	13.0 2.20	21.5 2.43	24.0 2.17
Fundamentals of woodworking	17.5 2.00	23.5 1.73	27.0 1.80	29.0 1.90	22.5 2.22

Table 116 (Continued)

Instructional concepts	Occupational classification: Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization, semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Principles of industrial communications	4.5 2.33	13.0 2.09	4.5 2.40	17.0 2.67	11.5 2.67
Methods of storage and retrieval of information	9.5 2.10	9.5 2.18	8.5 2.30	14.0 2.71	11.5 2.67
Principles of hydraulics pneumatics, and fluidics	23.0 1.90	26.0 1.63	13.0 2.20	1.0 3.14	14.5 2.61
Theory and application of fluid power	26.5 1.85	33.0 1.27	19.5 2.00	6.5 2.95	18.0 2.50
Principles of offset printing, silk screen, and camera operations	9.5 2.09	13.0 2.09	30.5 1.70	30.0 1.76	31.0 1.44
Techniques of photographic half tone	26.5 1.86	26.0 1.64	32.5 1.40	33.0 1.43	33.0 1.28
Principles of contact and picture printing	21.0 1.95	28.5 1.55	32.5 1.40	32.0 1.47	32.0 1.39
Basic electronic circuits	9.5 2.10	5.0 2.55	19.5 2.00	10.0 2.86	6.5 2.83

Table 116 (Continued)

Instructional concepts	Occupational classification				
	Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization, semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Basic electronic control processes	14.0 2.05	7.5 2.27	19.5 2.00	3.5 3.00	9.0 2.72
Electronic communications theory and adaptation of hardware	9.5 2.09	17.0 2.00	19.5 2.00	26.0 2.24	28.0 1.94
Integrated circuits	26.5 1.86	17.0 2.00	27.0 1.80	23.0 2.38	26.0 2.05
Qualitative electrical theory	30.0 1.81	17.0 2.00	27.0 1.80	27.0 2.14	22.5 2.22
Basic metalworking processes	26.5 1.86	23.5 1.73	8.5 2.30	17.0 2.67	6.5 2.83
Principles of material joining (welding)	26.5 1.86	21.0 1.82	8.5 2.30	14.0 2.71	8.0 2.78
Principles of tool making	33.0 1.71	30.5 1.45	23.5 1.90	17.0 2.67	19.5 2.44
Fundamentals of heat treating	31.5 1.76	26.0 1.64	27.0 1.80	21.5 2.43	19.5 2.44

Table 116 (Continued)

Instructional concepts	Occupational classification: Business contact semi-professional N = 21	Organization professional and managerial II N = 11	Organization semi-professional N = 10	Technology professional and managerial II N = 21	Technology semi-professional N = 18
Precision measurement	31.5 1.76	21.5 1.82	4.5 2.40	6.5 2.95	5.0 2.94
Simulated industrial experience	9.5 2.09	9.5 2.18	13.0 2.20	10.0 2.86	3.0 3.22
Investigate, research, and experimentation of technical problems	4.5 2.33	6.0 2.36	2.0 2.50	6.5 2.95	1.5 3.28
System analysis and activity planning	3.0 2.43	4.0 2.64	4.5 2.40	19.5 2.57	4.0 3.11

DISCUSSION

A frequently asked question at the university level is, what are the graduates of industrial arts education doing? This study has disclosed the following data.

Seventy-nine percent of the graduates were in education. The majority, 71 percent, of these were located in the northeast part of the United States. It is the opinion of the researcher that the majority of the students at Indiana State University were from Indiana or surrounding states and therefore tend to obtain employment in the general area after graduation. Another factor that may contribute to this trend is the common practice of hiring officials to seek qualified graduates from a local college or university. It may also be surmised that an educational institution may be more sensitive to area needs and therefore have the tendency to prepare graduates for regional employment.

The data reveal that 29 percent of the graduates were employed outside of the northeast region. This may be an indication that graduates are highly qualified for their positions and sought after by employers on the national basis. Should this be true, Indiana State University can be proud of the educational program and performance rendered in the field of education by the graduates.

Graduates were represented in a variety of educational assignments. The most common school classification was high school 9-12, 36 percent of the graduates. Thirty-seven percent of the graduates had assignments in high school 10-12, Jr./Sr. high school, and junior high school. Eighty percent of the graduates had a full time assignment in industrial arts education. The largest single group of teachers, 38 percent, were in a school with an enrollment of 501-1000 students.

The most frequent educational assignment was a single-activity-instructional laboratory with responsibility for instruction in general drawing, general electricity, general graphic arts, general metals, general plastics, general power, and general wood. Or, an assignment in an area-unit-instructional laboratory with responsibility for technical drawing, architectural drafting, electricity, electronics, graphic arts, foundry, machine shop, sheet metal, plastics, welding, auto mechanics, or fluidics. Other educational responsibilities were in an innovative program, multiple-activities-instructional laboratory, nontechnical instruction, or administration.

The data reveal that many of the graduates were teaching in an area of specialization. Since area-unit-instructional laboratories and single-unit-instructional laboratories are a reality it would only seem logical that this type of institution should be given consideration on the university level. It should also be noted that fourteen graduates reported teaching in an innovative program. This may be a small number but the opportunity for students to pursue this area should not be ignored.

It appears that students who have an interest for teaching in a particular area should begin to specialize early in their college career.

Approximately 70 percent of the graduates in education had completed their master's degree as compared with 30 percent in industry. A contributing factor to this high percent in education may be that educators are often encouraged to do graduate work. Salary in many instances may be used as an incentive for continued education. Another factor that can not be overlooked is that in some locations a master's degree is a requirement for teacher certification.

An examination of the technical instructional concepts revealed that the importance placed on concepts varied according to the area in which the graduate was employed. An example of this is illustrated by the concept of principles of offset printing, silk screen, and camera operation which was rated 'essential' by 84 percent of the graduates in the graphic arts area-unit-instructional laboratory, Table 77. A similar pattern of evaluation was made by graduates who had assignments in the single-activity-instructional laboratory. Only in a few cases were instructional concepts ranked 1.0 through 3.0, identified outside of the area of specialization.

A review of the professional instructional concepts, grouped according to school classification, area of instruction and business or industry, reveal that the graduates placed a high value on the concept of fundamentals of laboratory safety. Thirty-four to 67 percent of the responses were in the 'essential' column. The researcher can only conclude that there is an awareness of laboratory safety among the graduates. It may be surmized that the emphasis placed on safety in the university laboratories has developed an awareness of safety among the graduates. Another factor that can not be overlooked is the increased emphasis on safety standards regulating working conditions and manufactured items which may in some indirect way tend to promote an awareness of safety among the graduates.

The graduates in college or university, vocational school, and business or industry placed a high value on the concept of simulated industrial experience. As viewed by the researcher, a simulated industrial experience is a replication of a manufacturing system in the classroom. The student is in a class in which learning is emphasized while associated with the production of goods. He has a role in a system and at the same time he has a variety of experiences that will develop an understanding of the manufacturing process. The environment provides an awareness of machines, processes, materials and sources of power. There is the opportunity to develop an understanding of the function of man as a director and organizer in a manufacturing system.

Learning in this type of a class can be carried on individually or collectively in groups. The student has the opportunity to identify the problem, research, experiment and make decisions for action. Motivation for learning stems from the role that the student has in the company. In final analysis, the success of the operation depends upon the ability of the student to find solutions for the problems related to the manufacturing processes. It was concluded by the researcher that the experiences gained in this type of learning environment were applicable to education and business or industry.

Approximately 20 percent of the graduates were employed in business or industry. The most common areas of industrial employment were: business contact, semi-professional; organization, professional managerial II; organization, semi-professional; technology, professional managerial II; and technology, semi-professional. It would only seem logical that students who have an interest in industry but choose the teaching curriculum should have the opportunity to select courses that would qualify them for industrial employment.

The graduates in business or industry ranked the fundamentals of technical drawing high, as did the graduates in education. At this point, it may be said that drawing still remains a vital means of communication. The researcher is unable to comprehend why the concept of computer graphics had a higher percent of 'no-value' and 'desirable' responses than 'important' and 'essential' in a time when the computer is being adapted to many industrial functions.

The findings for this study reveal that there was a difference between the major areas in education which tend to confirm the need for specialization. In addition to determining the different needs, the findings can also serve as a guide to help identify the instructional concepts that support various areas of specialization.

This study was designed as a follow-up of the graduates of Indiana State University. Its purpose was to aid in the development of an improved industrial arts education program. The data that were collected have been of value for the evaluation of the industrial arts education program.

On the basis of the study, the following recommendations were made:

1. To conduct a study to determine the possibility of a business or industry option (plan B) as a part of the industrial arts education program.
2. To conduct a follow-up study in ten years to determine the status of the industrial arts education graduate.
3. To conduct a detailed study to determine the specific needs of the industrial arts education graduate who is employed in business or industry.
4. To conduct a study to determine the need for safety instruction as it is related to the industrial arts education program.

SUMMARY

The purpose of this study was to aid in the development of an improved industrial arts education program at Indiana State University by obtaining the opinion of the graduates relating to their needs and to use these views as a guide to implement curriculum modification.

The objectives of the study were:

1. To determine the types of positions that were held by the graduates.
2. To determine the degree of importance that is placed on course content in industrial arts education by the graduates.

The data were collected with a mailed questionnaire which was sent to 622 graduates who earned the Bachelor of Science degree between August 1, 1960 and August 1, 1970.

The findings were arranged according to the status of the graduates and the importance placed on instructional concepts.

Status of the Graduates

Four hundred ninety-five graduates participated in this study. Of these, 393 were in education and 102 were in business or industry.

The majority of the graduates, 87.7 percent, were located in the northeast, of which 351 were in education and 78 were in business or industry.

There were several classifications and areas of employment

in education and business or industry. The percent, mean, and rank of all classifications and areas with ten or more responses were included in tables.

The educational classifications were: college or university, vocational school, high school 10-12, high school 9-12, Jr./Sr. high school, junior high school 7-9, elementary K-6, elementary K-8, middle school, and other. Six areas of instruction were included in this study. Innovative program and multiple-activities-instructional laboratory were single entry areas. Areas with subdivisions were: single-activity-instructional laboratory, area-unit-instructional laboratory, nontechnical instruction, and administration.

The nontechnical instructional groups were: professional subjects, related subjects, guidance or counseling, and other. None of the nontechnical educational categories had ten or more replies, so all categories were combined together and treated as a group.

Groups within the administration area were: buildings and grounds, business administrator, coordinator, director, principal, superintendent, supervisor, and other. All groups within this area were small, so they were combined and all categories were treated as a group.

Graduates in business or industry were grouped according to the two way classification of occupations as developed by Ann Roe (24). The classifications that had ten or more responses were: business contact, semi-professional;

organization, semi-professional; technology, professional managerial II; and technology, semi-professional.

Importance Placed on Course Content

Professional and technical education instructional concepts for the industrial arts education program were evaluated on a four point scale. The scale was: 1) No-value, 2) Desirable, 3) Important, 4) Essential.

There was a common agreement among educational occupational classifications and educational area of work regarding the importance of professional education instructional concepts. The fundamentals of laboratory safety, evaluation of student progress, and laboratory management were instructional concepts ranked high.

Greater differences occurred in the evaluation of technical education instructional concepts. In general, this content was rated 'essential' and 'important' by the graduates in education. The technical instructional concepts of fundamentals of technical drawing, fundamentals of woodworking and basic metal-working processes were rated the highest. An evaluation of the data by area of instruction reveals that instructional concepts directly related to a laboratory had the highest percent of 'essential' and 'desirable' responses.

The graduates in business or industry had a higher percent of 'no-value' and 'desirable' responses for professional and technical instructional concepts than the graduates who were in education.

The instructional concept of fundamentals of laboratory safety was ranked high by all five groups in business or industry. The concept of laboratory management and requisition writing were ranked high by four of the five industrial classifications.

In the technical instructional concepts, the fundamentals of technical drawing was ranked 1.0 by the five industrial classifications. Investigate, research, and experimentation of technical problems was considered to be second in importance by the graduates in business or industry.

Nineteen areas of instruction were grouped into three clusters. The first and largest cluster (item 1, 4, 7, 8, 9, 10, 14, 15, 16, and 19) contained the instructional areas of metals, woods, drawing, administration, and other. Electricity, electronics, general power and auto mechanics (items 2, 6, 11, 12, and 17) were the instructional areas selected for the second cluster. The last cluster (items 3, 5, and 13) consisted of the instructional areas of graphic arts and plastics.

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APPENDIX A: LETTERS

INDIANA STATE UNIVERSITY TERRE HAUTE, INDIANA 47809

SCHOOL OF TECHNOLOGY (812) 232-6311

October, 1972

Dear Industrial Arts Education Graduate:

You have been selected as the main source of information for an evaluation of the industrial arts education program at Indiana State University.

The purpose of this study is to determine the value of professional and technical instructional concepts as they relate to occupational performance. This data will serve as a guide to help determine the future emphasis on instructional content.

Your cooperation in the completion of the enclosed questionnaire, at your earliest convenience, and returning it in the self addressed envelope is appreciated.

Thank you for your assistance.

Sincerely yours,

Ethan A. Svendsen

Ethan A. Svendsen, Chairman
Industrial Arts Education

Warren J. Wold

Warren J. Wold,
Assistant Professor of
Industrial Arts Education

Enclosure

INDIANA STATE UNIVERSITY TERRE HAUTE, INDIANA 47809

SCHOOL OF TECHNOLOGY (812) 232-6311

November 1, 1972

Dear Industrial Arts Education Graduate:

Approximately two weeks ago you received a letter and questionnaire concerning an evaluation of the industrial arts education program at Indiana State University. As of this mailing, we are anxiously waiting for your reply.

I am enclosing a copy of the questionnaire and a self-addressed envelope on the assumption that the original one may have been lost or mislaid. Please take a few minutes of your valuable time and complete the questionnaire so that we can determine the value of instructional concepts as they relate to occupational performance.

Thank you for your assistance.

Sincerely yours,

Warren J. Wold

Warren J. Wold,
Assistant Professor of
Industrial Arts Education

INDIANA STATE UNIVERSITY TERRE HAUTE, INDIANA 47809

SCHOOL OF TECHNOLOGY (812) 232-6311

November 28, 1972

Dear Industrial Arts Education Graduate:

During the past six weeks you have been sent two questionnaires concerning the evaluation of the industrial arts education program at Indiana State University. Since your return has not been received, I am enclosing a third questionnaire and return envelope so that you may have the opportunity to assist in program improvement.

If you have already mailed your previous copy, please accept my thanks.

Sincerely yours,

Warren J. Wold

Warren J. Wold,
Assistant Professor of
Industrial Arts Education

APPENDIX B: INSTRUMENT

An Evaluation of Indiana State University

INDUSTRIAL ARTS EDUCATION PROGRAM

by the Graduates, 1960-1970

The number that appears at the top of the page is for data processing purposes only so that neither you nor your institution will be identified in any report or findings.

Name ______________________________

1. In which of the following are you presently employed?

   a) ___ Education   b) ___ Business or industry

There are three sections to this questionnaire. The first section should be completed by everyone. Section two should be completed by those who are in education. Finally, section three should be completed by those who are in business or industry.

October 1972

SECTION I

Directions: This section should be completed by EVERYONE. Place a check (✓) in the appropriate column to indicate how much value a knowledge of, or an ability in, the following professional and technical areas is to you in performing the responsibilities of your present position. Place a value on the subject matter only, DO NOT attempt to evaluate on the basis of a specific course you may have had.

1) No-value: There is no need for this knowledge in your present position.

2) Desirable: Some knowledge enables you to perform more effectively but is not required for your position.

3) Important: Some knowledge is needed to carry out the responsibility of your present position.

4) Essential: A high degree of knowledge is needed to carry out the responsibility of your present position.

	1) No-value	2) Desirable	3) Important	4) Essential
Professional				
2. Philosophy of industrial arts education				
3. Methods of teaching industrial arts				
4. Evaluation of student progress				
5. Laboratory management				
6. Techniques and procedures for the selection of instructional materials				
7. Course construction				
8. Lesson planning				
9. Theory and organization of the general shop				
10. Principles of laboratory planning				
11. Requisition writing				
12. Micro teaching				
13. Fundamentals of laboratory safety				
Technical				
14. Fundamentals of technical drawing				
15. Charts and graphs				
16. Computer graphics				
17. Principles of architectural drafting				
18. Industrial arts design				
19. Descriptive geometry				
20. Sources, development, and transmission of power				
21. Automotive repair and maintenance				
22. Tune-up, repair, and care of air cooled engines				
23. Principles of test equipment and electrical diagnosis				
24. Analysis, diagnosis, service, and maintenance of home appliance				
25. Service and repair of vehicle systems				
26. Fundamentals of wood working				
27. Principles of industrial communications				
28. Methods of storage and retrieval of information				
29. Principles of hydraulics, pneumatics, and fluidics				
30. Theory and application of fluid power				
31. Principles of offset printing, silk screen, and camera operation				
32. Techniques of photographic half tone				
33. Principles of contact and picture printing				
34. Basic electronic circuits				
35. Basic electrical control processes				
36. Electronic communications theory and adaptation of hardware				
37. Integrated circuits				
38. Qualitative electrical theory				
39. Basic metal working processes				
40. Principles of material joining (welding)				
41. Principles of tool making				
42. Fundamentals of heat treating				
43. Precision measurement				
44. Simulated industrial experience				
45. Investigate, research, and experimentation of technical problems				
46. System analysis and activity planning				

Directions: This section should be completed by EVERYONE. Place a check (✓) before the most appropriate answer to each question.

47. What year did you graduate from Indiana State University?

a) ___ 1960
b) ___ 1961
c) ___ 1962
d) ___ 1963
e) ___ 1964
f) ___ 1965
g) ___ 1966
h) ___ 1967
i) ___ 1968
j) ___ 1969
k) ___ 1970

48. In what area of the country do you now live?

a) ___ Northeast: North of the southern border of Kentucky and Virginia and east of the western border of Kentucky, Indiana, and Michigan.
b) ___ Southeast: South of the northern border of Tennessee and North Carolina and east of the western border of Tennessee and Mississippi.
c) ___ Northcentral: Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.
d) ___ Southcentral: Arkansas, Louisiana, Oklahoma, and Texas.
e) ___ Northwest: Idaho, Montana, Oregon, Washington, and Wyoming.
f) ___ Southwest: California, Colorado, New Mexico, Nevada, and Utah.

49. How many hours of graduate work have you completed?

a) ___ none
b) ___ 1-14 hrs. beyond the bachelor's degree
c) ___ 15-29 hrs. beyond the bachelor's degree
d) ___ Master's degree
e) ___ 1-14 hrs. beyond the master's degree
f) ___ 15-29 hrs. beyond the master's degree
g) ___ Specialist degree
h) ___ 30-44 hrs. beyond the master's degree
i) ___ 45 hrs. or more beyond the master's degree
j) ___ Doctoral degree

SECTION II

Directions: This section should be completed by those who are in EDUCATION. Place a check (✓) before the most appropriate answer to each question.

50. How do you classify the school in which you are employed?

a) ___ college or university
b) ___ vocational school
c) ___ high school 10-12
d) ___ high school 9-12
e) ___ Jr./Sr. high school
f) ___ junior high school 7-9
g) ___ elementary k-6
h) ___ elementary k-8
i) ___ middle school
j) ___ other

51. How long have you been employed by your present school system?

a) ___ first year
b) ___ second year
c) ___ third year
d) ___ fourth year
e) ___ fifth year
f) ___ sixth year
g) ___ seventh year
h) ___ eighth year
i) ___ ninth year
j) ___ tenth year
k) ___ eleventh year
l) ___ twelfth year

52. How many years have you been teaching?

a) ___ first year
b) ___ second year
c) ___ third year
d) ___ fourth year
e) ___ fifth year
f) ___ sixth year
g) ___ seventh year
h) ___ eighth year
i) ___ ninth year
j) ___ tenth year
k) ___ eleventh year
l) ___ twelfth year

53. What is the approximate student population of the school in which you are employed?

a) ___ 1-50
b) ___ 51-100
c) ___ 101-200
d) ___ 201-500
e) ___ 501-1000
f) ___ 1001-2000
g) ___ Over 2001

54. How do you classify your assignment in industrial arts?

a) ___ full time
b) ___ 3/4 time
c) ___ 1/2 time
d) ___ 1/4 time

In which ONE of the following six areas of work do you spend the largest percentage of your time? (check one only)

Area 1

55. Innovative program

a) ___ Industrial Arts Curriculum Project, Continuum Education Enterprise, (orchestrated systems) etc.

Please turn to next page.

Area 2

56. Multiple-activities-instructional laboratory.

a) ___ Comprehensive General Shop

Area 3

57. Single-activity-instructional laboratory (general unit shop).

a) ___ General Drawing
b) ___ General Electricity
c) ___ General Graphic Arts
d) ___ General Metals
e) ___ General Plastics
f) ___ General Power
g) ___ General Wood
h) ___ Other

Area 4

58. Area-unit-instructional laboratory (unit shop).

a) ___ Technical Drawing
b) ___ Architectural Drafting
c) ___ Electricity
d) ___ Electronics
e) ___ Graphic Arts
f) ___ Foundry
g) ___ Machine Shop
h) ___ Sheet Metal
i) ___ Plastics
j) ___ Welding
k) ___ Auto
l) ___ Fluidics

Area 5

59. Nontechnical instruction

a) ___ Professional subjects
b) ___ Related subjects
c) ___ Guidance or Counseling
d) ___ Other

Area 6

60. Administration

a) ___ Buildings and Grounds
b) ___ Business Administrator
c) ___ Coordinator
d) ___ Director
e) ___ Principal
f) ___ Superintendent
g) ___ Supervisor
h) ___ Other

SECTION III

Directions: This section should be completed by those who are in BUSINESS OR INDUSTRY. Place a check (✓) before the most appropriate answer to each question.

61. What is the approximate number of employees in your business or industry at your location?

a) ___ 1-20
b) ___ 21-50
c) ___ 51-100
d) ___ 101-250
e) ___ 251-500
f) ___ 501-1000
g) ___ 1001-2000
h) ___ Over 2001

62. How many years have you been employed by your present firm?

a) ___ first year
b) ___ second year
c) ___ third year
d) ___ fourth year
e) ___ fifth year
f) ___ sixth year
g) ___ seventh year
h) ___ eighth year
i) ___ ninth year
j) ___ tenth year
k) ___ eleventh year
l) ___ twelfth year

63. How many years have you been in your present position?

a) ___ first year
b) ___ second year
c) ___ third year
d) ___ fourth year
e) ___ fifth year
f) ___ sixth year
g) ___ seventh year
h) ___ eighth year
i) ___ ninth year
j) ___ tenth year
k) ___ eleventh year
l) ___ twelfth year

64. Please state your present occupational title (production manager, accountant, etc.).

____

65. Please state the nature of the business or industry in which you are presently employed (electronics, auto manufacturing, etc.).

____

APPENDIX C: SPEARMAN'S RANK CORRELATION COEFFICIENT AND LORR RADHAKRISHNAN CLUSTER ANALYSIS

Variables used in instructional areas:

X_1 General drawing.

X_2 General electricity.

X_3 General graphic arts.

X_4 General metals.

X_5 General plastics.

X_6 General power.

X_7 General wood.

X_8 Other.

X_9 Technical drawing.

X_{10} Architectural drafting.

X_{11} Electricity.

X_{12} Electronics.

X_{13} Graphic arts.

X_{14} Machine shop.

X_{15} Sheet metal.

X_{16} Welding.

X_{17} Auto mechanics.

X_{18} Nontechnical instruction.

X_{19} Administration.

Table 117. Spearman's rank correlation coefficient matrix for nineteen instructional areas

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
X_1	1.00								
X_2	.56	1.00							
X_3	.75	.18	1.00						
X_4	.67	.72	.42	1.00					
X_5	.76	.21	.77	.46	1.00				
X_6	.30	.70	-.09	.64	-.04	1.00			
X_7	.93	.60	.71	.57	.80	.39	1.00		
X_8	.58	.55	.35	.76	.55	.60	.74	1.00	
X_9	.91	.47	.64	.66	.72	.29	.90	.68	1.00
X_{10}	.91	.45	.67	.61	.73	.20	.88	.59	.97
X_{11}	.11	.71	-.20	.27	-.09	.49	.18	.28	.11
X_{12}	-.04	.39	-.36	.03	-.13	.15	-.01	.08	-.03
X_{13}	.53	-.06	.75	.20	.61	-.15	.50	.18	.47
X_{14}	.66	.58	.43	.82	.53	.64	.79	.86	.74
X_{15}	.69	.53	.44	.74	.46	.57	.72	.67	.78
X_{16}	.76	.57	.52	.85	.52	.59	.81	.78	.82
X_{17}	-.02	.45	-.34	.45	-.24	.83	.08	.50	.05
X_{18}	.57	.43	.42	.57	.44	.29	.57	.43	.49
X_{19}	.71	.69	.37	.72	.50	.44	.74	.64	.75

a X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_{17}	X_{18}	X_{19}
1.00									
.10	1.00								
-.02	.76	1.00							
.49	-.29	-.19	1.00						
.68	.29	-.05	.22	1.00					
.74	.20	-.16	.18	.87	1.00				
.76	.17	-.18	.24	.93	.93	1.00			
-.07	.15	.31	-.32	.47	.36	.38	1.00		
.48	.13	.12	.48	.37	.29	.42	.21	1.00	
.72	.43	.29	.21	.67	.62	.70	.37	.72	1.00

Table 118. Spearman's rank correlation coefficient matrix for nineteen instructional areas - arranged by cluster

	X_1	X_4	X_7	X_8	X_9	X_{10}	X_{14}	X_{15}	X_{16}
X_1	1.00								
X_4	.67	1.00							
X_7	.93	.75	1.00						
X_8	.58	.67	.74	1.00			C_1		
X_9	.91	.66	.90	.68	1.00				
X_{10}	.91	.61	.88	.59	.97	1.00			
X_{14}	.66	.82	.79	.86	.74	.68	1.00		
X_{15}	.69	.74	.72	.67	.78	.74	.87	1.00	
X_{16}	.76	.85	.81	.78	.82	.76	.93	.93	1.00
X_{19}	.71	.72	.74	.64	.75	.72	.67	.62	.70
X_2	.56	.72	.60	.55	.47	.45	.58	.53	.57
X_6	.30	.64	.39	.60	.29	.20	.64	.57	.59
X_{11}	.11	.27	.18	.28	.11	.10	.29	.20	.17
X_{12}	-.04	.03	-.01	-.08	.03	-.02	-.05	-.16	-.18
X_{17}	-.02	.45	.08	.50	.05	-.07	.47	.36	.38
X_3	.75	.42	.71	.35	.64	.67	.43	.44	.52
X_5	.76	.46	.80	.55	.72	.73	.53	.46	.52
X_{13}	.53	.20	.50	.18	.47	.49	.22	.18	.24
X_{18}	.57	.57	.57	.43	.49	.48	.37	.29	.42

X_{19}	X_2	X_6	X_{11}	X_{12}	X_{17}	X_3	X_5	X_{13}	X_{18}
1.00									
.69	1.00								
.44	.70	1.00		C_2					
.43	.71	.49	1.00						
.29	.39	.15	.76	1.00					
.37	.45	.83	.51	.31	1.00				
.37	.18	-.09	-.20	-.36	-.34	1.00	C_3		
.50	.21	-.04	-.09	-.13	-.24	.77	1.00		
.21	-.06	-.15	-.29	-.19	-.32	.75	.61	1.00	
.72	.43	.29	.13	.12	.21	.42	.44	.48	1.00

Table 119. Instructional areas selected by Lorr Radhakrishnan cluster analysis

	Using C_e = .60					
	Cluster No. 1	Mean of $\overline{r}$ with other items in cluster	Cluster No. 2	Mean of $\overline{r}$ with other items in cluster	Cluster No. 3	Mean of $\overline{r}$ with other items in cluster
Items	1	.758	2	.563	3	.760
	4	.731	6	.543	5	.690
	7	.801	11	.618	13	.680
	8	.700	12	.403		
	9	.801	17	.525		
	10	.762				
	14	.780				
	15	.751				
	16	.816				
	19	.697				

Table 120. The average mean for Spearman's rank correlation coefficient with cluster numbers

Cluster number	Average $\bar{r}$	Average $\bar{r}$ with cluster number 1	2	3
1	.760	-	.297	.485
2	.530	.297	-	.141
3	.710	.485	.141	-