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RESEARCH IN INDUSTRIAL EDUCATION FOR ADVANCED DEGREES  
AT IOWA STATE COLLEGE PRIOR TO 1950

by

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Signatures have been redacted for privacy

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## I. INTRODUCTION

Graduate work in industrial education is relatively new in comparison to some other fields. Investigation revealed that the first three theses in the field of industrial education at Iowa State College were completed in 1925. Prior to 1950, no student had received the Ph.D. degree whose major interest or whose research had been in the field of industrial education. This study, therefore, has included only research which had been done by students who had received the degree of Master of Science from the Iowa State College. During the first five years these studies were classified under the major field of trades and industries. The next ten years, the major field was industrial arts and it was in the division of engineering. The last ten years the major was industrial education in the Department of Vocational Education in the Division of Agriculture.

It was further decided to include all theses which listed a major in vocational education if the title suggested any application to industrial education. In case of doubt, a thesis was read before a final decision was reached concerning inclusion or exclusion from the study.

### A. Purpose of the Study

This study has four purposes. They are as follows:

1. To provide an easily accessible reference to studies which have been completed in the field of industrial education and also in any given phase.
2. To make abstracts of these studies available to college instructors in order that they may quickly and easily find those which apply to a particular unit of study.
3. To save graduate students considerable time in finding what has previously been investigated, and thus allow them more time to spend on new and constructive research.
4. To determine if there was any definite trend in pattern in the types of investigations conducted.

### B. Method of Procedure

An abstract was written for each of the 230 theses which were completed prior to 1950. In order to group the theses, they were divided into 11 different classifications as follows: (1) history, (2) industrial arts areas, (3) physical plant, (4) crafts, (5) trades, (6) curriculum studies, (7) administration, (8) student personnel, (9) teacher personnel, (10) teacher education, and (11) teaching techniques and materials.

Some of the theses have been referred to in more than one of these classifications. However, at least one reference has been made to each thesis which has been written prior to 1950.

## II. HISTORY

Industrial education, as most people think of it today, includes the industrial arts program which is a part of general education and the trade and industrial program which is specialized or trade training. The industrial arts program has gone through many changes in terminology, aims, and course content. During its 50 years in the educational program it has been known as manual training, manual arts, industrial arts, and some other terms of lesser importance. The aims, which at first were strictly the attainment of skill, have shifted so they now include its contribution to general education.

### A. Industrial Arts and Trade Training

A study of trade schools in 18 Latin American Republics including Cuba was made by Lindeman (121). He related that Latin America has made great strides forward in the task of training its youth for industrial pursuits. The old penal or reform trade schools had given way to trade schools which included other secondary subjects and were part of the educational system of the state. Angelbeck (4) found that the first manual training school in Milwaukee was established in 1891 when woodwork and drawing were introduced to help provide

for those pupils who wished to prepare for the mechanical occupations. About the same time as the Milwaukee experiment, Davis (46) reported that manual training was started in the junior high schools of St. Louis. The factors which brought about the desire for shopwork were a need for trained workers and a desire to lengthen school life. Dean (47) stated that the trade and industrial program in Iowa began in 1918 when four towns and 47 students participated. By 1946 those figures had grown to include 75 towns, 358 teachers, and 11,758 students.

#### B. Periodical Trends and Other Studies

In an analysis of the two industrial education magazines for the period 1920 to 1934, Jones (103) found that more column inches were devoted to articles on woodworking than to any other two areas combined. Metalwork ranked second and was gaining. Articles on teaching devices, home workshops, and the general shop were all on the increase. In a study which included the years 1936 to 1947, Frederick (63) pointed out that the war years gave impetus to articles dealing with aeronautics, distributive occupations, machine shop, discipline, welding and forging.

The history and characteristics of period furniture were studied by Thomas (206). He divided his discussions into four main groups: American, English, French, and miscellaneous styles.

Hagen (78) made a study of the life and educational philosophy of Lorenzo Dow Harvey who, as director of Stout Institute, Menomonie, Wisconsin, made a great contribution to the advancement of industrial education in the United States.

### III. INDUSTRIAL ARTS AREAS

It has required considerable effort on the part of industrial arts leaders to convince administrators and boards of education that industrial arts programs should consist of more than one area of work. Although a few schools are still holding to the one area of woodworking, most schools have gradually changed over to a broad general program which includes several areas of work. In the following discussion, four areas are discussed separately because there were several studies dealing with each area. Other areas, in which there had been only one or two studies, are combined into a miscellaneous section.

#### A. Wood

An analysis of the related information taught in junior high school woodworking was made by Gard (66). He compared what was being taught and what industrial arts leaders thought should be taught. A similar study was made by McKinley (133) in which he compared the views of industrial arts leaders and industrial arts teachers on the topic of related information for woodwork. Weber (217) used books, periodicals, bulletins, and other sources in his study of related subject matter for

woodworking. He also included a suggested reference list for three different size budgets. Gilson (71) prepared an outline of a course in related science for woodworkers by combining the topics found in science textbooks with those found in woodworking textbooks. Technical information for woodworking in junior high school was selected in a study by Thorson (209) with the aid of ten industrial arts teachers.

Common errors in wood-shop technique were studied by Cunningham (43) when he observed 913 pupils at work and recorded 1,216 errors. A study by Freeman (64) indicated that 92 per cent of the industrial arts projects made in the schools of Memphis were being used in the homes. Steinhoff (197) studied the methods of storing woodworking project materials and concluded that metal storage cases were the most satisfactory.

Williams (223) analyzed 50 courses of study in junior high school woodwork, and stated that a large percentage needed to be revised and brought up to date. Elder (54) developed a training course in the practical use of the framing square. Bergstrom (15) concluded that since many of the units of instruction were so similar, it would appear that training could be provided in the fundamentals of the carpentry, cabinetmaking, and patternmaking trades simultaneously.

Corbin (40) and Jenkins (98) made studies of wood-finishing practices and conditions in Illinois and Iowa.

## B. Metal

Course content in general metalwork for high schools was selected by analysis of 20 common metalwork textbooks by Van Eman (210). Hockey (95) used opinions of metalworking teachers throughout the United States to develop course content for general metalwork. The engine lathe outnumbered all other machines in the machine shops of Minnesota according to a study by Knoss (111). A great variety of projects were made in the machine shops, but the ball peen hammer and the bench machine vise were most common. Wick (220) recommended a shop containing 2,500 square feet for a class of 15 students in junior college machine shop. He also stated that organization of course work should be principally based upon uses of the lathe but other machines should not be neglected.

In an analysis of sheet metal pattern development, Keith (106) selected 12 problems and developed a drawing and an operation sheet for each. Milnes (142) pointed out that related information on metals had the greatest significance for the vocational school, but industrial education teachers approved of related information in the junior high, senior high, and vocational school.

## C. Drafting

Luce (125) checked 240 drawings made by students from

various parts of the Midwest. Two errors appeared more frequently than all other errors combined. The two errors were incomplete invisible corners and incomplete or overrun visible corners. Winter (225) observed 550 drawing students in an effort to determine the common errors in mechanical drawing technique. Results of a study by Hammes (83) indicated that in general, when determining mechanical drawing grades, lettering was weighted from four to six times as heavily as the results obtained from scientifically developed scales for grading mechanical drawing. Rose (178) developed a lettering guide which he tested in his study. He concluded that the guide would improve the quality of lettering and reduce the expenditure of time for lettering. Using 388 samples of student lettering, Wood (227) selected samples which could be used as guides in the grading of freehand lettering.

Hale (79) concluded that drawing courses should be organized along more practical lines and should be of some useful article rather than abstract and isolated exercises. After an analysis of 16 mechanical drawing books, Barron (8) recommended that mechanical drawing books should contain material pertaining to everyday life. Northquest (154) found a difference in the quantity, but very little difference in the quality of work done by mechanical drawing students in large and small classes. McConnell (129) analyzed 28 mechanical drawing textbooks and indicated a growing tendency

to emphasize the cultural and consumer values, and to decrease the number of copy problems.

#### D. Automobile

Hartman (88) reported that 95 per cent of the schools were doing actual repair work to some extent in their auto mechanics courses, but he concluded that the training of efficient operators of motor vehicles was the most important aim of the courses. Johnson (102) used such laboratory tests as simple reaction time, choice reaction time, foot reaction time, headlight glare, and speed of foot movement in an effort to predict automobile driving ability. He found the correlation between driving ability and laboratory tests sufficient for making group comparisons, but not high enough for predicting individual driving ability. Two automobile laboratory textbooks were rated on vocabulary load and sentence structure by Shaw (188). He concluded that "Automotive Service" by Kuns seemed to be more suitable for high school seniors than "The Gasoline Automobile" by Elliott. Martin (136) checked all colleges and universities which granted advanced degrees to determine whether any theses on the subject of auto mechanics had been written. He found seven studies in seven different universities, and analyzed them regarding such items as methods used, sources of data, spelling errors, number of charts, and number of footnotes.

## E. Miscellaneous

Thompson (207) found that junior high school pupils appreciated, in a small degree, the aesthetic possibilities of industrial arts activities. Reeves (172) pointed out that design was of the greatest value to the students in later life in the field of consumer appreciation. Most teachers agreed, in a study by Sissel (192), that emphasis and time spent on related information in printing should be doubled. Schubert (187) indicated that people were interested in education of a practical nature and they felt that a course in home mechanics would be valuable to include in the industrial arts curriculum.

According to Taylor (204), contractors felt that home owners were taking a more active part in the building of their own homes than they were intelligently capable of doing.

In the field of electricity, Bivans (18) developed a course in radio for high schools, Hayes (90) developed a course in electricity for technical schools, and Koschler (114) developed a course in electronics for teachers' colleges.

Practices in publishing school newspapers were studied by Beinert (12). Teaching units in the craft of brushmaking were developed by Bowers (21), and learning content in violin making for industrial arts students was outlined by Sherman (189).

#### IV. PHYSICAL PLANT

It has taken many years to convince boards of education and superintendents that the industrial education laboratory should not be located in a dark basement room with concrete walls and floors. However, the efforts of industrial education leaders are showing results as evidenced by better lighted, better ventilated, lighter colored rooms with proper acoustical treatment.

Care of equipment and shop safety factors have received considerable emphasis in studies at Iowa State College, probably because the industrial education teacher is often judged by his housekeeping abilities and a record free from serious accidents.

##### A. Layout and Lighting

Smith (193) checked 26 shops for desirable and undesirable layout features. He found that work areas in order of frequency were woodwork, finish room, drawing, and sheetmetal. In a study of 30 high school shops, Reynolds (174) pointed out that 70 per cent were located in basement rooms, and nearly one-half were one-room shops. All reported inadequate finishing rooms, and 80 per cent reported a shortage of storage space.

Lighting conditions in drafting rooms was studied by McAfee (127). He reported that a light reading taken when a room was crowded with pupils lowered the reading from eight to nine foot-candles from the reading taken when the room was empty. Suhling (201) checked students under various light intensities while setting type in printing classes. Results showed that an increase in light intensity, where it was not necessary to read, did not increase production by any appreciable amount.

#### B. Tools and Machines

A study of methods employed in the care of tools and equipment by Burkhiser (28) disclosed that most shops used students for routine duties, while some duties were performed by the teacher only, and other duties, such as sharpening jointer knives, required outside help. Hill (94) pointed out that keeping tool-kits at benches was the most economical with respect to time, tool-panels were next, and the tool-room system was the most time consuming. In a study of forms of tool representation, Monroe (144) concluded that the advantage of the half-tone for recognition purposes probably was not sufficient to warrant the extra cost.

Melberg (139) indicated that many junior high schools could add metalworking to their curricula by the addition of relatively small amounts of new equipment. The five machines

which Nieman (152) found to be the most common in senior high schools were the lathe, circular saw, jointer, band saw, and grinder. In an effort to establish criteria for the selection of power woodworking equipment, Applegate (6) asked experienced teachers to check features which they liked or disliked about the band saw, circular saw, and jointer.

### C. Library

Everhart (57) surveyed junior and senior high schools in the western half of Iowa and Matt (137) surveyed the eastern half in regard to such library items as location of industrial education library, selection of books, methods of loaning books, system of cataloguing, and methods of handling periodicals. Similar studies were made by Harms (86) in Central Illinois, Jepsen (99) in Arizona, and Schafer (184) in Western Wisconsin. In a study of seven teacher-training institution libraries, Gray (74) found only 42 books were common to all. Twenty-eight and six tenths per cent of the books pertained to woodwork and 21 per cent pertained to mechanical drawing.

### D. Safety

Carelessness was the chief cause of accidents and the jointer was the most dangerous power machine according to a

study by Judy (105). Hand tools accounted for nearly four times as many accidents as power machines. Wass (216) concluded that the school section of the Iowa safety code was inadequate and should be rewritten, that uniform accident reporting should be required, that class demonstrations on the use of fire extinguishers should be required, and that a safety course should be required in all teacher-training institutions. Hall (82) made a study of safety conditions in the industrial arts shops in the St. Louis area, and Vanover (211) made a similar study in 55 industrial education shops in Montana. Kranzusch (115) took photographs of safe and dangerous situations or practices in the shop and with them he developed a safety test.

## V. CRAFTS

The increase in the number of machines over the 25-year period included in this study has shortened the working day and left man with more leisure time. This extra time has increased the interest in hobby activities. The home workshop has been one of the activities to gain momentum from this additional leisure time.

### A. Home Workshops

Benz (114) related that both parents and students were enthusiastic about the idea of building home workshop equipment in the industrial arts classes. The 60 boys included in a study on home workshops by Kittle (109), had woodwork for their principal activity. The wood lathe was found in more home workshops than any other machine, and 60 per cent of them were homemade. Palmer (159) found that 15 per cent of the boys taking industrial arts work had a home workshop. He also found woodwork to be the principal activity and the wood lathe to be the most common machine. He concluded that the industrial arts department should offer more information on building home workshop equipment. Perkins (167) made a study of the adult home craftsman and his results were quite similar

to others in that projects having the highest frequency were those made of wood. He did point out, however, that adults, for the most part, design their own projects. Olsen (157) studied the home workshop club in Des Moines which was three years old at the time of this study. Recreation was the major value the members received from their home workshop with only a small percentage deriving any financial gain.

#### B. Hobbies and Other Interests

Music and sports were leading activity interests of young men in a study made by Carty (33). Adams (1) reported that one out of every three Michigan high schools sponsor a camera club and he concluded that teacher-training institutions should do more in the way of preparing teachers for this activity. Lown (124) found that fellowship ranked high among the reasons boys gave for taking part in the sea scouting programs. In an analysis of interests and needs of evening school students, Bardonner (7) stated that adults attend evening school for general self improvement and to prepare for a better position.

## VI. TRADES

From the evidence available in the research here reviewed, it would appear that most schools have not given enough emphasis to or have not explained carefully enough the need for skilled craftsmen. Studies in which high school pupils are asked which occupation they would like to follow usually result in several times more pupils indicating they would like to enter a profession than the demand will actually accommodate. On the other hand, only a small number of pupils, considerably fewer than the demand for such, indicate that they are interested in entering a trade.

## A. Course Content

Several studies have attempted to set up training courses for various trades. Whiffen (218) worked out a course in boiler repair for railroad apprentices. He submitted to tradesmen suggestions for teaching boiler repair and also developed information and job sheets for use by the apprentice. Ray (171) analyzed the bricklaying trade and presented a break-down to be used for instructional purposes. Nethken (151) developed a course of training in practical power plant operation from the standpoint of three power plant workers,

the boiler room helper, the stationary fireman, and the boiler room maintenance man. Moseley (145) surveyed aircraft mechanics for their recommendations on job and equipment training. He found that in general the mechanics agreed upon the need for training, and also upon the type of training.

#### B. Miscellaneous

In a study dealing with apprenticeship and on-the-job training programs, Hanson (84) reported that the length of training for on-the-job training programs was two years, while the length of apprenticeship programs varied from three to six years. Frasier (62) found by analyzing the needs of the five basic building trades, that to supply the demand for skilled workers in Iowa in 1939, there should have been admitted into training in 1934 the following number of students: masons 420, carpenters 3,708, painters 1,652, plasterers 276, and plumbers 1,288. Daniels (45) analyzed and evaluated the ideas, experiences, and practices of supervisors and coordinators concerning the diversified occupations program.

## VII. CURRICULUM STUDIES

The industrial education curriculum has gone through many changes the past 25 years, and several studies have been made in an effort to determine which practices should be continued. One of the questions has been whether a school should organize its industrial arts program along the lines of the unit shop, in which only one phase of work is taught at a time, or along the lines of the general shop, in which several phases of work are taught in one room at the same time. Another question has been the advisability of offering industrial arts for girls, and whether they should be taught in separate classes or in co-educational classes. More recently there have been studies on the part-time cooperative program. In this program the students spend half of the day on the job in business or industry, and the other half day in school studying related subjects.

### A. Industrial Arts Programs

In a study dealing with the organization of an industrial arts course for a typical Iowa high school, Messer (140) reported that fathers want their boys to have a wide range of experiences, and are more in favor of repair work than construction. Kiser (108) worked out a typical junior high

school course in industrial arts for a city of 5,000 population. A study of the industrial arts curriculum in the junior high schools of Illinois by Russell (180) showed that the majority of the teachers favored the unit type shop. Industrial arts was required in the seventh and eighth grades, and was elective in the ninth grade. The majority of the North Carolina schools investigated by Burnes (29) offered all industrial arts courses on an elective basis. Carter (32) found that Western Oklahoma parents having boys in industrial arts classes, thought the smaller projects in wood and metal should be dropped from the courses, but the larger projects which were in daily use in the home should be retained. A South Dakota study by Cook (39) indicated just the opposite. He found that the parents were in favor of smaller projects but the boys preferred the larger projects.

#### B. General Shops

Experienced general shop teachers indicated to Haldreth (91) that the general shop type of organization was best suited to the medium-sized junior high and the small senior high. Common practice was for general shop to be taught by one teacher in a one-room shop. The four units of work offered most frequently were woodwork, metalwork, electricity, and graphic arts. In an analysis of 32 junior high school general shop courses of study, Carver (34) found that 22

separate units of work were included in the various general shop courses. Martens (135) pointed out that there was little agreement as to exact objectives for a general shop program in consolidated schools. However, he noted a definite trend toward acceptance of the general education objectives, with very little importance being placed on vocational objectives. Wahtera (214) found an overwhelming majority of Michigan schools favored offering the general shop at the junior high level and about one-third favored offering it at the senior high level.

#### C. Industrial Arts for Girls

As the emphasis in industrial arts shifted from the attainment of skill to its contribution to general education, leaders began to see values for girls as well as boys. Several studies were made to determine course content and objectives for an industrial arts course for girls. By gathering opinions of parents and industrial arts teachers, Kroll (116) found that some of the units which should be included in an industrial arts course for girls were household safety, automobile information, economic values, and improvements in the modern home. Clawson's (36) results were similar, and he reported considerable agreement between town and farm families regarding the units to be included in a girls' industrial arts course. Karn (113) pointed out that

co-educational industrial arts classes were more common than classes in which the girls were segregated, and also that on the average girls do about as well as boys. Harton (97) also found that most girls received their industrial arts in classes with boys, and the most common courses taken by the girls were drawing, bench work, home mechanics, printing, and auto mechanics. Outlines for a home mechanics course for girls and a home economics course for boys were presented by Prebble (169) following a survey of teachers and parents. Beck (10) pointed out that graduate students in two colleges were in agreement that girls should take industrial arts, but they did not agree on whether the sexes should be segregated for such instruction.

#### D. Cooperative Programs

The cooperative program in which pupils spend part time in school and part time in a local business establishment has become quite popular in recent years. In an effort to determine the interest in such a program, Reyman (173) received offers to cooperate from 82 business establishments out of a total of 136. His survey of the students showed that the group with the highest marks was interested in attending college, the middle group was interested in the cooperative program, and the lowest group was interested in neither. In a similar study by Parker (161) involving Negro youth, 61 per cent of

the employers stated that they would cooperate in a part-time vocational training program. Snook (195) found that 83.4 per cent of the employers believed the public schools should cooperate with business and industry in the vocational training of workers. Judish (104) listed 25 teaching practices which were used in teaching related material to diversified occupations classes in North Carolina schools.

#### E. Miscellaneous

Instruction in handwork was given in about 40 per cent of the North Dakota rural schools according to a study by Blide (19). Materials used in the handwork activity were primarily wood, paper, and clay. Smith (194) pointed out that the industrial arts outlined in the state course of study did not include all of the items of industrial arts being taught in the elementary schools of South Dakota. He found a total of 1,802 items of an industrial arts nature included in other subjects.

In a survey of 463 industrial education teachers in Iowa, only 64 indicated to O'Connor (156) that they were teaching consumer education. Most of these were teaching consumer education as related information. Reeves (172) found that industrial arts teachers believed that design was of the greatest value to the students in later life in the field of consumer appreciation.

After an analysis of traffic accidents in Arizona, Stone (200) outlined a course of study in driver education. Wrahlstad (228) stated that slightly more than half of the public junior colleges of the middle west were offering industrial arts. He proposed a curriculum for junior college industrial arts after examining recommendations from authorities in teachers' colleges and universities. In consideration of the mathematics involved in the teaching of industrial arts, Neill (148) reported that arithmetic, plane geometry, algebra, and solid geometry were of greatest value to the teacher of industrial arts.

## VIII. ADMINISTRATION

The industrial arts field presents several problems from the standpoint of administration. One group of superintendents reported that their most serious problem in this field was the selection of capable teachers. This was especially evident during World War II. Another problem was that of financing the program. Studies show that it costs from 52 per cent to 82 per cent more per pupil-hour to teach industrial arts subjects than it does to teach other subjects. Other considerations deal with values derived from industrial arts and policies followed in various schools.

### A. Status of Industrial Arts

Twenty-seven out of 30 Iowa consolidated schools selected at random offered industrial arts according to a study by Hall (81). A poll of high school boys in these schools showed that ninth, tenth and eleventh graders voted industrial arts as their most interesting subject. In the twelfth grade, physics was found most interesting and industrial arts was second. Greene (75) made a study of industrial arts in the secondary schools for Negroes in three states. He reported that in Virginia 44 per cent, in West Virginia 60 per cent, and in

North Carolina 24 per cent of the Negro schools offered industrial arts. A survey of industrial arts for Negroes in the rural high schools of Mississippi by Nelson (150) showed that Negro high schools in less than one-half the counties in the state offered industrial arts work. Another study of industrial arts in four Negro high schools of Oklahoma by Harris (87) stated that barbering and shoe repairing were offered in addition to the other common industrial arts courses. Wills (224) found that woodwork and drawing courses were most common during the years 1929 to 1934 in certain South Dakota schools.

#### B. Values of Industrial Arts

Page (158) pointed out that industrial arts has a very vital part to play in the scheme of general education, and it correlates very closely with the Seven Cardinal Principles of Education. He further stated that industrial arts helps the individual vocationally, socially, economically, avocationally, and informationally to be a better equipped worker and citizen. One hundred and twenty adults rated worthy home membership and vocational values the highest of all values received from industrial arts courses. Pendleton (165) indicated that the industrial arts program on the secondary level formed a good foundation upon which to build an educational program for adults. He concluded that equipment was appropriate and a

wide variety of work was available in the industrial arts field to meet individual needs and desires of adults.

### C. Policies in Industrial Arts

Some production and maintenance work was being carried on in most school shops according to Scott (186). Most teachers did not endorse with enthusiasm production work in industrial arts classes, but they indicated such activities could be included in trade and industrial classes. Beck (10) found general agreement among teachers in that less emphasis should be placed on exercise work whereas more emphasis should be placed upon related information and the general educational values of industrial arts. Michigan industrial arts teachers indicated to Wahtera (214) that the general shop type of organization was more satisfactory for junior high and small schools, whereas the unit shop was better suited to senior high schools and schools in large cities.

In a study of the methods of interpreting industrial arts, Wise (225) reported that exhibits and hobby fairs were rated the highest. Berry (16) found industrial arts men divided on the topic of federal aid to schools. However, industrial arts men agreed that schools were under obligation to the community to provide the industrial arts shops for use of those out of school.

#### D. Financing Industrial Arts

The cost of teaching industrial arts was found to be somewhat higher than the average cost of teaching all other subjects. Edmunds (53) found the average cost of teaching industrial arts in Missouri to be \$0.3192 per pupil-hour compared to \$0.1848 for all other subjects. This was 82 per cent higher for industrial arts than the average cost of teaching all other subjects. Brooks (24) reported the average cost of teaching industrial arts in Kansas was \$0.2510 per pupil-hour compared to \$0.1432 for the average cost of teaching all other subjects. This was 75 per cent higher for industrial arts than the average cost of teaching all other subjects. A similar study in Oklahoma by Floyd (60) showed the cost of teaching industrial arts to be 60 per cent higher per pupil-hour. Schell (185) found that the cost of teaching industrial arts in Iowa was only 52 per cent more than the average cost of teaching other subjects. McClintock (128) reported the cost of teaching industrial arts in Michigan to be \$0.0946 per pupil-hour. The foregoing costs were gathered during the school years 1927 to 1930 inclusive. The writers agreed that the reasons why the cost of teaching industrial arts was higher than the cost of teaching other subjects were that classes were smaller, floor space was greater per pupil, and equipment was expensive.

Other studies dealing with finances included one by Gregg

(76) and Norton (155) in which they studied the methods used by industrial arts teachers in handling and accounting for supplies.

#### E. Miscellaneous

Iowa superintendents indicated to Holzapfel (96) that one of their most serious problems in the administration of industrial arts was the selection of capable teachers. Craft (41) found that industrial arts teachers lacked public speaking ability and also lacked knowledge of child psychology.

In a study of industrial arts laboratory forms, Pease (163) reported 139 different forms were being used to serve 23 different purposes. A group of judges considered 14 of the forms necessary.

Rukavina (179) found that World War II had considerable influence upon industrial arts programs in Iowa, especially in the smaller schools. Due to the shortage of teachers, many schools were forced to discontinue industrial arts.

## IX. STUDENT PERSONNEL

Considerable investigation at Iowa State College has been devoted to studies which were concerned with student personnel. These studies, which included both high school pupils and college students, dealt with guidance, tests and measurements, pupil and employer interests, and occupational progress. Results of these studies tended to indicate that the guidance program was in great need of attention.

### A. Guidance

The need for vocational guidance in high school was clearly disclosed by Klaaren (110) when he showed that in 1925 nearly ten times more pupils were interested in professional services than the demand would accommodate. Ten years later, in 1935, a study in the same schools showed that the interests of the pupils were closer to the demands. However, there were still four times as many pupils interested in professional services as the demand would accommodate. Kusche (117) disclosed similar results when 38 per cent of the pupils indicated a desire to enter a profession whereas census reports showed only 4.5 per cent of the population employed in the professions. Only 2.5 per cent of the pupils indicated a desire to enter a

trade while the census report indicated that 13 per cent of the pupils could be gainfully employed in the trades in Eastern Wisconsin.

In a study of occupational interests in the public schools of Des Moines, Evans (56) concluded that a course in occupations resulted in a change toward a more realistic attitude for job opportunities. Gill (70), on the other hand, disclosed that courses in occupations did not seem to produce any noticeable change in occupational interests. Dell (48) reported that 81 out of 113 industrial arts teachers were engaged in limited counseling activities. He also stated that superintendents ranked social science and home economics teachers ahead of industrial arts teachers as far as potential counseling abilities were concerned. In an interview with 106 young men, Grauel (73) found that nearly twice as many pupils graduated from high school if they received some guidance than did those who had received no guidance.

Richards (175) pointed out that reform schools were making an effort to maintain educational opportunities equal to those of public schools, but concluded that more guidance work should be done in the reform schools. In another study of reform school boys, Van Tries (212) recommended that parents, teachers, and churches unite to provide more wholesome activities such as dances, clubs, hobbies, and home workshops.

## B. Tests and Measurements

Johnson (100) reported that the yes-no form of test questions would measure most accurately the knowledges possessed by students of woodwork and mechanical drawing. The completion test was second in reliability followed by the multiple choice test. The three forms combined showed a higher reliability than any one alone. Mulvany (146) concluded that the essay examination could be made to approach the objective test both in reliability and objectivity. Criteria for judging objective type questions were established by Stiles (199) after he had analyzed available textbooks and magazine articles on the topic. Landis (119) constructed and validated an achievement test in printing and Gerber (69) did the same for orthographic projection. Baxter (9) used 57 published objective tests to construct a performance test and an information test for mechanical drawing. Kranzusch (115) devised a test in shop safety in which he used photographic illustrations of safe and dangerous practices. Etzel (55) found that the better readers tended to make higher scores on all shop tests.

## C. Prediction of Achievement

Beckley (11) reported that there was little reason to believe that individual differences in student achievement in engineering drawing in college courses would result from

industrial education experiences in high school. Garrison (68) found that neither high school drawing marks nor the total high school average was significant in predicting the first college drawing mark, but those factors were significant in predicting success in the second and third drawing courses. According to Minor (143), the Kuder Preference Record was not a satisfactory instrument for predicting achievement of Iowa State College engineering freshmen. In a study of navy trainees, Swanson (203) revealed that the general classification, mechanical aptitude, English, and mathematics tests were about equally effective in predicting the final grade in naval electrical school.

For predicting achievement in junior high general metal shop, Roberts (176) reported that a pre-test was better than either a test of mental ability or an occupational interest inventory. In a comparison of tests, Cramlet (42) concluded that an aptitude test would indicate a boy's probable success in shop classes more accurately than an intelligence test. White's (219) study indicated that the Stenquist Mechanical Aptitude tests I and II, and the Detroit Mechanical Aptitude test for boys would predict probable success in auto mechanics with some degree of accuracy. Herdman (93) made a comparison between boys who dropped out of high school and boys who completed high school, and developed a formula for predicting pupil mortality.

#### D. Pupil, Parent, and Employer Interests

Pupils were asked by Fricke (65) to give their reactions to the industrial arts subject which they had enjoyed the most, the subject from which they had derived the most good, and the degree to which they found each of the subjects interesting. Woodworking ranked first in each category. In an evaluation of 61 units of work which might be offered in a school, Simmering (191) found that both parents and pupils ranked instruction in driving at the top of the list. Dick (49) reported that 85 per cent of the employers interviewed were in favor of an industrial arts program, but as a group they were not well informed about the industrial arts program. Fifty per cent had not seen any of the projects which the boys had made in the last three years even though they had been displayed in a store window.

#### E. Occupational Progress

Anderson (3) made a study of 152 high school graduates who had taken at least one year of industrial arts work. One hundred and thirty-seven graduates reported that industrial arts experience had been helpful to them in their homes, 108 reported it had been helpful to them in their work, and 67 reported that their first job was related to industrial arts. Guzman (77) reported that 20 per cent of all industrial

education graduates of Tuskegee Institute who were included in his study were in businesses directly connected with the trade learned at Tuskegee. He also found there were more graduates employed in the trades of applied electricity, auto mechanics, printing, and tailoring than in other trades. Peet (164) found that 15 out of 16 industrial arts graduates were following work identical with their training. For electrical engineers, 15 out of 17 were doing work identical with their training and two were in work related to their training.

#### F. Miscellaneous

Bridges (23) reported that 47.9 per cent of the male high school graduates of Vincennes, Indiana, for the years 1934 to 1947 had taken some industrial arts courses. During this time there was a definite trend toward increased enrollment in industrial arts courses. Meuler (144) found a direct relationship between the semesters of industrial arts and the ability to recognize good design in industrial products. Several suggestions were made to Good (72) by industrial education teachers who were former students at Stout Institute concerning ways of improving the industrial education program at that school. Some suggestions indicated that more emphasis should be placed on industrial arts design and that practice teaching should duplicate to a greater degree actual teaching conditions.

## X. TEACHER PERSONNEL

Studies in teacher personnel reveal that there are many poorly-prepared teachers handling industrial arts courses. In some states as few as one-third of the industrial arts teachers have a major in that field. The industrial arts-coaching combination has long been common. Most people agree it is an unfortunate combination but few administrators have done much to remedy the situation. Trends in industrial arts teachers' salaries showed a gradual decrease between 1922 and 1934. From 1935 to 1941 there was a gradual rise followed by a sharp rise from 1942 to 1947.

### A. Preparation, Duties and Experience

A number of studies have been conducted on teacher preparation. Carter (31) reported that 70.4 per cent of the senior high school industrial arts teachers of Illinois had majored in industrial arts and 57 per cent held a Bachelor's degree. In Kansas, Livingston (123) found only 46 per cent had majored in Industrial arts but all except 10 per cent held a Bachelor's degree.

The North Dakota study by Meachen (138) and the Iowa study by Weivel (221) both showed that only one-third of the

industrial arts teachers had majored in industrial arts while in college. The Sayovitz (182) study was concerned with the trade and industrial program and he found that 28 per cent had a college degree or a two-year diploma. An analysis of the training and experience of 98 industrial arts leaders was made by Pease (162) and showed that 95 of the men had college training in industrial arts but only 48 had a major or a minor in the field. Ninety-one per cent of the leaders held a Bachelor's degree.

#### B. Status, Tenure, and Salary

Nearly everyone is interested in the tenure and salary of a position and teachers are no exception. A considerable number of studies dealing with these topics have been made at Iowa State College.

Studies by Boller (20), Buchanan (26), Hanson (85), and Wievel (221) have been made in Iowa which were concerned with these subjects. All have reported a tendency for those teachers remaining in the profession to move toward the larger school systems, and the tenure and salaries increased with the size of the school.

Minnesota studies by Knoss (112) and Lindstrom (122) showed that salaries have been on the increase since 1934 and the average tenure was 5.63 years. Meachen (138) found that in North Dakota, salaries were positively related to years of

experience, periods taught per week, and to per capita school tax, and negatively related to size of the town. Fuehler (170) pointed out that the greatest percentage of industrial arts teachers began their careers in cities having a population between 1,000 and 2,000, and also 89 per cent of the teachers who taught the entire ten-year period of the study remained in the same position. Roberts (177) found that Indiana teachers could expect remuneration in keeping with experience up to 20 years.

#### C. Miscellaneous

Carlile (30) revealed that athletics was the most prevalent type of extracurricular activity carried on by industrial arts teachers, and administrators indicated to Nordeen (153) that they used that combination because it was "customary" and as a "matter of economy". Drago (52) concluded from his study that the greatest value of the rating scale for teachers was for self-analysis. The study by Sherman (190) indicated such a great variation in state requirements that he recommended uniform requirements in all states for the certification of industrial arts teachers.

## XI. TEACHER EDUCATION

Most teacher-training institutions are interested in improving their programs. One step in improvement is to survey what other institutions are doing. Considerable emphasis at Iowa State College has been placed upon studies in the areas of undergraduate, graduate, and trends in teacher education. In undergraduate work, the tendency has been toward a greater variety of courses, and in graduate work the trend has been away from the writing of a thesis in favor of the addition of more course work.

## A. Undergraduate

The term which should be used to designate the industrial education department has received more than its share of controversy ever since the first manual training course was introduced. One of the following studies found that five different terms were used by eight colleges within a single state, but industrial arts and industrial education were more common than other terms when all studies were considered.

Several of the teacher-education studies, Appell (5), Bibb (17), Cole (38), Johnson (101), and McCrorie (131) included a group of colleges within a single state while Gardner

(67) included 33 colleges throughout the United States, and Hall (80) included 17 Negro Land-Grant colleges. In addition to terminology, these studies were concerned with such items as qualifications of staff members, requirements for graduation, and areas in which courses were offered. Results showed that there was about the same variation within a state as there was throughout the United States on the various items studied. Livingston's (123) study indicated that teacher's colleges should give more practical work and practice teaching, and also that college instructors should be better acquainted with conditions in secondary education. Benson (13) found that printing teachers needed more information on advanced display composition, cylinder press work, book bindery, printing inks, color work, and design. Industrial education teachers indicated to Good (72) that teacher training institutions should make practice teaching more like teaching on the job.

#### B. Graduate

Thompson (208) found that all but 1.6 per cent of his respondents were satisfied with the Master of Science program at Iowa State College. Increased job satisfaction and increased earning power were desirable features resulting from graduate study. About half of the respondents were in favor of dropping the thesis requirement. A majority of the graduates included in the study by Peoples (166) felt that laboratory work should

be offered for graduate credit, more courses should be offered in the administration and supervision of industrial education, and the thesis requirement should be dropped in favor of additional class work.

Studies by Burgett (27) and Farnan (58) were concerned with such items as entrance requirements, courses offered, requirements for graduation, and types of degrees granted.

### C. Trends

Trends in industrial arts teacher training for the five-year period 1921-1926 were compared with the five-year period 1926-1931 by Alderson (2). He found that many items in the study, such as the requirements for an industrial arts major, remained quite constant during the ten-year period, but industrial arts electives were doubled the first five years and tripled the second five years. Wriedt (229) listed the following courses as showing an increase during the ten-year period from 1929 to 1939: metalwork, general shop, concrete, electricity, and drawing. Tendencies pointed toward more general courses leading to a study of a greater variety of materials and processes. Parker (160) found that manual training was still the most popular term, but industrial arts was gaining slowly over the period from 1931 to 1937. He also pointed out that the number of industrial arts subjects offered in Montana junior and senior high schools remained the

same during the period but the frequency increased about one-third.

In a study concerning policies which apply to practice teaching, Lathrop (120) indicated that the public school was the logical, practical place for the practice teacher to do his teaching, and there should not be more than one practice teacher in a class at one time. Stapher (196) found that aeronautical programs were increasing. By 1946 aeronautics had been introduced into 148 teacher-education institutions.

## XII. TEACHING TECHNIQUES AND MATERIALS

Many studies have been made on the use of teaching techniques and materials. The chief interest seemed to be in the use of films, instruction sheets, vocabulary studies, and a few of miscellaneous nature. The interest in films as a teaching aid has been growing steadily. Because of this increasing interest, considerable investigation has been done to discover the value of films. The use of instruction sheets as a supplement to other teaching methods received considerable emphasis during the middle thirties. The vocabulary studies showed that common word lists did not provide an adequate vocabulary for students of industrial education subjects.

### A. Films

McKnight (134) found that for teaching the use of the steel rule and the micrometer, the groups which were shown the films scored considerably higher on tests than the non-film groups. In addition, the film groups indicated that the film presentation was more interesting and easier for them to understand. Hayden (89) also found that his film-taught group showed a decided gain over the lecture-taught group. Also the film presentations used only about two-thirds as much time as

the lecture presentations. Wright (230) and Pine (168) used sound motion pictures and film strips for presenting occupational information and reported that films were not an effective substitute for equivalent printed material. Nelson (149) pointed out that teachers preferred the motion picture to portray human movements or mechanical motion and the still picture for illustrating structural details. A study by Cochrane (37) indicated that there was no advantage when sound motion pictures were substituted for an equal amount of time spent in laboratory practice in the teaching of mechanical drawing.

#### B. Instruction Sheets

Results of the Schade (183) study indicated that instruction sheets in mechanical drawing were of considerable value when used as a supplement to demonstration methods. The average points gained by his group were 13.4 which, according to statistical treatment, was highly significant. The study by Flock (61) showed an average gain of 16.96 per cent in favor of the groups using instruction sheets in mechanical drawing. Lulow (126) found a gain of 33.5 per cent in favor of the groups using operation sheets in a machine woodworking course, and in hand woodworking, Douglas (51) reported a total average gain of 38 per cent in favor of the groups using instruction sheets. Bryant (25) was the only person to find

no advantage in the use of instruction sheets. His study dealt with the teaching of related information to seventh grade woodworking classes.

### C. Vocabulary Studies

Up to the present time, 14 vocabulary studies have been made in a variety of different fields and utilizing a number of reading material characteristics. Each writer tabulated over 100,000 words from certain lines of a number of different references covering his field of study. After selecting the words which appeared most frequently, each writer compared his lists with the Ayres and Thorndike lists of commonest words. In each study it was found that the common word lists did not provide an adequate vocabulary for students of industrial education subjects. For convenience these studies are summarized in Table 1.

### D. Miscellaneous

McCoy (130) reported a definite advantage in having pupils keep notebooks for a course in electricity. The difference was 8.78 points per pupil in favor of the group which had recorded material in notebooks. Warner (215) found that high school and college instructors agreed quite well on recommended practices for teaching high school industrial

Table 1  
Summary of Vocabulary Studies

Author	Field	Characteristics Studied*						
		A	B	C	D	E	F	G
Brandt (22)	Woodwork	16	101,275	4,151	26	6	379	13
Clarke (35)	Forging	15	103,251	4,840	19	8		
Curl (44)	Electricity	6	112,351	3,846	59	24	359	183
Dominetta (50)	Auto Mechanics	6	110,584	3,396	21	22	29	8
Ferns (59)	Pattern Making	14	155,884	4,586	23	12	113	13
King (107)	Machine Shop	8	112,509	4,186	33	17		108
McCullough (132)	Cement and Concrete	4	107,062	5,186	28			
Nay (147)	Carpentry	11	112,092	4,709	42	28	832	
Ruthrauff (181)	Mechanical Magazines	124	112,662	6,504	15	12	69	19
Sterling (198)	Wood Finishing	9	158,669	6,527	27	7	10	
Sutton (202)	Rural Ind. Arts	9	105,627	4,895	19	16	381	14
Voth (213)	Mechanical Drawing	10	102,042	4,702	95	9	528	
Williams (222)	Photography	12	101,085	4,182	18	7		
Kyl (118)	Sheet Metal	9	105,760	3,536	36	19	399	1952

\*Characteristics Studied:

- A: Number of different books or magazines used
- B: Number of running words tabulated
- C: Number of different words tabulated
- D: Number of different abbreviations tabulated
- E: Number of different symbols tabulated
- F: Number of different figures tabulated
- G: Number of different fractions tabulated

Table 1 (Continued)

Author	Characteristics Studied*							
	H	I	J	K	L	M	N	O
Brandt (22)	1,740	1,014	14	460	45.3		484	562
Clarke (35)	1,030	1,030	5	509	49.4		158	282
Curl (44)	1,398	1,051		558	53.0	338		
Dominetta (50)	1,228	1,056	8	592	58.0	204		254
Ferns (59)	1,912	1,008	17	526	52.1	607		277
King (107)	1,768	1,029	16	544	52.8	427		326
McCullough (132)	1,064		10	460	42.0			
Nay (147)	1,716	1,029	14	525	51.1	445		584
Ruthrauff (181)	2,155	1,050	13	600	56.6	535		438
Sterling (198)	2,190	1,005	18	503	50.0	662		
Sutton (202)	2,187	1,018	18	507	50.0		443	348
Voth (213)	1,425	1,004	9	568	56.5			195
Williams (222)	1,112	1,112	5	617	55.4	164		261
Kyl (118)	1,122	1,002	7	531	52.9	214		522

## \*Characteristics Studied:

- H: Number of words with a frequency of five or more and used by three or more authors
- I: Number of words matched against Ayres & Thorndike list of 1,000 most common words
- J: Lowest frequency used in selecting matching words
- K: Words not appearing in Ayres & Thorndike lists of 1,000 commonest words
- L: Per cent of words not appearing in Ayres & Thorndike lists of 1,000 commonest words
- M: Number of total selected words not appearing in Thorndike list of 10,000 commonest words
- N: Number of total selected words not appearing in Thorndike list of 20,000 commonest words
- O: Number of borderline words

arts. In the study by Thiede (205), a group of recommended practices were established for presenting demonstrations to junior high industrial arts classes.

## XIII. TRENDS IN RESEARCH EMPHASIS AT IOWA STATE COLLEGE

The graduate program in industrial education at Iowa State College was begun in the early twenties, and the first graduate degrees were granted in 1925. Since that year there has been considerable fluctuation in the number of degrees granted each year with the maximum being reached in 1936 when 26 Master's degrees were completed. The number of degrees granted each year is shown in Table 2.

Table 2

Number of Master's Degrees Granted Each Year Prior to 1950

Year	Number Degrees Granted	Year	Number Degrees Granted
1925	3	1938	12
1926	0	1939	11
1927	0	1940	14
1928	3	1941	14
1929	5	1942	4
1930	7	1943	1
1931	9	1944	4
1932	13	1945	0
1933	18	1946	6
1934	15	1947	13
1935	11	1948	9
1936	26	1949	16
1937	16		

The effect of World War II upon the graduate program in industrial education is evident from the table. It is

conceivable that the large numbers receiving graduate degrees in the middle thirties may have had some relation to the depression of the early thirties when it was nearly impossible for a teacher to find summer employment.

When the research was divided into the 11 classifications and the pattern determined for each year, the number of studies was so small for each year that it was difficult to trace trends in patterns for the 25-year period. However, at certain periods greater emphasis was noted in some fields than in others. During the late twenties many studies compared the cost of teaching industrial arts to the average cost of teaching all other subjects. These studies were similar with the exception that each was conducted in a different state. During the first half of the thirties many unrelated investigations were conducted concerning tests and measurements. The preparation and use of instruction sheets proved to be a popular topic during the early and middle thirties.

Three phases of industrial arts received considerable attention during the middle thirties, i.e., drafting, industrial arts for girls, and vocabulary studies. The vocabulary studies were similar except that each covered a different area of industrial arts work. The home workshop and the general shop program were popular topics from the middle through the late thirties. Little similarity could be found among these investigations.

Throughout the thirties and early forties, considerable emphasis was placed upon a determination of course content and to studies of library facilities. Studies of course content were not related to each other, whereas studies of library facilities were similar except they were made in different states. Three types of studies which did not become popular until the forties were concerned with prediction of achievement, surveys to determine the need for a vocational program, and studies of the industrial education program in colleges of several different states. The first two of the foregoing were quite varied in content, but there tended to be considerable repetition in the studies of industrial education programs in colleges of the various states.

Little change in emphasis was evident in the theses which appeared dealing with shop layout and equipment, shop safety, films as an instructional aid, and graduate work in industrial education. Some other studies which were popular the entire period tended to be very similar except that they applied to different states. Most of these studies were concerned with teacher preparation, duties, status, tenure, and salary.

## XIV. SUMMARY

The first graduate degree in industrial education at the Iowa State College was granted in 1925. From that date until the end of the calendar year 1949 there were 230 Master's degrees in industrial education.

During the first few years of this period the degrees were granted in trades and industries, later in industrial arts and during the last ten years of the study in industrial education.

This study was divided into three phases. The first phase was to abstract each of the 230 studies. The second phase was to briefly review the research when classified into areas of industrial education in which the research studies were made. The third phase was an attempt to note trends or changing patterns which had taken place in the type of research work undertaken.

The largest number of degrees granted in any one year was during 1936 when 26 of the 230 studies were submitted. The effect of World War II was clearly noted in the small number of graduate degrees granted during this period. For the five-year period from 1942 to 1946 inclusive there were but 15 men who obtained a Master of Science degree in industrial education from the Iowa State College.

A P P E N D I X

INDIVIDUAL STUDY ABSTRACTS

ADAMS, LYNN CARL (1)

Functioning of High School Camera Clubs in Michigan (1941)

Data for this study were compiled from personal interviews with 26 high school camera club sponsors.

Results showed that approximately one high school in three sponsored a camera club. The majority of club sponsors were science teachers. The name "Camera Club" was preferred by the majority of clubs. Age of clubs ranged from one to ten years with an average of 4.46 years. Most clubs started as a result of student initiative.

Club objectives followed rather closely the seven cardinal principles of education. Most clubs set up one or more qualifications which the candidate must meet before he could become an active member. Two clubs were open to boys only, while the other 24 were open to both boys and girls. Most clubs met weekly, some during school and others after school with a definitely planned program for each meeting. Club affairs were largely pupil planned and managed. The field trip for picture taking purposes was the most popular type of activity program. Exhibits were also very popular. Dark rooms were provided in 24 of the 26 schools.

The author concluded that teacher training institutions should do more in the way of photography, that there is a need for a textbook written for high school pupils, and that clubs should be financed by the school.

ALDERSON, GLENN ALLEN (2)

Trends in Industrial Arts Teacher-Training Curricula for the  
Past Ten Years (1932)

Information for this study was collected by questionnaire and a personal visit to each of the 20 mid-western colleges studied.

Results showed that the requirements for an industrial arts major for the first five-year period, 1921 to 1926, remained almost constant, the average being lowered only .08 credit hours. During the second five-year period, 1926 to 1931, the average required hours were raised 4.21 credit hours. Minor requirements followed the same pattern. Required hours for the second minor was raised during the first period and lowered again during the second. General electives were considerably lower at the end of the first period, however by the end of the second period the number equalled that for the beginning of the study. Industrial arts electives were doubled the first five-year period and tripled the second period. Many courses offered the first period were eliminated and many new courses were added. Agriculture, in connection with the industrial arts curriculum, was gradually lowering from the place it once occupied.

## ANDERSON, CHESTER ROBERT (3)

Occupational Progress Made by Industrial Arts Students of  
Lincoln High School, Kansas City, Missouri (1949)

Data for this study were collected by personal interview with 152 former students who had graduated from the Lincoln High School between 1943 and 1947, who had taken at least one year of industrial arts, and who still lived in Kansas City.

Results showed that the graduates had completed an average of five and six-tenths semesters of shop work. Fifty-seven per cent had obtained a job within one week after graduation, 86 per cent had obtained work within six months, and 17 graduates had not secured employment for two years after graduation. Ninety-four graduates reported that they had received increases in salary, and 29 reported they had received no increase. Sixty-seven reported that their first job was related to industrial arts, and 58 reported that their present job was related. One hundred and eight graduates reported that industrial arts had been helpful to them in their work, and 137 reported it had been helpful to them in their homes. Sixty-five graduates had attended college for an average of slightly over two years. The salary of the graduates ranged from \$168 to \$4,800 per year with an average of \$1,635.

ANGELBECK, FIDELIUS EDWARD (4)

History of Industrial Arts Education in the High Schools of  
Milwaukee, Wisconsin (1936)

The first manual training offered in Milwaukee was established in the attic of the East Side High School in 1891 with woodwork and drawing being the subjects taught. The factors which brought about the desire for industrial training were: (a) the inadequacy of the existing curriculum to provide for those who wanted to go into mechanical pursuits, and (b) the influx of foreign workmen who were given the desirable skilled jobs because of the training which they had received abroad.

The merchants' and manufacturers' association helped bring about the establishment of the manual training department which was started with the idea of giving it a one-year trial. The first manual training department was so successful that provision was made to teach it in all future high school buildings.

Many of the early teachers were men from the trades who had had no teacher training. The aim of the first manual training department was largely the attainment of skill, but later other aims were added and the main purpose was contribution to general education.

Power machinery was used as early as 1891. The first power was a gas engine, later it was steam, and finally electricity was used.

## APPELL, SAM DARLING (5)

Industrial Education in Some of the Colleges of Nebraska  
(1949)

Data for this study were gathered by personal interview, supplemented by both check sheets and a study of the 1948-1949 college catalogs. Seven Nebraska colleges were included in the study.

Results showed that the terms used to designate the industrial education departments were Industrial Arts, Industrial Education, Practical Arts, and Engineering Shops. The total number of credit hours required for a baccalaureate degree was the same in all of the colleges, 125 semester hours. All of the colleges granted the degree of Bachelor of Science and the degree of Bachelor of Science in Education. Only one of the colleges had a club associated with the industrial education department. Six members of the total faculties were professors, five were associate professors, two were assistant professors, two were instructors, and two were student assistants. The number on the staff varied from one to four in the different colleges. The number of semester hours required for a major in industrial education varied from 24 to 45 semester hours. The number of shop courses offered varied from five to 23 in the different colleges.

## APPLEGATE, LESTER BURNELL (6)

Recommended Criteria for the Selection of Power Woodworking  
Equipment for the Industrial Arts Laboratory (1936)

A check sheet was used and a personal interview was held with industrial arts teachers who were known to have had considerable experience in both using and selecting power equipment for industrial arts laboratories. Three machines, the band saw, the circular saw, and the jointer were used in the study. The industrial arts teachers were asked to check the features which they liked or disliked about these three machines put out by the various manufacturers.

## BARDONNER, NELLO EMERSON (7)

An Analysis of the Interests, Needs, and Activities of the  
Students of the Waukegan Township Public Evening School at  
Waukegan, Illinois (1932)

Information for this study was secured from the superintendent and director of the evening school, and from a questionnaire filled out by the evening school students.

Results showed that interests, needs, and activities of those students varied greatly because of the cosmopolitan group of people who attended. Many were foreign born or of foreign-born parents. Education of the students ranged from none at all to college graduates. Occupations engaged in were numerous but there were considerably more laborers than skilled tradesmen. Leisure time varied from none at all to 40 hours per week which included those not working.

Some of the reasons given for attending evening school were general self-improvement, seeking better position, and advancement in trade or occupation. A majority attended only one term of evening school and very few attended beyond six terms. The age group from 20 to 29 had the greatest frequency with very few attending beyond the age of 40 years. The home economics groups seemed to have profited most, and the courses desired most were comptometry, practical electricity, aviation, radio, and law.

BARRON, JAMES EARL (8)

An Analysis of Mechanical Drawing Books Frequently Used in  
Senior High Schools (1936)

Material for this study was compiled from an analysis of 16 textbooks in the field of mechanical drawing. Thirty-two topics were chosen and the number of square inches of material was measured.

Results showed that the items using the most space were elementary orthographic projection, sheet metal developments and intersections, care and use of instruments, pictorial drawing, geometrical construction, lettering, fastenings, architectural drawing, advanced orthographic projection, sectional views, tracing and reproducing, auxiliary views, sketching and measuring, dimensions and dimensioning. Only one book contained material pertaining to aeronautical and marine engineering. None of the books contained material on air-conditioning, block-printing, commercial art, etching, or cartooning. Only two books contained material on electricity.

The author recommended that mechanical drawing books should contain material pertaining to everyday life.

BAXTER, EARNEST W. (9)

Determination of Objective Test Content for  
Mechanical Drawing (1931)

Fifty-seven published objective tests were analyzed in this study and it was found that they measured 14 abilities. Sixty-four per cent of the total number of scores were given for the first three abilities which were information, pencil drawing, and pictorial drawing. With this for a background the author devised a performance test and an information test which were given to 100 students. Instruments were not used in the performance test so the student would depend more upon accuracy of interpretation than upon technique in the use of instruments. This is in accord with the view that instrumental skill is not essential in order that the instruction in mechanical drawing may meet the consumer's need for ability to read and understand drawings.

Conclusions drawn from information tests indicate that they have value as a measure of the students acquisition of information on the subject, but they will not measure the student's ability to draw and to interpret drawings. The performance type test showed that students can interpret drawings and express the information through another medium. Scores indicate that the student continues to acquire ability in this type of interpretation and expression upon taking additional courses in mechanical drawing.

BECK, ELWIN RUSSELL (10)

Concepts of Industrial Arts Teachers with Reference to Certain  
Phases of the Industrial Arts Program (1939)

Information for this study was collected from industrial arts graduate students at Iowa State College and Colorado State College during the summer of 1939.

Results showed that 85 per cent of the teachers considered their own course of study to be of much value in teaching, but only 24 per cent found their state course of study to be of much value. They believed that instructional and informational units should be included in a course of study. If project lists and drawing lists were included, they should be suggestive only. There was agreement that girls should take industrial arts courses, but lack of agreement as to whether it should be in mixed classes. The teachers believed that attitude, creative ability, industriousness, care of equipment, waste-fulness of materials, design, accuracy, quality of workmanship, and individual progress should be considered when measuring a pupil's achievement. There was general agreement that there should be more emphasis on related information and general educational values, but less emphasis on exercise work.

## BECKLEY, JESSE FAY (11)

Predicting Success in Engineering Drawing at Iowa State College  
from Senior High School Industrial Education Experience  
(1948)

Information for this study was secured from records found in various departmental and administrative offices at Iowa State College. The high school record was secured from the registrar's office and the grades for the three engineering drawing courses were secured from the Engineering Drawing Department. The students considered were those who had entered college in September, 1946, who had completed one full year of engineering drawing, and who had taken the American Council on Education Psychological Examination. This included 105 students.

Several regression equations were developed around these factors but each time the resulting correlation was insignificant as a means for predicting achievement in engineering drawing.

The author concluded that there is little reason to believe that individual differences in student achievement in engineering drawing in college courses result from industrial education experiences in high school.

## BEINERT, CARL JOHN (12)

Practices in Publishing, Managing, Printing and Financing,  
Pupil-Produced Newspapers in the Public High Schools of Iowa  
(1940)

Data for this study were gathered by personal interviews with printing instructors in Iowa.

Results showed that 20 men were assigned to the printing department in Iowa schools. Fourteen were spending full time, and four schools employed two printing instructors. Two schools offered printing on the vocational level, 11 on an industrial arts basis, and three in both classifications. In one junior and one senior high school the printing department had sole responsibility for the paper, in one the English and printing departments shared responsibility, and the journalism and English departments were charged with responsibility of publishing in all other schools. Of the 12 school papers which were printed in the school print shops, three were done in vocational classes and nine in industrial arts classes. Eight of the schools used newsprint and four used book paper. Making page layout dummies was the work of the printing instructor in two cases, the English instructor in three, the journalism instructor in five, and a staff member in the other two. Seven of the papers carried advertising. The budget was made up of money received through advertising sales and from the school activity fund.

## BENSON, LLOYD MARK (13)

A Determination of the Educational Needs of Printing  
Instructors in Five States of the Middle West (1934)

Data for this study were collected from questionnaires sent to 279 printing instructors. One hundred and fifty-one questionnaires were returned.

Results showed that 46.7 per cent of those answering indicated a desire for improvement in their line of work. Thirty per cent indicated a desire for more information on the following subjects: advanced display composition, cylinder press work, book binding, color work, design, and the uses, troubles and remedies of printing inks.

BENZ, LELAND ARTHUR (14)

Advisability of Constructing Home Workshop Equipment in  
Industrial Arts Classes (1940)

Data for this study were obtained from 33 industrial arts teachers and 159 industrial arts students on a check sheet through personal interview, and from 122 parents of industrial arts students by check sheet through the mail.

Results showed that 73 per cent of the teachers indicated that students had made requests to construct home workshop equipment in industrial arts classes, and 63 pieces of equipment had already been constructed. Ninety-seven per cent of the teachers felt that a place should be provided in class for such work and that the proper place was at the senior high level. Fifty-one per cent of the boys already had a home workshop and 96 per cent of those not having one indicated that an opportunity to build home shop equipment would aid them in getting a shop started. Eighty-nine per cent of all boys expressed a desire to build home workshop equipment. Ninety-five per cent of the parents favored construction of home workshop equipment in school, and 92 per cent thought it would foster the creation or improvement of their son's home workshop.

BERGSTROM, JOHN ALBIN (15)

Correlative Constants in the Major Fields of Woodwork (1933)

Trade analysis material and courses of study pertaining to general woodwork, cabinetmaking, carpentry, and pattern-making were gathered and an analysis was made for the purpose of selecting and obtaining a classified arrangement of content material common to each of the trades.

After careful analysis of each of the trades, the author concluded that since many of the units of instruction were so similar, it would appear that it was relatively possible to provide training for junior high school pupils in the fundamentals of the carpentry, cabinetmaking, and pattern-making trades simultaneously.

BERRY, MILLARD LAVERNE (16)

An Interpretation of the Responses of Fifteen Industrial Arts Men in Positions of Authority, Relative to Fifty-Seven Industrial Arts Issues (1939)

The author began with 255 concepts which he had gathered from the literature of the field. He sent them to two industrial arts leaders who narrowed the list down to what they considered the 57 most important concepts. Then, by personal interview, he presented the 57 issues to 15 industrial arts men for their rating.

Results of the study showed that the 15 industrial arts men believed that administrators and teachers needed more knowledge of the real philosophy and contributions of industrial arts, administrators should not dictate what areas should be taught in the shop, schools were under obligation to provide industrial arts shops for use of those out of school, and industrial arts should be made common to all in junior high regardless of future status. Industrial arts should provide for integration and close correlation with the rest of the school, it should run throughout the school system, and the teaching of safety was one of the instructor's major duties. There should be fewer industrial arts teachers who act as coaches. The growth of students should be in the direction of abilities and understandings rather than in mere construction of projects.

## BIBB, HERMAN LEON (17)

## Industrial Education in Tennessee Colleges (1947)

This study included nine colleges that offered the Bachelor's degree in industrial education. Each of the colleges responded to a request for its latest catalog, and these catalogs were used as the basis for the study.

Results showed that the terms used for identifying the teacher education departments of industrial education were "Industrial Arts" and "Industrial Education". Only four of the institutions had a distinct four-year curriculum for those students who were majoring in industrial education. From one to five instructors comprised the industrial education faculty in the different colleges. The titles of industrial education faculty members ranged from professor to student assistant with the term instructor as the prevailing title. The educational preparation of the faculty members fell into three categories: those holding Master's degrees, those holding Bachelor's degrees, and those holding no degrees.

The quarter hour requirement for a major in industrial education varied from 36 in one college to 54 in another. Most of the schools were in agreement concerning the type of courses that were to be offered, but the number of required hours in each differed considerably. The quarter hours offered by each college in industrial education varied from 45 hours in one college to 169 in another college.

## BIVANS, IRA (18)

## A Course in Radio for Senior High Schools (1939)

Data used in this study were compiled from a check sheet sent to industrial arts teachers, and a course content sheet sent to radio experts.

Results showed that very few industrial arts teachers were qualified to teach radio. The industrial arts teachers believed there was a need for a simplified radio text, that a simplified course in radio would be interesting to high school boys, and that radio should be taught in the junior and senior years of high school.

The radio experts believed that a radio course ought to be 35 per cent theory and 65 per cent construction. They also believed that the most important unit in the course should include how to read a wiring diagram, the theory of operation of tubes, names of all parts of a radio, and symptoms of radio troubles.

BLIDE, DAN CHRISTIAN (19)

Status of Industrial Arts in One-Room Rural Schools of  
North Dakota (1936)

Information for this study was collected by personal interviews with 219 rural school teachers and 33 county superintendents.

Results showed that instruction in handwork was given in about 40 per cent of the rural schools studied. Equipment was very limited, and in most cases was either furnished by the teacher or obtained from the homes of the pupils. The handwork was usually carried on at the pupils' regular seats and most often included grades four to eight. In most cases the handwork was carried on during school hours, but 52 per cent had no regular periods set aside for this work. Materials used were primarily wood, paper, and clay. Most teachers were satisfied with the results but the county superintendents were not. Teachers and superintendents agreed that handwork helped in solving the problem of such cases as the pupil who was average for his grade or who lacked interest in other studies.

BOLLER, ALLEN THEODORE (20)

An Analysis of Industrial Arts Teacher Tenure in the State of  
Iowa from 1921 to 1931 (1933)

Data for this study were compiled from the Iowa Educational Directories for the years 1921 to 1931 inclusive.

Results showed that in 1922 there were 421 teachers teaching industrial arts for the first time. The number of new teachers each year gradually dwindled down until in 1931 there were only 158 new teachers starting to teach industrial arts. Of the 421 teachers who started in 1922, only 41, or 9.7 per cent, were still teaching in Iowa ten years later. Ten of these 41 had remained in the same school during the period. It was found that industrial arts teacher tenure increased with the size of the town. The average tenure in towns of less than 500 population was 1.26 years, for towns of 3,000 to 3,500 population it was 2.22 years, and for towns of 5,500 to 6,000 it was 3.50 years. It was also found that salaries increased with the size of the town. The average salary for the ten-year period in towns under 500 population was \$1,343 while the average salary in towns of 4,000 was \$1,740, or a difference of \$400.

BOWERS, RALPH WALDO (21)

Teaching Units in the Craft of Brushmaking (1941)

Results showed the following list of teaching units for a course in brushmaking:

Tools used in brushmaking  
Surface enrichment of wood  
Grinding a twist drill with a nib  
Drilling sockets for the bristles  
Drilling holes into the sockets for the wire  
Separating the bristles  
Selecting and preparing materials for the socket  
Fastening bristles into the socket with wire  
Using staples to fasten bristles  
Glue and peg method for fastening bristles  
Working with bone  
Cleaning hair  
Cleaning horn for brush handles  
Whisk brooms

BRANDT, LEO (22)

A Reading Vocabulary for High School Pupils in  
Woodworking Classes (1936)

Data for this study were compiled by tabulation of all words in the first six lines of each page from 16 different woodworking textbooks.

Results showed that the investigation included a total of 101,275 running words. There were 4,151 different words, 26 different abbreviations, six different signs, and 492 different numbers. There were 1,740 words, with a frequency of five or more, used by three or more authors. One thousand and fourteen words with a frequency of 14 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words, and 460 words, or 45.3 per cent, did not occur on either list.

The author concluded that this study indicated that many words were peculiar to woodworking, and showed that the Ayres and Thorndike word lists were not adequate for woodworking students and teachers.

## BRIDGES, CHARLES EDWIN (23)

## Trends in Industrial Arts Enrollment and Occupational Opportunities in Vincennes, Indiana (1948)

Data for this study were compiled from the permanent record cards in the office of the high school principal and from census statistics.

Results of the study showed that out of the 1,269 male students who graduated from Lincoln High School during the 1934 to 1947 period, 47.9 per cent had taken some industrial arts work. During this period there was a definite trend toward increased enrollment in industrial arts.

Unemployment had long been a problem in Vincennes. During the days of the depression unemployment reached 18.9 per cent. Even in 1935, when the state showed a gain of 24.8 per cent in employment, this area showed a loss of 8.2 per cent. In March 1947, unemployment reached 2,100 or 8.6 per cent of the labor force of the area. The percentage for the state at this time was 4.1 per cent. Personal interview and positive labor recruitment have clearly demonstrated that the available labor supply was interested only in local employment.

## BROOKS, MARK LEROY (24)

A Study of the Relative Cost of Teaching Industrial Arts and the Average Cost of Teaching All Other Subjects in the High Schools of Thirty-Two Cities in the State of Kansas for the school year 1927-1928 (1930)

This study included 32 cities which were selected to give a wide population range and a fair geographic distribution. The size of the cities ranged from 100 to 140,000 population. Data were compiled from a questionnaire and also from annual reports for the year 1927-1928 in the state superintendent's office.

Results showed that the cost of teaching industrial arts was \$0.2510 per pupil hour compared to \$0.1432 for the average cost of teaching all other subjects. This was a difference of \$0.1078, or 75 per cent higher for industrial arts. In most cases, in the cities where the cost of teaching industrial arts was found to be high, the cost of teaching other subjects was also found to be high. There was no significant correlation between the size of the school and the cost of teaching industrial arts.

The author concluded that the cost of teaching industrial arts was higher because industrial arts classes are smaller, the floor space is greater per pupil, and the equipment is expensive.

BRYANT, DONALD CLARKE (25)

Effectiveness of Information Sheets and the Lecture-Discussion  
Method of Teaching Related Information to Junior High School  
Woodworking Classes (1936)

All students in six classes of woodworking were given an objective test at the beginning of the term. Three classes were then taught by the lecture-discussion method and three classes were taught by the use of information sheets. The members of the class were given ample time during the periods to study the sheets and they were allowed to study them whenever they desired. The test was given again at the end of the course.

Results of this experiment showed that there was no significant difference between the results obtained by teaching related information to seventh grade woodworking classes by the lecture-discussion method or by the use of information sheets.

BUCHANAN, JESSIE CLEVELAND (26)

Status of Iowa Industrial Arts Teachers in 1944 (1946)

Information for this study was obtained from the Personal Report of Teachers' Qualifications, on file in the State Department of Public Instruction, and from the Iowa Educational Directory. Data were collected for each of 385 industrial arts teachers and also 345 schools in which they taught.

Results showed that there was a drop in the number of industrial arts teachers from 747 to 472 during the period from 1940 to 1944, and a decrease in the number of schools offering industrial arts from 625 to 345 during the same period. There was a tendency for those teachers remaining in the profession to move toward the larger school systems. Fifty per cent of the industrial arts teachers taught in schools with an enrollment of less than 100 pupils, and 60 per cent of the teachers holding the Master's degree were in schools with less than 100 students. About one-third of all the teachers of industrial arts held a major in this subject, and 60 per cent of these were teaching only shop courses. Three Iowa counties offered no industrial arts courses.

BURGETT, RAYMOND W. (27)

Salient Factors Pertaining to Graduate Work in Industrial Arts  
Education and Vocational Industrial Education (1935)

Information for this study was compiled from graduate school catalogs of institutions all over the United States. The topics selected for research in this study were extent of courses offered, basic nature of courses offered, admission to the graduate school, tuition and fees, resident requirements, nature of credit distribution, thesis requirements, admission to candidacy, final examinations, graduate instruction, accredited standing, library facilities, fellowships and scholarships, and placement service.

Results showed that more institutions were offering graduate work of a vocational-industrial nature than of an industrial arts education nature. More graduate degrees in industrial education were granted from publicly-supported universities and colleges than from privately supported institutions. Nearly every institution, through some provisional means, admitted advanced undergraduate students into some of their graduate courses.

## BURKHISER, DONALD MORRISON (28)

Methods Employed in Care of Tools, Equipment and Supplies by  
Industrial Arts Teachers in Iowa (1942)

Information for this study was gathered by means of check sheets which were sent to 130 industrial arts teachers in cities of 3,000 population or larger. Eighty-eight per cent of the check sheets were returned.

Results showed that most shops used a student organization for the care of shop routine duties. Some duties, such as sharpening auger bits and circular saws, keeping check on supplies, and taking an annual inventory, were performed by the teacher only. Still other duties, such as sharpening band saw blades and jointer knives, required the services of persons other than students or teachers. Nearly all teachers held their classes until all hand tools and machine accessories were in their proper places. The cost of tool and machine breakage was assumed by the local school board if accidental, and by the student if broken through carelessness. Considerable variation was evident in the storage of hand tools. Materials and supplies in most of the shops were kept in a storage room, but open racks were used for lumber.

BURNES, CHARLES ALLAN (29)

Courses in Industrial Arts for High Schools Based on a Survey  
of Present Offering in North Carolina (1941)

Information for this study was gathered by a questionnaire followed by a personal visit.

Results showed that all industrial arts teachers responding had college degrees and over half had taken work toward the Master's degree. Of the 51 schools used in the study, 21 had at least one required course. In the other 30 schools, all courses were elective. Mechanical drawing was the most commonly taught industrial arts subject, and it was followed by hand woodworking and cabinet making. A few schools had some metalworking. Only two schools had any industrial arts classes for girls. Trade and industrial classes were offered in 20 of the schools and the diversified occupations program was operating in 22 schools.

The author concluded that woodworking and mechanical drawing received too much emphasis in most of the schools investigated. The author also briefly outlined courses for the various grades.

CARLILE, OLYN C. (30)

## A Survey of the Industrial Arts Program and Teacher Qualifications in the Public Schools of Arizona (1931)

Information for this study was gathered by means of a questionnaire which was sent to every industrial arts and vocational industrial teacher listed in the Arizona Educational Directory for the school year 1930-1931. Ninety-eight questionnaires were sent out and 58, or 59.9 per cent, were returned.

Results showed that industrial arts teachers spend 83 per cent of their time on industrial arts subjects. Woodworking still made up the major part of the industrial arts program. Less than 12 per cent of the industrial arts teachers were teaching academic subjects in addition to industrial arts. Athletics was the most prevalent type of extra-curricular activity carried on by the industrial arts teachers. Seventy-six per cent of the teachers were spending from two to three hours per week making repairs for the school. Seventeen per cent were teaching in evening school. Arizona industrial arts teachers ranked high among the states with the amount of professional preparation. Eighty-two per cent of the industrial arts teachers received their college training outside the state of Arizona. Eighteen out of 42 had majors in industrial arts and seven had minors.

## CARTER, ASA (31)

## Preparation, Teaching Program, and Extra-Curricular, and Other Activities of 457 Industrial Arts Teachers in the Junior and Senior High Schools of Illinois (1933)

Data for this study were collected by a questionnaire which was sent or taken personally to each of the industrial arts teachers of Illinois, exclusive of Chicago. Seventy-three per cent were returned and 70.1 per cent were usable.

Results showed that 7.4 per cent of the teachers had Master's degrees, 52.2 per cent had Bachelor's degrees, 10 per cent had almost enough credit for a degree, and 3 per cent had no training for teaching. Seventy and four-tenths per cent majored in industrial arts in college. Professional magazines were read by 94.9 per cent and professional books by 88.8 per cent. Eighty and five-tenths per cent attended conventions, 67.3 per cent attended summer school, 25.6 per cent attended night school, and 41.1 per cent did extension work. The range in teaching experience was from one to 39 years with a median of 9.8 years. Sixty different subjects were taught by industrial arts teachers with mechanical drawing and woodwork ranking first and second. Teachers in small cities were more often required to teach academic subjects. Extra-curricular duties included repairing school furniture, selling tickets, and sponsoring clubs. A total of 117 different hobbies were reported by the industrial arts teachers.

CARTER, MARVIN LESTER (32)

Determination of the Subject Material Needed for High School  
Shops in Western Oklahoma (1932)

Information for this study was collected by sending several sets of a questionnaire to each shop teacher in Western Oklahoma. The teacher was to send a copy of the questionnaire to the parents of each boy in his shop classes. Of the 280 questionnaires sent out, 200 were returned.

Results showed auto mechanics, plumbing, tool sharpening, practical electricity, masonry, practical concrete work, general repair, and soldering should be taught in a general shop program. The small problems in woodwork, carpentry, and sheetmetal work were not considered important as a rule. Many of the traditional pieces of furniture making should be dropped from the list; however, the larger pieces which are in daily use in the home were to be retained. Very little emphasis should be placed on glass cutting, leather work, basket weaving, rope work, and sheetmetal work.

The study included a complete list of units which might be included in industrial arts courses and the parents' rating of each.

## CARTY, THERON SYLVESTER (33)

Recreational Desires of Young Men in Ames, Iowa,  
Based Upon Their Activity Interests and Participation (1942)

Information for this study was collected during the summer of 1940. Some of the schedule forms which were used were filled out by personal interview, and others by leaving the form to be filled out by the individual.

Results showed that of 184 young men between the ages of 16 and 25 years, three out of five were high school graduates, one-half were attending or had attended college, and the majority had full or part-time employment. One out of three reported having more than 20 hours of leisure time per week with the median being 16.5 hours per week. One-third of the men spent from 50 cents to one dollar per week for leisure activities, and another third spent from one dollar to two dollars. The median was \$1.12 per week. Thirty-five per cent held membership in some sport organization but very few worked for employers who promoted recreational activities. Seven out of ten participated in musical activities and four out of five had a hobby.

The ten top activities in which the young men took part were swimming, dancing, movies, golf, ice skating, fishing, baseball, softball, and bowling. Reasons given for not participating in activities were cost and inconvenient working hours.

## CARVER, LOWELL L. (34)

Survey of Junior High School General Shop Courses of Study  
(1937)

Information for this study was compiled from 32 courses of study which were received after a letter was sent to 228 schools requesting their general shop course of study.

Results showed that all 32 of the courses were written within ten years prior to the study. Fifty-six per cent of the courses were written by committees of industrial arts teachers. In one-third of the cases, consultants were engaged to help make up the course. The courses of study ranged in length from a brief outline of five pages to 190 pages. The average length was 51 pages. Very few courses stated what credit was given for the work offered. Seventy-two per cent of the courses used the organized outline form. Eighty per cent of the courses contained an introductory statement, 87 per cent listed objectives, 53 per cent included lists of equipment and supplies, 70 per cent gave lists of reference material, 60 per cent included teaching procedures, 72 per cent listed projects and most of them gave a choice of projects. Very few of the courses indicated that textbooks were used and very little was said about testing. Twenty-two separate units of work were mentioned in the courses and 33 per cent used instruction sheets. It was common practice in the general shops to carry on several units of work at the same time.

## CLARKE, EDMOND VINCENT (35)

A Reading Vocabulary for Students of Forge Practice Based On  
An Analysis of Textbooks in Forging (1935)

Data for this study were compiled by tabulation of all words in the first six lines of every page of 15 common forge textbooks.

Results showed that the investigation included a total of 103,251 running words. There were 4,840 different words, 19 different abbreviations, and eight different signs. One thousand and thirty words with a frequency of five or more, were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and only 49 per cent were found in either list.

The author concluded that the Ayres and Thorndike lists did not form adequate vocabularies for students of forge practice.

## CLAUSON, WALTER CURTIS (36)

A Proposed Course of Study for Girls in General Shop Based on  
a Survey of Homes in Clayton County, Iowa (1937)

Information for this study was gathered by means of questionnaires which were sent to both town and farm families in Clayton County. Of the 170 questionnaires which were sent out, 126 were returned.

Results showed that a great deal of the subject matter for a course in general shop for girls would be applicable to both town and farm girls because there was considerable agreement between what town families thought their girls should study and what farm families thought their girls should study. Automobile knowledge was ranked first by the families followed by household safety, painting, finishing and decorating, house construction, plumbing, miscellaneous items, electricity, and woodwork. An outline for a proposed course was included.

## COCHERANE, ROBERT ERNEST (37)

## Effects of Substituting Sound Motion Pictures for Laboratory Practice Upon Achievement in High School Mechanical Drawing (1949)

This study was made to measure the differences in pupil achievement in tenth-grade mechanical drawing when sound motion pictures were substituted for an equal amount of time spent in laboratory practice. Three classes, with a total of 62 pupils, were used in the experiment, and also three study units were used, namely: dimensioning, sectioning, and auxiliary views. By using a rotation method each of the three classes were a part of the experimental group for two of the three units used in the experiment. The experimental groups were shown the sound motion picture. The control group did not have the picture but spent that time in laboratory practice. The criterion used in the experiment was the difference in achievement for each pupil when taught by the two methods. All instruction, other than the film, was the same for each group.

Results showed that from the evidence in this study, using the methods that were used, and the units of drawing taught as they were taught, and achievement evaluated as it was done, the hypothesis can not be rejected that equal effectiveness ensues from either method.

COLE, DUANE RAYMOND (38)

## Industrial Education in Some Colleges of Missouri (1948)

Data for this study were collected by means of schedules and personal interviews. Six colleges were included in the study.

Results showed that the term industrial arts was used by two colleges and the term industrial education was used by four colleges. All the colleges offered majors in industrial arts. The number of semester hours for a Baccalaureate degree varied from 120 to 126 in the six colleges. One of the colleges granted advanced degrees in industrial education. The number of instructors in the six colleges varied from two to four with a total of 16 full-time instructors. Four were professors, two were associate professors, four were assistant professors, and six were instructors. Three of the group held the Doctor's degree, ten the Master's degree, and three the Bachelor's degree.

The number of credit hours for a major in industrial education varied from 25 to 42 and from 15 to 18 for a minor. Four colleges required one minor, one required two minors or an extra major and another did not require any minor. Student teaching was required by all colleges. Three of the colleges had an industrial education club. The value of all shop equipment ranged from \$9,300 to \$63,791.

## COOK, ORLAN PARDON (39)

A Proposed Course of Study for Industrial Arts in South Dakota  
(1930)

Each superintendent in the state of South Dakota was asked for the names of four or five patrons of his school most interested in school work. A questionnaire was sent to each of these patrons. To get opinions of boys already enrolled in industrial arts classes, teachers were contacted and furnished questionnaires to hand out among their students. The adult questionnaire was planned to give the usefulness or practical factor and the student questionnaire to show the interest factor.

Results tended to show that the courses in industrial arts should be general rather than vocational. The "handyman" or "worthy home membership" objective was of greater importance than "cultural values" and "vocational guidance". Skill with tools and enough fundamental knowledge for doing the many jobs which must be done around the home were desired. There seemed to be more need for auto mechanics, electricity, knowledge of tools, and general repair than for woodwork such as was being taught at the time. In woodwork, the patrons showed a desire for the smaller rather than some of the larger more costly projects while the boys preferred the larger projects. With these suggestions in mind, the author worked out a course of study.

CORBIN, WILLIAM EMERY (40)

Wood-Finishing Practices and Conditions in Industrial Arts  
Laboratories of Northeastern Illinois (1938)

Data for this study were gathered by personal interview and observation at the school shops.

Results of the study showed that the majority of the woodworking classes were made up of freshmen and sophomores, and very few girls were enrolled. The common practice was to devote 80 per cent or more of the class time to laboratory activities and the remainder to related study. The tendency was to meet daily for 60 minutes, although there were still some double 45 minute classes.

Woodfinishing was usually taught at the time needed on the project, and during the related information time. The most common stain was oil stain and varnish was the most common top finish. Only 55 per cent of the shops had separate finishing rooms, but 85 per cent of the instructors believed that a separate room would improve finishing. There seemed to be no uniform way of caring for finishing brushes, but suspending in turpentine was principally used for wet storage. Most shops had from one to ten reference books and pamphlets dealing with finishing. Half of the instructors believed that there should be more emphasis placed upon finishing in teacher-training courses.

CRAFT, ARTHUR WILBUR (41)

Deficiencies in Qualifications of Industrial Arts Teachers in  
Northwest Ohio (1938)

Information for this study was gathered by personal interview with 50 principals in schools of Northwest Ohio.

Results showed that the following were some deficiencies of the industrial arts teachers: lack of public speaking ability, too little industrial experience, lacking in knowledge of child psychology, failure to contribute to the literature of their field, research not extensively carried on, not enough visitations to other shops, lack of related information in industrial arts laboratory, and little use of visual aids. The use of tobacco was the outstanding deficiency related to personal qualifications. Others were poor penmanship, and too little participation in community projects. Inability to mingle easily with social groups was first on a list of social deficiencies. Others were: lack of shop discipline, not well grounded in use of correct English, and indifference toward assignment of extra school duties. Use of equipment and students for commercial construction ranked first in professional ethics deficiencies.

In spite of the many deficiencies listed by the principals, they were, on the whole, satisfied with the work being done by industrial arts teachers.

## GRAMLET, ROSS CHESTER (42)

A Comparison of Junior and Senior High School Students Based on Results of Intelligence Tests, Mechanical Aptitude Tests, Fundamental Tests in Woodwork and Mechanical Drawing (1932)

The Kuhlmann intelligence test and the John Stenquist Mechanical Aptitude test were used for this study.

Results showed that the correlation between intelligence and fundamentals of woodworking was  $.68 \pm .033$ , intelligence and fundamentals of mechanical drawing was  $.65 \pm .017$ , intelligence and mechanical aptitude was  $.76 \pm .024$ , mechanical aptitude and fundamentals of woodworking was  $.77 \pm .015$ , mechanical aptitude and mechanical drawing was  $.84 \pm .01$ , fundamentals of woodworking and mechanical drawing was  $.79 \pm .015$ .

The author concluded that the aptitude test would indicate a boy's probable success in shop classes more accurately than the intelligence test. The study also indicated that manipulative ability is not shown by the intelligence quotient.

## CUNNINGHAM, FLOYD MITCHELL (43)

## Common Errors in Elementary Wood-Shop Technique (1932)

An outline of technique for tool operations was prepared. All operations over which there was controversy regarding the correct method of use were eliminated. This outline was followed in observing and recording errors of a total of 913 pupils in elementary woodworking classes in several different schools.

Results showed that a total of 1216 errors were recorded. These were listed under 84 different groups of errors. Forty-one errors were observed four or more times. The five most common errors were the following: (a) failure to have as much of the plane bottom in contact with the stock as possible, (b) holding the hand saws with both hands while sawing, (c) failure to select a block and fit the sandpaper, (d) failure to start the hand saws near the heel and on the back stroke, and (e) failure to use long, uniform strokes with the hand saws when the cut was well started.

The author believed that if teachers would use the outline of technique, instruction would be improved, many errors would be eliminated, and there would be a definite upward trend in the progress of the pupils.

CURL, FLOYD THOMAS (44)

A Reading Vocabulary in Electricity Based on an Analysis of  
the Content of Electricity Textbooks (1937)

Data for this study were compiled by tabulation of all words in the first eight lines on each page of subject matter in each of six electrical textbooks.

Results showed that the investigation included a total of 112,351 running words. There were 3,846 different words, 59 different abbreviations, 24 symbols, 359 numbers, 136 decimal fractions, and 47 common fractions. There were 1,398 different words with a frequency of five or more, used by three or more authors. One thousand and fifty-one words with a frequency of nine or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words, and 558, or 53 per cent, did not appear in either list. Three hundred and thirty-eight words with a frequency of five or more were not found in the Thorndike list of 10,000 commonest words.

The author concluded that the evidence showed a need for more uniform vocabulary for writers of electrical textbooks.

## DANIELS, ERNEST FREDERICK (45)

Evaluation of Industrial Education Handbook Material for the  
Trade and Industrial Program in Missouri (1944)

The purpose of this study was to formulate a set of guiding principles which should prove helpful to the coordinators in all phases of the coordination program in diversified occupations. Certain ideas, experiences, and practices of supervisors, coordinators, and others, had been formed concerning the successful practices and desirable characteristics of a diversified occupations program. This study was an effort to properly analyze, evaluate, and make available this information. The complete handbook was included in the study. It was divided into chapter headings as follows: introduction of the diversified occupations program, installation, operation, evaluation, improvement, bibliography, and miscellaneous.

DAVIS, JOHN WINFIELD (46)

History of Manual Training in the St. Louis Public Schools  
(1938)

Data for this study were compiled from the Annual Reports of the St. Louis Board of Education and from the Proceedings of the Board of Education.

Results showed that many terms have been used to describe the work through the years, but "Manual Training" was selected for this study because it was used more in the reports than any other term. The factors which brought about the desire for manual training in St. Louis were a need for trained workers and a desire to lengthen school life. A drawing course was the first effort to fulfill the need for manual training. A seven-year experiment with manual training in the seventh and eighth grade resulted in the board of education establishing manual training as a regular feature of the district school program, in 1898. The first year it was supported by donations from private citizens. The aims of the first manual training departments emphasized the attainment of skill. The first course of study consisted of a series of 20 exercises in wood. Manual training first appeared in St. Louis high schools in 1901. The aims soon changed from mechanical perfection to contribution to general education.

DEAN, C. THOMAS (47)

The Development of Trade and Industrial Education in Iowa from  
1917 Through 1947 (1948)

The trade and industrial program in Iowa began in 1918. During that year there were four centers that participated in the programs to give instruction to 47 students. The amount of money spent that first year was \$1,740.50, half of which was paid by the federal government and the remainder by the local districts.

The first large increase came in 1920. That year there were 37 centers, 120 teachers, and 3,217 students of which 716 were females. The total cost that year was \$50,974, of which the state paid \$19,373 and the balance was provided by federal and local funds. Another noticeable increase in the program came in 1939. That year there were 60 centers, 192 teachers, and 4,654 students. The cost had risen to \$99,890 and was paid from federal and local funds. There was a gradual increase in the program until the peak was reached in 1946 when there were 75 centers, 358 teachers, and 11,758 students participating.

DELL, SAMUEL MILTON (48)

The Function of the Industrial Arts Teacher in the Guidance  
Program of the High Schools of Kansas (1934)

Data for this study were collected by questionnaires sent to the superintendent or principal of each school in Kansas. Four hundred and seventy-five questionnaires were mailed out, 150 were returned, and 137 were usable.

Results showed that 81 out of 113 industrial arts teachers were counseling. Ninety-two were able to give vocational counseling, 60 moral counseling, 49 educational counseling, 40 social counseling, and 33 were able to counsel on health. Superintendents believed that the social science department ranked first in potential counseling abilities, home economics second, and industrial arts close behind. Industrial arts teachers ranked high in the qualification of liking students but rather low in their ability to understand student problems. Therefore, they were in need of education in the adjustive phase of guidance so they would have a more sympathetic understanding of student problems. Industrial arts teachers possess the qualifications which the superintendents think are significant for a counselor. They have the necessary abilities for vocational and moral counseling but need more ability in educational, social, and health problems.

DICK, DELBERT CLIFFORD (49)

Employer Interest in and Attitude Toward Industrial Arts in  
Maryville, Missouri (1949)

A survey was made of 120 employers in the Maryville Public School District by personal interview and the use of a checklist.

Results of the study showed that only one out of every eight employers had taken industrial arts in the local high school. Seventy-seven believed that industrial arts had benefited their employees, and 80 said that if they had the privilege of attending school again they would enroll in industrial arts courses. One hundred and two of the employers favored teaching industrial arts in high school, but 18 said they did not know enough about the work to make a fair statement. Only 15 of the employers had visited the industrial arts shops in the last few years and only one-half of them had seen any of the projects made by the boys in the previous three years.

The author recommended that more stress be placed on the development of personality, that the industrial education curriculum be broadened, and that an effort be made to secure more publicity for the department.

## DOMINETTA, JAMES MILTERN (50)

## Analysis of Auto Mechanic Textbooks to Determine a Reading Vocabulary for Students in Auto Mechanics Classes (1936)

Data for this study were compiled by tabulating all words of the first five lines on every page in five auto mechanics textbooks.

Results showed that the investigation included a total of 110,584 running words. There were 3,396 different words, 21 different abbreviations, and 22 signs and figures. There were 1,228 words, with a frequency of five or more, used by three or more authors. One thousand and fifty-six words with a frequency of eight or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words, and 592, or 58 per cent, did not occur on either list. Two hundred and four words with a frequency of five or more were not found on the Thorndike list of 10,000 commonest words.

The author concluded that the evidence indicated that the Ayres and Thorndike lists were not valid word lists for students of auto mechanics.

DOUGLASS, JAMES HARVEY (51)

Instruction Sheets as Aids in Teaching Handwork in Wood  
(1931)

This experiment was carried out with the aid of four woodworking instructors. Instruction sheets and a test were constructed by the author and the test was given to all classes used in the experiment at the beginning of the course. Demonstrations were given to all groups and in addition some groups were given instruction sheets which they were required to keep, while other groups were given the same material orally. The 232 students all made the same projects and at the end of 18 weeks both groups were given the same test they had taken at the beginning of the course.

Results showed that there was a total average gain of 38 per cent in favor of the groups using the instruction sheets while at the same time the difference in the mean intelligence quotient of the two groups was only one point in favor of the group using the instruction sheets.

DRAGOO, ALVA WILLIAM (52)

## A Rating Scale for Shop Teachers (1930)

In determining what traits or characteristics should be included, an investigation of the literature in the field was made for the purpose of securing the opinion of authorities as to what constitutes good teaching.

The result was a scale which consisted of 17 traits or characteristics and was quite similar to one by Lancelot and Starrak, Iowa State College Rating Scale. Some of the traits were preparation, interest in subject, ability to arouse interest in students, selection and organization of projects, craftsmanship, shop management, personality, and cooperativeness. The person making the rating could make a check along a line somewhere between zero, which was the lowest, and ten, which was the highest.

The author concluded that the greatest values of the rating scale were for self-analysis, to help in the improvement of teaching, aid in indicating progress if made periodically, and stimulation of teachers to greater educational effort. In general, teachers rated themselves higher than did supervisors.

## EDMUNDS, SAMUEL (53)

A Comparative Study of the Actual Cost Per Pupil-Hour of Teaching Industrial Arts and the Average Cost of Teaching All Other Subjects in the High Schools and Junior High Schools of Thirty-Nine Cities in the State of Missouri for the Year 1929-1930 (1932)

The survey for this study included 40 cities, or 68 per cent of all cities within the state of Missouri which offered industrial arts in its school curriculum.

Results showed that the average cost of teaching industrial arts was 31.92 cents per pupil-hour compared to 18.48 cents per pupil-hour for all other subjects. This was a difference of 15.17 cents, or 82 per cent, higher per pupil-hour for teaching industrial arts than for teaching other subjects. The lowest per pupil-hour cost of teaching industrial arts was 11.69 cents while the highest was 95.57 cents. For other subjects, the lowest was 3.67 cents while the highest was 94 cents. Generally speaking, if the cost of teaching industrial arts in a particular school was high, the cost of teaching all other subjects was also high in that school.

ELDER, WALTER T. (54)

Development of a Course of Study in the Practical Use of  
the Framing Square (1925)

Very few carpenters understand all the uses of the framing square. Years ago the master took time to teach the apprentice the finer points of the trade, but now days many apprentices or helpers are left to pick up what they can because of the hurry and speed of the mechanic on the job.

This study divided one tool, the framing square, into many easy-to-understand units. The lessons and problems included in this training course dealt with board measure, brace measure, octagon scale, bridging, polygons, hopper joints, roof framing, and stair layout.

## ETZEL, SAMUEL (55)

An Analysis of Test Scores in the Ninth Grade, Using the  
Thorndike-McCall Reading Test, the Otis Test, Stenquist Test  
(Form II) and Fundamental Shop Tests (1936)

The purpose of this study was to determine what scores good readers and poor readers make on shop tests.

Results of the study indicated that reading and intelligence were significantly related. In all tests the better readers tended to make the better scores on all shop tests, but this condition was not present to any pronounced degree. Reading seemed to have small influence upon the relationship between intelligence and woodworking but it probably was an important factor in the relationship of intelligence and mechanical drawing.

## EVANS, ALEXANDER (56)

An Analysis of the Occupational Interests of Ninth-Grade Boys  
in the Public Schools of Des Moines, Iowa (1933)

A check list with 135 representative occupations was presented to 397 ninth-grade boys, none of which had studied occupations.

Results showed that 25.6 per cent of the checks were for likes, 21.7 per cent for indifferences, and 52.6 per cent for dislikes of the various occupations listed. About half of the group were then given a course in occupations and at the end of a year they were all given the check list again. A definite change occurred in the group (the experimental group) that had the course, which did not occur in the other group, the control group. The trend in the experimental group was toward more likes, less indifferences, and less dislikes, while the control group showed no definite trend. The experimental group showed an increase of likes for every occupational group while the control group showed a slight increase in four, and a slight decrease in five groups. The total per cent of change was 25 per cent for the experimental group and nine per cent for the control group.

The author concluded that a course in occupations caused a change of attitude in the boys taking the course.

## EVERHART, FRANK McQUEEN (57)

## A Survey of the Industrial Arts Libraries in Junior and Senior High Schools with an Enrollment of 200 or Over, Located in the Western Half of Iowa (1933)

Data for this study were collected by personal visits to 68 industrial arts shops located in the western half of Iowa.

Results showed that 73 per cent of the industrial arts libraries were located either in the shop or the drawing room. In 55 per cent of the schools there was no definite appropriation for the shop library. In 66 per cent of the schools the instructor selected the books for the shop library, and in 77 per cent he was in charge of the books. No system of cataloguing was used in 73 per cent of the shop libraries. Books were loaned for outside use in 36 per cent of the schools. In 89 per cent the shop libraries were locked when the instructor was absent.

Pupils showed more interest in periodicals than books in 65 per cent of the schools. In 71 per cent of the schools the instructor furnished some of the reference books for pupil use and in 47 per cent he furnished one or more periodicals. Only nine per cent of the schools had any trouble with loss of books. Periodicals were bound into volumes in 14 per cent of the schools. Forty-eight per cent of the teachers used special assignments to get students to use the library.

## FARNAN, LINDSAY GEORGE (58)

## Graduate Offerings in Industrial Education (1948)

This study included 33 colleges and universities which were found to offer advanced degrees in industrial education. The information was compiled from catalogs from the various schools and from personal letters from persons connected with those schools.

Results showed that 15 of the schools required a student to have a specified scholastic standing in his undergraduate work, 16 schools required an entrance examination, six required both of these, and eight required neither scholastic standing nor entrance examination. All schools required a major and a minor but the number of hours in the major field varied from two to 22 while the number of hours for a minor varied from six to 18. Twenty of the schools required a thesis, and 13 gave an option of a thesis or extra courses. Twenty-nine of the schools gave thesis credit ranging from two to 15 hours. The number of semester hours credit required for the Master's degree varied from 18 to 32. Sixteen schools allowed extension credit. Thirty accepted transfer credit ranging from three to 15 hours. Residence requirements ranged from 24 weeks to one year. Twenty-two of the schools required completion of the degree within six years while the rest allowed from two to ten years. Twenty-nine schools required a final grade average of B. Twenty schools granted the

Master of Science degree, 11 the Master of Arts, seven the Master of Education, and one the Master of Industrial Education. Thirty-one of the schools required a final comprehensive examination. Seven listed language requirements, but these could be waived for the student of industrial education. Twelve schools offered courses in shop practice and drawing for graduate credit. The study included each schools' requirements and course offerings in table form.

FERNIS, EARL A. (59)

A Reading Vocabulary in Pattern Making Based On An Analysis of  
the Content of Pattern Making Textbooks (1937)

Data for this study were compiled by tabulation of all words in the first eight lines on each page of subject matter in each of 14 pattern making publications.

Results showed that the investigation included 155,884 running words. There were 4,586 different words, 23 abbreviations, and 12 symbols. There were 1,912 words, with a frequency of five or more, used by three or more authors. One thousand and eight words with a frequency of 17 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 526, or 52.1 per cent, did not appear on either list. Six hundred and seven words with a frequency of five or more were not found on Thorndike's list of 10,000 commonest words.

FLOYD, J. DENTON (60)

A Study of the Relative Cost of Teaching Industrial Arts and  
Other Subjects in the High Schools of Forty Cities in Oklahoma  
for the School Year 1927-1928 (1929)

This study included 40 cities selected for a wide range of population and geographic distribution. Data were compiled from a questionnaire and also from the annual reports for the year 1927-1928 in the state superintendent's office.

Results showed that the pupil-hour average cost of teaching industrial arts in all the schools studied was \$0.1591 compared to an average of \$0.0991 for all other subjects. This was a difference of six cents, or 60 per cent higher for industrial arts than for other subjects. The lowest cost found in the study was \$0.0776 for industrial arts and \$0.0515 for other subjects, while the highest was \$0.2605 for industrial arts and \$0.1508 for other subjects. In most cases, if the cost of teaching industrial arts was high in a school, it was also high for teaching other subjects. The cost of teaching in the large cities was higher than in the small cities for both industrial arts and other subjects.

The author concluded that the cost of teaching industrial arts was higher because industrial arts classes were smaller, the supplies were higher per pupil, the floor space was greater per pupil, and teachers of industrial arts received higher salaries than teachers of other subjects in some of the schools.

FOLCK, LEO GILBERT (61)

Value of Instruction Sheets in Teaching Mechanical Drawing  
(1936)

Eleven operation sheets and eight information sheets were used in this study. A 144-item test was given at the beginning of the 16-week course and again at the end. Six instructors helped carry out the experiment. Each instructor had two groups, an A group which used instruction sheets, and a B group which did not have access to the instruction sheets. A and B groups ranked very close on I.Q. with the average being 99.56 for group A and 100.39 for group B. All groups were required to make the same drawings.

Results showed that on the second test the gain in favor of group A over group was 20.94 per cent for instructor A's classes, 17.23 per cent for instructor B's classes, 21.44 per cent for instructor C's classes, 9.3 per cent for instructor D's classes, 20.28 per cent for instructor E's classes, and 12.58 per cent for instructor F's classes.

The author concluded that the instruction sheets were worthwhile since the total average per cent gained was 16.96 in favor of the groups which used the instruction sheets.

## FRASIER, PERRY GILBERT (62)

An Analysis of the Needs for Vocational Education of the  
Five Basic Building Trades in Iowa (1934)

To determine the number of workers there should be in each of the trades in a given community it was necessary to adopt some standard of distribution. The standard adopted in this study was that the number of workers in any trade which was universally required should bear the same relation to the population of the community as the number of workers in the same trade in the United States bears to the total population of the United States. The replacements required in a trade were equal to the sum of the replacements made necessary due to death, transfer or retirement, and growth, both of population and trend of growth in the trade. This study was based on a training period of five years, consisting of a two-year school training period and three years of apprenticeship before the learner attained the status of journeyman.

Results showed that to supply the demand for skilled workers in the five basic building trades in Iowa in 1939, there had to be admitted into training in 1934 the following number of students: masons 420, carpenters 3708, painters 1650, plasterers 276, and plumbers 1288.

## FREDERICK, LAWRENCE MONT (63)

Content of Articles Published in Industrial Arts and  
Vocational Education Magazine, 1936-1947 (1948)

Each of the articles appearing in the Industrial Arts and Vocational Education magazine over the period from 1936 to 1947 were carefully analyzed with three criteria in mind: (1) type of subject matter, (2) time of publication, and (3) source of the article.

Results of the study showed that articles concerning the general shop and general metalwork were popular throughout the study. Articles about printing and curriculum construction were steady during the period. Foundry and auto mechanics declined somewhat. The following subjects were most popular in the magazine during the pre-war years: home planning, electricity, leatherwork, trade analysis, home workshops, and instruction sheets. The war years gave impetus to articles about aeronautics, distributive occupations, machine shop, welding, and discipline. Guidance, which was quite strong throughout the study, received increased emphasis since the war.

## FREEMAN, OTIS LEWIS (64)

Analysis of the Worth and Usability of Industrial Arts Problems  
Made in the Schools of Memphis, Tennessee (1933)

Information for this study was compiled from 1,172 questionnaires which had been filled out by parents, pupils, teachers, and administrators.

Results showed that parents and pupils are in favor of discarding the smaller projects for larger, more useful projects. The "handy-man" or "worthy home membership" objective seemed to be of greatest importance in the minds of the parents. They believed that every boy should be trained to use the common bench tools and be able to do the various "handy-man" jobs around the house. Selection of projects to be made should be based to some extent upon the usability factor, and the larger projects had the higher per cent of usability. Ninety-two per cent of the industrial arts projects made by school children were either being used in the homes or had been sold. This would seem to indicate that the projects were well chosen. In addition, when one considered the incidental education, fundamental knowledge, acquired skills, attitudes and ideals, it seemed reasonable to conclude that industrial arts work in Memphis had been to a large measure successful.

FRICKE, EMMETT WALTER (65)

Pupil Interest in Industrial Arts Subjects in the  
Sioux City Junior High Schools (1949)

Data for this study were compiled from a checklist on which 359 pupils were asked to give their reactions to the industrial arts subject which they had enjoyed the most, the subject from which they had derived the most good, the degree to which they found each of the subjects interesting, and their desire regarding the time allotted for industrial arts subjects in their school day.

Results showed that from the standpoint of enjoyment, woodwork was ranked first, followed by printing, electricity, metalwork, and mechanical drawing. The subjects from which the pupils indicated they had derived the most good were in the same order except printing and electricity changed places. Each of the five subjects, with the exception of mechanical drawing, was rated by the pupils as having a rather high degree of interest for them. Eighty per cent of the boys indicated a desire for more time in industrial arts subjects, while only two per cent indicated that they desired less time. The remaining 18 per cent indicated that they thought the present time allotment was just about right for their needs.

GARD, THERON DAVID (66)

Analysis of Related Information Taught in Junior High School  
Woodworking (1934)

Data for this study were gathered by a return of 91 questionnaires from industrial arts teachers and six questionnaires from industrial arts leaders. A comparison was made between what was being taught and what industrial arts leaders thought should be taught.

Results showed that the teachers and leaders agreed to a considerable extent, but the leaders believed that more related topics should be emphasized than were being emphasized by the teachers. The time spent in teaching related information grouped largely from 10 per cent to 30 per cent of the shop period, but ten out of 91 teachers used less than 10 per cent of their time and six used more than 30 per cent of the shop period. Under the heading of lumber, both groups listed the following topics as being important: how to figure board feet, recognition of common woods, effect of moisture on wood, cause of warping, and working qualities and uses of different varieties. Under heading of finishing materials, both groups listed object of woodfinishing, kinds and uses of stains, shellac, varnish, turpentine, and fillers.

GARDNER, EUGENE VERNON (67)

## Undergraduate Offerings in Industrial Education (1949)

Data for this study were compiled from the latest bulletins or catalogs from many of the colleges of the United States which offered industrial education on the undergraduate level. Some colleges were eliminated because their catalog gave no specific course description, and some because they offered less than 70 semester hours in industrial education. After the limitations were imposed, 33 schools remained and were included in the study.

Results showed that the number of semester hours of credit required for a major in industrial education ranged from 24 to 50, for a minor from 12 to 25, and for graduation from 128 to 132. Twenty-two of the 33 schools offered courses in automobile ranging from two to 34 semester hours. Eight offered aeronautics with hours ranging from seven to 29. Fourteen offered courses in the building trades with a range from two to 15 hours. Crafts were offered in 25 schools with credit ranging from two to 93 hours. All schools offered drafting ranging from six to 49 hours. Twenty-nine schools offered from two to 39 hours of electricity. Courses in metalworking were offered in all the schools with a range from four to 56 semester hours. Twenty-two of the schools offered printing ranging from three to 83 hours. All the schools offered courses in woodworking with course offerings ranging from six to 49 hours.

GARRISON, PAUL ISAAC (68)

Relation of High School Drawing Grades to Achievement in  
Engineering Drawing at Iowa State College (1948)

Information for this study was secured from records found in various departments at Iowa State College. The high school record was secured from the registrar's office and grades for the three engineering drawing courses were secured from the Engineering Drawing Department. Students considered in the study were freshmen entering the college in September, 1946, who had completed one full year of engineering drawing, and who had taken the American Council on Education Psychological Examination.

Through analysis of linear and multiple regression the following conclusions were derived. In Engineering Drawing 131, the high school drawing grade average alone was not significant in predicting college drawing grades, and when added to the A.C.E. and total high school average, still did not show a significant advantage in prediction. In Engineering Drawing 132, the high school drawing grade, when used alone, was a significant factor in predicting college drawing success, and when used in addition to the other two factors showed a highly significant advantage in predictive value. In Engineering Drawing 133, the high school drawing grade alone was a highly significant factor in predicting college drawing success, and when used in conjunction with the other two factors indicated a significant advantage in prediction.

GERBER, HENRY PHILIP (69)

The Construction and Validation of a Performance Test in  
Orthographic Projection (1935)

The test, which it is impossible to include here, was made up of 81 different items on three view drawings. There was usually one view missing, and sometimes there were a few missing lines on the views which were represented. The student was to complete the views and draw the missing view. Sixteen textbooks were studied for type problems, sequential order and extent of offerings in orthographic projection, but the problems for the test were not copied from any text. The test was given to four high school classes in mechanical drawing, then, after correcting the test, it was reworked to eliminate catch or misleading problems. The test was given again two years later.

The author believed that by studying the results a teacher could see where his instruction had been weak.

GILL, LESTER NORTHROP (70)

An Analysis of the Occupational Interests of Ninth-Grade Boys  
in Nine Iowa Communities (1933)

A check list with 135 representative occupations was presented to 275 boys in nine different schools. The boys were to make check marks to indicate their likes, dislikes, or indifference to the various occupations.

Results showed that there were 24 per cent likes, 23 per cent indifferences, and 53 per cent dislikes for the occupations listed. About half of the group were then given a course in occupations and at the end of the year they were all given the check list again. The group not having the course, the control group, showed greater change of interests toward occupations than the group which had the course, the experimental group. The control group showed an increase of 16 per cent in likes as compared with 13 per cent for the experimental group. The control group showed a decrease of eight per cent in dislikes as compared with five per cent for the experimental group. Both groups showed nearly the same order of preference for the various occupational groups. The experimental group showed a definite trend toward agriculture, while the control group showed a greater increase in likes for the trades.

The author concluded that as far as this study was concerned a course in occupations did not seem to produce any significant change in the occupational interests of ninth-grade boys.

GILSON, JOHN GUSTAVE (71)

Outline of a Course in Related Science for Woodworkers  
(1933)

The author analyzed several science textbooks and courses of study to get a comprehensive list of topics ordinarily taught in science courses, and the result was a list of 900 topics. Of these only about 100 were found in four or more of the seven texts and these were used as a "selected list". Then five woodworking texts were analyzed using the combined list of science topics as a checklist to determine which science topics were referred to in describing the materials, tools and processes of woodworking. More than 300 topics were found to be in some way related to the woodworking trade, and, of these, 140 were referred to in at least three of the five texts. An outline of suggested content was prepared by combining the topics found in a majority of the science texts and those found in a majority of the woodworking texts.

## GOOD, HARRY F. (72)

A Survey of the Performance of Four-Year Graduates of the Stout Institute School of Industrial Education for the Purpose of Curriculum Revision (1929)

A questionnaire was sent to each of the 170 four-year graduates of the school of industrial education and 72 replies were received. The questionnaire was made up of 28 point-blank questions so the answers were original and varied.

Results showed that the following suggestions were made by the graduates: give more attention to analysis of adaptability in terms of demands made on industrial arts teachers, give more work in planning and organizing courses of study, make practice teaching as near like teaching done outside as possible, have each instructor indicate where his subject enters into the curriculum in the schools where the student may teach, give students more information as to what they might expect in regard to actual teaching conditions, provide a thorough course in industrial arts design, give students information as to handling of finances, ordering materials, and similar problems, and let student's record govern the amount of extra-curricular work he is allowed to do.

## GRAUEL, WALTER EDWARD (73)

Vocational Guidance, Training and Employment of Young Men in  
Moscoatah, Illinois (1940)

Information for this study was gathered by personal interview with 106 young men between the ages of 16 and 23 who were not enrolled in any school.

Results showed that 58 per cent were graduated from the local high school, and 12.5 per cent had college ducation. Thirty-five per cent had taken training in trade schools, night schools, or correspondence schools. Fifty-three per cent had some guidance while in high school. The guidance was of little value to 39 per cent but of much value to 46 per cent. Eighty-four per cent of those having guidance were graduated from high school, while only 48 per cent of those without guidance were graduated. Ninety-four per cent of the guidance group took industrial arts, while only 75 per cent of the non-guidance group took industrial arts. One hundred per cent of the guidance group took a form of vocational training but only 46 per cent of the non-guidance group took any vocational training. Ninety per cent of the guidance group were employed while 79 per cent of the non-guidance group were employed. High school vocational training assisted 75 per cent of them on their first jobs and 88 per cent on later jobs. The practical and vocational subjects out-numbered the others 15 to one as the subjects in which the former students regretted they had not had more training.

GRAY, ROLLAND OTIS (74)

The Literature of Industrial Arts Education as Determined by a  
Survey of the Libraries of Seven Teacher Training Institutions  
of the Middle West (1934)

Material for this study was compiled by checking the libraries of seven midwestern colleges. Two of the colleges were Iowa schools, the Iowa State College and the Iowa State Teachers College. From previous studies of school libraries a check list of 1500 industrial arts books was compiled.

Results showed that the seven libraries included in the study had from 412 to 725 of the titles on the check list. A total of 1,360 of the 1,500 titles was found in at least one of the seven libraries. Forty-two books, or 2.1 per cent, of the 1,500 were common to all the libraries. Forty per cent of the books were published between 1920 and 1929. Industrial arts areas covered by the books were as follows: woodwork 28.6 per cent, mechanical drawing 20.9 per cent, theory of industrial arts education 9.1 per cent, metalwork 6.9 per cent, printing 4.6 per cent, electricity 4.4 per cent, and auto mechanics 3.1 per cent.

## GREENE, FRANK T. (75)

The Status of Industrial Arts in the Secondary Schools for Negroes in Virginia, West Virginia, and North Carolina  
(1932)

A questionnaire was sent to the principals of all public junior and senior high schools for Negroes in the three states. Of the 225 questionnaires sent out, 44 per cent were returned.

Results showed that in Virginia 44 per cent of the Negro schools offered industrial arts, in West Virginia 60 per cent, and in North Carolina 24 per cent offered industrial arts. The percentage of teachers having special industrial arts training was 93 for Virginia, 100 for West Virginia, and 84 for North Carolina. The industrial arts subjects most commonly taught were woodwork, carpentry, mechanical drawing, and electric wiring.

A large percentage of the industrial arts teachers received their training in colleges within the state in which they were teaching. The general condition of the shop housing and equipment was usually checked as average. The schools in which no courses in industrial arts were offered indicated a desire of having such work.

GREGG, HARRY E. (76)

Methods of Handling and Accounting for Supplies Used by  
Industrial Arts Teachers in the State of Missouri (1934)

Data for this study were compiled from a return of 73 questionnaires which had been sent to 93 schools.

Results showed that 4.1 per cent of the schools furnished supplies free of charge to students and 20 per cent furnished part of the supplies free of charge. Thirty-eight per cent of the teachers were required to collect as much money as had been paid out, 16 per cent had to make up personally any loss, 54 per cent bought supplies and had a bill sent to the board of education, 38 per cent bought supplies locally, and 56 per cent received a discount when buying supplies locally. Fifty-eight per cent of the teachers charged for materials when taken from the stock room and 42 per cent made a charge when the project was completed. Eighty per cent of the teachers issued supplies themselves, seven per cent assigned a student to issue supplies, and 13 per cent allowed pupils to get their own supplies. Forty-nine per cent made a charge for finish by the board foot, and 46 per cent figured finish with the stock. Sixty-two per cent had the pupil figure cost of project but required checking by the teacher. Sixty-four per cent of the shops showed a loss, seven per cent balanced, and 29 per cent showed a profit.

GUZMAN, IGNACIO LOYOLA (77)

Occupational Progress Made by Industrial Education Graduates  
of Tuskegee Institute (1948)

Information for this study was gathered by mailing 750 questionnaires to men and women who had graduated from the industrial education department with certificates, diplomas, or degrees during a 20-year period.

Results showed that 57 per cent of all graduates had received Bachelor of Science degrees. Most of the graduates were found to have weekly incomes between 36 and 75 dollars. Less than one per cent of the graduates with degrees were receiving less than \$36.00 per week. There were more graduates employed in the trades of applied electricity, auto mechanics, printing, and tailoring than in other trades. Graduates with diplomas received more salary increases than holders of the other two academic awards. Thirty-nine graduates were in business for themselves. Only in the printing trade were there more graduates employed by colored than white employers. Twenty per cent of all graduates reported in this study were in businesses directly connected with the trade learned at Tuskegee.

HAGEN, BERNHARD C. (78)

Life and Educational Philosophy of Lorenzo Dow Harvey  
(1937)

Mr. Harvey was born November 23, 1848 in New Hampshire. At 18 months of age he moved with his parents, who were farmers, to Wisconsin where he lived and worked for the rest of his life. At 16 years of age he began teaching rural school and later was a high school principal and superintendent. While in school work, he studied law and was admitted to the bar in 1877. In 1892 he became president of the Milwaukee Normal School. In 1898 he was elected to the Wisconsin State Superintendency but, because of politics, was removed in 1902. He then went to Menomonie as superintendent of schools and director of the Stout Institute. Under his direction the institute grew from a small frame structure to a large institution which ranks among the best in the state.

Mr. Harvey believed the pupil should be taught to think. He believed that manual training bridged the gap between the real life of the pupil outside of the school and the more artificial life within the school. He advocated trade training with a direct vocational purpose. He was a firm believer of education for girls, especially training for homemakers. He attempted to show that there was merit in training the individual for that type of work wherein he was most likely to succeed. Mr. Harvey died June 1, 1922.

HALE, WILLIAM PLEASANT (79)

Mechanical Drawing Content Based on Consumers' Needs (1932)

To determine what type of drawings are most used the author checked advertisements, newspapers, magazines, and library books.

Results showed the following drawings listed in order of frequency: pictorial, free-hand sketches, drawings without dimensions, sections, mottoes and emblems, dimensioned drawings, lettering and posters, diagrams and charts, outdoor graphs, silhouettes, line maps, interiors, floor plans, geometrical constructions, wiring diagrams, developments, elevations, and conventions.

The author concluded that the courses should be organized along these lines, and the drawings should be of some useful article rather than abstract and isolated exercises.

HALL, CLYDE WOODROW (80)

Undergraduate Offerings in Industrial Education in  
Negro Land-Grant Colleges (1949)

From the Proceedings of Conferences of Presidents of Negro Land-Grant Colleges, it was found that there were 17 such institutions in the United States. Each institution was asked to send its latest bulletin or catalog from which the information for this study was taken.

Results showed that the minimum number of semester hours of credit required for a Bachelor's degree ranged from 124 to 158, and the mean was 137 semester hours. All the colleges in this study offered credit for courses in drawing and the range was from seven to 16 semester hours. History of industrial education was offered by 16 of the 17 colleges. All institutions offered courses in methods, and credit ranged from three to 14 semester hours. Credit was offered for student teaching in all of the colleges and the mean was 5.5 hours. Eight schools offered courses in shop planning. Fifteen of the schools offered courses in automobile mechanics, and the same number in electricity. Fourteen offered courses in machine shop, 12 had courses in masonry, and five had courses in printing. Courses in radio were offered by eight schools, sheet metal by 13, shoemaking by nine, and tailoring by eight. Courses in woodwork were offered by all 17 colleges, while ten offered wood finishing, and 12 offered plumbing courses.

## HALL, EVERETT VICTOR (81)

The Status of the Industrial Arts Work in the Consolidated  
Schools of Iowa (1933)

Data for this study was collected by personal visit to 30 schools selected at random from the 361 consolidated schools of Iowa.

Results showed that industrial arts was taught in 27 of the 30 schools. Most schools offered industrial arts as a one-year course and in most cases it was given in the ninth grade. The 80-minute period was the most common of the various length periods. Half of the schools offered nothing but woodwork in industrial arts and less than half were offering mechanical drawing. Most of the instructors did not have the objectives of industrial arts very well in mind and only three of the 27 had an outline of the course they were teaching. Three out of four instructors fulfilled the state requirements but half of them lacked methods of teaching the subject.

A poll of high school boys in the 27 schools studied showed that for ninth-graders, industrial arts was the most interesting course with general science second; for tenth-graders, industrial arts was first with agriculture second; for eleventh-graders, industrial arts was first with general science second; and for twelfth-graders, physics was first with industrial arts second. This interest appeared to justify the teaching of industrial arts in the schools.

HALL, SAMUEL FREDERICK (82)

Safety Conditions in Industrial Arts Woodworking in the St.  
Louis Area (1938)

Thirty-three schools in the St. Louis area were used in this study. The schools ranged in size from 150 to 2,800 students.

Results of the study showed that 33 per cent of the instructors thought their classes were too crowded. The 33 shops were equipped with 363 machines, 224 of which were wood-turning lathes. One-third of the shops had a separate room for machines, but this plan was favored by only nine per cent of the instructors. Pusher sticks were available on 36 per cent of the table saws, 36 per cent had splitters, and 52 per cent had kickback dogs. Saw guards were not being used regularly in one-third of the shops. Pushers were available on 54 per cent of the jointers, and band saw wheels were well guarded in 95 per cent of the shops. Safety zones around machines were used in nine per cent of the shops. Goggles were provided in 27 per cent of the shops, and grinding machine guards were in place in every shop. First aid equipment was provided in 81 per cent of the shops. Safety was taught by oral instruction, lecture, and visual aids. A student safety foreman was used in 15 per cent of the shops.

HAMMES, ROMAN MATHIAS (83)

The Effect of Lettering Upon the Grading of  
Mechanical Drawings (1935)

The procedure was to have three different students do the lettering on three drawings which were made as nearly identical as possible by having them all drawn by the same student. The similar drawings with the lettering of the different students were then graded by ten different experienced drawing teachers.

Results showed that lettering was given from four to six times as much weight in the general run of grading for mechanical drawing as that allowed by scientifically developed scales for grading mechanical drawing.

## HANSON, DURWIN MELFORD (84)

Apprenticeship and On-the-Job Training Programs in Iowa  
(1949)

The information used in this study was compiled from the applications for approval on file with the State Department of Public Instruction approving agency, the Veterans Education and Training Division. Apprenticeship programs included those trade-training facilities certified by the Apprentice-Training Service and approved by the State Department of Public Instruction. On-the-job training programs included the trade establishments approved only by the State Department of Public Instruction. The information was collected during the month of June, 1949.

Results showed that the study included 2926 in training, with 1138 classified in the construction trade group, 403 in the manufacturing trade group, and 1385 in the service trade group. The distribution of training programs in the construction trade group by size of community indicated a relationship of apprenticeship and on-the-job training programs to the size of the community. Seventy-nine per cent of the apprentice programs were located in cities with populations of 10,000 and over, while 80 per cent of the on-the-job programs were located in communities of less than 10,000 population. It was found that the length of training for on-the-job training programs was two years, while the length of apprentice programs varied from three to six years.

HANSON, MURILL H. (85)

An Analysis and the Determination of Trends of Teaching  
Combinations and Salaries of Teachers of Industrial Arts in  
Iowa, 1922-1932 (1932)

The data used in this study were obtained from the Iowa Educational Directories for the years 1922 through 1932.

Results showed that the trends in the various teaching combinations with industrial arts during the ten-year period indicated an increase with the following: principal, commercial, history, other social sciences, and industrial arts only. The trend was toward a decrease with the following: superintendent, coach, agriculture, and physics. Twenty-two per cent of the teachers were teaching industrial arts only. Based on the school years 1929-1930 and 1931-1932, 33 out of 100 teaching industrial arts were also coaching, 31 of 100 were teaching agriculture, 26 of 100 were superintendents, 24 of 100 were teaching industrial arts only, 18 of 100 were teaching physics, 16 of 100 were principals, 16 of 100 were teaching mathematics, and 12 out of 100 were teaching general science.

Salary averages during the ten-year period were listed as follows: 1922 - \$1,990; 1924 - \$1,873; 1926 - \$1,838; 1928 - \$1,809; and 1930 - \$1,791.

HARMS, WILLIS OTTO (86)

Industrial Arts Libraries in the Public Senior High  
Schools of Central Illinois (1937)

This survey covered 99 shops in 55 schools located in 52 cities of central Illinois.

Results showed that in 40 per cent of the cases the books were kept in the school library and were checked out to individual shops. In the rest of the cases the books were kept in various places about the shop, tool room or instructor's office. In 85 per cent of the cases the instructor was in charge of the books and in 15 per cent students were in charge. One-half of the shops had no system of cataloguing the books. In 94 per cent of the cases books were loaned for use outside the shop. Only 29 per cent of the schools had a definite appropriation for library use. In 65 per cent of the shops the instructor owned from one to 35 of the books in the shop library.

Students showed more interest in periodicals than books in 80 per cent of the cases. Periodicals were bound in yearly volumes in 19 per cent of the libraries and were kept indefinitely in 68 per cent of the libraries. There was trouble with books and periodicals disappearing in 24 per cent of the libraries. In 85 per cent of the cases the shop libraries remained locked when the instructor was absent. No textbook was used in 34 per cent of the courses. There were 614 differently titled books

found in the 99 shops and 30 different periodicals. Thirty-eight different texts were used in the various shop courses. Fifteen per cent of the instructors did not motivate their students to use the library.

## HARRIS, FRANCIS HAROLD (87)

Industrial Arts in North Central Association Negro High Schools  
of Oklahoma (1942)

Information for this study was collected by questionnaire and personal interview. The study included the four Negro high schools in Oklahoma with membership in the North Central Association of Colleges and Secondary Schools.

Results showed that there were eight industrial arts teachers in the four schools. Six of the teachers held the Bachelor's degree, one the Master's degree, and one had no degree. Salaries of the eight teachers ranged from \$1,125 to \$1,850. Three of the teachers also served as an assistant coach. Teaching devices employed by the group included the use of instruction sheets, teacher demonstrations, and the foremanship shop personnel organization. The school exhibit was favored by seven of the eight teachers while one believed it should not be held. Courses offered in the four schools included woodwork and woodfinishing, metalwork, carpentry and related trade, auto mechanics, mechanical drawing, photography, electricity, upholstery, barbering, and shoe repair.

HARTMAN, HARRY V. (88)

Organization and Content of Courses in Auto Mechanics for  
Junior and Senior High Schools (1931)

A questionnaire was used to gather opinions of what should be taught and also to determine what practices were being used in auto mechanics classes. The questionnaire was sent to 144 teachers of auto mechanics in the Central and Eastern states.

Results of the study concerning practices were that the number of pupils in a class should be about 20. The length of class should be 60 minutes for junior high, 90 minutes for senior high, and 120 or 180 minutes for a vocational class. The median cost of equipment was about \$2,000. Eighty-seven per cent of the schools used instruction sheets to some extent and 95 per cent of the schools were doing actual repair to some extent.

Concerning what should be taught, the course was broken down into the following headings with many units under each: bench work, general service work, ignition, battery, starter, generator, lights, cooling system, carburetor and fuel system, motor, transmission and clutch, rear axle, front axle, steering gear, and brakes.

The author concluded that the training of efficient operators of motor vehicles was the most important aim of auto mechanics.

HAYDEN, ROYAL CLIFFORD (89)

Comparative Effectiveness of Silent Motion Pictures and  
Lecture Methods of Teaching Industrial Arts Students  
(1936)

Two groups of 24 students each were used in this study. One group was taught by the lecture method and the other group by the silent motion picture.

Results showed that the film-taught group made a decided gain over the lecture-taught group. There was also more retention on the part of the film-taught group. Student reactions indicated that the film presentations were more interesting than the lectures. Although the amount of material covered was exactly the same, the length of time required to present the film material was one hour and fifty-nine minutes for the eight films as compared with three hours and thirty-five minutes for the lecture presentations.

HAYES, WALTER OWEN (90)

Recommended Course in Electricity for a Technical High School  
Based Upon a Survey Made in Des Moines (1947)

Material for this study was gathered by personal interview with experienced tradesmen.

Results showed that the tradesmen believed that the school should offer two years of basic electricity. They also believed that provisions should be made for training, either in the school shops or in industrial shops, in the three major electrical areas of automotive electricity, electric motor service, and building wiring. Boys interested in any of the occupations not represented in the three, such as neon sign making, should be allowed to get such training on the job by working part time with a trained expert while still in school.

A complete outline of the proposed course of study was worked out but cannot be included here.

HELDRETH, WILLIAM VIRGIL (91)

## Characteristics of the General Shop (1940)

Information for this study was gathered by a survey of the literature and by a questionnaire sent to general shop teachers all over the United States.

Results showed that the comprehensive general shop was offered more often than the general unit shop. The purpose of the general shop was to act as a finding or exploratory course and, as such, it seemed to be best suited to the medium-sized junior high school and the small high school. The average number of semester's work offered in the general shops was 3.6 semesters. Common practice was for the general shop to be taught by one instructor in a one-room shop without partitions to separate the units of work. The four units of work offered most frequently were woodwork, metalwork, electricity, and graphic arts. According to the survey, the ideal size of a general shop would be 40 feet by 82 feet with a 14 foot ceiling. Seventy-two per cent of the instructors favored a rigid course of study with definite learning units in each area, but the rest favored free activity. Usually, general shop was required below the ninth grade and elective above the ninth. Twenty-five was the average size of junior high classes and 21 for senior high classes.

## HENNING, ROBERT THEODORE (92)

Values Derived from Industrial Arts by One Hundred and Twenty  
Male Adults (1934)

Data for this study were gathered by making 60 personal interviews in each of two Wisconsin cities. The cities were Appleton, an industrial city, and Oshkosh, a non-industrial city. The persons interviewed had taken some industrial arts courses at least five years previous to the study. Each person was asked which of the following values ranked highest with the various industrial arts courses: vocational, avocational, guidance, worthy home membership, and consumer values.

Results showed that for auto mechanics, the industrial city ranked worthy home membership first and vocational values second, while the non-industrial city ranked worthy home membership first and consumer values second. For drafting, the industrial city ranked vocational values first and the non-industrial city ranked all values very low. For electricity, the industrial city ranked both worthy home membership and vocational values quite high while the non-industrial city also ranked worthy home membership quite high. For sheet metal both cities ranked vocational values highest. Woodworking was given the highest rating of all the courses with worthy home membership leading in both cities and vocational values second in both. The worthy home membership value seemed to be more popular than any of the other values.

HERDMAN, RAYMOND WAIN (93)

Predicting Pupil Mortality Among High School Boys  
(1949)

Data for this study were compiled from the Wethersfield, Illinois, High School records of 283 boys who entered school from 1934 through 1944. A comparison was made between the 71 withdrawals and 212 graduates of this group.

Results showed that the boy who dropped out of high school differed from the graduate boy in several ways. He was older upon entering high school. He was less intelligent. He was absent a larger per cent of his school time. He received lower elementary school grades. He received poorer high school grades. He made lower industrial arts grades but the difference was not so pronounced in shop as it was for all high school subjects. The occupation of the father when classified as to farm or non-farm had no effect upon the boy's withdrawal from school.

A formula for predicting pupil mortality was developed.

HILL, LAWRENCE ALVIN (94)

Time Efficiency Analysis of Industrial Arts Tool Systems in  
Junior High Schools (1936)

Information for this study was gathered by observing, counting each trip to the place of tool storage, and timing the trips as the students prepared for work at the beginning of the period and also as they put away their work at the end of the class period.

Results showed that in shops having no tools at the work benches the mean number of trips per student made to secure or return tools was 3.7 trips per period. In shops having tool kits at benches, two trips per period were made to the place of tool storage. In shops using tool-panels, 4.1 seconds were spent at the place of tool storage while in shops having tool rooms, 21.2 seconds were spent standing at the tool room. In shops using tool-panels, 71 per cent of the time per trip was spent in walking while in shops having tool rooms, 39 per cent of the time per trip was spent in walking. The tool systems where tools are kept at the benches were generally more economical of time, with the systems using tool-panels rating second, and the tool room systems more time consuming.

## HOCKEY, LAWSON EARL (95)

Course Content in General Metal for Industrial Arts in Junior  
and Senior High Schools (1941)

This study was made up of opinions which were received when 200 questionnaires were sent to supervisors and teachers throughout the United States who were teaching or had received training in general metal.

Results of the study showed that seventh and eighth graders should be given patterns for their projects but students in higher grades should make their own patterns. Seventh and eighth graders should be taught to use only hand tools. Students should be taught to sharpen most tools in all grades, but drill sharpening should be taught in senior high. Forge work, foundry work, art metal work, and driver education were best adapted to the senior high school level. The bench type machines were suitable for all grades above the eighth, but production type machines should be used only in senior high. Sheet metal machines were suitable for senior high and a limited amount in the ninth grade. Work with tin cans should be confined to the seventh grade. Junior high students should be given an average amount and senior high students considerable information about materials, tools, consumer education, technical information, occupational information, related mathematics, and related science.

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HALZAPFEL, ELMER WILLIAM (96)

Administrative Relationships of Superintendents and Industrial Arts Teachers in Small High Schools in Northern Iowa (1937)

Superintendents attending Iowa State College and superintendents at the Northwest Iowa Teachers Meeting were asked about their problems concerning industrial arts. From these comments a checklist was made and given personally to 31 superintendents of small high schools.

Results of the study showed that the biggest problem of superintendents in the administration of industrial arts was the selection of capable teachers. The second major problem was effective supervision, and the difficulty of keeping machines and tools in good repair was the most difficult problem in the field of supervision. The third general problem was integration of industrial arts with other curriculum content. The fourth ranking problem was keeping records of materials and yearly inventories, and the next problem was purchasing of proper types of tools and equipment. General building administration was a problem in that space for storage, equipment, and pupils was too limited to meet the demands.

HORTON, GILBERT A. (97)

The Extent, Nature, and Objectives of Industrial Arts for High School Girls in the States of Texas, Alabama, Louisiana, and Mississippi, for the Year 1932-1933 (1933)

Data for this study were collected by a questionnaire sent to high schools in the above mentioned states. Of the 119 schools answering the questionnaire, 70 reported they were teaching industrial arts to girls.

Results showed that there were 19,535 girls in the 70 schools, and 2,060 of these girls were taking industrial arts courses. In the same 70 schools there were 7,457 boys taking industrial arts courses. The six industrial arts areas offered most frequently were mechanical drawing, bench work, freehand drawing, home mechanics, printing, and auto mechanics. Most of the girls took their industrial arts work in classes with boys.

The most frequent objectives of industrial arts were:

(1) to cultivate appreciation of good design and workmanship as a consumer, (2) to awaken avocational interests in the pupil to give a richer and happier leisure, and (3) pre-  
vocational -- (a) to stimulate and direct the studies of the pupils into the general subject of choosing a life work, and (b) to give valuable preliminary training for industrial occupations by developing a certain degree of skill.

JENKINS, THOMAS SCHUYLER (98)

Common Wood-Finishing Practices in High School Shops of Iowa  
(1934)

Material for this study was gathered by personal visit and interview with the woodworking instructors in 36 high school shops.

Results of the study showed that the demonstration method was most frequently used for giving instructions concerning finishes and finishing procedures. The finishing materials used and the order of frequency was as follows: stain, varnish, shellac, enamel, paint, wax, oil, and lacquer. Twenty-five per cent of the instructors gave no related information concerning the finishes. The three methods of determining cost of finishes were estimated by board feet, quantity used, or additional percentage. Sixty per cent of the schools had a separate room for finishing, 16 per cent had metal cabinets for finishing supplies, 27 per cent had metal waste cans, and 59 per cent had fire extinguishers. Varnish brushes were usually kept in a solution of turpentine, shellac brushes were kept in alcohol or shellac, and paint brushes were cleaned after each use. Seventy per cent of the instructors personally handed out the finishing materials.

JEPSEN, CARL SERNSEN (99)

## Industrial Arts Libraries of Arizona High Schools (1942)

Data for this study were compiled from a checklist sent to 52 industrial arts instructors. Thirty-one, or 60 per cent were returned.

Results showed that the typical industrial arts instructor had a class of 19 students. He was in charge of the shop library in which there were 12 books. He received an indefinite amount each year with which to buy new books, and in 1941 he bought four books of his own selection. One-third of the books in the shop library belonged to the instructor. Students showed more interest in periodicals than in books. In the 31 schools there were 630 copies of 71 different books but one-half the instructors thought their libraries needed more of both magazines and books.

The author concluded that the average industrial arts department needs to have more reference books in its library and a definite amount of money budgeted each year for this purpose.

JOHNSTON, ALBERT EARL (100)

A Study of the Reliability of Certain Industrial Arts Tests  
(1931)

Three forms of objective tests were prepared. They were yes-no, multiple choice, and completion tests for woodworking and mechanical drawing. After a trial run, some of the questions were restated and then the tests were given to over 700 boys and girls in industrial arts classes in communities surrounding Iowa State College.

Results indicated that the yes-no form of test measures most accurately the knowledge possessed by students of woodwork and mechanical drawing. The completion test ranked second in reliability followed by the multiple choice test. The three forms combined into a battery of tests showed a higher reliability than any single form taken alone. More than two semesters of woodwork did not seem to increase the boys' knowledge and must be justified by other objectives; however, this was not true with mechanical drawing. The original test questions and the revised tests both were included in the study.

JOHNSON, IRA HUGO (101)

Industrial Education in Minnesota State Teachers Colleges  
(1940)

Material for this study was gathered by personal interview at six Minnesota colleges.

Results showed that each college was individually responsible for its industrial education teacher training program and there was considerable variation from college to college. Three colleges used the term "Industrial Arts" and three used the term "Industrial Education" to designate their work. The term instructor was the prevailing title for teachers in the industrial education departments. One or two men composed the industrial education faculty in all the colleges. All instructors had the Master's degree. The Bachelor of Science degree was granted to industrial education majors in all the colleges. The quarter hour requirement for a major in industrial education ranged from 45 to 50 hours. In all the colleges an industrial education major must have had two minors or one additional major outside the department. Course offerings varied from 40 to 79 quarter hours, and hours for practice teaching varied from four to ten hours. The value of equipment in the colleges varied from \$5,035 to \$9,150. All colleges had a teacher placement service. Instructors in the Minnesota teacher colleges were attempting to make the industrial education teacher training program more uniform throughout all the colleges.

## JOHNSON, LEVERNE (102)

The Determination of Characteristics Involved in the  
Ability to Drive an Automobile (1936)

This study was made to determine if any laboratory test or combination of tests, used in the study, would predict automobile driving ability. Some of the laboratory tests were simple reaction time, choice reaction time, headlight glare, foot reaction time, and speed of foot movement. The criterion against which the laboratory tests were evaluated was a test of driving ability made on an outdoor driving field. The reliability of the driving field test was .68 which was not sufficiently high for predicting individual driving ability. It was sufficient, however, for making group comparisons.

Results of the study showed that the best combinations of laboratory tests for predicting driving ability were choice reaction time, braking time, simple reaction time, and speed of foot movement. The best single test was choice reaction time.

JONES, EARL WILLIAM (103)

Trends in Industrial Arts Education Based on Analysis of  
Periodical Literature from 1920 to 1934 (1935)

Two publications, "Industrial Arts and Vocational Education" and the "Industrial Education Magazine" were used in this study. The articles were grouped into areas and the column inches were tabulated.

Results showed that woodworking ranked first with more space than any other two areas combined. Metalworking ranked second and was gaining. Electricity showed a marked increase during the study and pointed toward becoming one of the leading courses. Mechanical drawing, printing, and machine shop ranked next in order of space used for articles. Safety education showed a steady increase but did not reach the point where it could be admitted to the first 25 classifications. Information published concerning courses of study decreased 20 per cent during the study but it still ranked sixth in space. Articles concerning the attitude of teachers toward their work decreased 16 per cent, and articles about salaries showed a gradual decline. There was an increase in the amount of space given to teaching devices, home workshops, records and reports, and the general shop program. Articles on related information held about even throughout the study.

## JUDISH, FRANK LOUIS (104)

Practices in Teaching Related Material to a Diversified  
Occupations Class in North Carolina (1941)

Material for this study was collected by means of a personal interview with all coordinators in North Carolina.

Results showed that certain teaching devices were used. The following are listed in order of their composite rating by the coordinators: individual conferences, occupational analysis, interviews, blueprints, instructor's check sheets, talks by experts, lesson assignments, manipulative practice, observation, visual aids, periodicals, employer's check sheets, equipment, advisory committees, books, school departments, demonstrations, job sheets, checking the assignment, lecture, correspondence courses, field trips, bulletin boards, tests, and audio aids.

As additional information, the study showed that all except one coordinator had college degrees, and that one had 29 years of teaching experience. All coordinators were working on advance degrees and all had experience in an occupation in addition to teaching.

JUDY, WAYNE MYRON (105)

Accidents and Safety Education in the Industrial Arts Shops of  
Iowa (1932)

A questionnaire was sent to all industrial arts teachers in Iowa who were teaching in towns of 400 population or more. Four hundred questionnaires were sent out and 252 were returned with 249, or 62 per cent, being usable.

Results showed that 726 accidents required medical care, 552 were caused by hand tools, 156 were caused by power machinery, 113 were treated by a physician, 18 resulted in the loss of any part of the body, 12 resulted in the loss of one or both eyes, and six resulted in the loss of some bodily member. More accidents occurred during the hour between 11 and 12, second was three to four, third was two to three, and fourth was ten to 11. The jointer was the most dangerous power machine, with the band saw second and the table saw third. Chisels were the most dangerous hand tools with hand saws second and knives, planes and hammers third. Carelessness, disobedience of rules, and hasty work were the most common causes of accidents.

The author concluded that safety methods and devices which were being employed were not adequate and that the industrial arts shops of Iowa were badly in need of a more thorough system of safety inspection.

KEITH, FLOYD L. (106)

Instructional Analysis of Sheet Metal Pattern Development  
(1930)

The author collected information for this study from his own experience and from visits to shops where sheet metal pattern development work was being done. He selected 12 problems and gave a drawing and an operation sheet for each. The twelve problems were representative of the field. To develop a complete course a teacher could select additional problems for presentation in each type of development.

KING, CARL HOWARD (107)

A Reading Vocabulary for Students of Machine Shop Practice  
(1937)

Data for this study were compiled by tabulation of all words of the first seven lines on each page in eight machine shop textbooks.

Results showed that the investigation included a total of 112,509 running words. There were 4,186 different words, 33 different abbreviations, 17 different symbols, and 108 common fractions. There were 1,768 words with a frequency of five or more, used by three or more authors. One thousand and twenty-nine words with a frequency of 16 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words, and 544 words, or 52.7 per cent, did not occur on either list. Four hundred and twenty-seven words with a frequency of five or more did not occur on the Thorndike list of 10,000 commonest words.

The author concluded that this evidence indicated that the Ayres and Thorndike lists were not valid word lists for students of machine shop practice.

KISER, CARL D. (108)

A Survey of a Typical Junior High School Course in  
Industrial Arts for a City of Five Thousand Population  
(1928)

In writing this thesis the author was guided by five sources of information: experience as teacher in a general shop, observation of shop work in different schools, college instruction, extensive reading along this line of work, and personal advice and conferences with qualified instructors.

Results showed that the study dealt with the development of industrial arts not only in the United States but also in foreign countries, with the development and advantages of the junior high school, and with industrial arts terminology which has been so confusing to the minds of many people. The author worked out a suggested industrial arts course for the seventh, eighth, and ninth grades. He concluded with a discussion of the teacher, the shop, and the equipment.

## KITTLE, DEAN FALLS (109)

The Activities and Equipment Found in the Home Workshops of  
Sixty Boys in Lima, Ohio (1935)

Data for this study were collected by making a personal investigation of the home workshops of 60 boys. Seventy-six and six-tenths per cent of these boys were, or had been, in the author's industrial arts classes.

Results showed that ninth grade boys, with 37 per cent ranked highest in the number of home workshops. Sixty-two per cent of the workshops were located in the basement of the boys' homes. The garage was the second most popular location. Woodwork was the principal activity in 67 per cent of the shops. Construction and repair, with 45 per cent, ranked first in the type of work carried on. Articles of furniture with a percentage of 50 ranked highest among the things made. Forty-three per cent of the plans and ideas which the boys used were taken from books and magazines, and *Popular Mechanics* ranked highest among the magazines. Machines were found in 68 per cent of the shops, and 41 per cent of the machines were home made. Wood lathes were found in 42 per cent of the shops, and 60 per cent of them were home made. The jig saw ranked second and was found in 33 per cent of the shops. A majority of the boys started their workshop when in the seventh or eighth grade. The best equipped workshops were those in which the father worked with his boy.

## KLAAREN, ABER MARINUS (110)

A Comparison of Occupational Interests of Boys Attending  
Certain Iowa High Schools in 1925 and 1935 (1935)

A survey was made in 1925 in which 88 consolidated schools took part. Ten years later, in 1935, 48 of the same schools took part in a similar survey. In comparing the results, only the 48 schools which took part in both surveys were used. The 1925 survey included 1296 boys and the 1935 survey included 1926 boys.

Results showed that in each survey the group which had chosen professional service was most out of line with the demand according to the Iowa census. In 1925 the professions were chosen by 33 per cent of the students while the demand was for 3.2 per cent. In 1935 the professions were chosen by 15 per cent while the demand was for 4 per cent.

Ninth-grade boys expressed an occupational interest as often as high schools boys, indicating a need for vocational guidance in junior high school. The year 1935 not only showed a larger percentage of boys expressing occupational interest, but it also tended to conform more closely to the demand than 1925. In both studies the small number of occupations chosen indicates a need for occupational information. In 1925, interest and high pay were important reasons given for choices, but in 1935 that had shifted to fitness and assured income.

## KNOSS, FORREST FRED (111)

Machine Shop Operations in Industrial Arts Taught in High  
Schools of Minnesota (1948)

Information for this study was gathered by questionnaire and followed by a personal visit if no reply was received.

Results of the study showed that nearly every shop contained lathes, drill presses, shapers, power saws, milling machines, and grinders. The engine lathe outnumbered all other machines, averaging 8.76 lathes per shop. Twenty-eight of the 32 lathe operations listed on the questionnaires were taught by more than 50 per cent of the teachers. Face milling, index milling, and slotting were the operations taught on the milling machine by most instructors. Sharpening drills and grinding lathe centers were the two most common grinding operations. Horizontal shaping was the only operation that all instructors taught on the shaper. Bench operations appeared to be part of the work taught in the machine shops and in some cases occupied half of the time that a student spent in machine shop classes. Among the great variety of projects listed, the ball pein hammer and the bench machine vise were the most popular.

## KNOSS, WAYNE WESLEY (112)

## Status of Minnesota Industrial Arts Teachers in 1947 (1949)

Data for this study were gathered from five sources and were obtained on all teachers who were registered as industrial arts teachers in the annual reports on file at the State Office Building in St. Paul.

Results of the study showed that the median salary of all industrial arts teachers used in this study was found to be \$3,000. Sixty per cent of the teachers receiving a salary of \$3,000 or more had been teaching for at least ten years. It was also shown that those teachers employed in the larger towns or larger school systems were receiving higher salaries. Sixty-five per cent of Minnesota's industrial arts teachers were employed for a period of nine months. Most of the teachers, 73.9 per cent, taught no classes in addition to industrial arts. Of the subjects that were taught in addition to industrial arts, physical education was indicated most often, followed by science and then social studies. The more experienced teachers taught fewer classes in other fields. Seventy-nine per cent of the teachers had Bachelor's degrees, but only 3.7 per cent had Master's degrees. Fifty-four per cent of the teachers had done no graduate work.

KORN, CHARLES EDWARD (113)

Industrial Arts for Girls in Secondary Schools in the  
Middle West (1932)

Information for this study was gathered by a questionnaire which was sent to schools throughout the Middle West.

Results showed that industrial arts courses for girls was becoming more evident each year and it was more evident in large city areas than in small communities. Drawing and wood-work were offered to girls more often than other types of work, probably due to the fact that many schools offered only these two types of work in their curriculum. On the average, girls did about as well as boys in shop classes. Girls in classes with boys occurred more often than classes for girls only. High school girls who elected industrial arts courses were usually in the upper classes.

KOSCHLER, THEODORE ALEXANDER (114)

Determining Course Content in Electronics for Teachers Colleges  
(1947)

Teacher training institutions all over the United States were surveyed to see what was being done in the way of teaching electronics.

Results showed that 60 per cent of the teacher training institutions were teaching electricity, 34 per cent were teaching radio, and 15 per cent were teaching electronics. Twenty-three per cent of the institutions indicated that they intended to teach electronics in the near future.

Electronics manufacturers were contacted and asked what background they thought students should have and what content a course should include.

## KRANZUSCH, RAY FREDERICK (115)

The Development of an Instructional Test in Shop Safety  
(1941)

The author compiled a list of situations involving factors of safe and dangerous practices typical to industrial arts shops. He then took pictures and placed encircled numbers on each picture to indicate dangerous or safe situations or practices. A safety test was devised, the purpose of which was to determine the students' ability to recognize the safe and dangerous situations or practices indicated by the encircled numbers. The test was tried on faculty and graduate students.

It was the author's opinion that the photographic illustrations would be of greater value in impressing upon the minds of student workers practices which may involve accidents than any amount of verbal instruction concerning the same practices.

KRALL, HARRY WALTER (116)

Content for an Industrial Arts Course for Girls (1938)

One hundred cases were used for this study. Twenty-five were homes representing industrial occupations, 25 were homes representing the professions, 25 were industrial arts instructors, and 25 were wives of industrial arts graduate students.

Results of the study showed that the jury of 100 believed that an industrial arts course for girls should include the following units: (1) household safety, (2) automotive knowledge, (3) danger elements - such as monoxide gas or attempting to rescue one in contact with a live wire, (4) economic values - such as heating, lighting, building materials, or a knowledge of insurance, and (5) improvements in the modern home -- such as painting, finishing, decorating, and home construction.

KUSCHE, HOWARD NORMAN (117)

Vocational Guidance in High School Industrial Arts in  
Eastern Wisconsin (1936)

Data for this study were compiled from a sheet filled out by 243 high school industrial arts students in five cities of Eastern Wisconsin.

Results showed a great need for guidance when 38 per cent of the students indicated a desire to enter a profession, while the census report showed only 4.5 per cent of the population in the professions. Only 2.5 per cent wanted a trade while the census reported 13.4 per cent employed in the trades. Only 3.7 per cent were interested in agriculture while the census report showed that 25 per cent of the population were in agriculture. Only one in ten students had an appreciable knowledge of the field he had decided to enter. Fathers and friends had the greatest influence on the students' selections. Only 12 boys had been influenced by their teachers. Serious discrepancies existed between the types of work the students would like to do and the types required by the chosen vocation.

In answer to the question of how their needs could better be met by the high school, the students' reply was more vocational assistance.

KYL, RICHARD RUDOLPH (118)

Analysis of Sheet Metal Publications to Determine a Reading  
Vocabulary for Students in Sheet Metal Classes (1935)

Data for this study were compiled by tabulation of all words of the first eight lines from each page of nine sheet metal publications.

Results showed that the investigation included a total of 105,760 running words. There were 3,563 different words, 36 abbreviations, 19 symbols, and 399 different figures. There were 1,122 words with a frequency of five or more, used by three or more authors. One thousand and two words with a frequency of seven or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 531, or 52.9 per cent, did not occur on either list.

The author concluded that this would seem to indicate that there was a need for a word list for sheet metal students.

LANDIS, RUSSELL HENRY (119)

The Construction and Validation of an Achievement Test  
in Printing (1934)

The author found that making a test for a first term course in printing was very difficult because there was no uniformity in the use of text and reference books among the schools participating in the study. An experimental test, based on an analysis of five textbooks and ten courses of study, was made. Criticisms of test items by printing instructors resulted in the elimination of items not taught in a first term printing course, and the revision of questionable or ambiguous items.

Results of the revised test showed a coefficient of reliability of .94 with a probable error of  $\pm .01875$ . This indicated that the test was a highly reliable measure of achievement in the phase of printing covered by the test.

## LATHROP, IRWIN JOSEPH (120)

Policies in the Program of Industrial Arts Education Which Apply to Practice Teaching in Illinois, Iowa, and Wisconsin (1938)

Material for this study was gathered by checklists, personal interviews, and from college catalogs.

Results of the study showed that the public school was the logical, practical place for the practice teacher to do his teaching. Practice teachers should not be assigned to teach courses in which they have not had adequate preparation. There should not be more than one practice teacher assigned to a class. The critic teacher should have a minimum of one year's training beyond the Bachelor's degree with special work in supervision.

The length of practice teaching courses surveyed varied from a total of 50 hours to 180 hours. A breakdown of the practice teacher's time showed the following: lesson plans, 10.3 per cent, teaching time, 51.3 per cent, observation, 14.2 per cent, correction of papers, 1.7 per cent, conferences, six per cent, supervised study, .65 per cent, laboratory assistants, .87 per cent, individual teaching, 5 per cent, reading professional literature, two per cent, and outside activity, .87 per cent.

LINDEMAN, CARL V. (121)

## The Rise of the Latin American Trade Schools (1925)

This study of 18 Latin American Republics including Cuba was made through direct correspondence with the trade schools in their respective republics.

The study showed that Latin America has made great strides forward in the task of training its youth for industrial pursuits. The old penal or reform trade school has disappeared. The social distinction sharply separating manual labor from other vocations was being broken down. The trade schools were not only attracting the artisan class but also those of the middle class of society.

The trade schools were almost entirely separated from the church and had become a part of the educational system of the state. The introduction of secondary subjects in the curriculum had brought about better relations between the trade schools and the schools of higher education. Provision for vocational guidance was made in the curriculum. The student's first year was preparatory after which he was allowed to select the course he expected to follow.

Age requirements were about the same as in this country with the minimum 13 years and the maximum 20 years. Machine shops were well equipped, sometimes exceeding the needs of the school.

LINDSTROM, OSCAR HENRY (122)

Analysis of Tenure and Salaries of Minnesota Industrial  
Education Teachers, 1931-1946 (1947)

Data for this study were obtained from the files of the Minnesota Department of Education, Vocational Division, and from the Annual Reports of General Industrial Teachers.

Results showed that the trend of average salaries for the years 1931 through 1946 were downward until 1934-1935, then there was a gradual rise to 1941-1942, followed by a sharp rise to 1945-1946. The average salary was \$1,936 for the 15-year period. The highest average salary was \$2,553 and was paid during the year 1945-1946. The average starting salary was \$1,526. Men who taught five years received an average salary of \$1,594, from six through ten years, \$1,824, and from 11 through 15 years, an average of \$2,199. The average tenure of industrial education teachers in the state was 5.63 years. The average number of years of college training of industrial education teachers in the state was 3.07 years, with the highest average of 3.75 years held by men teaching in towns of less than 500 population and the lowest average of 2.77 years held by men teaching in the largest cities.

## LIVINGSTON, EVERETT G. (123)

A Study of the Preparation, Salaries, Interests and Factors  
Related to the Work of Industrial Arts Teachers in the State  
of Kansas (1930)

Data for this study were gathered by means of a questionnaire sent to every industrial arts instructor in the secondary schools of Kansas. A total of 516 questionnaires were sent out and 301 responses were received.

Results showed that 46 per cent of the men teaching industrial arts majored in industrial arts, 13 per cent majored in education, and 10 per cent had not as yet received the baccalaureate degree. Only three per cent held the Master's degree in 1929 but 30 per cent were doing advanced study. Sixty-five per cent of the teachers reporting were supplied by the three state teachers colleges and the agricultural college.

The average salary of 241 teachers in 1929-1930 was \$1,807, and 35 per cent of those were "first year" men whose average salary was \$1,509. There was a tendency to decrease starting salaries but to give larger increases from year to year. Thirty-nine per cent of the men teach woodwork as their only industrial arts subject and 79 per cent teach woodwork either as a single subject or in combination with other subjects. Only 29 per cent of the teachers were teaching just industrial arts subjects. Coaching was the most common combination with industrial arts and agriculture second. Ten per cent of the teachers taught evening classes. Only eight per

cent were over 40 years of age and a large number of the married teachers were saving as much as 25 per cent of their salary, mostly in insurance. Eighty-seven per cent of the industrial arts teachers came from rural communities or small towns. Few teachers made any contributions to their professional magazines.

Industrial arts teachers suggested that teachers' colleges could be improved by giving more practical work and less theory remote from actual practice, by giving more and better organized practice teaching, and by seeing that the college instructors are better acquainted with the conditions in secondary education.

LOWN, JACK ALLEN (124)

Evaluation of Sea Scouting in Iowa (1947)

Data for this study were collected by questionnaires sent to Sea Scout leaders and crew members in Iowa and adjoining states. Some personal interviews were conducted also.

Results showed that Iowa leaders average four years older than leaders in adjoining states but the leaders in adjoining states rank higher in scouting. The average time spent by leaders on sea scouting was seven hours per week while for crew members it was four hours per week.

Water activities and fellowship were the boys' main reasons for being Sea Scouts. Character development and citizenship training were the top objectives of the organization. The study showed that recruiting programs were weak and most of the new members came from "bringing in friends".

LUCE, L. WINSTON (125)

Common Errors in Drafting Form (1931)

Two hundred and forty drawings which had been made by students throughout the Mid-West were checked and the errors tabulated. The plates covered a cross-section of students from seventh grade through seniors in an engineering college. Some of the more common errors were found to be the following: incomplete invisible corners, incomplete or over-run visible corners, erasures, tangents, arrowheads, line too heavy, line too light, uniformity of a line within its own length, finished corners on invisible lines which do not meet, wrong line, irregular crosshatch lines, space between arrowhead and extension line, center holes enlarged or entirely through paper, break conventions, no fraction line in dimension line. The range in the number of times each error was found on the 240 drawings was from 1365 for the first one listed down to ten for the last one.

LULOW, RAY VERL (126)

A Comparison of the Effectiveness of the Lecture Method Versus  
Operation Sheets in Teaching the Techniques of Machine Wood-  
working to Senior High School Students (1933)

This study was carried out by using four groups of 35 students each. Two of the groups were given operation sheets, demonstrations and discussions while in the other two groups lectures were substituted for the operation sheets. The chronological ages and intelligence ratings of all groups were very similar. All students were given an objective test at the beginning of the semester and the same test again at the end of the semester. The same demonstrations and discussions were conducted in all groups but the two experimental groups were handed operation sheets while the two control groups were given a lecture on the procedure to be followed.

Results showed that the average gain between the first and second test for the experimental groups was 69 per cent of the first score, while for the control groups it was 36.5 per cent of the first score. This was a net gain of 33.5 per cent in favor of the groups using the operation sheets.

The author concluded that the value of operation sheets did not depend alone upon the use that is made of them in the classroom, but also the teacher receives valuable professional training in collecting and classifying the material, thus he is better prepared for the actual teaching.

McAFEE, GEORGE ELLSWORTH (127)

Lighting Conditions in Fifty School Drafting Rooms in the  
Chicago Area (1935)

Data for this study were gathered by personally checking the light intensity in 50 drafting rooms in the Chicago area.

Results showed that in 33 of 50 drafting rooms the light was much too low on dark days. Artificial light was entirely inadequate for evening school work in ten rooms, and much lower than desirable in a number of others. In many rooms the light efficiency was reduced by dark paint or an accumulation of dust.

In a large majority of rooms the natural light entered from the left or left rear of the pupils. Most artificial lights were of the direct type. Light readings in empty rooms and rooms crowded with pupils showed that the presence of pupils lowers the light intensity on the work plane between eight and nine foot-candles for natural light. Tests showed that blackboards and bulletin boards lowered light intensity very noticeably near boards but very little at a distance of six feet or more.

## McCLINTOCK, WAYNE BURR (128)

A Cost Analysis of Industrial Arts Education in Junior High School Classes of the Upper Peninsula of Michigan from September 1930 to September 1933 (1936)

This study included 31 cities located in the upper peninsula of Michigan. Data were collected through a personal visit with the supervisor or teacher of industrial arts in each of the cities.

Results showed that in 1930-1931 the average cost of teaching industrial arts was \$0.0946 per pupil-hour. This was divided into \$0.0852 for cost of instruction and \$0.0094 for cost of supplies. In 1932-1933 the cost of teaching industrial arts was \$0.0227 per pupil-hour, or 21.74 per cent lower than in 1930-1931. Costs were reduced by the following three general conditions: (a) those affecting pupil hours, such as number of boys, number of periods per week, and length of school year; (b) those affecting teachers, such as lower salaries, fewer teachers, and number of classes; and (c) those affecting supplies, such as material fees, use of scraps, smaller projects, repair jobs, more drawing, and length of school year.

McCONNELL, JOSEPH LAFAYETTE (129)

Trends in Mechanical Drawing Based on an Analysis of  
Textbooks Published From 1900 to 1934 (1936)

Material for this study was compiled from an analysis of 28 textbooks in the field of mechanical drawing.

Results showed that there was a growing tendency to emphasize the cultural and consumer values. Copy problems were decreasing in number while the useful articles as problems were increasing. The study showed that the number of illustrations, the number of problems, the number of questions and topics for discussion or testing were all increasing. A growing number of other books or publications were being cited and authors were beginning to include guidance information. The provision for planning and designing by the students was increasing. Terminology and wording of textbooks were becoming less technical. The emphasis upon related information was rapidly expanding. An increasing amount of space was being devoted to orthographic projection, working drawings and machine drawing while architectural drawing was growing slowly. Freehand drawing appeared to be growing in importance, along with a decreasing emphasis upon the use of instruments and the techniques of mechanical drawing. Surface development and sheet metal drawing was losing space and geometrical drawing was rapidly waning. Units on design and electrical drawing were appearing in the later books.

MCCOY, CHARLES FRANCIS (130)

The Value of Pupil Notebooks in the Teaching of Electricity in  
the Junior High School (1934)

Two groups of 57 pupils were used in this study. They were divided on the basis of the Stanford Achievement Test, and the groups ranked very close together. The group which was to use notebooks had a mean score of 96.33, while the group which did not use notebooks had a score of 96.71, a difference of .38. A preliminary test was given and the mean score of the group which was to use notebooks was 1.94, while the score of the other group was 2.08, a difference of .14.

Results showed that at the end of nine weeks of instruction the group which used notebooks had a mean score of 71.61, while the group which did not use notebooks had a score of 69.24, a difference of 2.37 points per pupil in favor of the group which used notebooks. The notebooks were taken from the pupils, and nine weeks later, without being told, both groups were again given the final test. In this test the group which had used notebooks had a mean score of 54.63, while the group which had not used notebooks had a score of 45.85, a difference of 8.78 points per pupil in favor of the group which had recorded material in notebooks.

The author concluded that a difference as great as this seemed to justify the use of notebooks for a junior high class in electricity.

McCRORIE, THOMAS RUSSELL (131)

Industrial Education in Illinois Colleges (1947)

Data for this study were collected by personal interview at eight Illinois colleges.

Results showed that the terms used to designate the industrial education departments in the various colleges were Industrial Education, Industrial Arts, Industrial Arts Education, Industry, and Technical College. The total number of credit hours required for the baccalaureate degree was approximately the same in all the colleges. Four of the colleges granted the Bachelor of Science and four the Bachelor of Science in Education degree. Two colleges granted advanced degrees in industrial education. There were 37 full-time instructors in all the colleges. The smallest number was three and the largest was 11. There were six professors, eight associate professors, 13 assistant professors, and ten instructors. Six of the men held the Doctor's degree, 28 held the Master's degree, and three the Bachelor's degree. The credit hours for a major in industrial education varied from 36 to 72 quarter hours.

Artificial light was adequate in 50 per cent of the colleges, shop size was adequate in 64 per cent, and storage was adequate in 59 per cent of the colleges. The value of equipment ranged from \$7,500 to \$252,000. The shop was being used for avocational purposes as well as teacher education in all colleges.

McCULLOUGH, ARTHUR EARL (132)

A Reading Vocabulary for Cement and Concrete Based On An  
Analysis of Current Literature (1937)

Data for this study were compiled by tabulation of 53,323 words from books by four authors and of 53,739 words from magazine articles by 70 writers.

Results showed that the investigation included a total of 107,062 running words. There were 5,182 different words and 28 signs and abbreviations. One thousand and sixty-four words, with a frequency of ten or more, used by five or more writers, were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 460 words, or 42 per cent, did not occur on either list.

The author concluded that the Ayres and Thorndike lists did not form adequate vocabularies for students of cement and concrete classes.

## MCKINLEY, FOWLER EPHRAIM (133)

Related Information Taught in Ninth and Tenth Grade Woodworking  
in Illinois (1936)

This study was a comparison of the views of 13 industrial arts leaders in colleges and universities and 49 high school woodworking teachers. The personal interview was used for collecting information.

Results showed that the high school teachers and the industrial arts leaders agreed to a considerable extent on what should be taught. In the main, the leaders believed that more related information should be taught than was being taught; however, both groups agreed that from 10 to 20 per cent of the shop period should be used for topics of related information. The greatest disagreement seemed to be in regard to guidance information. The leaders were much stronger on this item than the teachers. The study included a list of all items which were being taught and all items which the leaders thought should be taught.

McKNIGHT, HAROLD WILLIAM (134)

Some Effects of Projected Audio-Visual Aids in Senior High  
School Industrial Arts Metalworking (1948)

The pupils in six classes were each taught two subject-matter units, namely, the steel rule and the micrometer. The instruction received by each group was similar, except that the instruction in three of the six classes was supplemented by the use of a film. The three classes which were the film classes for the lesson on the steel rule were the non-film classes for the lesson on the micrometer. Objective tests were given two days preceding the instruction period, the day following the instruction period, and three weeks following the instruction period.

Results of the study showed that the classes whose instruction was supplemented with projected audio-visual aids scored higher than the non-film classes. Also, 95 per cent of the pupils reported that they liked the film presentation better than the non-film presentation, and that it was more interesting. Ninety per cent of the pupils agreed that the film presentation made it easier for them to master new ideas.

## MARTENS, ARTHUR CHRIST (135)

Course Content for the General Shop in Consolidated Schools  
(1939)

This study was made up of the opinions of a jury composed of high school seniors, parents, industrial arts teachers, and educational leaders.

Results showed that there was no agreement as to exact objectives of an industrial arts course in consolidated schools, but there was a definite grouping toward the general educational objectives. The vocational objectives seemed to be considered of practically no importance. The jury believed it was better to include a larger selection of individual units from the various areas of industrial arts than to choose two or three areas and include all the units under each. Elementary woodworking was ranked first by parents and industrial arts teachers, while home electricity was first with educational leaders and driving was first with high school seniors. A composite ranking by all groups placed the following at the head of the list in the order given: home electricity, driving, finishing and refinishing, elementary woodworking, blueprint reading, and household mechanics.

MARTIN, BERYL EDISON (136)

The Application of Accepted Criteria in the Analysis of  
Available Theses on Auto Mechanics (1933)

Material for this study was gathered by examining all available theses on the subject of auto mechanics. Seven theses dealing with the subject were found in seven different universities.

Results showed that five of the seven used the questionnaire method for securing data, one used tests, and one did not give the method used. Sources of data varied widely as did the method of selection of sources. Six of the seven studies were conveniently indexed. All tables were clear and easy to understand, and the tables were accurate in all but one of the theses. Three of the studies contained no charts, five were free from spelling errors, three presented the conclusions in the form of a summary, two drew definite conclusions and one evaluated a proposed curriculum. Citations ranged from 11 to 53. Five had conveniently arranged bibliographies. Five contained from one to 28 footnotes. Four gave references for factual statements and three did not give references.

## MATT, HAROLD DEWITT (137)

## A Survey of the Industrial Arts Libraries in Junior and Senior High Schools With an Enrollment of 200 or Over, Located in the Eastern Half of Iowa (1932)

Data for this study were collected by personal visits to industrial arts shops in the eastern half of Iowa.

Results showed that 65 per cent of the industrial arts libraries were located either in the shop or the drawing room. Only 39 per cent of the shops had a definite appropriation for the shop library. The instructor selected the books in 63 per cent of the shops and in 77 per cent he was in charge of the shop books. No system of cataloguing was used in 56 per cent of the shops. Books were loaned for outside use by 60 per cent of the shops. In 70 per cent of the shops the libraries were kept locked when the instructor was absent.

Pupils showed more interest in periodicals than books in 60 per cent of the shops. The instructor furnished some of the reference books in 58 per cent of the shops and in 47 per cent he furnished one or more periodicals. Only nine per cent of the shops had trouble with books disappearing. Periodicals were kept indefinitely in 54 per cent of the shops and in seven per cent they were bound. Sixty-five per cent of the instructors used special assignments to get the students to use the library.

## MEACHEN, JAMES HAROLD (138)

Preparation and Duties of North Dakota Industrial Arts Teachers  
(1946)

Information for this study was gathered from the files of the North Dakota State Department of Public Instruction. The study included 55 industrial arts teachers.

Results showed that North Dakota schools educated 65 per cent of all industrial arts teachers who were teaching in the state during the 1945-1946 school year. One-third of all industrial arts teachers had completed a major in industrial arts, and less than one-fourth of the majors had been teaching in cities of over 15,000. Forty per cent of the industrial arts teachers held the Master's degree, and 38 per cent of this group had received the Master's degree from North Dakota colleges. One-half of those with the Master's degree were teaching in towns of less than 200 population. Teachers who had majored in industrial arts enjoyed higher salaries than those who had taken a minor in industrial arts. Teachers in the larger systems tended to have had more years of experience and were required to teach fewer subject combinations but they also received lower salaries. Salaries were positively related to years of experience, periods taught per week, and per capita school tax, and negatively related to size of town, school enrollment, and population density within a county. Science, physical education, mathematics, and social studies were the most common subjects taught in combination with industrial arts.

MELBERG, MERRITT EUGENE (139)

Equipment for Junior High School Metal Shops (1946)

A list, made up of all the metalworking tools and equipment that could be found, was sent to 56 junior high schools. The instructors were to check in one column the items they already had, and in another column the items they thought should be included in an ideal junior high metalworking shop. The tools were divided into eight major categories which were: tools which were common to two or more areas of metalwork, sheet metal hand tools, sheet metal machines, tools for machine shop practice, tools for automobile mechanics, art metal tools, forge and foundry tools, and welding equipment. Forty-three tools fell into the first classification, 33 of which were rated as essential and ten desirable. Sheet metal appeared to be the area most adaptable to the junior high school metalworking program. It also appeared that metalworking might be added to the curricula of many junior high schools with the addition of very little equipment.

MESSER, GODFREY (140)

Organization of an Industrial Arts Course for a Typical  
Iowa High School (1929)

Questionnaires were sent to superintendents and industrial arts instructors in various parts of the state. The questionnaires were to be sent home with the boys of the industrial arts classes to be filled out by their fathers. Out of 485 questionnaires, 168, or 34 per cent, were returned, and 109 of these were completely checked.

Results showed that the fathers wanted their boys to have a wide range of experiences. They showed enthusiasm for auto mechanics, carpentry, tool sharpening, plumbing, and wood finishing. They were more in favor of repair than construction. They thought there was too much emphasis on woodwork. They were in favor of reorganizing the industrial arts shop on the diversified activities plan. With the suggestions from the questionnaires, the author worked out, and included in the study, an outline for a high school course in industrial arts.

## MEULER, MILTON CARL (141)

## The Extent to Which Industrial Arts Contributes Toward the Recognition of Aesthetic Qualities in Industrial Products (1939)

The author first made a list of some 50 industrial products which he expected to find in a home. He then visited 60 homes and checked on his list the items which he found there, and also added new items as they appeared. He then selected the 32 items which he found to be most common and made four sketches of each. He selected a jury of 15 competent individuals in the field of industrial arts design, industrial design, and art education. The jury was asked to select the sketch they believed possessed the best design in each group. The same sketches were presented to 400 senior students, both boys and girls, in six schools.

Results showed that for the boys, the group having the greatest number of semesters of industrial arts answered 71.8 per cent of the test items correctly according to the judges. There was continual decrease in the per cent of items answered correctly relative to the decrease in semesters, except for the eight-semester group which surpassed the ~~nine~~-semester group slightly. For the girls, the ten- and 13-semester groups fluctuated somewhat, but from the ten-semester group down to no industrial arts, there appeared to be a direct relation between the semesters of industrial arts and the ability of the girls to recognize good design in industrial products.

The mean score for the girls was 15.21 of the total 32 items. For the boys it was 14.37 items.

The author concluded that industrial arts contributed in some measure toward the recognition of aesthetic qualities in industrial products.

MILNES, HAROLD COOPER (142)

Analysis of Related Information on Metals for Students of  
Industrial Arts and Industrial Education (1936)

Eighty-one topics of related information were listed on a check sheet and industrial education instructors were asked to score them according to the grade level at which they were most important.

Results of the study showed that ten of the topics were scored as having major importance for the junior high school, 45 for the senior high school, and 74 for the vocational school. The instructors thought that related information on metals had greatest significance for the vocational school. The discovery, development, and use of the various metals was the information considered to be of greatest importance. The hobby value was considered most important for the junior high school level. Industrial education instructors approved of related information in the junior high, senior high, and the vocational school.

## MINOR, WILLIAM THOMAS (143)

Usefulness of the Kuder Preference Record for Predicting  
Academic Success of Iowa State College Engineering Freshmen  
(1947)

Two hundred and sixty engineering freshmen were used in an attempt to evaluate the effectiveness of the Kuder Preference Record as a device for predicting achievement of college students in engineering. The fall quarter grade average was chosen as the criterion.

Results showed that the correlation was too low to have predictive value in the forecasting of achievement.

The author concluded that the Kuder Preference Record is not a satisfactory instrument for predicting achievement of engineering freshmen. Useful as this inventory may be for the purpose for which it was developed, there seemed to be little justification for using the interest pattern as an indication of academic achievement.

MONROE, LYNNE C. (144)

The Effect Upon Recognition of Various Forms of Tool Representation  
(1932)

The purpose of this investigation was to determine which form of tool representation was the more easily recognized, a half-tone cut of the tool, or a line drawing.

Results of the tests given to junior and senior high school students showed only a very slight advantage for the half-tone.

The author concluded that the difference probably was not sufficient to warrant the extra cost of half-tones.

## MOSELEY, GILBERT ARNOLD (145)

Job and Equipment Training Recommendations of Licensed  
Aircraft and Engine Mechanics (1948)

A questionnaire was developed containing 152 types of jobs and 122 types of shop equipment which were believed by the author to be common to the airplane mechanics trade. Questionnaires were sent to mechanics who held a Department of Commerce, Civil Aeronautics Administration Mechanic certificate with a rating for both aircraft and engine work. There were 253 questionnaires returned.

Results showed that, in general, the mechanics agreed upon the need for training in each of the items but they were in highest agreement on the servicing and maintenance jobs and in lowest agreement in the case of heat treating and instrument testing equipment. It would be worth while for anyone planning to start such a course to consider each item listed and the rating given it by the mechanics.

MULVANY, SHERMAN A. (146)

The Reliability of Certain Essay Examinations in Industrial  
Arts Woodworking (1932)

Thirty essay questions were made up, revised, and divided into three tests of ten questions each by a committee of graduate students. The tests were given to 91 junior high school students. They were administered and graded by three instructors in three different towns. Each instructor was furnished a sample set of answers to aid in scoring.

Results showed that the coefficients of reliability of the odd-even scores, which were given by the three instructors, were .69, .697, and .704. The total variation of only .014 was a decided agreement in the reliability of the tests and seemed to indicate the scorers were all about equally consistent in their grading. There was greater agreement regarding the rank order of students in low ability and high ability than those of average ability.

The author concluded that the essay examination may be made to approach the objective test both in reliability and in objectivity.

NAY, WILBUR SMITH (147)

An Analysis of Carpentry Books Used in Schools for Determining  
a Reading Vocabulary in Carpentry (1936)

Data for this study were compiled by tabulation of all words in the first eight lines of every page from 11 carpentry publications.

Results showed that the investigation included a total of 112,092 running words. There were 4,709 different words, 832 different figures, and 60 different symbols and abbreviations. There were 1,716 words, with a frequency of five or more, used by three or more publications. One thousand and twenty-nine words with a frequency of 14 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 525 words, or 51.1 per cent, did not occur on either list. Sixty per cent did not occur on the Ayres list and 66 per cent did not occur on the Thorndike list.

The author concluded that the Ayres and Thorndike lists did not form adequate vocabularies for students in carpentry classes.

NEILL, THEODORE R. (148)

The Mathematics Involved in the Teaching of Industrial Arts  
(1931)

Material for this study was collected by means of a questionnaire sent to teachers of industrial arts in the Midwest, and to a few teachers at scattered points throughout the United States. A total of 202 replies were received.

Results showed that the average amount of college preparation in mathematics was 11 per cent of the instructor's entire college course. The instructors considered arithmetic, plane geometry, algebra, and solid geometry to be valuable to the teacher of industrial arts. Over 50 per cent reported that commercial arithmetic, college algebra, graphic algebra, trigonometry, analytics, and calculus are of little or no value to the industrial arts teacher. The instructors listed the following skills as being used very often in the teaching of industrial arts: linear measure, square measure, common fractions, decimal system, and cancellation. Geometric construction was also ranked as being often used.

NELSON, PAUL C. (149)

Selection, Preparation, and Presentation of Projected Visual  
Instruction Material for Industrial Arts (1934)

Information for this study was collected by means of a check list which was sent to industrial arts teachers who were known to have used visual instruction material in their teaching.

Results of the study showed that the motion picture should be used when the purpose of the lesson was to portray human movements or mechanical motion, but the still picture was better for illustrating structural details. The 16 mm. film was most desirable for classroom motion pictures. The projector should be located behind the pupils whenever possible. Visual instruction can be very effectively used in presenting closely related technical and occupational material. At the time of this study, the silent motion picture was most used in industrial arts classes with glass lantern slides second and filmstrips and sound motion pictures tied for third.

NELSON, WILLIAM BENJAMIN (150)

A Survey of Industrial Arts for Negroes in the Rural High  
Schools of Mississippi (1934)

Information for this study was compiled from a questionnaire sent to 44 Negro high schools in the state of Mississippi. Questionnaires were answered by 32 of the schools.

Results showed that 83 per cent of the Negro population was located in rural districts. Less than 50 per cent of the counties in the state had high schools for Negroes in which industrial arts courses were offered. There was a desire for an industrial arts program to be offered at the only state-supported college for Negroes. The average amount of time the shops were in use for class purposes in all the Negro schools was five hours per week. It was found that, although very little industrial arts work is available, most of the Negro high schools have farm shops. Farm shop did not take the place of industrial arts work, however, because a large percentage of the pupils left school at the junior high level before they were allowed to take farm shop.

The author recommended that the equipment of the farm shop be supplemented to make it possible to teach industrial arts in the same shop.

NETHKEN, HARLEY J. (151)

Development of a Course of Study in Practical  
Power Plant Operation (1925)

Material for this study was compiled from the author's own experience as a stationary engineer and teacher, from experiences of engineers, firemen, and repairmen over the state, from literature sent out by manufacturers, and from books and technical journals.

The course was broken down and analyzed from the standpoint of three power plant workers: the boiler room helper, the stationary fireman, and the boiler room maintenance man. Each job was broken down and described in detail. Following is a sample list of jobs performed: cutting a boiler out of service, cooling a boiler down, emptying a boiler, cleaning a boiler, cleaning a furnace and combustion chamber, filling a boiler with water, building a fire in a furnace, repairing a blow-off valve, firing by hand, firing by stoker, banking fires, testing for correct water level, and testing a steam gage.

## NIEMAN, THEODORE LEWIS (152)

Motorized Woodworking Equipment in Public Senior High Schools  
of Central Illinois (1938)

Data for this study were gathered by personal inspection of 37 school shops in central Illinois.

Results of the study showed that the five most common machines found in school shops were the lathe, circular saw, jointer, band saw and grinder. The minimum number of machines found in any one school was two, and the maximum was 38. Thirteen different motorized machines were found, but 11 was the greatest number of different machines found in any one school. In nine of the 37 schools, only the advanced boys were allowed to use the power machines. One-third of the shops were being used every period of the day. The instructors were in most cases responsible for maintenance of the shop equipment. Eighty-one per cent of the machines in use were floor models, 42 per cent were direct drive, 43 per cent were indirect drive, and 16 per cent were shaft driven. Most shaft driven machines were 20 years old or older. A total of 26 machines had no guards.

NORDEEN, VERN THEODORE (153)

The Industrial Arts Teacher and Athletic Coach Combination in  
Schools of Western Iowa (1939)

Data for this study were collected by questionnaire, and in addition 25.5 per cent of the schools were visited personally.

Results showed that 72 per cent of the industrial arts instructors held the baccalaureate degree and 17 per cent held the Master's degree, while 97 per cent of the coaches held the baccalaureate degree and three per cent held the Master's degree. Seventy-one per cent of the industrial arts instructors had undergraduate majors in industrial arts, compared to 47 per cent of the coaches having majors in industrial arts. Twenty-three per cent of the coaches had undergraduate majors in physical education. Eighty per cent of the men with an industrial arts-coaching combination also taught academic subjects. Twenty per cent of the coaches favored the industrial arts-coaching combination while 33 per cent felt they were unable to give their best quality of instruction in the industrial arts classes. When the administrators were asked why they combined coaching and industrial arts they said it was "customary" and also it was a "matter of economy".

## NORTHQUEST, OTTO ALBIN (154)

An Experiment in Seventh Grade Mechanical Drawing to  
Determine the Achievements of Pupils in Small Versus  
Large Classes (1936)

Two classes, one small with 22 students, and one large with 44 students, were set up at the beginning of the semester. All students in both classes were not used in the study but only those who could be matched up after considering academic rating, chronological age, and I.Q. Drawings and teaching conditions were kept alike in both classes.

Results showed that there was little difference in the quality of the work accomplished by the students of the two classes. There was, however, a difference in the quantity of work as the students in the small class did 14.5 per cent more work than the students in the large class. The study also indicated that class size is not an influencing factor in the achievement of factual knowledge, as the scores made on tests were very similar.

NORTON, JOHN MICHAEL (155)

A Comparative Study of Finance Methods Used by the  
Industrial Arts Teachers of Illinois (1933)

Data for this study were compiled from questionnaires sent to 218 industrial arts teachers. There were 150, or 68.8 per cent, of the questionnaires returned.

Results showed that 60 per cent of the teachers bought their own supplies. In 61 per cent of the cases the board of education paid for supplies at the time of purchase. In 3.4 per cent of the cases the board furnished all materials free to pupils. Thirty-five per cent of the teachers had a fund from which to buy supplies, 12 per cent bought all supplies locally, 87 per cent bought some supplies locally, and 35 per cent were required to make costs and collections balance. Sixty-four per cent charged extra to cover waste and 10 per cent was the most common addition. Fifty-two per cent of the industrial arts shops showed a loss, 32 per cent balanced, and 16 per cent showed a profit. Fifty-two per cent of the teachers estimated the charge for finishing materials, 17 per cent had no charge, and 15 per cent charged by the board foot of lumber. Thirty per cent of the school boards budgeted a certain amount of money to the industrial arts department, 20 per cent used a shop card of the meal ticket type, and 24 per cent bought supplies at the beginning of the school year. Seventy-two per cent of the teachers were satisfied with their method of handling accounts.

O'CONNOR, WILLIAM DORSEY (156)

Consumer Education Taught by Industrial Education Teachers  
of Iowa (1949)

A check list prepared by the author was sent to all teachers in Iowa who were listed as teaching industrial education. Of the 463 check lists sent out, 221, or 48 per cent, were returned and 64 indicated they were teaching consumer education, but only 55 went on to answer the remainder of the items on the check list.

Results showed that 13 per cent of those who responded were teaching consumer education as a separate course and the remainder were teaching it as related information. Forty-six per cent of those not teaching consumer education indicated that lack of training was the reason. Twenty-three of the 55 respondents teaching consumer education were using laboratory periods, and 21 were conducting experiments to determine the quality of products.

Only three of those teaching consumer education were using a textbook, but many were using Consumer's Guide and Consumer's Research Bulletin. Lectures by the instructor, reports by the students, and demonstrations by the instructor were the procedures most often used. Eighty-nine per cent were of the opinion that the first objective should be to develop wiser purchasing and consumption habits.

## OLSEN, RAY THEODORE (157)

Development of A Home Workshop Club in Des Moines, Iowa  
(1936)

A home workshop club was organized in Des Moines in 1933. Attendance over a three-year period varied from seven to 61. Members varied in age from 22 to 66 years with 40 years being the median. The members represented 29 different occupations. A majority of the workshops were from three to six years old. Basements were by far the most popular location for home workshops, and 81 per cent were equipped for doing woodwork. Shops were used 12 months out of the year by 44 per cent of the men. The number of hours spent in the shop each week varied from two to 50. Magazines furnished more plans for home workshop club members than any other source, and original plans ranked second. The wood turning lathe was the most widely used piece of power equipment, and 11 per cent of the power machines were homemade. The median expenditure for hand tools was \$30.00 and for power tools, \$66.00. Only 11 per cent of the members derived any financial profit from their shops. Recreation or leisure time activity was named more often than any other value of the home workshop.

The author found that a regular time and place for meetings was essential to good attendance.

PAGE, EARL L. (158)

## Values to be Derived from the Industrial Arts (1928)

Information for this study was collected by questionnaires which were sent to deans of education, superintendents of schools, supervisors of industrial arts teachers, principals of technical high schools, professors of industrial arts teacher training, teachers of industrial arts, and editors of industrial arts magazines. Ninety-six questionnaires were sent out and 45 were returned.

Results showed that the jury agreed that the industrial arts have a very vital part to play in the scheme of general education. Industrial arts correlates very closely with the seven cardinal principles of general education. The study of industry was intimately related to each of the school subjects because it gave experiences which were vitally related to life. Industrial arts and academic teachers need a better understanding of each other's principles so they can cooperate more fully.

The author concluded with the thought that

The industrial arts was a body of subject matter, industrial in content, which deals with industrial information, processes, and skills, to the end that the individual may be vocationally, socially, economically, avocationally, and informationally a better equipped worker and citizen.

## PALMER, HAROLD SMITH (159)

## Functions of the Industrial Arts Department in Establishing and Maintaining Home Workshops in Mason City, Iowa (1936)

Data for this study were gathered by a personal interview with each of the 791 boys who were enrolled in an industrial arts class.

Results showed that 115, or 14.6 per cent, of the boys had home workshops. Woodwork was the principal type of activity in 75 per cent of the shops. Over 90 per cent of the home workshops were started because of one of the following reasons: father had a shop, shopwork at school, always liked to make things. Seventy-two per cent spent five or more hours per week in their shop, and 12 per cent spent 15 or more hours per week. Sixty-one per cent had one or more pieces of power machinery. The pieces of machinery found most frequently in the home workshops were the wood turning lathe, grinder, circular saw, and the jig saw. The projects most frequently made were: hanging shelves, lamps, foot stools, magazine racks, tables, models, and book ends.

The author concluded that the industrial arts departments should offer more information on building home workshop equipment, and should give leisure activities a permanent place in the school program.

PARKER, EDWARD ALBERT (160)

Trends in Industrial Arts and Vocational Education in Montana, 1931-1937 Inclusive, with Suggestions for Improving Industrial Arts Teacher-Education Work in Montana Colleges (1938)

Data for this study were compiled from records in the files of the Montana state high school supervisor.

Results showed that the same number of subjects, 16, were offered in industrial arts in both 1931 and 1937, but the frequency of mention increased from 84 to 110. Manual training was the most popular term used but industrial arts was gaining slowly.

There was a greater demand for industrial arts teachers who had minored in science and mathematics than other courses. In general, the Montana industrial arts teachers were not continuing work toward higher degrees. The state needed more and better teacher-training facilities. Only one school offered training in industrial arts and that school offered only woodwork and drawing. Over half of the Montana teachers were trained outside of the state.

PARKER, FRED HOWARD (161)

Need for a Cooperative Vocational Program for Negro Youth in  
Tulsa, Oklahoma (1944)

Information for this study was gathered by check sheet and a personal interview with business establishments within the city limits of Tulsa, Oklahoma.

Results of the study showed that retail trades, personal services, and construction industries had offered the Negro more opportunities for employment than had other industries. One hundred and eighty-four establishments which employed Negroes listed 513 as the number of Negro workers who were at that time employed on jobs which required a definite training or learning period. Only one per cent of the Negro workers were engaged in occupations that required college training. Nine per cent of the Negro workers were engaged in selling, 17 per cent were skilled workers, and 34 per cent were semi-skilled workers. Thirty-nine per cent of the jobs listed by the Tulsa employers required one year or less of training, and 27 per cent required two years of training. Employers indicated that there was a scarcity of trained Negro employees and that Negro youth there needed vocational training. Sixty-one per cent stated that they would cooperate in a part-time vocational training program for Negro youth.

PEASE, EVERETT G. (162)

An Analysis of the Training and Experience of 98  
Industrial Arts Leaders (1932)

The industrial arts leaders for this study were selected by writing to the heads of the industrial arts departments of 112 teacher-training institutions, and to the 48 state directors of vocational or industrial arts education and asking them to list the five people which they considered to be leaders in their section of the country. The 104 men who received the most votes were sent the questionnaire to which 98 responded.

Results showed that the leaders' college training ranged from none to 20 semesters with ten semesters as the mean. Bachelor's degrees were held by 91 per cent of the leaders, and over half of these degrees were granted by mid-western colleges. The Master's degree was held by 55 of the men, and 14 held the Doctor's degree. Ninety-five had college training in industrial arts although only 48 had a major or minor in this field. Seventy-five per cent had taught more than 15 years, and 16 had taught 30 or more years. Eighty-six of the men had high school teaching experience and 77 had taught in college. Eighty-one had teaching experience in other subject matter fields of which mathematics ranked first, science second, and social science third. Seven had received trade training in a trade school and 86 had trade experience ranging from one-half to 18 years.

## PEASE, GERALD MERRIT (163)

Industrial Arts Laboratory Forms for High Schools with  
Enrollment of 500 or Less (1939)

Seventy schools replied to a request for forms used in their industrial arts laboratory, and  $\frac{1}{4}$  of these sent samples of their forms. One hundred and thirty-nine different forms were received, and they served 23 different purposes.

Results showed that a group of judges, made up of leading industrial arts teachers in Ohio, considered  $\frac{1}{4}$  of the forms necessary for the small high school. The project plan was considered to be the most important and the others were library loan, requisition to board, supplies inventory, equipment inventory, tool loan, permit to operate machines, enrollment card, clean-up, pupil requisition, pupil program record, supply card, receipt, and pupil personnel. Sample forms were given in the study.

PEET, WILLIAM H. (164)

The Relation of Vocational Training to Its Subsequent Use  
(1928)

An attempt was made to get information about alumni, but most schools do not maintain a follow-up program, or if they do it extends over only a short period of time. Questionnaires were sent to former students of Iowa State College classified in the electrical, mechanical, roadmaking, and structural two-year non-collegiate courses and to four-year industrial arts graduates. Questionnaires were also sent to some former students of Stout Institute, Menomonie, Wisconsin.

Results showed that 15 out of 16 industrial arts graduates were following work identical with their training, while one was doing unrelated work. For the electrical engineering course, 15 out of 17 were following work identical with their training and two were doing work which was related to their training. For roadmaking, 16 out of 21 were following work identical with their training, while three were doing unrelated work and two were unemployed. For structural engineering, four out of six were doing work identical with their training, while one was doing related work and one unrelated. For mechanical engineering, only one reply was received and that person was doing work which was related to his training.

PENDLETON, JOHN HENDERSON (165)

Industrial Arts as a Factor in Adult Education (1939)

Material for this study was collected by questionnaires which were sent to vocational and industrial arts teachers in Iowa and Utah.

Results showed that there was a definite need for an organized program of adult education. Many authorities point out the advantages of industrial arts as a desirable factor in adult education. The industrial arts program on the secondary level forms a good foundation upon which to build an educational program for adults. Industrial arts equipment is ideal for the same type of work on the adult level. A wide variety of work is available in the industrial arts field to meet individual needs and desires of adults. The population of rural Iowa and Utah respond well to the opportunity for continued schooling. Adult education affords an excellent opportunity for the expansion of industrial arts because people have time and a growing interest in education for economic and personal satisfaction.

## PEOPLES, EARL RAY (166)

Graduate Work in Industrial Education at Iowa State College  
From 1928-1940 (1940)

Data for this study were collected by means of a check sheet which was mailed to every person who had received his Master of Science degree in Industrial Education at Iowa State College. Those persons who lived near the author were contacted personally. One hundred and twenty-two graduates were contacted and 94, or 77 per cent, of the check sheets were returned.

Results showed the following factors had influenced the graduate to attend Iowa State College: high standards of scholarship, strong industrial education department, courses offered were the ones they wanted, written contributions by the head of the department, democratic school spirit, and the school was a practical one. A majority of the graduates felt that laboratory work for graduate credit should be offered, more courses should be offered in the administration and supervision of industrial education, and the thesis requirement should be dropped in favor of additional course work.

PERKINS, MALCOLM HENRY (167)

Industrial Arts Content for the Adult Home Craftsman (1939)

Subject-matter for this course was gathered by an analysis of the projects found in several magazines in the field of homecraft and industrial arts.

Results of the study showed that the home workshop movement was spreading rapidly and probably would have spread more rapidly if the persons desiring to engage in the work could have received training in the fundamental processes involved. Homecrafts offered a vast number of activities by which one could spend his leisure time in a profitable or recreational manner.

The projects which were analyzed were, for the most part, of original design. Those made of wood had the highest frequency and consisted mostly of furniture articles with toys, novelties, and games ranking next. The suggested course content consisted of processes to be performed and knowledge to be learned in order to make a suggested list of projects.

The author believed that educational authorities needed to give more attention to the wise use of leisure time.

PINE, LEON GITTENS (168)

Effectiveness of Filmstrips in Presenting Occupational  
Information (1941)

Students from five central Iowa high schools were used in this study. A total of 276 students, including both farm and non-farm students, participated. Two occupations, Journalism and Newspaper Operation as a Career, and Careers in Radio were used in the study. Some of the groups were given printed material and others were shown the filmstrips.

Results of the study tended to indicate that the filmstrips used in this experiment were not an effective substitute for equivalent printed material as a method of presenting occupational information.

PREBBLE, FRED (169)

Organized Material for Curricula in Home Mechanics for Girls  
and Home Economics for Boys (1933)

Data for this study were compiled from questionnaires which were sent to 18 teachers who had written articles or had had experience in this field, and from questionnaires sent to 250 parents. Responses were received from 12 teachers, and 30 per cent of the parents contributed material which they thought should be included in the courses. Outlines were prepared using the suggestions received from both sources. The outlines were then sent to teachers, principals, and college professors, and from the returns the final outlines were made.

## PUEHLER, STANTON HENRY (170)

## Tenure and Salaries of Industrial Arts Teachers in the State of Wisconsin from 1926 to 1936 (1937)

Data for this study were secured from the files of the office of the State Superintendent of Public Instruction at Madison, Wisconsin.

Results showed that the average tenure of industrial arts teachers in Wisconsin during the ten-year period was 4.09 years. Industrial arts expanded most during the school year 1927-1928 and retracted most in 1934-1935. A majority of the teachers began their careers in cities having between 1,000 and 2,000 population. Sixty-two per cent of the industrial arts teachers in 1926 were still teaching in 1936, and 89 per cent of the teachers who taught during the entire ten-year period remained in the same position. The number of industrial arts teachers in Wisconsin increased from 268 to 345, or 22.4 per cent during the period. The highest average salary was \$2,090 in 1930-1931 and the lowest was \$1,800 in 1933-1934. The financial advantage of being located in a large city rather than a small city was from \$250 to \$1,100. The larger cities recovered more rapidly from depression salary levels. Professional training of nine years beyond the eighth grade increased the average annual salary by \$138 and ten years increased the salary by \$950.

RAY, J. EDGAR (171)

An Analysis of the Bricklaying Trade for Instructional Purposes  
(1930)

The author, who served his apprenticeship, worked seven years as a journeyman, and taught 13 years in a teacher-training institution. He gave a complete break down of the bricklaying trade which included the following headings: survey of the trade, tools, brick, lime, cement, mortar, spreading mortar, corners, bonds, walls, chimneys, arches, fireplaces, advanced brickwork, scaffolding, construction details, operation sheets, unit operations, trade tests and performance, kinks in bricklaying, bricklaying trade terms, and estimating.

REEVES, ROBERT EUGENE (172)

Teaching Design in the Industrial Arts Shops of Iowa (1947)

A questionnaire was constructed and sent to each of the 520 industrial arts instructors whose names appeared in the Iowa Educational Directory for the school year 1946-1947. A total of 338, or 65 per cent, were returned.

The author divided the returns into two groups: group A, 43 per cent, had a course in design while in college, and group B, 57 per cent, had no course in design. The instructors believed that design was of the greatest value to the students in later life in the field of consumer appreciation. They also believed that industrial arts work would be of greater value and of greater interest to the pupils if more design were introduced. Only three per cent of group A and nine per cent of group B did not teach any of the considerations of design, but 43 per cent of group A and 78 per cent of group B did not feel qualified to teach all the considerations of design to their shop students. Nearly all felt that more design instruction should be given to prospective industrial arts instructors while in college. About three out of four instructors believed that the art instructor and the industrial arts instructor should work together in teaching industrial arts design.

REYMAN, HOWARD ALVIN (173)

An Occupational Survey of Nevada, Iowa, with Implications for  
a Part-Time Diversified Occupations Program in the High School  
(1947)

A survey was made by personal interview with the owner or manager of each of the 136 businesses in Nevada and by use of a questionnaire to collect data on the students' preferences.

The business men showed their interest and approval of a cooperative part-time diversified occupations program by offering 82 training stations. Thirty-three per cent of the students indicated an interest in enrolling in part-time cooperative training. The study showed that students with higher grades were interested in going to college, the next higher group were interested in the diversified occupations program, and the lowest group was interested in neither.

The author concluded that there were enough work stations available and there was sufficient student interest to make it advisable to start a diversified occupations program in Nevada.

REYNOLDS, MARSHALL L. (174)

Provisions for Teaching Industrial Arts in Five Iowa Counties  
(1949)

Data for this study were collected by means of questionnaires which were sent to the instructors of industrial arts in 51 high schools in five Iowa counties. Thirty of the questionnaires were returned for use in the study. The phases of the industrial arts programs studied were: physical aspects, curriculum, and educational qualifications of the instructors.

Results showed that 70 per cent of the industrial arts shops were located in basement rooms. Ninety-three per cent were located so as to receive outside light. Forty-six per cent of the shops were one-room shops with an average of 12 pupils per class. Twenty per cent were two-room shops with an average of 13 pupils per class, and 33 per cent had three-room shops. The shops with more rooms tended to offer a larger variety of industrial arts work than the one-room shops. All finishing rooms were declared inadequate by the instructors and 80 per cent reported inadequate storage space for unfinished projects. A planning area was provided in half of the schools that reported. The closed tool panel was the most popular method of storing tools. Nearly all schools reported adequate hand tools, but many did not have sufficient power equipment.

All schools included woodwork in their curricula and mechanical drawing ranked second in number. Fifty-three per cent of the instructors had courses of study to follow.

RICHARDS, GEORGE HENRY (175)

The Status of Industrial Education in Seven State Reform  
Schools for Boys in the Middle West (1934)

Present day reform schools have improved considerably. The chief aim of early reform schools was to maintain lowest possible cost per capita. The earning capacity of those confined was exploited and little provision was made for education.

Results of this study showed that present day reform schools were trying to maintain equal educational opportunities with children outside. In some of the schools the boys spend half the day in a shop and half in the academic school. Six of the seven schools studied left the choice of shop to the boy himself while one had a guidance and placement committee. Of the 45 instructors, 71 per cent had no college or apprenticeship training, and 35 per cent had less than one year teaching experience. The instructors ranked high in trade experience with 80 per cent having from one to 50 years experience. Salaries of instructors averaged \$67.00 per month for those receiving maintenance and \$113.00 for those without maintenance.

It was concluded that better-trained instructors would make the training program more successful. This, of course, would involve higher salaries. The author also concluded that more scientific placement of the boys in the shops would probably increase their efficiency and help them be more successful after leaving the school.

ROBERTS, LOYAL RAYMOND (176)

Predicting Achievement in General Metal Shop in Junior High  
School (1949)

A pretest was given to 100 boys during the first week of the semester and also again at the end of the semester to measure achievement. An attempt was made to predict achievement from the following tests which were administered early in the semester: the Hennon-Nelson Tests of Mental Ability, the Lee-Thorpe Occupational Interest Inventory, and the Revised Minnesota Paper Form Board Test, Series M.

Results showed that when single variables were considered, the best prediction of general metal shop scores was obtained from the pretest scores with a correlation of .777. The second best was the test of mental ability with a correlation of .674. The best combination of two variables was the same two. A coefficient of correlation of .806 was found when all three variables were used. The elimination of any single variable was accompanied by a significant loss in prediction.

ROBERTS, THOMAS HARRISON (177)

## Status of Indiana Industrial Arts Teachers in 1946 (1947)

Information for this study was obtained from the Annual School Reports for the year 1946-1947, Annual Report of the Auditor of State, and the Indiana School Directory for the school year 1944-1945. Data were collected on 543 industrial arts teachers employed in the Indiana public schools in 1946.

Results showed that the median salary of all Indiana industrial arts teachers was \$2,800. Length of experience was one of the most important factors affecting the salary of industrial arts teachers and it appeared that a teacher could expect remuneration in keeping with experience up to 20 years. The Master's degree was held by 29 per cent of the industrial arts teachers, and salary increases generally were proportionate to semester hours of college training up to 216 hours. Those teachers who taught industrial arts only tended to receive more pay than those who taught additional subjects. Thirty-seven per cent of the teachers had taught in cities of 30,000 to 100,000 population and received a median salary of \$3,107. Schools with an enrollment of 500 or more tended to employ a greater percentage of industrial arts teachers with Master's degrees. Industrial arts was combined more often with science, mathematics, physical education, and social studies.

ROSE, HOMER GLINTON (178)

A Determination of the Effectiveness of Certain Methods of  
Hand Lettering in the Junior High School (1937)

The author developed a lettering guide which was tested in the study. The device consisted of a 16-gauge flat frame about two inches by five inches with fine wires variously spaced running horizontally. There were lines on the frame running at 65 degrees to indicate proper slant for inclined letters. Three instructors and 12 classes were used in the study. One half of each class used the guide while the other half used guide lines. Tests were given at various times during the course.

After studying the results, the author concluded that the use of the wire lettering guide would improve the quality of lettering made by junior high students, and it would also reduce the expenditure of time for lettering.

RUKAVINA, FRANK DANIEL (179)

## Impact of World War II on Industrial Arts in Iowa (1944)

The number of industrial arts teachers who taught in Iowa was greatly affected by World War II. This number was affected both by the number who left the teaching profession and by the lack of a sufficient number of beginning teachers to replace them.

Results showed that in 1942 one-third of the industrial arts teachers of Iowa were also superintendents of schools. This was a substantial increase over 1940, and it probably indicates that superintendents were filling in as industrial arts teachers during the emergency. There was a larger decrease in the number of schools which offered industrial arts in 1942 than in the number of teachers who taught industrial arts. It was concluded that larger schools placed more emphasis on industrial arts and took teachers away from the smaller schools causing them to discontinue industrial arts because no teacher was available. Teachers who held the Master's degree were much more stable in regard to permanency of position, and in general, held better positions than teachers who had Bachelor's degrees.

## RUSSELL, ELLSWORTH MERRITT (180)

The Industrial Arts Curriculum in the Junior High Schools of  
Illinois (1941)

Information for this study was compiled from questionnaires which were sent to 107 teachers in 62 junior high schools. Eighty-six, or 80.4 per cent, of the questionnaires were returned but 11 men were not teaching at that time so 75 questionnaires were used for the study.

Results of the study showed that the teachers preferred the unit shop and this was the prevailing type in operation at that time. Industrial arts was generally required in the seventh and eighth grades and was elective in the ninth grade. The most commonly offered courses were bench woodworking, mechanical drawing, electricity, general metalworking, freehand drawing, household mechanics, cabinet woodworking, and printing.

RUTHRAUFF, CURTIS LLOYD (181)

A Reading Vocabulary for Mechanical Magazines Used in  
Industrial Arts Classes (1937)

Data for this study were compiled by tabulation of 112,662 running words taken from 124 separate magazines from eight different publications used in industrial arts shops.

Results showed that there were 6,504 different words, 69 different figures, 15 different abbreviations, 12 different symbols, and 19 common fractions. There were 2,155 words, with a frequency of five or more, used by three or more publications. One thousand and sixty words with a frequency of 13 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 600 words, or 56.6 per cent, did not occur on either list. Sixty per cent did not occur on the Ayres list and 55.4 per cent did not occur on the Thorndike list.

The author concluded that since so many words did not occur on the Ayres and Thorndike lists, these lists did not form adequate vocabularies for industrial arts classes.

SAYOVITZ, JOSEPH JOHN (182)

Preparation and Duties of Industrial Education Instructors in  
Minnesota (1947)

Information for this study was collected for the school year 1945-1946, and included only those instructors who taught in the trade and industrial program. The study was classified under five headings as follows: the general program, the day trade program, the part-time trade program, the evening trade extension program, and the part-time cooperative program.

Results of the study showed that there were 195 instructors teaching in the total program. Of this number, 162, or 83 per cent, taught under only one of the five headings, while 17 per cent taught under more than one. Where the instructor taught in more than one program, one of them was generally the day trade program. The day trade and the part-time trade programs were more widely used than the evening trade extension and the part-time cooperative programs. Fifty-five of the 195 instructors had a college degree or a two-year diploma, and 77 had one or more years of college. Seventy-one per cent of the instructors taught in the three largest cities in Minnesota. There was generally little relationship between the population of the city and the salary received by the instructor.

SCHADE, OLIVER (183)

The Value of Instruction Sheets as a Supplement to Demonstration  
Methods in Mechanical Drawing (1936)

Twenty-five instruction sheets were constructed for this study. Four teachers and 120 students were involved in the experiment. All students were given the same explanations and demonstrations, but some had instruction sheets while others had only specifications. The classes were balanced against each other according to numbers, classification, and homogeneity.

Results of statistical treatment showed that for a group of this size any average gain in points higher than 4.567 would be significant. In this study the average points gained in favor of the group using the instruction sheets was 13.401, which was highly significant.

The author concluded that instruction sheets in mechanical drawing were of value when used as a supplement to demonstration methods.

SCHAFER, RUBEN JOHN (184)

A Survey of the Industrial Arts Shop Libraries in the Public  
Junior and Senior High Schools Located in the Western Half of  
Wisconsin (1934)

Data for this study were collected by personal visits to  
65 industrial arts shops in western Wisconsin.

Results showed that 46 per cent of the shops kept the  
books in closed cabinets, 32 per cent kept them on the  
teacher's desk, and others kept them in a tool room, teacher's  
office or on open book shelves. There was no definite appro-  
priation for library use in 45 per cent of the shops. Book  
selections were made by the instructor in 86 per cent of the  
shops and in 100 per cent he was in charge of the books. No  
system of cataloguing was used in 37 per cent of the shops.  
Books were loaned for outside use by 81 per cent of the shops.  
In 71 per cent of the shops the libraries were kept locked  
when the instructor was absent. One instructor owned 80 of  
the books in the shop library and 77 per cent of the instructors  
owned some of the books.

Students showed more interest in periodicals than in  
books in 78 per cent of the shops. In 16 per cent of the  
shops there was trouble with books and periodicals disappearing.  
There were 356 different titles of books and 26 different  
periodicals found in the 65 shops included in this study.

SCHELL, HENRY THEODORE (185)

## Comparative Cost of Teaching Industrial Arts in Iowa (1931)

This study was made in 40 cities selected for geographic distribution and range in population, the range being from 150 to 8,000 persons in the city. The data were collected by questionnaire and from the annual reports in the state superintendent's office for the year 1929-1930.

Results showed that the cost of teaching industrial arts was \$0.2039 per pupil-hour compared to \$0.1334 per pupil-hour for all other subjects. This was a difference of \$0.0705, or 52 per cent higher per pupil-hour for industrial arts than for other subjects. In most cases, in the cities where the cost of teaching industrial arts was found to be high, the cost of teaching other subjects also was found to be high and vice versa.

The author concluded that the cost of teaching industrial arts was higher because instructional cost was higher due to small classes, the equipment was expensive, the floor space was greater per pupil, and in many places the course was poorly administered.

SCOTT, CHRIS NELSON (186)

Production and Maintenance Work as Industrial Arts Content  
(1938)

Information for this study was collected by personal visits to schools and by interviews with graduate students at Iowa State College.

Results showed that some production work was carried on in most of the school shops included in the study. In general, the quantity of production work in any one school was quite small, but it was more prevalent in the smaller schools. School furniture and athletic equipment were the most common production projects. Industrial arts instructors were not enthusiastic for production and maintenance work, and they believed that industrial arts equipment was not adapted for production work. They believed that production work was better suited for use in vocational training situations than as content for industrial arts courses. It was generally difficult to sustain interest in production and maintenance projects. In many cases the use of pupils for production and maintenance did not prove economical. The teachers believed that proper use of production and maintenance activities called for careful analysis of the content and careful planning of the presentation and administration of the problem.

SCHUBERT, WILLIAM HAROLD (187)

Evaluation of Home Mechanics Content Based Upon a Survey of  
Jobs Done in the Home (1934)

Material for this study was gathered by personal interview at 100 homes in Ames, Iowa. Ninety-four of the 100 consented to answer the questions. There were 126 items on the checklist, and also two direct questions. One question was, "Do you do some of your own repair work?" and the other question was, "Do you feel that a course in home mechanics has a place in an industrial arts program?" To the first question, 91 per cent answered yes and to the second question, 100 per cent answered yes. After the 126 checklist items there was a space to check if the person had done the job within the last two years and another space to check if the person felt the item should be included in a course in home mechanics. There was a strong similarity between the two checks.

The survey indicated that people were interested in education of a practical nature and that they felt a course in home mechanics would be a valuable course to include in the industrial arts curriculum.

## SHAW, LYLE JAMES (188)

Rating Two Automobile Laboratory Textbooks on  
Vocabulary Load and Sentence Structure (1940)

The two textbooks used in this study were "The Gasoline Automobile" by Elliott and "Automotive Service" by Kuns.

Following is a break down of the results.

	Elliott	Kuns
Technical words	331	148
Difficult words	443	224
Frequencies listed	4330	1965
Not found in Winston's Simplified Dictionary	17	7
Not in Thorndike's List of common words	23%	34.2%
Average length of sentences	22	22
Simple sentences	55%	48%
Compound sentences	7%	6%
Complex sentences	38%	46%
Dependent clauses	51	83
Average phrases per sentence	3.68	3.1

The vocabulary in the "Automotive Service" textbook seemed to be more suitable for high school seniors than that in "The Gasoline Automobile" textbook.

SHERMAN, ALLEN JOHN (189)

Learning Content in Violin Making for Industrial Arts Students  
(1940)

A detailed history of the violin with pictures made up the major part of this study. The author believed that violin making was a worth while industrial arts activity because it gives the student an opportunity to gain knowledge of historical research, to grow in appreciation, to increase his ability to plan constructive projects, and to develop desirable attitudes.

SHERMAN, WILLIAM MARION (190)

Certification of Industrial Arts Teachers in the  
United States (1939)

Data for this study were compiled from information received by a personal letter to the Superintendent of Public Instruction of each state in the United States.

Results showed that the number of years of college training required for industrial arts teachers in the United States varied from two years to four and one-third years. The number of semester hours of industrial arts work a teacher must have had in college in order to teach the subject varied from six to  $53 \frac{1}{3}$ . The number of semester hours in education varied from none to 29. Practice teaching hours varied from none to 12 semester hours. In some states requirements were very low while in others one must attend a college in that state.

The author recommended that the states should work toward uniform requirements for certification of industrial arts teachers.

## SIMMERING, LAWRENCE FREDERICK (191)

Student Interest In and Parental Attitude Toward Industrial  
Arts in the Ames Public Schools (1946)

Information for this study was gathered by check sheets on which both students and parents evaluated 61 units of work which might be offered in a school.

Results showed that both students and parents ranked instruction in automobile driving at the top of the list, placing it far ahead of any other unit. Parents evaluated units and courses relating to the home second in importance. Girls indicated greatest interest in the graphic arts and craft units, while the boys placed mechanical units near the top of their lists. From the results of the study a recommended course for each grade was outlined.

## SISSEL, FORREST DALE (192)

Analysis of Related Information on Printing for Students of  
Industrial Education (1941)

Information for this study was gathered by a check sheet which was sent to the 77 schools in Iowa and Wisconsin which offered printing as an industrial arts or vocational education course.

Results showed that the teachers generally agreed that related information was very necessary in the teaching of printing. General information, as well as that of history and trade information, was considered to be of much importance. Most teachers agreed that emphasis and time spent on related information in printing should be doubled, but a set course would be both cumbersome and useless in many systems where the department must produce job work for the school system.

SMITH, FREDRICK MARTIN (193)

Evaluation Survey of Industrial Arts Laboratories in  
Northwest Missouri (1938)

Data for this study were compiled by making a personal visit to 26 schools in Northwest Missouri. The study included two snapshot views of each of the shops visited.

Results showed that 50 per cent of the shops were well located in the wings of the buildings, and 57 per cent were desirably located on first floor levels. Thirty-three per cent of the single doors and 45 per cent of the double doors were objectionable because they swung into the shops. Fifty-two per cent of the single and 45 per cent of the double doors were desirably equipped with glass. Forty-six per cent of the floors were concrete. Work areas in order of frequency were: woodwork, finish room, drawing, sheet metal, and recitation. Woodworking was allotted the greatest amount of space. Fifty per cent of the shops had desirable natural lighting, 65 per cent had desirable wall colors, 34 per cent had dark woodwork, and 50 per cent had ceilings too low. Eighty-four per cent of the shops had windows with clear glass, 73 per cent had no window shades, 64 per cent had no reflectors, and wattage was inadequate in all shops. Forty-six per cent of the shops had master switches. Thirty-four per cent of the shops used enclosed tool panels, 23 per cent used tool rooms, 93 per cent had first aid kits, 11 per cent had fire extinguishers, 14 per cent had metal waste containers, and 76 per cent had no locker provisions.

SMITH, IVAN WALTER (194)

Nature and Extent of Elementary Industrial Arts in South Dakota  
(1937)

Data for this study were compiled by analysis of 15 courses of study and by interview with classroom teachers, supervisors, and county superintendents.

Results of the study showed that the state course of study for elementary schools was used by nearly all rural and small town schools. Ninety-five per cent of the schools used the six weeks achievement tests based on the state course of study and practically 100 per cent used the final tests. Five out of six of the largest independent school districts of the state used either the state course of study for elementary schools or a printed course of their own which closely followed the state course. The Rural Educator published summaries as well as tests of the work to be covered each six weeks. The industrial arts outlined in the industrial arts course in the South Dakota course of study is not the extent of the industrial arts being taught in the elementary schools of the state. A total of 1,802 items of an industrial arts nature were found in the state course in other fields. Eight hundred and sixty-five items of an industrial arts nature were found in the fused social studies program, 141 industrial arts items in science and hygiene, 345 items in art, 218 in history, 221 in geography, ten in arithmetic, and two in English.

## SNOOK, LORING FRANKLIN (195)

A Survey to Determine the Need for a Distributive, and Trade and Industrial Education Program in Ames, Iowa (1941)

Information for this study was gathered by personal interviews with the employers in the various business establishments in Ames, Iowa. Two hundred and sixty-five businesses were included in the study.

Results of the study showed that 83.4 per cent of the employers believed the public schools should cooperate with business and industry in the vocational training of workers in Ames. Thirty-three of the establishments had an organized training program. Sixty per cent of the payroll jobs required a definite training or learning period.

It was concluded that labor turnover in Ames was sufficient to facilitate the inclusion of a vocational program built around local needs. These needs were listed as proprietary persons, skilled workers, sales persons, and office and clerical workers.

STAPHER, ELMER FREDERICK (196)

Status of Aviation Instruction in Teacher Education Programs  
in the United States (1946)

The book "A Guide to Colleges, Universities and Professional Schools in the United States" was consulted and it showed that 148 institutions had aeronautical programs. These institutions were asked to send their latest catalogs. All major airlines and the United States Civil Aeronautics Administration were consulted with reference to research work concerning aviation education.

Results showed that 56 per cent of the schools teaching aeronautics were junior colleges. Fifty-six per cent of all the schools teaching aeronautics had an enrollment of less than 1,000 students, and 78 per cent had less than 2,000. Twenty-eight per cent of all the colleges offered a course in radio and communication, 80 per cent offered navigation, 99 per cent taught by the use of the theory method, while 57 per cent taught shop practice as well as theory.

Flying was more prevalent in the programs of the junior colleges than in the programs of the arts and science and teachers' colleges. The junior colleges appeared to be more vocational-minded than the other schools. Science and mathematics were two of the most important prerequisites of a course in aeronautics.

STEINHOFF, GEORGE LESTER (197)

Methods of Storing Woodworking Project Materials in the  
Industrial Arts Laboratory (1940)

This study was carried on mostly by mail on a nation-wide basis. Many drawings of storage lockers were included in the study.

Results showed that the teachers rated metal storage cases most satisfactory, with wood as a second choice. One door should cover a group of compartments for each class in the junior high school, but for senior high, individual doors were preferred. The doors should be hinged at the side with master key locks provided. Storage compartments should be finished both inside and out, they should be fireproof, and there should be provisions for ventilation. The compartments should all be approximately the same size, with a few that are larger to take care of large pieces. A good average size compartment was two feet by two feet by two feet six inches. The storage lockers should be located within the shop.

## STERLING, WILLIAM HOPKINS (198)

An Analysis of Woodfinishing Books Used in Schools for  
Determining a Reading Vocabulary in Woodfinishing (1937)

Data for this study were compiled by tabulation of all words in the first eight lines of each page from nine different books on woodfinishing.

Results showed that the investigation included a total of 158,669 running words. There were 6,527 different words, 27 different abbreviations, seven different symbols, and ten different figures. There were 2,190 words, with a frequency of five or more, used by three or more authors. One thousand and five words with a frequency of 18 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 503 words, or 50.04 per cent, did not occur on either list.

The author concluded that the Ayres and Thorndike lists did not form adequate vocabularies for students of woodfinishing classes.

STILES, FRED DELMAR (199)

A Critical Analysis of Objective Woodworking Test Questions  
Used by Illinois Industrial Arts Teachers (1936)

Eight textbooks and four magazine articles were analyzed to determine rules for the construction of test items in order to secure criteria by which objective type questions could be checked. All available objective type tests were secured from schools in Illinois located in cities of more than 5,000 population, with the exception of Chicago and Joliet. A total of 2,297 objective type questions were checked with the criteria.

Results showed that a total of 1,207, or 52.5 per cent, of the questions contained errors. Some of the general rules for construction of test questions were: use large number of items, avoid ambiguity, and answer to one item should not depend upon preceding item. True-false rules were: use less than 20 words in item, avoid determiners, avoid items which are partly true and partly false, use approximately an equal number of true and false items, and do not use negatives to change a true item to false. Multiple choice rules were: use four or more responses, and all responses should be plausible. Completion rules were: make response call for single date, word or short phrase, and avoid using too many blanks in a sentence. Matching rules were: use ten to 15 items, and have excess of statements in one column.

STONE, LEONARD ALFRED (200)

A Course of Study in Driver Education Based Upon an Analysis  
of Traffic Accidents in Arizona (1941)

Data for this study were compiled by reviewing and analyzing the motor vehicle accidents for the years 1937, 1938, and 1939.

Results showed that the collision of one or more vehicles was most frequent in occurrence. The non-collision type of accident was the most frequent fatal accident, or about 40 per cent of the total. Saturday and Sunday were the days when the greatest number of accidents occurred. The majority of all accidents occurred in daylight, but a large number of fatal accidents, 44 per cent, occurred at night. Accidents occurred more frequently between the hours of five and nine p.m. Sixty per cent of all fatal accidents occurred on state highways, and accidents were more numerous on straight-of-ways. Ninety per cent occurred on roads where no defects were reported and 80 per cent occurred during clear weather conditions. Poor brakes were the most frequent defect reported, but no defect was reported on cars involved in 80 per cent of the accidents.

Pedestrian accidents showed that 33 per cent were struck while crossing streets or roadways between intersections. One out of four pedestrians killed by an automobile were under the influence of liquor.

SUHLING, AUGUST FRED (201)

The Efficiency of Student Printers in Hand Composition  
Under Various Light Intensities (1935)

Data for this study were compiled by observing student printers working under various light intensities from three foot-candles to 25 foot-candles. Two exercises were used, one a motor exercise, and the other a copy exercise.

Results showed that an increase in light intensity, where it was not necessary to read, did not increase production in hand composition by any appreciable amount. However, when copy was used, there was a definite increase in production as the light intensity was increased. The greatest light used in the experiment was 25 foot-candles so it was not known if production would be increased with more light. A check to see if the exercises were of equal difficulty was made by having them all composed under a constant light intensity of 12 foot-candles, and the scores were very close together.

SUTTON, FRANCIS ALBERT (202)

A Reading Vocabulary for Rural Industrial Arts Classes Based  
On An Analysis of Farm Shop Publications (1936)

Data for this study were compiled by tabulation of all words of the first six lines on every page of nine publications on farm shop work.

Results showed that the investigation included a total of 105,627 running words. There were 4,895 different words, 19 different abbreviations, 16 different symbols, and 381 different figures. There were 2,187 words with a frequency of five or more, used by three or more authors. One thousand and eighteen words with a frequency of 18 or more were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words and 507 words, or 50 per cent, did not occur on either list. Fifty-seven per cent did not occur on the Ayres list, and 62 per cent did not occur on the Thorndike list.

SWANSON, EDGAR PETER (203)

Prediction of Achievement in Technical Service Courses at  
the Iowa State College (1944)

This study was undertaken with 841 trainees in the Naval Electrical School at Iowa State College in 1943. Test scores were available in the following fields: general classification, mechanical aptitude, English, mathematics, and spelling. These scores were from tests which were taken at the time of entering the Navy.

Results showed that each test individually seemed about equally effective in predicting the final grade average, with the single exception of the spelling score where the predictive value was much less. It was found that by using all test scores and the regression equation, the final grade average could be predicted within seven points in about two-thirds of the cases.

TAYLOR, CYRUS BYRDART (204)

Home Planning as an Industrial Arts Activity (1940)

Home economics and architectural drawing texts were selected, and from them two check sheets were developed -- one to apply to home owners, and another to apply to architects and general contractors. The answers of a total of 75 home owners and 25 architects and general contractors were tabulated for this study.

Results showed that the home owner in the small-house class took an active part in the building of his own home, and, therefore, a course should be given to help him do better the desirable activities that he would do anyway. The experts felt that the home owner took a more active part in the building of his home than he was intelligently able to take. A course in home planning would be an advantage as a means of increasing the consumer understandings of the prospective home owner. Both groups believed that a home planning course would have more value if it were presented to out-of-school adult classes rather than to high school students. Such a course should teach the owner to sketch floor plans, investigate cost factors, appreciate good construction, and make intelligent decisions as to placement of equipment and the choice of materials and fixtures.

## THIEDE, ALFRED LOUIS (205)

A Determination of Methods and Practices to be Recommended in  
the Giving of Demonstrations to Industrial Arts Shop Classes  
in the Junior High School (1933)

Material for this study was gathered by questionnaire. One hundred and fifty were sent to men in institutions of higher learning and 145 were sent to industrial arts teachers. Of the 295 which were sent out, 195 responses were received.

Results showed that the demonstration method of teaching was used most frequently for shop instruction. In the demonstration the teacher should use tools like the student will be using but he should not use a student's work when demonstrating the next step. In general it was considered a good plan to use printed material to supplement the demonstration. If no printed material had been prepared, it was considered advisable to put an outline on the blackboard so the student would have some written order of procedure when he returned to work. Demonstrations should not often exceed ten minutes in length and also there should not be more than one during a period of one hour. The demonstration should come before the learner has tried to perform the operation and the pupil should understand why, as well as how, the operation is done. The inexperienced teacher should go through all demonstrations before attempting to present them to a class. Demonstrations may come any time, but near the beginning of the period was preferred. The instructor should ask questions

over the demonstration to see if it was clear, and also a brief summary was desirable. The learner should be made to feel free to ask questions during a demonstration. The instructor should face the learner and comments should be given along with the demonstration. Related material which is not necessary for doing the work being taught should be given at some time not connected with the demonstration. Details as well as major steps should be taught. It is advisable at times to let the learner help with the demonstration. The instructor should clean up and put away tools and materials which he has used in the demonstration.

THOMAS, EDWARD RUSSELL (206)

History and Characteristics of Period Furniture Styles  
(1940)

The material for this study was secured by contacting various libraries, industrial establishments, furniture dealers, museums, publishing houses, and antique shops. Discussions were arranged in four main groups, namely, American, English, French, and miscellaneous styles.

Results showed that oak, walnut and mahogany have been the main furniture woods, and mahogany was the favorite cabinet wood. Some styles were named after craftsmen, others after monarchs, and others after historical eras. Many styles were known by more than one name. There was considerable overlapping so that features which were common to one style were also common to other styles. Shapes and designs of legs and chair backs, and decorative motifs were the distinguishing features in practically all the styles. The most popular piece in all the styles was the chair. Almost from the beginning of furniture history there seems to have been a constant desire to produce pieces lighter in weight and still maintain adequate strength.

THOMPSON, FRANKLIN HALSTEIN (207)

The Functioning of the Art Knowledge of Junior High School Pupils and Teachers in Industrial Arts Classes (1940)

Thirty-one photographs of woodworking projects were selected from actual projects made in the shop and from textbooks ordinarily found in an industrial arts shop library. These were submitted to a jury of seven men well known for their work in the field of design. The judges were asked to rate the photographs according to their aesthetic ideas with special reference to design. The same photographs were also presented to eight teachers of industrial arts, and to 250 junior high school boys in six representative towns who were enrolled in an industrial arts class.

Results showed that the per cent of agreement between the composite pupil ratings and the judges was 40.59 per cent.

The author concluded that junior high school pupils appreciate, in a small degree, the aesthetic possibilities of industrial arts activities, that the pupils' appreciation of the aesthetic is largely determined by natural interest and apparently not by industrial arts instruction, and that the great similarity of some projects which were constructed by the boys seemed to indicate that pupil interest was not greatly considered by industrial arts instructors.

## THOMPSON, JAMES WILLIAM (208)

Value of the Master of Science Program in Industrial Education  
at the Iowa State College as Rated by Former Students  
(1949)

Data for this study were collected by means of a checklist which was mailed to each person living in the United States who had completed the Master of Science program at Iowa State College between the years 1933 and 1948 inclusive. One hundred and sixty-two checklists were sent out and 123, or 75.9 per cent, were returned.

Results showed that a majority of the respondents reported the following reasons had greatly influenced their decisions to take the Master of Science program in industrial education: to increase earning power, to become a more effective teacher, to qualify for a better position, to provide for greater security, to insure speedier advancement, to qualify for supervisory work, and to qualify for administrative work.

A high degree of satisfaction with the Master of Science program was expressed by 70 per cent of the respondents. Moderate satisfaction was expressed by 26 per cent, and dissatisfaction by 1.6 per cent. Seventy-nine and seven-tenths per cent indicated that their graduate work had paid off in terms of increased earning power. Increased job satisfaction resulting from graduate work was reported by 91.9 per cent. The requirement of a thesis was favored by 46.3 per cent while 48.8 per cent were not in favor of the thesis requirement.

THORSON, OSCAR MARTIN (209)

Technical Information for Junior High School Woodworking  
(1939)

The author used several textbooks to select 275 wood-working facts. These facts were presented to a jury of ten industrial arts teachers who rated them under one of three headings: most important, less important, and least important. The facts receiving a percentage score of 70 or more by the jury were listed in table form in the study. The tables covered several pages so it was impossible to include them here, but they were well worth the attention of any one preparing to teach woodworking in the junior high school.

VAN EMAN, ROBERT FRANK (210)

Content of a Course in General Metalwork for High Schools  
(1937)

A group of graduate students at Iowa State College helped the author select 20 common metalworking textbooks from which the course content was selected. Each book was read carefully and the content divided under one of the following seven headings: equipment, instructional units, metals, projects, supplies, tables, and tools.

Results showed that 15 of the books listed a total of 64 items of equipment. Seventeen books included discussions about 114 tools. Thirteen of the books contained information about 71 metalworking supplies, and seven books had information about metal. Eighteen of the books listed 735 projects. Seven of the books contained 41 tables, and 16 of the books included 31 units of instruction. All these items were listed in table form in the study.

VANOVER, HOWARD LEE (211)

Safety in Fifty-five Industrial Education Shops in Montana  
(1949)

A personal visit was made to 55 school shops located in 24 towns of 22 counties in the state of Montana. The visit was made while classes were in session and the data were collected by means of a check list.

Results showed that 80 per cent of the instructors had restrictions on machines for ninth-grade pupils, but none restricted the use of machines in the eleventh or twelfth grades. Color dynamics was employed in 13 per cent of the shops, five per cent had marked danger zones, and four per cent had a means to prevent slipping at the machines. Only 40 per cent of the grinders had adequate guards and 40 per cent of the tool rests on grinders were in improper adjustment. Forty-seven per cent of the shops had all machines fastened to the floor and 95 per cent of the machines were individually motor driven. Twenty-one per cent of the circular saws had guards on them, and 46 per cent had push sticks available. Ninety-one per cent of the jointers had guards provided, and 78 per cent had a push stick available. Wheels on all band saws were well guarded but the blades on 34 per cent were dull. Neither goggles nor eye shields were available in 18 per cent of the shops.

Fire drills were practiced in 96 per cent of the shops but four per cent were without fire extinguishers.

## VAN TRIES, ROBERT PERSHING (212)

Some Implications for Industrial Education Based Upon  
the Background of Boys at the Minnesota State Training School  
(1947)

Information for this study was obtained by personal interviews at the Minnesota State Training School for Boys at Red Wing, and from the records of the school.

Results of the study showed that of the 278 boys, 193 had previous records. Larceny accounted for about one-third of the crimes. Of the 278 boys, 205 smoked, 41 drank, 25 engaged in immoral practices, and 24 gambled. Nearly all the boys attended movies and 62 attended dances. Sixty-eight boys belonged to the Boy Scouts, 29 to the Y.M.C.A., 15 to 4-H clubs, and 23 to community clubs. Over half the boys admitted roaming the streets at night, and 55 belonged to gangs. Seventy-five boys said they attended church regularly and 39 others attended often. Two hundred and fourteen of 352 parents had below an eighth-grade education, and only six were college graduates.

The author recommended that since nearly all boys make use of the movies for recreation, parent-teacher and educational associations do more to promote good, clean movies. The school should do more in sponsoring dances and other activities. Industrial arts teachers should promote home workshops and hobby clubs, and churches should help in promoting Boy Scouts and other clubs.

VOTH, JOHN J. (213)

An Analysis of Mechanical Drawing Text-Books Used in Iowa High Schools for the Purpose of Determining a Reading Vocabulary for Mechanical Drawing (1933)

Data for this study were compiled by tabulation of all words of the first five lines of every page of the most commonly used textbooks in mechanical drawing.

Results showed that the investigation included a total of 102,042 running words. There were 4,702 different words, 95 different abbreviations, 9 different signs, and 528 different figures. Of the 102,042 words, 1,425 had a frequency of five or more. The word used most frequently was "line" and it was used 1,241 times. The fact that 64.2 per cent of the 1,000 words used most frequently did not occur in the Ayres list, and 65.4 per cent of these 1,000 words did not occur in the Thorndike list of 1,000 commonest words in the English language was evidence that these two lists were not valid word lists for mechanical drawing.

WAHTERA, KAUKO ALEXANDER (214)

## Industrial Arts Policies in the State of Michigan (1941)

Data for this study were compiled from questionnaires which were returned by 137 schools in the state of Michigan.

Results showed that the general shop was preferred by an overwhelming majority as the best type of shop for the junior high school, and about 33 per cent also liked the general shop program for high school students. The unit shop program was found in over half of the schools, and 75 per cent of the teachers thought that it was more advisable for the larger cities. The 60-minute period seemed to be the most common length in both junior and senior high school. Seventy per cent of the teachers thought it was the correct length for junior high but senior high needed more time. Industrial arts was taught from the fourth to the twelfth grades in the various schools, but it was offered most frequently in the ninth and tenth grades. Seven out of eight teachers used some type of pupil personnel organization. Seventy-five per cent of the shops were operated at a loss, and the loss was made up by the board of education. Sixty per cent required payment in full before the project could be taken home. The central office handled all money in 42 per cent of the schools and in the others the instructor was responsible. About half the instructors bought their supplies by the year while the other half bought supplies as needed. Seventy-five per cent of the

teachers loaned tools to other departments. Approval of the superintendent or principal was required before work of other teachers was begun in the shop in 50 per cent of the schools. Seventy per cent of the teachers allowed pupils to work in the shop after school, and 50 per cent allowed outside groups to use the shops. As a safety precaution, 60 per cent of the teachers required students to ask permission to use power machinery, 30 per cent required to students to pass a written test on the machine, 25 per cent required shop aprons, and 50 per cent required sleeves to be rolled up. Forty per cent of the teachers used procedure sheets and 51 per cent used instruction sheets.

The writer concluded that there was need for more uniformity in the industrial arts program, and also that teachers should become more aware of the objectives, concepts and trends in industrial arts education.

WARNER, MARION E. (215)

Recommended Practices in the Use of the Project Method in  
Teaching High School Industrial Arts (1933)

Data for this study were collected by a questionnaire sent to high school and college industrial arts instructors. Of the 300 questionnaires sent out, 203 were returned.

Results showed that the two groups of instructors did not agree on whether part of the industrial arts course should be devoted to production work. The college instructors were in favor of some production work but the high school instructors were not in favor of production work in industrial arts classes. Both groups agreed that pupils should be given preliminary practice in the use of tools where there was danger of spoiling materials. The industrial arts pupil should design his own projects with aid or suggestions from the instructor. Pupils should be required to make out a bill of materials but they should not be required to keep a record of each day's work, and it is doubtful if they should be required to make a written review of their project upon completion.

Pupils should receive training in judgment through judging the work of other pupils. They should choose their projects from groups recommended by the instructor with permission to substitute another project of similar nature if they desire. Pictures and completed projects should be used in suggesting

projects, and pupils should make their own working drawings. The pupil should have as one objective the learning of operations and tool processes. Major emphasis should be placed on correct methods, and demonstrations probably should not be given to the entire class unless all pupils have an immediate need for the information. Jigs and machines should be used after the pupil has learned to do the operation by hand. Most instructors, 92.7 per cent, were in favor of some type of exhibit. In grading, the following should be taken into consideration: accuracy and quality of workmanship, quality of thinking and planning, and improvement in ability.

WASS, LEWIS EMERY (216)

Evaluation of Safety Factors in the Industrial Education  
Shops of Davenport (1946)

Four separate codes and standards were used as criteria to evaluate the safety factors involved in 20 school shops in the Davenport system.

Results showed that under the school section of the Iowa Code there were no substandard conditions in the school shops, but according to the industrial section of the Iowa Code there were 58 substandard conditions, and under the Industrial Code of Wisconsin there were 68 substandard conditions. The fourth standard, the insurance regulations, pointed to 291 substandard conditions. This showed one thing in particular, that the school section of the Iowa Code was far from adequate since 291 substandard conditions would require correction before full insurance coverage could be secured if operated by private industry.

The author concluded that the code should be rewritten, uniform accident reporting should be required, class demonstrations on the use of fire extinguishers should be required, and a safety course should be required in teacher-training institutions.

WEBER, RALPH EDWARD (217)

Review of Literature Dealing with Related Subject Matter  
Information for Junior High School Woodworking (1940)

Information for this study was gathered from books, periodicals, government bulletins, manufacturers' pamphlets, and theses.

Results showed that the topics referred to most frequently concerning wood and lumber were those regarding heartwood, sapwood, annual rings, seasoning, and grain. Those topics referred to only occasionally were concerned with veneers, plywood, forests, conservation, and bill of materials. Concerning paints and finishing materials, the topics referred to most frequently were stains, shellac, care of brushes, fillers, turpentine, and linseed oil. The least mentioned items were spray guns, abrasives, lacquer thinner, and paint and varnish removers. Concerning fastener information, nails and screws were referred to most frequently. Glue and abrasive papers were the miscellaneous items referred to most often.

The study contained a suggested reference list for three different size budgets, and also the publisher and cost of each reference.

WHIFFEN, URIDGE GLENN (218)

Training Course in Boiler Repair for Railroad Apprentices  
(1930)

Information for this study was gathered from the author's personal experience as an apprentice and journeyman, from courses taken in undergraduate and graduate college, from teaching experience, and from reading in the field. The purpose of the course was twofold: first, to give the tradesman suggestions about teaching his subject, and second, to give carefully worked-out information and job sheets which he could place in the hands of the apprentice.

The author first analyzed the railroad boilermaker's trade and then gave operation and information sheets on the following topics: staybolts, rivets, patches for fire boxes, side sheets, front flue sheet, back flue sheet, boiler tubes and flues, repairing small cracks, chipping and scarfing.

WHITE, HENRY ANDREW (219)

Correlation Between Mechanical Aptitude and Information  
Relating to Automobile Mechanics (1940)

Results of this study indicated that the Stenquist Mechanical Aptitude Tests I and II, and the Detroit Mechanical Aptitude Test for boys would prognosticate probable success in Auto Mechanics with some degree of accuracy. The Otis Self-Administering Test of Mental Ability and Reed's Midget Wiggly Block Tests were not considered satisfactory for this purpose.

WICK, SVERRRE K. (220)

A Machine Shop Course for Junior Colleges (1938)

Information for this study was gathered by a personal visit to the machine shops of seven colleges and universities located in the Middle West.

Results showed that a shop containing 2,500 square feet would be large enough for a class of 15 students. Equipment should include ten lathes, two milling machines, one sensitive drill, one radial drill, one universal grinder, one bench grinder, one shaper, one planer, one turret lathe, one power saw, one vertical milling machine attachment, two draw-in chuck attachments for lathes, two four-way tool posts for lathes, and one internal grinding attachment. Lathe work should be the backbone of the course, but other machines should not be neglected. Production work should be included in the course, especially for mechanical engineers. Exercises were justifiable when the time was short. Engineering machine shop instructors should have, in addition to ample trade experience, the equivalent of a four-year engineering course and some teacher training.

WIEVEL, BERNARD FIDELIS (221)

## Preparation and Duties of Iowa Industrial Arts Teachers (1943)

Material for this study was secured from the Uniform Report of Teachers Qualifications 1940-1941, Iowa Educational Directory 1940-1941, Official Register for Iowa 1941-1942, and Iowa Department of Agriculture Compilations of County Statistics.

Results showed that there were 776 teachers of industrial arts in 625 Iowa communities. Thirteen per cent of this group held the Master's degree and 75 per cent of those degrees were granted by Iowa colleges. Teachers with the Master's degree had fewer subject combinations than those without. Thirty-three per cent of the industrial arts teachers held majors in industrial arts. This group tended to teach in the larger schools and also tended to draw higher median salaries than the teachers who held an industrial arts minor. Salaries of industrial arts teachers were found to be significantly related to size of the school, years of experience, hours of industrial arts education, amount of college education, number of subject combinations, and density of population within counties. Seventy-six per cent of the industrial arts teachers were educated in Iowa, and less than half had done any summer school work since graduating. Industrial arts combinations with science, physical education, and agriculture were the most common.

## WILLIAMS, AMOS GRANT (222)

## An Analysis of Textbooks in Photography to Determine a Reading Vocabulary for Students of General Photography (1936)

Data for this study were compiled by tabulation of all words in the first six lines of every page of 12 textbooks of general photography.

Results showed that the investigation included a total of 101,086 running words. There were 4,182 different words, 18 different abbreviations, and seven different symbols. One thousand, one hundred and twelve words, with a frequency of five or more, were used in comparison with the Ayres and Thorndike lists of 1,000 commonest words in the English language, and 617 words, or 55.4 per cent, did not occur on either list. Also, 164 words did not occur on the Thorndike list of 10,000 commonest words. Since so many words did not occur on the common word lists, it was concluded that the common word lists were not adequate for classes of general photography.

## WILLIAMS, BURTON THOMAS (223)

An Analysis of Fifty Courses of Study in Junior High School  
Woodwork (1936)

Information for this study was gathered by sending 325 questionnaires to schools throughout the United States. Only a relatively small number of schools have courses of study available for sending.

Results of the study showed that courses were usually made up by committees of classroom teachers. A large percentage of the courses needed to be revised and brought up to date. It was common practice to include an introductory statement and objectives of the course. Teaching procedures were very limited and of questionable value. The courses devoted very little space to the subject of tests and measurements. Individual differences were being recognized and courses were providing methods for adapting instruction to individuals. Textbooks, reference books, and instruction sheets were being used to a considerable extent as teaching aids. The problem of supplies and equipment was receiving considerable attention. The organized outline was the most widely used form and most of the courses were mimeographed. The length of courses varied from an outline of one page to 171 pages.

## WILLS, WILLIAM WELCOME (224)

## Changes Occurring in Industrial Arts Departments of Certain South Dakota Public Schools from 1929 to 1934

Data for this study were gathered by personal interview with the superintendents of 17 schools located in cities of more than 2,000 population.

Results showed that over the five-year period there was a decrease of 6.7 per cent in the number of schools offering industrial arts. The average teaching experience increased 29 per cent during the period. More than 75 per cent of the teachers had college majors in industrial arts throughout the study. There was no significant change in the type of industrial arts offered. Woodwork and drawing courses were in the majority during both years. The teaching load of industrial arts teachers increased an average of 14 per cent, and class size increased seven per cent. Industrial arts teachers' salaries were reduced 21 per cent during the five-year period. The amount of money spent for shop and drafting equipment was decreased 78 per cent, but the amount spent for industrial arts reference libraries increased 17 per cent. The use of the single period for high school industrial arts classes increased from 40 per cent to 64 per cent during the period.

## WINTER, MAX AUGUST (225)

## Common Errors in Mechanical Drawing Technique (1931)

The data for this study were obtained by means of personal observation of 550 junior high school students in mechanical drawing classes. Tabulation was done on a sheet which contained all the errors the author expected to find.

Results showed that some of the more common errors in technique were: failure to face the vertical edge of the triangle toward the head of the T-square, to hold the pencil in a plane perpendicular to the paper through the line being drawn, to draw lines from bottom to top along the vertical edge of triangle, to support the hand on the third and fourth fingers when drawing lines with the pencil, to move the pencil from left to right when drawing lines along the top edge of T-square, to hold the pen point downward when filling the ruling pen, to turn the compass by rolling the handle between the thumb and forefinger, to draw circles and arcs with the compasses in one sweep, to incline the pencil slightly in the direction in which the line is being drawn, and failure to draw horizontal lines along the top edge of T-square. The errors listed above range from 150 for the first one down to 30 for the last. The complete list contained 40 items and includes each error that was observed two or more times.

WISE, GLENN ORION (226)

Methods of Interpreting Industrial Arts (1939)

Information for this study was gathered by a checklist rating in which 52 industrial arts instructors participated.

Results showed that the methods rating highest for interpretation of industrial arts were exhibits, hobby fairs, industrial arts publications, instructor visiting days, moving pictures, newspapers, patron visitation, and teacher contacts. The teacher, principal, and director were all to share the responsibility of interpretation. It was the duty of all school workers to be honest, informative, alert, aggressive, faithful, tactful, understandable, dignified, and use every facility to aid the people to learn about the schools. Newspapers were eager to publish pictures or news items that people will want to read. Patrons were usually more interested if the pupils wrote the news articles.

WOOD, CLEMMER R. (227)

A Scale for the Grading of Free-Hand Lettering (1929)

Three hundred and eighty-eight samples of student lettering were obtained from many different states. A jury of five, made up of four industrial arts teachers and one art teacher, classified the samples into seven groups. The author eliminated all the samples except those which each of the judges had put in the same group. The judges were then asked to select the one sample which they considered to be most characteristic of its group.

The author concluded that this sample from each group could be used as a guide in grading freehand lettering.

## WRAHLSTAD, JEROME GEORGE (228)

## Survey of the Industrial Arts Courses Offered in Public Junior Colleges of the Middle West and a Proposed Curriculum (1936)

Data for this study were collected from the catalogs of 46 public-supported junior colleges in Iowa, Kansas, Minnesota, Missouri, and Illinois. To determine what should be taught, 50 heads of departments and instructors in teacher's colleges and universities were asked what they thought a junior college should offer in the way of industrial arts.

Results of the study showed that slightly more than half of the public junior colleges of the Middle West offered industrial arts. Minnesota had the largest percentage of junior colleges offering industrial arts, while Iowa had the least. Minnesota also led with 28 for the average number of semester hours while Iowa was last with four hours. Drawing was the leading industrial arts subject taught, and it was the only subject offered in the junior colleges surveyed in Iowa.

For the proposed curriculum, authorities in teachers colleges and universities recommended that the average number of semester hours of industrial arts for junior colleges should be 16, and the order of importance of courses should be as follows: general drafting, general applied design, general woodwork, driver training, general electricity, general metals, printing, ceramics, cabinet making, and home mechanics.

WRIEDT, CECIL (229)

Trends in Industrial Arts Teacher Education Curricula from  
1929 to 1939 (1941)

Sixteen schools which were selected at random from the Mississippi Valley area were included in this study. Catalogs from the various schools were used to determine the number of semester hours of industrial arts offered during the years 1929, 1934, and 1939.

Results of the study showed that emphasis on the teaching of woodwork was being reduced while a greater variety of metal-working courses were being offered. General shop, concrete, and electricity were subjects that showed an increase in the number of hours offered. The number of schools offering general shop rose from two to nine during the ten-year period. The total number of shopwork hours showed a 35 per cent decrease while the academic course hours showed a 5.1 per cent increase. Architectural drawing and electricity showed an increase during the period while printing and auto mechanics showed a decrease in the total number of hours offered. Mechanical drawing showed a decrease during the first five years and an increase the next five year period, while free hand drawing was just the opposite. Tendencies pointed toward general courses instead of specialization.

WRIGHT, WAYNE KENNETH (230)

Sound Motion Pictures Versus Reading Material in Teaching  
Occupational Information (1941)

Students from four central Iowa high schools were used in this study. A total of 389 students participated. Two occupations, Journalism, and Radio and Television were used in the study. Some of the groups were given printed material and others were shown sound motion pictures.

Results of the study tended to indicate that printed materials were more effective in the presentation of occupational information than sound film materials covering the same facts.